Environmental Impact Assessment Report for:

„External Connection Infrastructure of the MFW Bałtyk II and MFW Bałtyk III”

VOLUME I. Summary

Gdańsk, March 2023

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1. INTRODUCTION

Introduction

This EIA Report of the Project entitled 'External Connection infrastructure for offshore wind farms MFW Bałtyk II and MFW Bałtyk III' was prepared by EKO-KONSULT Sp. z o.o. in Gdańsk on the basis of the order of MFW Bałtyk II Sp. z o.o. and MFW Bałtyk III Sp. z o.o. The Companies were established in order to prepare and execute the projects of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III, together with the necessary connection infrastructure. The projects are implemented jointly by Polenergia and Equinor.

The purpose of the planned Project is to transmit the power from the offshore wind farms MFW Bałtyk II and MFW Bałtyk III to the National Power System (KSE). The place of connection of both farms to the KSE is the 'Słupsk Wierzbięcino' substation.

The planned Project will be implemented (fig. 1 and 2):

- within maritime coastal waters, territorial sea and the exclusive economic zone within the limits administered by the Maritime Office in Gdynia,
- on the territory of the Ustka municipality, in Słupsk district, Pomeranian voivodeship,
- on the territory of the Słupsk municipality, in Słupsk district, Pomeranian voivodeship,
- within the boundaries of water bodies administered by the State Water Holding Polish Waters Regional Water Management Board in Szczecin (RZGW),
- within the limits of the competence of RDOŚ in Gdańsk,
- within the Modlinek and Pęplino Forestry Districts (Forest Inspectorate of Ustka, Regional Directorate of State Forests in Szczecinek – RDLP),
- within the closed areas of the Ministry of Defence.

Purpose and Scope of the EIA Report

The purpose of the Report is to determine the environmental consequences of the implementation, operation and decommissioning of the planned connections of MFW Bałtyk II and MFW Bałtyk III. The Report assesses the impact on the following components: people, animals, plants, sea, surface and underground waters, land surface, material assets, monuments and landscape, including cultural landscape, protected and naturally valuable areas, aerosanitary conditions, acoustic conditions, electromagnetic fields and mutual interaction between the above mentioned components.

This report on the environmental impact of the planned Project is an element of the EIA procedure - the necessity to prepare the report results from the decision of RDOŚ in Gdańsk on results from the decision of RDOŚ in Gdańsk of August 4, 2022, ref. RDOŚ-Gd-WOO.420.40.2022.AM.9. The scope of the Report was specified by RDOŚ in Gdańsk, the Director of the Maritime Office in Gdynia and the Commander of the Military Center for Preventive Medicine. The State Border Sanitary Inspector in Gdynia also expressed the opinion that an environmental impact assessment of the project should be carried out, and the report should be prepared within the statutory scope.

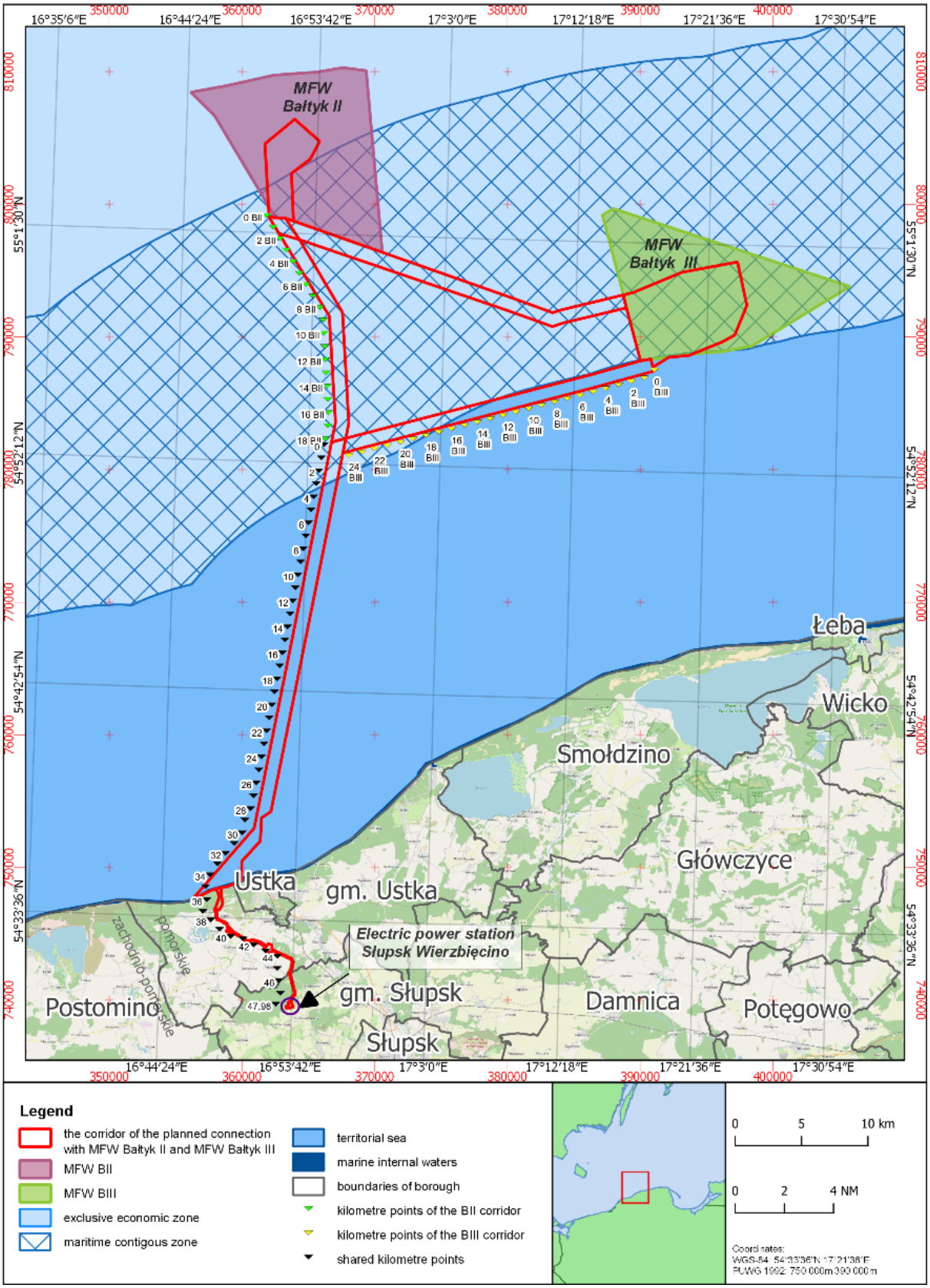

Figure 1 *Location of the connection infrastructure corridor of offshore wind farm MFW Bałtyk II and offshore wind farm MFW Bałtyk III*

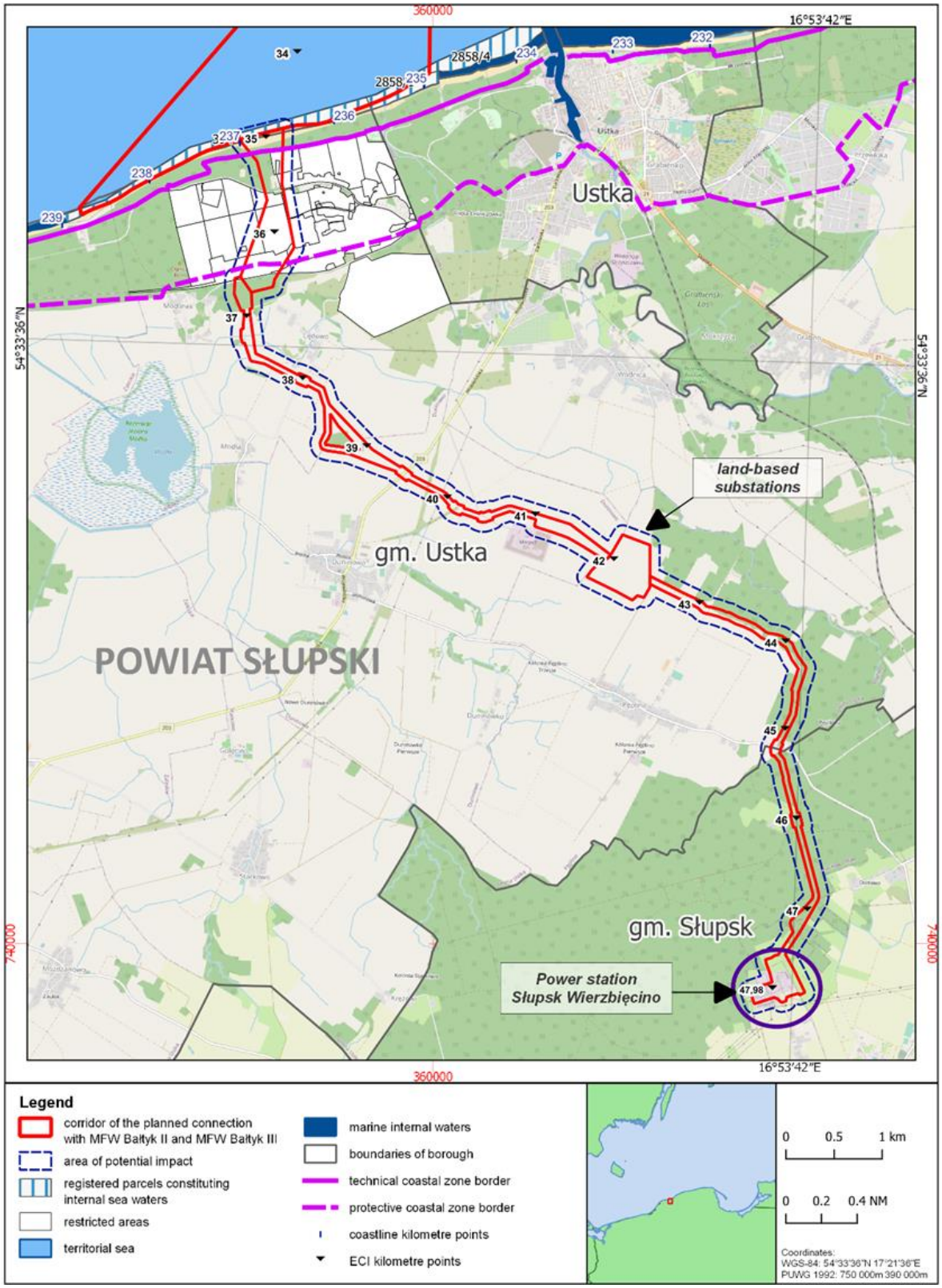

Figure 2. *Location of the onshore part of the planned Project on the background of administrative division*

Formal and Legal Aspects

The planned Project is a public purpose investment. In addition, in accordance with Article 3a of the Act of 24 July 2015 on the preparation and implementation of strategic investments in transmission networks (Journal of Laws 2022.273 i.e., as amended), the planned Project is a strategic investment in the field of transmission networks. Article 3(13) of the Act of December 17, 2020 on the promotion of

electricity generation in offshore wind farms (Journal of Laws 2022.1050 i.e., as amended). Connection infrastructure of offshore wind farms MFW Bałtyk II and MFW Bałtyk III is a set of equipment for power derivation, defined as a separate set of equipment and structures both connected and not permanently connected to the ground, including the seabed, used for power derivation from offshore wind farms.

For the offshore part, the Investor has obtained the so-called PUUK decisions (permission to lay and maintain cables), which determine the offshore cable corridor. On the onshore part, the point of reference is the connection agreements signed by PSE S.A. where the PSE Słupsk - Wierzbięcino substation is indicated as the place of reception of energy generated at sea. The decisions and conditions obtained determine the course and nature of the planned Project.

The planned Project is qualified to the so-called second category of projects, for which the need for an EIA report may be imposed by the authority. Since cable lines do not qualify for the need to obtain an environmental decision, the planned Project qualifies in connection with the need to implement onshore substations of about 8 hectares each (§ 3(1) of the Regulation of the Council of Ministers of September 10, 2019 on projects that may significantly affect the environment (Journal of Laws 2019.1839 as amended).

The Project Data Sources

The source of information about the basic parameters of the Project, necessary for the environmental impact assessment, was the data provided by the Investor:

- Technical Description of MFW Bałtyk II and MFW Bałtyk III Export System for Environmental Impact Assessment[1]. C256-EQ-A-FD-00002_02, developed in February 2022 (Technical Description),
- "Preliminary concept of onshore civil construction and cable installation works" (in original: Onshore civil construction & cable installation study. Final Concept Report. C256-EP-Z-RS-00001-C02"), prepared in April 2022 (hereinafter: Preliminary Concept).

Methodological Assumptions and Basic Sources of Environmental Data

The area covered by the marine enivironment surveys was a corridor, about 1 km wide, with an area of approximately 174.63 km^2, however the anticipated seabed interference associated with the construction phase will affect a much smaller area - i.e. a an about 5 m wide corridor per one cable.

The area covered by the onshore environmental surveys reached a total of about 15.88 km^2, while the corridor inside, where the Project will be located, is an area of approximately 1.83 km^2.

For the purposes of this Report, the working kilometre points of the corridor covered by the ED application were adopted. It should be emphasised that those are not the kilometre points of the cable, but the kilometre of the probable course of the corridor in which the Project will be located. Therefore, the kilometrage referred to in the Report is indicative. The target kilometrage of the cable lines will be the result of the further design process, which will take place in the further preparation phase of the Project.

The assumed width of the corridor allows for the avoidance of terrain obstacles that may be identified during the design stage.

The assessment of the impact on Natura 2000 areas occurring within the boundaries of the planned Project or in its vicinity was performed for species and habitats that are the subject of protection in the area, in accordance with the applicable SDF. Determining the proper conservation status of species and habitats and threats, reference was made to the following studies and documents:

- Draft Regulation on the establishment of a protection plan for the Natura 2000 area PLC990001 Ławica Słupska (https://www.ums.gov.pl/projekty_unijne/natura2000_LS/Natura_2000_LS.pdf);
- Documentation of the Plan of Conservation Tasks of the Natura 2000 area Jezioro Wicko i Modelskie Wydmy PLH320068, including:

[1] *In the original „Technical Description of MFW Bałtyk III and MFW Bałtyk III Export System for Environmental Impact Assessment"*

  - Complementary knowledge on natural habitats 6410 and 6510 in the Natura 2000 site Przymorskie Błota PLH220024, Snopowiązałka Foundation, Polkowo 2021,
  - Draft SDF update of the Przymorskie Błota Natura 2000 site,
- Order of RDOŚ in Gdańsk and RDOŚ in Szczecin of 25 September 2015 on the establishment of a conservation task plan for the Natura 2000 area Przymorskie Błota PLH220024.

2. CONDITIONS RESULTING FROM STRATEGIC AND PLANNING DOCUMENTS

This chapter refers to the international, national and regional documents that relate to offshore wind energy development strategies and formulate environmental protection objectives that may indirectly affect the manner of implementation and operation of the planned Project. The second set of documents were planning documents, providing the basis for the analysis of potential conflict and conflictogenic sites.

As part of the review of these documents, it was determined, among other things, to what extent the planned project was taken into account in strategic documents, including those relating to the country's energy and offshore wind energy development.

Strategic documents on broadly defined environmental protection and sustainable development were also reviewed, analyzing whether the planned project fits into the environmental objectives contained in the analyzed documents.

The analyzed Project is implemented under the so-called Transmission Spec Act, and therefore does not require analyzing compliance with planning documents at the local level, i.e. local spatial development plans, although these documents were used in the EIA Report in identifying spatial conditions and determining the nature of development in terms of permissible noise levels.

The implementation of the planned Project is neutral with respect to the environmental objectives set out in the strategic documents and consistent or compatible with the strategic objectives set out in these documents.

3. CHARACTERISTICS OF THE PLANNED PROJECT - INVESTOR'S VARIANT

The planned Project includes two independent electricity export systems from offshore wind farms MFW Bałtyk II and MFW Bałtyk III and, optionally, a cable connection between the offshore farms with the necessary infrastructure for their implementation and operation and, optionally, a cable connection between the offshore farms.

The Project includes the following components:

- offshore:
  - 2 AC (three-core) submarine export cables from the offshore substation (OSS) within the MFW Bałtyk II area to the landfall, each approximately 60 km long,
  - 2 AC (three-core) submarine export cables from the offshore substation (OSS) within the MFW Bałtyk III area to the landfall, each approximately 67 km long;
  - optional cable connection between MFW Bałtyk II offshore wind farm and MFW Bałtyk III offshore wind farm with a length of approx. 30 km – a corridor being a reserve for possible future laying of export cables and optical fibre;
- HDD trenchless crossing of the coastal zone with all cable lines between 236,5 and 238,5 kilometre point of the Polish seashore (according to the kilometre points of the Maritime Office);
- onshore:
  - 4 underground AC export cable sets from the landfall to 2 planned onshore substations (ONS), approximately 8 km long- 2 lines for each MFW;
  - 2 substations ONS in the area of Pęplino with a total area of 16 ha (8 ha for each);
  - 2 underground AC export cables from the ONS substation in the area of Pęplino to designated points of common coupling at the Słupsk Wierzbięcino KSE substation (Transmission substation) with a length of approx. 6 km (one line for each station).

Moreover, the Project includes the infrastructure necessary for the service of connections and offshore wind farms. i.e. fibre optic lines, which can be an integral part of the offshore cables and an access road to the substations ONS. Optionally, storage facilities may be constructed within the ONS in the next stage.

Because both planned connections are located in a single corridor on land and partially share a common route in the sea, and due to the probable implementation of both connections at the same time, it was decided to apply for a single environmental decision. The place of connection of both farms to the KSE is the Słupsk Wierzbięcino substation.

Main Parameters of the planned Project by connection from MFW Bałtyk II and MFW Bałtyk III

Parameter	Value/description	
	ECI MFW Bałtyk II	**ECI MFW Bałtyk III**
Length of the offshore connection infrastructure	approximate 60 km	approximate 67-97 km Including 30 km of connection between MFW BII and BIII
Length of the onshore connection infrastructure	approximate 14 km	
Type of offshore power cables	High Voltage Alternating Current (HVAC) multicore submarine cables	
Type of onshore power cables	Export ground cables consisting of 3 separate single-core cables in AC technology (HVAC)	
Power cable voltage between the offshore and onshore substations	220 kV	
Power cable voltage between the onshore substation and Słupsk Wierzbięcino substation	400 kV	
Maximum number of offshore cables	2 single cable lines	2 single cable lines
Maximum number of onshore cables	2 cable lines, each consisting of 3 separate single-core cables	2 cable lines, each consisting of 3 separate single-core cables
The landfall solution	Horizontal directional drilling HDD (optionally, HDD with a short section of deeper cable foundation - to the exit behind the last reef).	

Conditions for land use during the building phase

The area covered by the application for the environmental decision is a corridor within which the planned Project will be implemented. It is to be noted that the corridor covered by the application for an environmental decision is not the same as the area in which the Project will be implemented, which will be significantly smaller.

The area of direct seabed interference associated with the preparation and cleaning of the seabed and the laying of the cables will only occupy a strip of approximately 5 m for each cable and will amount to a total of approximately 1.55 km² for the 4 cable lines, which is 0.89% of the area covered by the application for the environmental decision. The estimated average trench width per cable will only be approximately 1.5 m. In addition, small sections of the bottom will be occupied periodically for vessel anchoring.

In the case of a trenchless passage using HDD technology, a short section of subsea trench 4 - 5 m deep is optionally considered (maximum length 800 m - up to the exit beyond the last reef). In this short section, the seabed intervention can be larger (in a strip of approx. 20 m per cable) and cover an area of up to approx. 0.064 km^2. This would result in a total seabed intervention area of up to approximately 1.61 km², or 0.92% of the area covered by the application for the environmental decision.

In the onshore part, the land occupation during the construction phase will be related to the implementation of the following elements of the planned Project:

- cable line landfall - construction site with a maximum land occupation of 0.85 ha;
- a construction strip of the underground cable lines with a width of approx. 30 - 32 m (widened to approx. 50 to 100 m in places of possible trenchless crossings);
- two onshore electricity substations (ONSs), each with an area of approx. 8 ha;

- an access road to the ONS substations of approximately 1.5 km in length.

Conditions for land use during the operation phase

During the operation phase, land occupation will be less than during the construction phase and will only cover the immediate vicinity of the cable route, where some restrictions are imposed to protect the cables from damage, and the ONS station area including the access road.

The use of the area of the planned Project in the offshore part during the operation phase will be carried out in accordance with the rules established in the POM Plan. According to the above mentioned arrangements, it is required to establish a safety zone around them by the territorially competent director of the maritime office, in which anchoring will be prohibited, with the exception of emergency anchoring and those related to installation and maintenance works.

In order to ensure access to the cable line during the operation phase, a technological zone (a permanent technical zone) will be established in the onshore section. The width of the technological zone will be from approx. 10m to approx.31 m, depending on the section of the cable corridor. The aim is to enable inspection and maintenance along the cable lines. In the immediate vicinity of the cables, i.e. in the technology corridor it will not be possible to plant trees due to the risk of damage to the cables by root systems and possible failure. In the case of non-forest areas such as arable land, meadows and pastures, the current use of the land will be possible. The permanent land transformation will mainly include the planned ONSs - a total of approximately 16 ha of agricultural land.

Decommissioning

The decommissioning process will depend on the decision whether to leave the defunct cable in the ground or remove it. If cables need to be removed, this will be a similar process to the construction phase with the same logistic layout. The offshore section will consist of decommissioning submarine cables. The offshore substations will be drained from their oils and lubricants, will be dismantled and their foundations cut away from the seabed. All parts will be recycled or disposal.

In the case of cables, once de-energized and inactivated, two possible methods of decommissioning are envisaged, either by leaving them in the bottom and in the ground or by removing them. The final decision on how the Project will be decommissioned will be made after the operation is completed.

Construction technology - marine part

Burying a power cable in the seabed can be done by simultaneously laying and burrowing the cable into the seabed (using a vessel called a cable carrier); the speed of cable laying is then regulated by the speed of burial and the nature of the seabed. A long period of favorable weather conditions is required during the operation to lay and bury the entire cable line.

The second method, which gives more flexibility, is to first lay the cable on the prepared (cleared) seabed and then bury/burrow it; it requires the use of two different units, i.e. the unit for laying (including a cable carrier or towed cable barge) and the unit for burying the cables - most often a service vessel equipped with a cable burying/burrowing device. This is the Investor's preferred method due to, among other things, less dependence on weather conditions.

Two methods of cable burial are considered by the Investor at this stage:

- water jetting - preferred,
- mechanical cutting – optional, in case of more difficult ground conditions.

The scope of applicability of the above-mentioned technology is determined by the geological conditions of the seabed. It is also possible to use the ploughing method to lay the cable, but this is not being considered by the Investor at this stage due to the risk of damage to the cable during the works.

If boulder fields that cannot be avoided are encountered, the cable will be laid on the bottom and protected from damage (not buried in the seabed).

Organisation of the construction trenchless crossing through the coastal zone

The cables will be brought out of the sea to land using HDD trenchless method and technical solutions for the crossing will be selected based on the results of geotechnical investigations, other local conditions, including the length of the crossing and access to the contractor's facilities.

HDD technology will be used with a drilling length of no more than 1.5 km, with the onshore section being no shorter than 120 m. Estimated time to drill 4 boreholes plus one spare and additionally for the future connection from the MFW Bałtyk I is up to about 1 year.

The execution of the trenchless crossing through the coastal zonewill require appropriate onshore construction site organisation, including: the demarcation of a construction site of approx. 0.85 ha, clearing of the construction site (including tree and shrub felling), necessary land levelling, fencing and securing of the construction site, provision of access (including organisation of temporary access roads), provision of utilities, organisation of construction facilities, storage depots, car parks and welfare facilities. It will also be necessary to construct an entrance chamber up to 3 meters deep.

Technology of laying onshore cable lines

The cable line will mostly be laid using the open-cut method. Construction works will be carried out in a construction zone with a width of approx. 30-32 m (Figure 3) into the following phases:

- clearing trees and bushes along the cable route,
- digging up and securing the trench,
- pouring out the bedding and laying the line system together with the grounding system, together with the necessary infrastructure and mounting elements, i.e.: the fibre optic line, cable joint closures and heads,
- partly backfilling the cable lines with a mixture of sand and cement,
- laying of protective concrete slabs (laid horizontally in the ground above the cables, on a filling of bentonite material, which is a mixture of sand and cement, below the warning tape and vertically, between cables belonging to different tracks in the same trench),
- laying the warning tape,
- backfilling the trench with appropriate compaction including restoration of the soil profile,
- land reinstatement.

However, selected watercourses and major roads will be crossed trenchless.

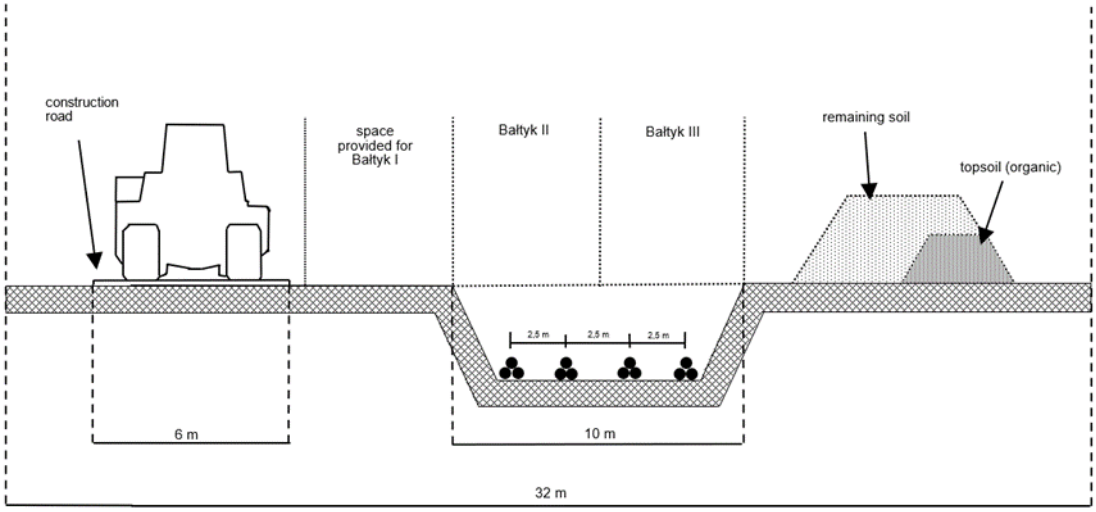

Figure 3. *Example scheme of corridor for construction of cables from MFW Bałtyk II and MFW Bałtyk III*

Underground cable lines will be laid in a dry trench. If it is necessary to dewater the trenches, pumps, needle-filters or additional dewatering trenches will be used.

Construction technology ONSs

It is planned to build two separated ONSs of a total area of approximately 16 ha in the area of the Pęplino village - one for MFW Bałtyk II and one for MFW Bałtyk III. The planned stations will be located on plots No. 148/3 and 148/4, Pęplino precinct, Ustka municipality.

Site preparation for the ONS will take approximately 6 months. No felling of trees is anticipated due to the nature of the site in the area of the planned ONSs - mainly arable land and grassland. The preparatory period will be followed by earthworks, and then the construction of buildings, foundations, etc., taking about a year, followed by the installation of equipment. Construction time is estimated to be around 2 years.

There will be a hardened access road to the Project site, including a hardened access road to allow permanent access to the planned ONS stations.

4. PROJECT ALTERNATIVES

Assumption in the planning and design process is to determine the optimal route of the connection infrastructure, taking into account environmental aspects, technical possibilities, minimising social conflicts and the risk of potential failures, ensuring economic optimisation of the Project.

This chapter discusses the alternative screening carried out to date in terms of location and technology variants. Both variant phases are relevant to the analysis of the environmental impact of the planned Project. Finally, it is indicated which of the alternatives discussed below are the so-called reasonable alternative options.

Location Variants

The location of the planned Project is determined primarily by the starting and ending points, which were determined at the stage preceding the obtaining of the environmental decision - the starting point resulting from the location of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III, approved by the issued PSZW decisions, and the end point determined by the conditions issued by PSE S.A. and the connection conditions to the NPS established by PSE S.A. and the signed connection agreement.

The planned Project is in line with the POM Plan and fulfils the rules and conditions of using water areas determined in it.

At the same time, the possibility of location variants in the offshore part has been restricted due to the existing POM findings. A particularly important aspect of the location (and technology) variation is the location of the cable ashore. Due to the necessity of ensuring the stability of the seashore, the land entry is planned using a trenchless method. For the purposes of the Project, two variants for the location of the land entry and the route of the cable infrastructure in the coastal strip area were analysed: west and east. The variant preferred by the Investor (proposed for implementation) is the eastern variant.

In the proposed variant, as a result of the analyses performed, the considered shore crossing technologies were limited to horizontal directional drilling (HDD) and horizontal directional drilling (HDD) combined with offshore trenching. In the western (alternative) variant, due to site location constraints (presence of a closed military training ground) and the associated necessary drilling length, it is not possible at this stage to exclude the use of two additional trenchless shore crossing technologies: microtunnel or Direct Pipe.

Technological Variants

The main technological options for taking power out of offshore wind farms involve a choice of cables or an overhead line.

The onshore routing of the planned Project, is based on laying the cables underground and is the preferred option. A possible alternative is an overhead power line 400 kV between the ONS and the PSE S.A Słupsk Wierzbięcino substation (on a stretch of about 6 km). In addition, the choice of trenchless crossing of terrain obstacles and the coastal zone, as well as the choice of trenchless crossing technology, are important for the analysis of environmental impacts. The HDD method, which involves the least interference with the forested shoreline zone, was selected for further conceptual and

design work. The estimated land occupation for the HDD construction site is two to three times less than the other methods, i.e. microtunnel and Direct Pipe.

Rational alternative variant

The rational alternative option is adopted for assessment in this Report consists of a landfall option further to the west (western option)using the HDD trenchless method and the construction of a 400 kV overhead line from the ONS substation to the PSE substation, instead of the underground cables proposed by the Investor.

The construction of the mid-forest 400 kV overhead line under alternative variant would involve clearing in a 35 m wide strip, over a distance of approximately 6 km. The operation phase of the 400 kV overhead line, on the other hand, would be associated with the establishment of a 70 m wide technological corridor from the 400 kV line (35 m each from the line axis in both directions). The LV power line is a source of electromagnetic field and noise emissions.

The overhead power line is a source of electromagnetic field and noise emissions. In order to perform a comprehensive environmental impact assessment as part of this EIA Report, calculations of noise (Annex 4, Volume IV) and electric and magnetic field strength distribution in the vicinity of the overhead line (Annex 5, Volume IV) were performed. The results of the calculations are included in the chapter assessing the environmental impact of the reasonable alternative (Chapter 11).

5. PREDICTED ENVIRONMENTAL CONSEQUENCES OF NOT UNDERTAKING THE PROJECT

Offshore and onshore connection infrastructure is an investment necessary for the operation of offshore wind farms. Failure to undertake the investment will make it impossible to achieve the main climate and energy goals and objectives. Diversification of energy sources, especially those focused on renewable sources, has a significant impact on reducing atmospheric emissions and decreasing dependence on imports. The planned Project will be an element of the energy sector. In this context, the non-implementation of the planned Project may cause negative effects on the environment.

Failure to undertake the planned Project means that there will be no impact on the marine and terrestrial environment mainly associated with the construction phase and is mostly of local, temporary and in most cases reversible. The lack of implementation of the planned Project does not mean that the natural environment will remain in its present state. Anthropogenic pressure and climate change are external factors that continuously shape regional and local natural conditions.

As the planned Project will not have a significant negative impact on protected natural valuable areas, including Natura 2000 sites, no significant benefits for the protection of these areas are expected if the Project is not implemented.

6. CURRENT USE OF THE WATER BODY AND LAND IN THE AREA OF THE PLANNED PROJECT

Offshore

Fishery

To characterise the fishery in the area of the planned Project, the fishing data of the Gdynia Fishery Monitoring Centre (CMR) from 2018-2021 for fishing quadrants into which the Baltic Sea is divided. The planned IP corridor runs through: L5, L6, L7, L8, M7, M8, N7, N8.

With regard to the value of catches carried out in the fishing quadrants analysed, it is possible to observe an almost 2-fold decrease in the volume and value of catches in 2020 compared to 2019 and a certain increase in these values in 2021 compared to 2020, but not reaching the level of 2019. One of the main factors determining these changes is the introduction of a ban on directed cod fishing from mid-2019, the catches of which in the fishing quadrants in question decreased in subsequent years from 105 tonnes (2019) through 18 tonnes (2020) to 8 tonnes (2021). The total value of catches accounted for between 0.41 and 0.64% of the total value of catches of the Polish Baltic fleet, while the share of particular fishing quadrants ranged from 0.01 to 0.15%.

Analysis of the 2021 fishing vessel traffic in each quadrant shows that the area covering fishing quadrants L5, L6 and L7 is the most sensitive. Probable fishing locations have been identified on both sides of the corridor. The intensity of fishing vessel traffic is very high in the vicinity of Ustka, but this is also considered to be related to approaching the port and not only to fishing. In contrast, the area of the ECI corridor within the other fishing quadrants was not an important fishing area.

Maritime transport and shipping

The planned Project crosses the most important customary shipping route in the Baltic Sea, TSS Ławica Słupska, going, among others, to sea ports in Gdynia and Gdańsk. In addition to vessels sailing to and from seaports, fishing vessels catching in the basin or sailing to other fishing grounds, as well as small recreational vessels (e.g. sailing yachts), also occur in the analysed water body. Vessel traffic in the TSS Ławica Słupska area is supervised by the Vessel Traffic Control Service VTS Ławica Słupska.

A gradual increase in shipping traffic is anticipated due to the growing importance of Ustka as a service port for offshore wind energy projects. With constant or slightly decreasing traffic of fishing vessels, assumed development of recreational shipping and water sports it should be assumed that the harbour in Ustka and the area of the approach to the harbour will require special attention in terms of ensuring safety of navigation.

National Defence

The planned Project is partially located in sub-areas with a leading function B - State defence. The first one was designated as a protection zone of the closed area in order to enable safe use of the military complex K-4175 Ustka for the surroundings. In the second one there are located Polish Navy waterways. These sub-areas, according to the provisions of the POM Plan, were made available for location of technical infrastructure, including power cables. In addition corridor passes through Zone no. 6, which is temporarily closed for navigation and fishing due to activities at the P-20 military training ground.

Infrastructure

The planned project is located approximately 50 km from the SwePol Link high-voltage direct current cable, operating for about. 20 years. In the immediate vicinity of the planned Project, there will be cable lines from other wind farms.

Mining concessions

The planned Project is located outside areas licensed for oil, petroleum and gas prospecting and exploration.

Onshore

The planned Project is mainly located in agricultural and forest areas, outside residential zones. In the coastal zone (the area of the Ustka Municipality), these are partly areas under the administration of the Maritime Office in Gdynia, and partly closed areas belonging to the Polish Army and the State Forests.

In order to identify obstacles and potential terrain collisions, for the purpose of this Report, sites and facilities that are in close proximity to the planned Project, or that are within the corridor designated for the planned Project, were preliminarily selected based on maps and planning documents. On the route of the planned Project 25 objects were identified and marked on the map and a field inspection was conducted in May 2022 with photographic documentation for which the Site Inspection Cards were prepared (of which 22 are located in Ustka Municipality and 3 in Słupsk Municipality). Site Inspection Cards were developed for these sites. The cards were used to identify potential impacts of the Investor's variant and the alternative variant, discussed later in the Report.

Particular attention was paid to material assets and residential development, as well as watercourses whose nature is changing from the data on the Hydroportal (from permanent to intermittent watercourses), and to protected areas and habitats.

The planned Project will cross a total of 8 public roads, 2 railway lines (one of them is a non-existing, historical railway line ‘Szlak zwiniętych torów’), 2 bicycle routes, and 2 watercourses: Struga Lędowska and Pogorzeliczka.

Public roads that cross the planned Project include Bosmańska Street, district road no. 1102G, district road no. 1103G, provincial road 203, municipal road no. 101047G-1, access road to MOWI S.A., district road 1108G and municipal road 1107 G. Railway roads include DP line no. 1102G and the non-existent historic railway line " Szlak zwiniętych torów". A collision along the route is also formed by the area of the Naval Centre in Ustka, which will be crossed trenchlessly. There are two companies in the vicinity of the corridor of the planned Project - MOWI S.A. and the Poliart printing company. Along the route of the Investor's variant, there are three residential buildings in the area of impact; in the alternative variant, there are an additional 7 residential buildings in the area of impact.

7. MARINE ENVIRONMENT CHARACTERISTICS

The characterisation of the marine environment was prepared on the basis of the results of the surveys conducted by the Investor and on the basis of PMŚ data and publicly available information, including data from other offshore wind farm investors.

Location and shape of the bottom of the basin

Denivelations along the ECI corridor route are approx. 33 m. Going northward the depth increases. The deepest area, with a value of 33 m, occurs at a distance of approx. 35 km from the shore. Subsequently, both in the northerly and easterly direction, the depths decrease to approx. 16 m, which is related to the entry of the ECI on Ławica Słupska.

Boulder areas and individual stones were found in approximately 13 % of the ECI corridor area during the seabed surveys. The boulder areas are located in the area of km 32 and 28 and in sections: 14 - 12.5 km, 8 - 6 km, 10 BII - 0BII and in the western part of the connector. Individual stones are scattered almost throughout the entire corridor, with the exception of the central and eastern part of the corridor connecting MFW Bałtyk II with MFW Bałtyk III. Larger accumulations occur in sections 24 BIII - 16 BII, 12 BIII - 9 BIII and 2 BIII - 0 BIII (Figure 7.5 Volume II).

Geological structure, bottom sediments, raw materials and deposits

The Quaternary sediments built up from glacial and water-glacial deposits lie beneath the bottom surface and form a continuous cover with a thickness of 20 to 45 m. In the subsurface structure in the ECI area, recognised on the basis of a detailed analysis of the results of seismo-acoustic surveys conducted by the Investor, glacial, fluvioglacial, stagnant sediments, differentiated sediments and fine- and medium-grained sands occur up to approximately 40 m (Volume III, Annex 1.2). On the basis of analyses of bathymetric, sonar and seismo-acoustic data (Volume III, Annex 1.2.), boulder clay, boulder clay with sand cover, mixed-grained sediments, sands on clay/silt (stagnant sediments) and fine-grained sands were identified on the surface of the bottom of the planned Project.

Surveys of bottom sediments within the ECI corridor were conducted by the Investor in 2013-2014 in the ECI area (Volume III, Annex 1.2). It was found that the investigated bottom sediments do not exceed the permissible concentrations of the investigated substances according to the Regulation of the Minister of Climate of 2 January 2020 on the catalogue of waste (Journal of Laws of 2020, item 10) and the Regulation of the Minister of Environment of 11 May 2015 on the recovery of waste outside installations and devices (Journal of Laws of 2015, item 796). Sediments do not qualify as waste.

In addition, on the basis of the analysis that has been carried out, it can be concluded that the movement of bottom sediments within the water bodies, the Project’s site and the area of its impact will not result in the release of metals and organic compounds from the sediments in concentrations that could potentially affect water status.

No documented mineral deposits or mineral extraction sites (mines) are identified in or near the area through which the offshore transmission infrastructure will run. The planned Project passes through prospective areas of II and IV crumb raw materials. On both the eastern and western sides of the ECI

corridor, geological areas of sand for coastal recharge have been identified. These areas are: Ustka 1, Ustka 2 and Ustka 3.

Marine water characteristics

Temperature. Seasonal variability in water temperature occurs in the ECI corridor area, as in the Baltic Sea as a whole. The highest bottom water temperatures (around 20°C) were recorded in July and August 2013, while the lowest temperatures were recorded in May 2013, December and January 2014 (around 4°C).

Salinity. In Polish maritime areas, the average salinity of bottom waters is between 5.5 and 12 PSU. Higher values are found in the Bornholm Basin and the Rynna Słupska (i.e. outside the corridor of the planned Project). In the shallow water area, the salinity variation is low, mostly not exceeding 2 PSU.

Assessment of the marine environment in the ECI area. The assessment of marine environmental status (sub-areas 36 and 38) shows that in the waters of sub-area 36 good status was achieved in following features: D1 biodiversity - zooplankton, D6 - seabed integrity and D9 - pollutants in fish and seafood - heavy metals, while in the waters of sub-area 38 in the features D8 pollutants with pollution-related effects - radionuclides and D9 - pollutants in fish and seafood - heavy metals. In the remaining features, good environmental status has not been achieved or has not been assessed. So far, for marine waters, no overall assessment of water status has been made.

Wildlife

Phytobethos. On the basis of surveys conducted by the Investor, it may be concluded that phytobenthos occurred sporadically during bottom surveys within Ławica Słupska. Areas with the greatest bottom coverage by macroalgae and due to the presence of rare plants are only found in the ECI corridor from the offshore wind farm MFW Bałtyk II. These are point aggregations along a section of approximately 5 m from km 7 BII to 12 BII. No valuable phytobenthos sites were found within the corridor connecting MFW Bałtyk III to land.

Macrozoobenthos. The surveys conducted by the Investor in the ECI corridor indicate the occurrence of species typical for the southern part of the Baltic Sea. In the characterisation reference was made to taxa occurring in soft bottom - the highest number of taxa (18) was found in the sandy and stony bottom of Ławica Słupska, and those occurring in rocky bottom - the highest number (28) was found in a large area of Ławica Słupska. The taxonomic composition, abundance and biomass of macrozoobenthos in the area of the planned Project are typical for the shallow and medium deep seabed zone of the open Baltic Sea. No protected species were found in the study area.

Areas of high zoobenthic biomass deserve special attention as potential feeding areas for fish and/or benthic-feeding birds such as the long-tailed duck and the scoter. The main food of these birds is bivalves.

Ichthyofauna. A total of 41 fish species were recorded in inventories carried out within the ECI corridor and those carried out in the vicinity (for the ECI of FEW Baltic II) and in the PMS surveys. Four fish species were recorded as being under partial species protection in Poland: the sand goby, the common goby, the common seasnail and the straightnose pipefish. Among alien species, bull goby and rainbow trout were recorded.

The analysed ECI corridor runs through the area of Ławica Słupska, where there is adequate depth and suitable substrate for spawning of the common seasnail (macroalgae) and the sand goby (stones and empty shells of molluscs). In addition, there are potential spawning grounds for herring and sprat (area of moderate spawning probability) within the planned Project. The obtained results also indicate that the area of the ECI corridor is used as a migration corridor for spawning (probably to the Slupia River) of the sea trout and the salmon. Increased migration was observed in autumn, despite the unfavourable pattern of wind directions and sea currents.

Sea birds. The analysed body of water is used by seabirds as a wintering site or as a stopover during migration. The planned Project is partly located within areas considered valuable for birds, i.e. Natura 2000 sites in which seabirds are the subjects of protection. These areas are:

- PLC90001 Ławica Słupska,
- PLB990002 Przybrzeżne Wody Bałtyku.

Surveys conducted both by developers and within the frame of the PMŚ indicate that the dominant species (most frequently observed) in the area of the ECI corridor was the long-tailed duck, and the highest densities of long-tailed ducks were found within Ławica Słupska. The long-tailed duck is a widely distributed species in the Baltic Sea, concentrating mainly in areas of moderate depth (up to 20-30 m) rich in zoobenthos, which is its main food base.

In addition, it can be assumed that other species of seabirds such as the velvet scoter, the common scoter, the black-throated diver, the red-throated diver, the grebe and the silver gull may potentially occur in the area of the planned Project.

Łąwica Słupska is one of the most valuable areas along the ECI corridor.

Marine mammals. Surveys conducted as a part of monitoring activities and for offshore wind projects indicate that detection/observation of marine mammals in the area of the planned Project and adjacent waters is rare. The used data confirm sporadic presence of harbour porpoises in Polish Baltic waters. Marine mammals probably use the area of the planned Project and adjacent waters covered by the monitoring study incidentally as a food migration area (following food-base fish species). The sea shore is used very occasionally by Baltic seals as a resting place. However, the number of observations collected is so small that no clear trends in animal behaviour or seasonality can be identified. There are currently no regular moulting, resting, feeding or breeding areas of marine mammals in the area of the planned Project.

Sand hopper is a small crustacean inhabiting the sandy beaches of the Polish Baltic zone. Individuals of this species can be found near the shoreline from May to October. During the day, sandhoppers hide in the sand, mainly under plant debris, and feed at night. In autumn, they move further from the shoreline, burrow deeper into the sand and enter a dormant state that lasts until spring. Surveys conducted on the beach within the ECI corridor indicate numerous occurrences of this species. It represents the high value of the surveyed shore section. It is one of the few fragments of natural beach on the Polish coast where this legally protected species occurs.

Biodiversity and the environmental assessment of the basin. The conducted environmental survey of the ECI corridor indicates that the most valuable area crossed by connections from the offshore wind farms MFW Bałtyk II and MFW Bałtyk III is Ławica Słupska (Natura 2000 site - PLC990001 Ławica Słupska), where biodiversity is relatively high compared to the POM, which is favoured by the more diverse habitat conditions present in the area (Figure.4, below). In addition, rare, strictly protected plant species occur here, i.e.: the fork-wort *Furcellaria lumbricalis* and the rosebay *Ceramium diaphanum*, two other species rare in the Polish maritime areas: *Coccotylus truncatus* and *Rhodomela confervoide*, as well as a higher number of macrozoobenthos taxa in comparison to other Polish marine areas, including the occurrence of a rare crustacean species *Eurydice pulchra*, included in the Red List of Threatened Species in the Baltic Sea, which occurs outside Ławica Słupska only in the vicinity of Orłowski Klif.

Lower natural values were identified in the corridor for the connection with MFW Bałtyk III and for the connector between the two farms, as these routes run along the edge of Ławica Słupska.

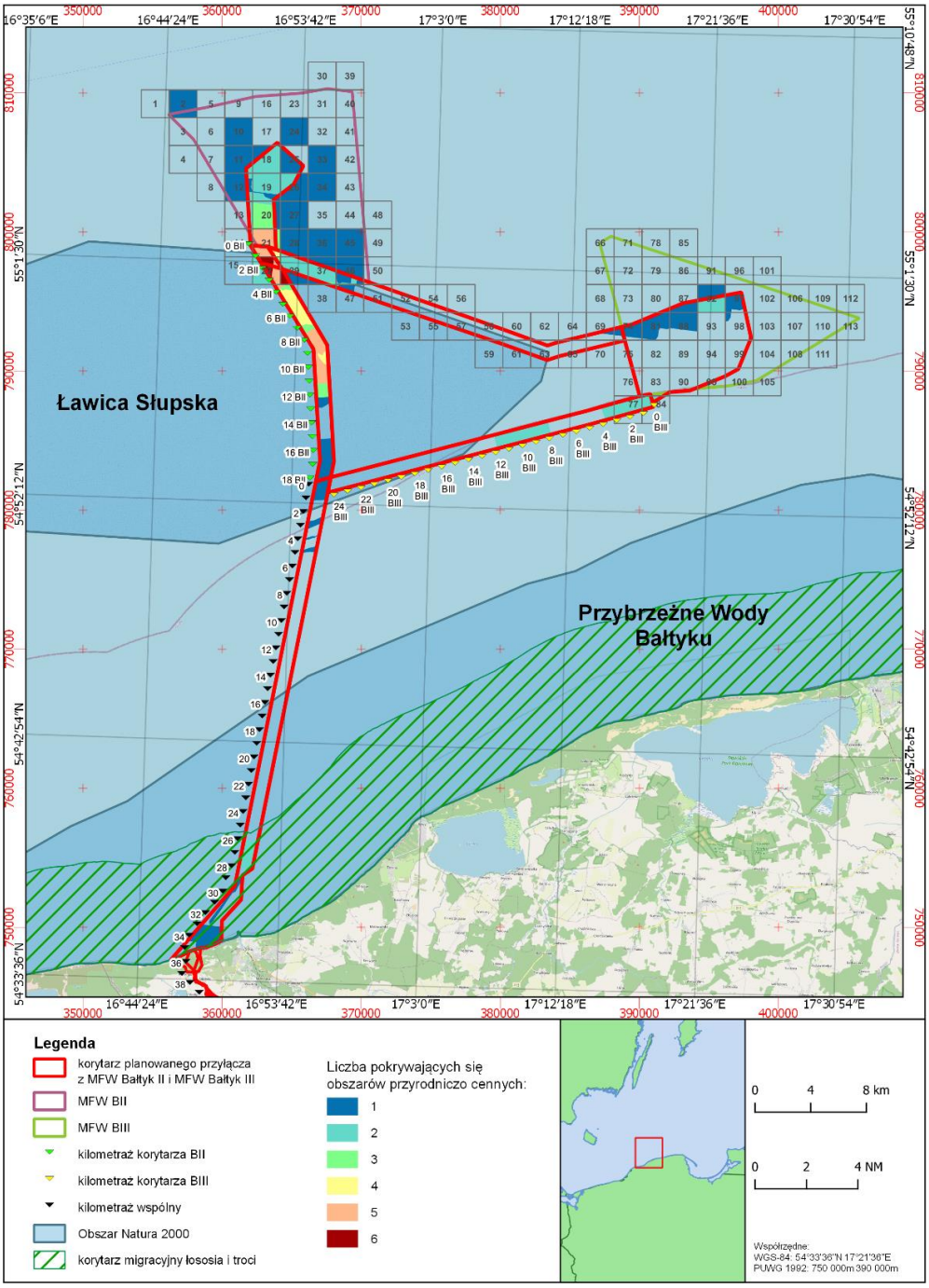

Figure.4. *Natural assets in the area of the planned Project*

Protected areas and ecological corridors

The planned Project is located within two protected areas established under the provisions of the Act of 16 April 2004 on Nature Conservation (Journal of Laws 2022.916 consolidated text). These areas include (Figure 4):

- PLC90001 Ławica Słupska:
  - MFW Bałtyk II – along the length of 19.4 km,
  - MFW Bałtyk III – along the length of approx. 12.4 km,
  - the connector between MFW Bałtyk II and MFW Bałtyk III along the length of approx. 21.2 km.
- PLB990002 Przybrzeżne Wody Bałtyku:
  - MFW Bałtyk II – along the length of 19.4 km,
  - MFW Bałtyk III – along the length of 19.4 km.

PLC90001 Ławica Słupska

The Ławica Słupska site is located in the open waters of the Proper Baltic in the Polish economic zone, approximately 22 km from the coast at the level of the town of Ustka. Its boundaries are defined by a 20 m isobath. The seabed formation in this area is highly variable. Depths in this area vary from 8 to 35 m. The shallowest parts of the seabed are located in the northern and western parts and include elevations of the so-called 'boulder bed' and parts of the sandy bottom. The objects of protection in the area are as follows:

- habitats:
  - sublittoral sandbanks (1110),
  - underwater rocky substrate, reefs (1170),
- bird species (wintering and migratory):
  - the black guillemot *Cepphus grylle* (A202),
  - the long-tailed duck *Clangula hyemalis* (A064),
  - the velvet scoter *Melanitta fusca* (A066).

PLB990002 Przybrzeżne Wody Bałtyku

The boundaries of the area extend for 200 km from the tip of the Hel Peninsula to the Pomeranian Bay. The seabed is characterised by unevenness, with denivelations of up to 3 m. The benthic fauna is dominated by small crustaceans. Six species of wintering birds and one migratory species are protected in the area.

- the long-tailed duck *Clangula hyemalis* (A064),
- the razorbill *Alca torda* (A200),
- the black guillemot *Cepphus grylle* (A202),
- the European herring gull *Larus argentatus* (A184),
- the velvet scoter *Melanitta fusca* (A066),
- the common scoter *Melanitta nigra* (A065).

Ecological corridors

For the South Baltic area, where the ECI for the MFW Bałtyk II and MFW Bałtyk III are planned, no concept or documentation defining the ecological corridors have been developed. The applicable planning document – the POM Plan does not present ecological corridors at sea.

Based on available publications and observations, it is indicated that the planned Project crosses a bird migration route, as the Baltic Sea along the Polish coast is part of the route for birds migrating between north-eastern Europe, the Urals and the Arctic Ocean, and western Europe. On the other hand, marine waters in the shallow coastal zone (up to 4 Mm from the shore) constitute an important migration route for bi-environmental species, probably related to spawning ascents to the Slupia River. The ECI area can be used as a migration corridor for: the sea trout, the European smelt, the Atlantic salmon and the rainbow trout, the river lamprey.

Cultural heritage

The research on the seabed conducted for the planned Project as well as analysed literature indicated the lack of cultural heritage objects, including the research field of the MACHU project[2].The opinions of the Pomeranian Voivodeship Conservator of Historical Monuments and the Director of the National Maritime Museum in Gdańsk conclud that there are no elements of underwater cultural heritage along the route of both connections from the MFW Bałtyk II and MFW Bałtyk III.

Hydro-meteorological conditions and air quality

On the basis of the available measurement data, it has been established that currents with south-westerly directions predominate in the area of the planned Project.

2 research field of the MACHU project (acronym for Managing Cultural Heritage Underwater) - a potential site of archaeological value - the area of occurrence of archaeological sites from the Stone Age

In the area of the planned Project, the onset of ice phenomena is observed from 2 January to approximately 26 March. The maximum number of days with ice is 59 days, with an average of 8 to 9 days. The thickness of the ice does not exceed 10 cm. Winters in this area are mild to very mild. Information presented in the Assessments of the Environmental Status of the Polish Maritime Areas of the Baltic Sea made on the basis of monitoring data from decades confirm the absence of hazards related to ice phenomena

Taking into account the ranges of concentration values according to which the air cleanliness class for land areas is assigned, it should be concluded that in the area of the planned Project, the permissible concentration values for SO_2, NO_2, PM2.5, which allow assigning a cleanliness class A to the marine area in the area of the Project, are not exceeded.

Acoustic and electromagnetic background

There are two types of underwater noise in the marine environment: continuous and impulsive. Natural sources of continuous sound are mainly: wind, rain, waves, ice and marine animals. Continuous anthropogenic noise is generated by among others marine transport, motorboat tourism or fishing. This noise is characterised by slight variations in frequency and intensity over time. Sources of impulsive noise can include sounds generated, for example, during the detonation of conventional munitions, or when wind turbine foundations are driven into the seabed. This noise, on the other hand, is characterised by its short duration (temporary area loading) and high energy.

In the context of the environmental assessment against the continuous underwater noise criterion for the Bornholm Basin, good environmental status was not achieved (the threshold value set by the BIAS project - i.e. 108 dB for continuous noise at the 95th percentile value - was not reached).

As the corridor of the planned Project is located in the Bornholm Basin area and passes through Zone No. 6, which is subject to temporary exclusions for navigation and fishing due to activities at the P-20 military training ground, impulsive sounds are a significant component of the marine background noise here.

The electromagnetic field found in the environment can be divided into natural and anthropogenic fields. The natural, most recognisable field is the Earth's magnetic field. In the case of the magnetic field generated in the area of the 450 kV DC transmission system Sweden-Poland (SWEPOL Link - which runs in the vicinity of the planned Project), it is comparable to the natural magnetic field of the Earth in terms of its impact on the surroundings.

Anthropogenic obstacles

The reconnaissance carried out within the ECI corridor showed that the identified anthropological objects lying in the area of the planned Project do not constitute monuments of archaeological, historical or cultural value. The geophysical survey conducted in the area of the planned Project (Volume III, Annexes 1.1., 1.2., 1.11.) did not indicate the presence of objects of military character i.e. torpedoes or mine-like objects. This does not mean that there are no remnants of these weapons, unexploded ordnance and chemical weapons in the area of the Project, especially within the fields of the MFW Bałtyk II and Bałtyk III.

8. LAND ENVIRONMENT CHARACTERISTICS

Location and topography

The area of the planned Project is located within two mesoregions: Wybrzeże Koszalińskie (Coast) and Równina Słupska (Plain), forming, according to the physicogeographic regionalisation, the Pobrzeże Koszalińskie macroregion.

At the landfall of the planned cable lines (between 236.5 and 238.5 km of shoreline (established by the Maritime Office), the beach is 30-60 m wide. Accumulation tendencies are noted in this section, which is related to the influence of breakwaters of the nearby port of Ustka.

The route of the planned Project is characterised by significant differences in terrain. A distinct belt-like pattern of relief is present here, including beach, a strip of sea dunes located directly behind

the beach (Lędowskie Wydmy) rising up to 40.4 m above sea level in some places. The background is a flat area of foreland and, in the last part of the analysed corridor, a moraine upland (in the area of the PSE S.A. Słupsk Wierzbięcino substation).

Geological structure and deposits

The planned Project is located outside the concession areas. There are no mineral deposits or mining areas within the borders of the planned project and in the area of its potential impact.

In accordance with Resolution No. XVII.176.2012 of the Ustka Municipality Council of 30 March 2012, the northern part of the ECI of the MFW Bałtyk II and III is located in the spa protection zone. Raw materials (brines, deposits of therapeutic peat) and a climate with healing properties have been documented in the spa area.

Soils

The dominant soil types are brown earths, which cover approx. 41% of the area. There is also a large share of podsolic soils (about 17 %) and arenosols, which cover about 14 % of the area. Approximately 12% is occupied by soils within closed and forested areas, for which no data. The smallest areas along the route of the planned Project are occupied by hydrogenic soils (approx. 3 %) and alluvial soils (approx. 0.1 %).

Hydrogenic soils are located in the vicinity of the Struga Lędowska river and the canals and drainage ditches. This type of soil is particularly sensitive to periodical changes in water conditions and thermal impacts and, and at the same time it is a habitat for valuable species of flora and fauna and an important water retention component of the environment.

The route of the planned Project runs through moderately fertile and fertile agricultural land. It covers about 42%. There are six agricultural complexes, of which the largest area is occupied by the good wheat complex of II, IIIa and IIIb quality class.

Surface water, groundwater and flood risk

The route of the planned ECI corridor of offshore wind farms MFW Bałtyk II and MFW Bałtyk III will cross two watercourses, i.e. the Struga Lędowska watercourse (km 37,2 of the ECI corridor) and the Pogorzeliczka watercourse (km 44,7 of the ECI corridor), and water facilities that carry water periodically or episodically. The watercourses, including drainage ditches, are in various states of maintenance. The place of the planned crossing through the Struga Lędowska watercourse is regulated (embanked). At the site of the planned Pogorzeliczka crossing, i.e. in the upper reaches, the watercourse is intermittent (there was no water in the watercourse during a field inspection in May 2022). The hydrographic network in this area is connected to the Modla lake, located approximately 900 m west of the planned Project corridor boundary. The Modła lake is also located within the boundaries of the Natura 2000 special protection site Przymorskie Błota PLH220024 and is the most sensitive element of the hydrographic network in the study area.

In the northern part of the planned Project (up to 38 km of the ECI corridor), groundwater occurs at a depth of about 2.5 m, water flow here is from the southwest towards the seashore. In the area of 39 km, groundwater occurs at a depth of 5 m and the further south their depth gradually increases. The corridor of the planned Project is located beyond the borders of Major Groundwater Reservoirs (GZWP). The presence of five groundwater intakes has been identified in the immediate vicinity.

The nearest to the planned Project (at a distance of approximately 50 m from the boundary of the planned Project) are the water intakes for a large fish processing plant, MOWI POLAND S.A., with depths ranging from 38 to 99 m taking in Tertiary and Quaternary waters.

Relatively close (at a distance of approximately 260 m from the western boundary of the ECI corridor) is the Modlinek municipal water intake. The intake was built in 1998 and captures Quaternary water from a depth of approximately 71 m.

There is no risk of flooding in most parts of the planned Project. In the coastal zone, the risk of flooding arises from the location of the corridor in the immediate vicinity of the sea (within the technical zone of the Marine Office).

Description of Environmental Components

The characterisation of the components in the corridor of the planned Project and in the zone of its potential impact was prepared on the basis of the annual nature inventory of 2021-2022 (Volume III, Annex 2).

Vegetation and habitats

The environmental inventory of vascular plants revealed the presence of 14 partially protected species. No strictly protected species were found. In addition to the naturally valuable vascular plant species, the briological inventory showed the presence of 16 partially protected bryophyte species. No strictly protected bryophyte species were found.

The area of the onshore corridor is characterised by a strip pattern of natural habitats typical of Pomerania, parallel to the coast. The inventory survey within the planned connection corridor identified 22 valuable vascular plant species, including 18 taxa under legal protection. Three vascular plant species are under strict protection.

The habitat inventory in the area of the onshore corridor showed the presence of 9 natural habitats. Their status and perspectives of protection vary, but they constitute an important element of the biodiversity of Pomerania and of the vegetation of the coastal zone of the southern Baltic Sea. Among the most important habitats in terms of biodiversity and floristic specificity is the priority habitat 2130 *coastal grey dunes*.

Forests

In the northern and southern part of the planned connection infrastructure, there are forests administered by the Regional Directorate of State Forests in Szczecinek, Forest District Ustka, the Modlinek Forest Division (in the northern part) and the Pęplino Forest Division (in the southern part).

The characterisation of the forest environment showed that the corridor of the planned Project is dominated by coniferous and fresh forests. In total, there are approximately 49 hectares of forest administered by the State Forests within the boundaries of the ECI corridor, but the extent of necessary felling for construction will be significantly less.

Biota of macrofungi and lichens

Within the corridor of the planned connection, 4 valuable species of large-fruited fungi were found, including 1 species – the chaga *Inonotus obliquus* under partial protection. No species of macrofungi under strict protection were found. In addition, 16 valuable lichen species were found within the corridor of the planned connection, including 4 species under strict legal protection, 11 species under partial legal protection.

Invertabrate fauna

Within the corridor of the planned Project and in the area of its potential impact, 3 species of invertebrates under partial species protection were found. The most frequently found species was the red wood ant (7 sites, including only one within the ECI corridor). The most valuable section of the planned Project is the northern, coastal part of the corridor: 34 – 37 km.

Ichthyofauna

There is one watercourse along the route of the planned Project - Struga Lędowska, which has the character of a permanent watercourse. The composition of the ichthyofauna of the Struga Lędowska was poor and typical for morphologically highly transformed small lowland streams. In the other watercourses, fish may occur periodically, mainly in their estuarine sections.

Herpetofauna

Within the corridor of the planned Project and in the area of its potential impact, 2 reptile representatives (the sand lizard was the most abundant species observed - 3 sites) and 5 amphibian representatives were found. The species groups found included brown frogs (the grass frog and the moor frog) and a complex of green frogs (the marsh frog, the pool frog and the common water frog). With the exception of the moor frog, which is under strict species protection, all species found are partially protected. In addition, breeding sites were recorded in wetlands, ponds, ditches and mid-field ponds.

Birds

Within the corridor of the planned Project and in the area of its potential impact 18 strictly protected breeding bird species were found, including 6 listed on Annex I of the EU Birds Directive. In addition, two game species were found that were considered valuable in terms of nature - woodcock and partridge. In the study area the most common were bunting (8 sites), red-backed monkeys (6 sites), as well as blackbird and whip (5 position each).

In addition, within the avifauna observation points, 239 species of birds were found flying over the area of the planned Project during spring and autumn migration.

The most valuable areas in terms of avifauna are the sections within the woodland, shrubland and wetlands

Terrestrial mammals

Within the corridor of the planned Project and in the area of its potential impact, 2 species of mammals under partial species protection were found: the European beaver and the squirrel. In addition, there were 686 observations of representatives of 13 mammal species that crossed the study area during migration.

Bats

Within the corridor of the planned Project and in the area of its potential impact, 4 bat species have been identified. All of them are under strict species protection in Poland and are listed in Annex IV of the EU Habitats Directive - the Daubenton's bat, the Natterer's bat, the soprano pipistrelle, and unmarked pipistrelle.

The most valuable areas of the planned Project in terms of bats are in the northern, coastal part of the study area (35 – 37 km), where most bat roosts were found, including within the ruins of the 9th Permanent Artillery Battery in Ustka, one of the wintering grounds of this species (35.1 km) was found at site No. 504 (gun emplacement No.4). In addition, a section of the forest at km 36.6 of the ECI corridor, where swarms of soprano pipistrelle were found, should be considered as a particularly valuable site.

Environmental components along the access roads

The Investor plans to use the existing road infrastructure, and if this is not possible, temporary roads will be allowed. As the annual nature inventory was conducted in a much broader corridor than the area covered by the ED application, the identification of natural conditions in the area of probable access roads to the future construction site was possible. Protected species and habitats were found in the vicinity of the analysed roads, but commonly found in the country, as well as potential amphibian migration sites.

Environmental evaluation

On the basis of the information gathered and the nature inventory, the most valuable nature areas along the route of the planned Project were selected, including: coastal grey dunes, mixed forests and coniferous forests on coastal dunes, wet meadow complex with the Struga Lędowska watercourse, fertile and acidic beech forests, and riparian oak-elm-beech forest. At km 39.7 of the ECI corridor there is a depression of land with periodic wetlands, acting as an ecological link/corridor in a monotonous agricultural landscape.

The distribution of the most valuable natural fragments of the area intended for the planned Project in terms of the occurrence of valuable vascular plant species, bryophytes, fungi and lichens, as well as associated fauna species and the ecosystem of wet meadows with the Struga Lędowska watercourse is shown in the figure below. The sections indicated therein require special attention and nature monitoring, especially during the construction phase.

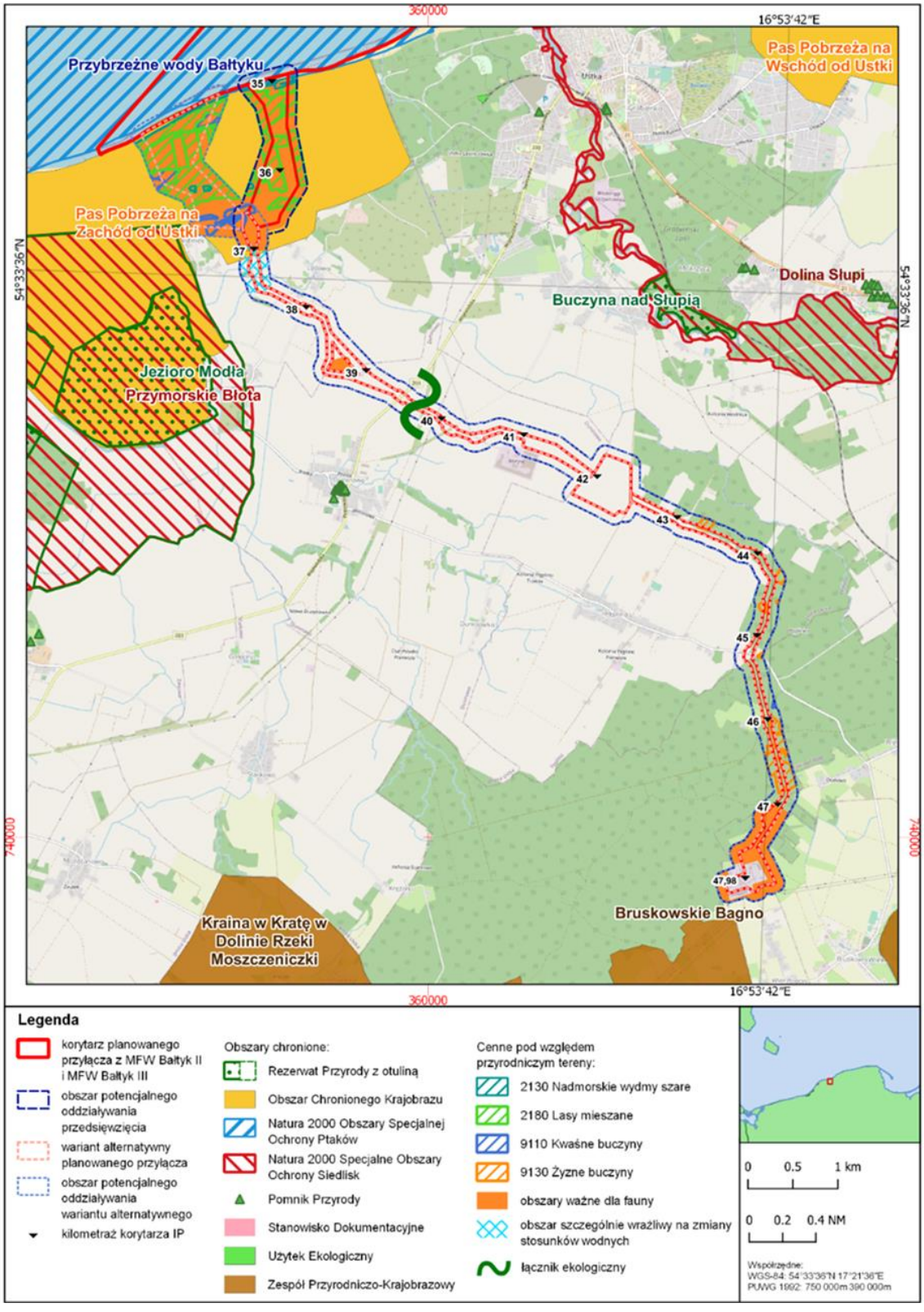

Figure 5. *Natural valorisation in the onshore area of the planned Project*

Protected sites, ecological corridors and biodiversity

The northern part of the planned Project onshore is located within the borders of the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki, at a distance of about 2 km. Approximately 300 m from the boundaries of the planned connection corridor is the Natura 2000 site Przymorskie Błota PLH220024.

Migration routes of amphibians, mammals and birds may occur in the area of the planned Project.

The most biodiverse sections along the ECI route include the areas of coastal grey dunes (the area of km 35 of the ECI corridor), mixed forests and forests on coastal dunes (35-36.5 km of the ECI corridor), wet meadow complex with Struga Lędowska (36.9-37.5 km of the ECI corridor), fertile beech forests (43, 44, 46-47 km of the ECI corridor) and acid beech forests (36.5, 45.8 km of the ECI corridor).

Landscape

The planned Project runs mainly through forest and agricultural land.

The forest areas in the northern part form an extensive complex, but are used by the military, which partly disturbs their natural character. Land in agricultural use occurs in the middle section (between 38 and 42.5 km of the ECI corridor). In the area of the planned construction of two ONS substations there is a large-scale industrial facility - the fish processing plant of MOWI POLAND S.A. – it is a site with a highly transformed landscape. Further on, the corridor of the planned Project runs through a forest edge and forest - up to the PSE S.A Słupsk Wierzbięcino substation.

Cultural heritage

In the corridor of the planned Connection point (35.1 km) there are individual objects that are part of the fortification complex of the 9th Permanent Battery in Lędów (9 BAS) entered into the provincial register of monuments. Besides, there are no archaeological sites or historical objects in the corridor of the planned Project. There are archaeological sites in the area of potential impact, as well as the complex of the Naval Training Centre, 46 of whose buildings are listed in the register of historical monuments. In addition, the planned Project is crossed by a disused historic railroad line (39.7 km of the ECI corridor).

Material assets and population

The route of the planned ECI will run through areas used in various ways, mainly through forest and agricultural areas. Urbanised areas account for only 4,2% of the study area. There is no single-family residential development in the area of the ECI corridor. There are cubic objects of the Naval Center and a fragment of the MOWI S.A. company. In the area of potential impact there are a total of 10 single-family residential buildings (8 in the municipality of Ustka, 2 in the municipality of Slupsk).

Climatic conditions and air quality

The planned Project is located away from facilities that could be a significant source of pollution. Air quality is good and there is no risk of exceeding pollution limits. The climate in the area of the planned Project is mainly influenced by the Baltic Sea. In terms of climate change, the most significant is the increase in the intensity, frequency and duration of storms, as well as the reduction of winter ice cover and the rise in sea level.

Acoustic and electromagnetic background

The main sources of noise are traffic routes and industrial facilities. For the provincial road crossing the Project, no significant exceedances of noise levels are recorded. In the context of electromagnetic fields in the area of the planned Project are located substations and power lines that are elements of the National Power System, including GPZ Słupsk Wierzbięcino 400/110 kV. The Słupsk Wierzbięcino substation is supplied by one cable line, three extra-high voltage lines and six high voltage lines.

9. IDENTIFICATION OF IMPACT OF THE INVESTOR'S VARIANT ON THE MARINE ENVIRONMENT

The planned Offshore Project was analyzed in a single location option, as the connection corridor from the offshore wind farms Baltic II and Baltic III must fit into the infrastructure corridor established in the POM Plan and be consistent with previously obtained decisions.

The potential impacts of the planned Project are primarily related to the construction phase (the impacts of the decommissioning phase are similar to those of the construction phase) and are associated with:

- necessary interference with the seabed causing temporary disturbance of bottom sediments and increased suspended sediment content in the water during construction activities related to cable burial;
- periodic underwater noise emissions from vessels and equipment necessary for laying and burying cables in the seabed;
- periodic emissions of exhaust fumes into the atmosphere from vessels engaged in the preparation work (clearing the bottom), laying cables, burying cables, and performing the trenchless crossing;
- restrictions on the movement of vessels, including fishing boats from Ustka and vessels moving on the TSS Ławica Słupska.

For the purpose of identifying potential construction phase impacts associated with a temporary increase in turbidity in the area of the works, the suspended sediment dispersion modeling included in Appendix 2a and 2b in Volume IV was performed for this Report.

During the operation phase, impacts on the marine area will be related to the operation of the cable, which causes heat and electromagnetic field emissions, as well as periodic inspections of the connection infrastructure.

Impact on the formation of the seabed

Construction phase

The construction of the planned Project will involve changes to the formation of the bottom due to:

- preparation of the bottom, laying and burying of cables,
- use of alternative methods of cable protection (in places where obstacles such as rocks and boulder aggregations cannot be avoided),
- deposition of sedimentary material mobilized and moved during cable burial works,
- anchoring of vessels.

The planned Project will cause interference with the seabed in a strip with a width of about 5 m for each cable, which will cause interference with the seabed with a total area of about 0.48 km², which is 0.27% of the area of the corridor of the planned Project, assuming the implementation of a total of 6 cables with a total length of about 314 km, ie:

- 120 km two cables from the OWF Baltic II,
- 134 km two cables from the OWF Baltic III,
- 60 km two cables planned to be laid in the future as a connector between the farms.

During the construction work, the bottom will be disturbed as a result of trenching with an average depth of 1.5 m and a trench width of 1.5 m, in which cables will be buried. In the context of the aforementioned disturbance, the most sensitive area is the sandbar zone, which is under systematic influence of wave action and continuous bottom reshaping. Therefore, a trenchless passage by the so-called HDD method is planned for this section. A fragment of this zone may optionally come within the range of construction works when the trenchless passage does not go beyond the last sandbar. In that case, a short section (up to 800 m maximum) will require deeper trenchong - up to 5 m. Taking into account the overall impacts on the formation of the seabed within the planned Project, it was concluded that they will be local, limited directly to the site of the works, and any resulting disturbance of the seabed surface will be short-term and reversible with the contribution of natural hydrodynamic processes.

Where the type of bottom will prevent excavation (e.g., stones, aggregations of boulders), the cable will be laid on the bottom and protected by, for example, a stone dumping or concrete mattress. In this section, the character of the bottom will change and local irregularities will be created, but they will be insignificant in relation to the relief and character of the surrounding bottom.

Laying/burying the cable using the Investor's preferred jetting method will cause disturbance of the bottom sediment and its dispersion until it settles. When burying one cable, at speeds of 250 and 350 m of cable per hour, the sediment will deposit within the boundaries of the trench (with sandy sediments), and its thickness will not exceed 1 mm. Within sections built of clay, silty sediments and till, the spatial extent of the deposition area will be 2 to 5 km from the cable axis, where up to a maximum of about 0.1-0.2 mm of sediment will be deposited. In a situation where cable burying will be carried out under better conditions (less wind and wave action) the deposition area will be smaller. Taking into account the thickness of sediment that will be deposited after laying all 6 cable lines and the maximum possible spatial extent of the deposition area, it was concluded that the impact of deposition on the bottom formation will be insignificant.

At the stage of preparation and construction works, there will be some hollows in the bottom at the berths of vessels installing elements of the connection infrastructure. These disturbances will be local - point-like (up to a maximum depth of 3 m - depending on the type of sediment), temporary and reversible, so the impact of anchoring on the formation of the seabed was considered insignificant.

Summarizing the total impacts on the bottom formation, it was concluded that in most cases the scale of these impacts will be small (within the corridor limits), and the impacts insignificant.

Operational phase

No impact on the bottom is expected during the operation phase of the planned Project.

Impact on geological structure, bottom sediments and access to raw materials and deposits

Construction phase

The impacts of the planned Project will affect only bottom sediments. No impact is expected on the geological structure and access to raw materials as well as deposits.

Laying and burial of cables in the bottom is associated with the disturbance of bottom sediments and shallow geological structure, as well as local changes in the physical and chemical properties of the sediments due to:

- cable burial,
- deposition of sediment material stirred up and mobilized during preparation for and burial of cables,
- use of alternative methods of cable protection (in places where obstacles such as stones and boulder aggregations will not be avoided),
- implementation of trenchless passage through the coastal zone,
- optional - dumping of dredged material.

In the course of cable burial works, sediments of different origin and structure will be disturbed at the bottom to an average depth of about 1.5 meters. They will be moved, their structure and physico-chemical properties will be changed (i.e. through remobilization of nutrients and contaminants), and then they will be dispersed in the form of suspended sediment, which will be redeposited on the bottom after the work stops. During the burying of a total of 6 cables using the jetting method, slightly more than 570,000 Mg of sediment dry mass will be stirred up, of which about 10% to 35% of the excavated material will be transferred into the water. Larger values relate to sections of the ECI corridor, where sediments with a high content of silty and clay fractions are found in the deep structure. These sections account for approx. 44% of the length of the entire ECI route. On the rest of the route, which is mainly composed of sandy sediments, about 10% of the excavated material will pass into the water column.

Analysis of the modeling results showed that, depending on the characteristics of the bottom sediments, the maximum range of water turbidity will be from about 1 kilometer to about 8 kilometers, with suspended sediment concentrations mostly not exceeding 10 mg/l. Water turbidity with a concentration of more than 30 mg/l will occur in the immediate vicinity of the trench. The maximum turbidity time will not exceed 16 hours. Upon completion of the work, there will be deposition of

suspended sediment on the bottom with a thickness of up to 1 mm at most. Taking into account the fact that the cables will not be laid at the same time (probably one after the other), the level of turbidity in the water column during the burial of one cable will be much lower. The cloud of suspended sediment will move with the progress of the work, and the concentration of suspended sediment in the water column in the areas where the cable will be buried will gradually decrease. The concentration of suspended sediment will be comparable to that during heavy storms. The impact was considered insignificant.

The disturbance of bottom sediments associated with, among other things, the burial of the cable will promote the transfer of pollutants from the sediments into the water. In the surface sediments of the planned Project, both concentrations of heavy metals and other pollutants (including PAHs and PCBs) are at very low levels, and the content of nutrients is typical for the sediments of the southern Baltic Sea. The volume of emissions of the above-mentioned substances to the water body that may occur in connection with the installation of the 6 cables will be insignificant compared to the annual load contributed by the rivers to the Baltic Sea. Therefore, there will be no deterioration of water quality during construction works. The impact was considered to be insignificant.

Considering the local extent of the impact associated with the potential use of other methods - i.e., laying cables directly on the bottom and protecting them with mattresses, for example, will result in local changes in the structure of the bottom sediments, which, in relation to the nature of the surrounding bottom, where pebbles and boulders are present throughout the route, can be considered insignificant.

Crossing the coastal zone of the planned connections from OWF Bałtyk II and OWF Bałtyk III will be carried out using the HDD trenchless method. The drilling will be performed to a maximum depth of about 50 meters below the level of the seabed. Along the drilling route, sediments will be disturbed and the continuity of lithologically different layers will be interrupted. The impact is considered local and insignificant.

If it is necessary to implement a shorter trenchless passage, in a short section of the nearshore zone (up to about 800 m), deeper trenches will be excavated. The excavated material from dredging the bottom, will be dumped within the ECI corridor in the form of small prisms at a depth of 10-12 m, east of the OWF Baltic II and/or OWF Baltic III cable lines. The maximum assumed area for dumping the excavated material will cover a bottom area of about 0.1 km². The effect of dredged material dumping will result in local disturbance of sediments. The dumped dredged material will mix with the original material laid down on the bottom. The impact will be local and limited directly to the dumping site. During dumping of the dredged material, metals, biogens and pollutants contained in the sediment will pass into the water, which, due to low concentration levels, will not adversely affect water quality. Storage of dredged material will cause short-term turbidity of the water column, limited to the region and duration of the work. The range of maximum spreading of dredged material will be within the ECI corridor. Taking the above into account, the impact is considered insignificant.

Summarizing the total impacts on bottom sediments, it was concluded that they would be insignificant.

Operation chase

Operation of the planned Project will be associated with a slight increase in the temperature of the bottom sediments in the immediate vicinity of the cables, due to temperature emissions generated by the cables during the transmission of power from offshore wind farms. If the cable is buried to an assumed depth of about 1 m to a maximum of 5 m, there will be heating of the sediment only in the direct vicinity of the cable. As you move away from it, the temperature will decrease. When the cable is buried to a depth of about 1 - 1.5 m, the temperature will rise slightly by about 2ºC in the near-surface layer of sediments (at a depth of about 20 cm from the bottom surface), which is particularly sensitive due to the benthic organisms that live there. As a result of close contact with seawater and bottom water currents, there will be an effective lowering of the sediment temperature to that of seawater. If alternative cable protection methods are used (e.g., covering with mattress or rock dumping) similarly to buried cable, the temperature of the conductor will be lowered to seawater temperature. This impact was considered insignificant.

Summing up the total impacts on bottom sediments, it was concluded that they would be insignificant.

Impact on marine waters, including marine water quality

Construction phase

During the construction phase, the main impacts on water will be related to a temporary increase in the level of suspended sediment in the water in the area of jetting of the cable. The maximum range of water turbidity will be from about 1 kilometer to about 8 kilometers, with suspended sediment concentrations mostly not exceeding 10 mg/l. Water turbidity with a concentration of more than 30 mg/l will occur in the nearest vicinity of the trench. The maximum turbidity time will not exceed 16 hours. Upon completion of the work, there will be deposition of suspended sediment on the bottom with a maximum thickness of 1 mm.

Disturbance of bottom sediments promotes the passage of contaminants from the sediments to the water. Since in the surface sediments of the planned Project, both concentrations of heavy metals and other pollutants (including PAHs and PCBs) are at very low levels, there will be no deterioration of water quality during construction activities. Thus, the impact is considered insignificant.

Impact on the state of the marine environment of the construction and operation phases under the MSFD

According to the current Marine Strategy Framework Directive, Poland is obliged to achieve good status of marine waters. The analysis of the impact of the planned Project on the state of the marine water environment was made with reference to the current assessment of the state of marine waters (by basin), based on the results of studies of biological and physicochemical elements of waters, obtained within the framework of the PMŚ. The state of the waters of two basins was taken into account, these are: 36 Open waters of the Bornholm Basin and 38 Polish coastal waters of the Bornholm Basin, within which the planned Project is located.

The assessment of the impact of the planned Project was made under the assumption of "no deterioration" of the current state of the waters, in relation to the established environmental objectives with targeted measures to achieve good environmental status in the marine environment. The current set of environmental objectives for marine waters was adopted by the Regulation of the Minister of Infrastructure of February 25, 2021 on the adoption of an updated set of environmental objectives for marine waters (Journal of Laws 2021.569).

Impacts of the planned Project on the current state of waters, both during the construction and operation phases, are considered insignificant. Both during the construction and operation phases, there will be no deterioration in the current state of the waters of the Bornholm Basin's sub-areas 36 Open Waters and 38 Polish Coastal Waters of the Bornholm Basin.

Impact on the environmental objectives of coastal waters established under the WFD

In accordance with the Water Framework Directive, environmental objectives for coastal waters in the area of the planned Project were established in the second update of the Oder River Basin Management Plan, effective February 24, 2023. Therefore, the Report assesses the impact of the planned Project on the possibility of achieving environmental objectives (including objectives for the Natura 2000 protected area Przybrzeżne wody Bałtyku PLB990002) within the coastal water body with code CW60001WB3 - *Polish coastal waters of the Bornholm Basin*. The impacts of the planned Project are considered temporary, local and reproducible, which will not cause a threat to the achievement of the established environmental objectives. *Operational phase*

Potential impacts of the planned Project during the operation phase were analyzed in terms of effects on water temperature. Heating of sediments and bottom waters may occur as a result of heat emissions from the cables. The analysis of thermal impacts (Section 9.10.) showed that there will be no heating of bottom waters, both if the cables are buried at a depth of about 1 to about 5 m, and if the cables are laid on the bottom surface and covered with rock dumping or concrete mattress. Thus, the impact was considered negligible.

Impact on Wildlife

The Report analyzed the potential impact of the planned Project on biotic resources of the marine environment during the construction and operation phases, with regard to the sensitivity of the species identified in the ECI area and their habitats. Impact assessment for individual components of

the marine environment has been performed in individual chapters of the Report (Chapters 9.4.1 - 9.4.6.) and carried out in accordance with the methodology adopted for the Report (Chapter 1.4.).

Phytobenthos

Concentrations of macroalgae were found only in the connection corridor from the offshore wind farm of the Baltic II, within the Ławica Słupska. Laying and burying the cable will result in the destruction of the bottom in a strip of about 5 m for each of the two cables. If macroalgae are present at the routing area, they will be destroyed. This may lead to a periodic reduction in biomass and temporarily affect the deterioration of living conditions and reduction of the food base for invertebrates, fish and birds. The area of direct interference in the phytobenthos region during the above-mentioned works will cover 0.09 km² of the bottom, which is 0.79% of the area of value in terms of phytobenthos, thus occupying 0.08% of the area of the planned Project for the Baltic Sea II OWF corridor. After the completion of construction works, the overgrowth of the stony bottom with phytobenthos may start already in the first vegetation season. However, the restoration of phytobenthos communities consisting of rare and protected species and/or those characterized by a high degree of macroalgae bed cover will most likely take several years. However, this is possible due to the presence of the same species also in other areas of the Ławica Słupska. The impact is considered to be moderate.

Summarizing the overall impacts on phytobenthos, it was found that they will be moderate for the connection from OWF Baltic II. There will be no impacts in the case of the connection from OWF Bałtyk III and the so-called inter-farm connector, as no macroalgae assemblages were found there.

During operation of the planned Project, when cables are buried in the bottom, the impact on phytobenthos will be neutral, as the existing habitat conditions will not change. Negative impacts may occur only in small areas of the bottom, where alternative methods of protection of the cable in the form of a rock dumping or concrete mattresses are applied; such methods are considered for hard bottom, where it will not be possible to bury the cables in the bottom. The impact is considered local and insignificant.

Macrozoobenthos

During the laying and burying of cables, there will be removal of benthic communities in a strip about 5 m wide for each cable. These changes will be most noticeable in the direct location of the operations, i.e. in the area of the trench, which is about 1.5 m wide and 1.5 m deep along most of the route. In total, the impact associated with bottom disturbance will affect less than 2.5% of the bottom area (in the ECI corridor), where a large biomass of benthic animals has been found, representing a total of about 0.23% of the bottom area covered by the application for an environmental decision.

After the completion of construction works, the first recolonization will take place - probably within a few weeks or so. Restoration of the structure and function of the soft-bottom benthic communities can be expected several years after the completion of the works. Due to the destruction of habitats and the long-term effect, the impact was considered moderate.

Indirectly, the impact on benthic organisms will be associated with an increase in the concentration of suspended sediment and its deposition on the bottom in the vicinity of the conducted works, but due to the small scale of the impact of water turbidity on the seabed (deposition of sediment on the bottom in the form of a layer of several millimeters) and the spatial extent limited mainly to the zone of works, this impact is considered insignificant.

Turbidity of the seabed may also occur as a result of dumping of dredged material from trenching in the shallow coastal zone. The resulting suspended sediment may affect benthic organisms, particularly filter feeders. However, given that the turbidity of the water column will be minor, within the boundaries of the ECI corridor, limited to the duration of the works, and the planned dumping site is located outside the valuable mussel aggregation areas, this impact should not have an adverse effect on the mentioned organisms of this part of the bed. Thus, this impact was considered direct, short-term, local in range, and therefore insignificant.

During the operation of the planned submarine cables, there may be impacts on macrozoobenthos associated with:

- the reef effect - the creation of new habitat due to the use of alternative methods of cable protection in the form of rock dumping or concrete mattresses,
- emission of electromagnetic fields by cables,
- temperature emission by cables.

The creation of a rock dumping or the use of a concrete mattress on a soft bottom will locally change the habitat type. The new substrate will be colonized by species typical of stony bottoms.

Based on the available modeling studies and literature data on the impact of the electromagnetic field generated by cables on benthic species and the magnitude of the electromagnetic field generated in the vicinity of the cables, it was concluded that the magnitude of this emission during the operation phase of the planned Project will not affect macrozoobenthos. Thus, the impact was considered insignificant.

During the operation phase of the planned Project, heat will be emitted to the environment due to the transmission of power through power cables. As a result, there will be heating of the sediments, which could potentially affect the benthic organisms living in them. Due to the widespread occurrence of benthic fauna in bottom sediments, the sediment layer to a depth of about 20 cm below the bottom surface is particularly important. Analysis of the model tests for Baltic sediments for a cable buried at a depth of 1.5 m (Chapter 9.10.) showed that directly above the buried cable, at a depth of about 20 cm, counting from the seabed surface, the sediment temperature will not rise above 2°C. In areas of the seabed where the cable will be laid on the surface and covered with a mattress or rock dumping, there will be no excessive heating of the seabed surface. The cable's constant contact with seawater will reduce its temperature to that of seawater. Considering the above, it was concluded that the effect of temperature on macrozoobenthos will be insignificant.

In conclusion, the impacts of the operation phase of the planned Project on macrozoobenthos were considered insignificant.

Ichthyofauna

Potential impacts of the construction phase of the planned Project on ichthyofauna will be related to the following factors:

- increase in the concentration of suspended sediment in water during construction works;
- remobilization of potential contaminants contained in bottom sediments;
- noise and vibration from equipment and vessels performing the works;
- possible creation of a mechanical barrier along the migration route of anadromous fish;
- periodic habitat changes and reduction of habitat quality.

During cable burial operations, the maximum extent of suspended matter spreading will only occur in the bottom layer of the water, potentially affecting bottom-dwelling fish species. For migratory anadromous fish, which mainly use the middle and surface layers of water, the impact will be less. After the work is completed, a layer of no more than 1.0 mm in thickness will be deposited on the bottom surface. Thus, the impact of the suspended sediment deposited on the bottom on the spawning grounds and feeding base of fish will be local and insignificant.

The main impact of the construction phase will be increased noise emissions from equipment and vessels used for the work. Taking into account the sensitivity of individual fish groups to increased noise levels, it can be assumed that the impact of this factor will be greatest for fish with swim bladders: cod, herring, sprat, which show the greatest sensitivity to sound. The level of sensitivity of Atlantic salmon and sea trout to noise is lower. On the other hand, demersal species without a swim bladder such as flounder, plaice and turbot, as well as protected species (small goby, sand goby, bottomfish) show lower sensitivity to noise impacts. Noise-related impacts were determined to be medium, and the significance of the impact was determined to be moderate.

The construction phase is also associated with increased vessel traffic. The planned ECI crosses the migration routes of spawning and feeding fish species of economic importance. Therefore, the conduct of cable laying/burying works and potential dumping of dredged material may periodically create an underwater physical barrier to fish migration. The barrier effect will be caused jointly by the increased movement of vessels in a given area, increased turbidity of water and underwater noise

emissions. Negative effects of the works (especially in the coastal zone, during the autumn period) will be noticeable for the spawning migration of Atlantic salmon and sea trout, especially with regard to the population using the Slupia River as a breeding site. This could be a potential negative impact on these species, and given the protection status of Atlantic salmon in the Slupia River Valley Natura 2000 area PLH220052 (spawning population rating B) - the impact has been assessed as significant for salmon and sea trout mainly in the context of generated submarine noise causing a frightening effect. The Report proposes elimination measures, through appropriate selection of the timing of selected works in the coastal zone, outside the period of ascent to spawning of salmon and sea trout. Details of the timing and types of work are described in Chapter 16.

Disturbance of the bottom structure and temporary elimination of benthic habitats within the trench will result in local disturbance of habitats and spawning grounds of ichthyofauna along the entire cable burial route. Particularly valuable ichthyofauna habitats are located in the area of Ławica Słupska, which is protected under the Natura 2000 network. In terms of the effect on spawning grounds, the impact is considered to be local, insignificant on the scale of the Baltic Sea, and negligible in the case of reduction of the fish food base associated with habitat disturbance. However, the effects of reduced habitat quality will also occur during the operational phase of the ECI, until the disturbed marine habitats are restored. In conclusion, the impact related to habitat transformation was considered moderate.

Summarizing the total impacts of the construction phase on ichthyofauna, it was concluded that they will be moderate. The only significant impact was found in connection with the possibility of a mechanical barrier in the coastal zone, during the period of ascent for spawning sea trout and salmon. The application of the elimination measures proposed in the Report, through the appropriate selection of the timing of works in the coastal zone, will allow the impact to be considered insignificant.

Potential impacts of the operation of the planned Project on ichthyofauna will be related to the occurrence of permanent magnetic field emissions. The level of noise generated in the functioning ECI can be described as negligible, since the cables will be buried in the bottom or covered with rock dumping or concrete mattress.

The impact of electromagnetic fields on ichthyofauna is poorly recognized, and the results of studies of the response of individual species are inconclusive. Potential impacts include interference with the natural magnetic field caused by electromagnetic field emissions around transmission cables. These impacts may result in disruption of orientation and consequent changes in the route of feeding and spawning migrations of fish.

For most of the fish species found in the inventory, sensitivity to electromagnetic field impacts was assessed as low and moderate. For anadromous fish species, such as Atlantic salmon and sea trout, the impact of magnetic fields on migration routes will be marginal, as these fish move in the midwater, usually at a considerable distance from the bottom.

The impact of electromagnetic fields was considered insignificant.

Marine mammals

Potential impacts of the construction phase of the planned Project on marine mammals will be related to the following factors:

- noise and vibration,
- increased ship traffic (spatial blockage).
- increase in suspended sediment concentration,
- obstruction/reduction of feeding grounds,
- remobilization of pollutants from sediments.

Of the above-mentioned analyzed impacts, only noise and vibration were considered moderately negative. The others were assessed as insignificant.

During the ECI construction phasewill be generated underwater noise and vibration, as a result of the movement of smaller and larger vessels engaged in construction work. According to noise emission forecasts, the highest noise level will be generated by a large cable installation vessel. The work will be temporary (movement of vessels performing the work) and will not significantly increase the

current noise background. In response to the resulting noise, there will be some frightening and disturbance of individual marine mammals, as well as temporary frightening of fish, which may affect the temporary availability and/or abundance of food for marine mammals in the Project area. After the completion of the work, acoustic conditions will be similar to those before the start of the work, which will allow the area to be used by existing marine mammal species. In conclusion, the noise impact was considered to be potentially negative and short-term. Considering the extent of the impact, which will be greater than the boundary of the DWA, and the incomplete knowledge of the risks from noise pollution to marine mammals and their protection status, the impact was considered moderate.

The potential impacts of the offshore cable operation phase will cause permanent impacts in the form of magnetic field emissions. Periodic ECI surveys will be carried out (once every 5 years, with the first three surveys planned in the first, third and fifth years, after the completion of construction) using seismic methods and will be a source of noise of short duration. In view of the sporadic occurrence of marine mammals in the area of the planned Project, this impact should be considered insignificant.

Sea birds

Potential impacts of the construction phase of the planned Project on seabirds will be related to:

- frightening birds wintering and resting in the basin during migration periods as a result of increased ship traffic;
- an increase in the concentration of suspended sediment in the water associated with construction works
- noise emissions from vessels and equipment necessary for laying and burying the cable line;
- exhaust emissions from vessels involved in construction work.

and primarily affect the most valuable sites for marine ornithofauna in the northern part of the connections, i.e.: the connection with OWF Bałtyk II and the connector between OWF Bałtyk II and OWF Bałtyk III, crossing the Natura 2000 area PLC90001 Ławica Słupska.

The installation of transmission cables will result in the frightening of migratory and wintering birds in the area where the work is carried out, thus resulting in their relocation to other parts of the basin. The period of migratory and wintering birds in the analyzed area is from October to the end of April. This impact has been determined to be short-term because it will cease as soon as the construction is completed, and the increased ship traffic associated with the construction work will not significantly differ from the standard traffic prevailing in the subject basin. However, due to the special importance of Ławica Słupska and its immediate surroundings and therefore the sensitivity of birds, this impact was considered moderate.

Other analyzed impacts related to temporary increase in suspended sediment concentration and emission of noise and atmospheric pollutants as a result of moving vessels were considered insignificant.

The presence and movement of vessels will be the main source of noise, and the main cause of disturbance to seabirds in the area covered by the construction of the Connection Infrastructure. However, the effect of disturbance will be local, short-term and reversible, as the impact will cease immediately after the completion of construction, and the noise caused by the Project will not differ from the noise generated by numerous vessels sailing in the Baltic Sea, especially in the vicinity of the main fairway of the TSS Ławica Słupska, which is adjacent to the PLC990001 Ławica Słupska area. Thus, the impact was considered insignificant.

Summarizing the overall impacts on birds, it was concluded that the impacts will be moderate, especially in the context of bird frightening in the Ławica Słupska Natura 2000 area, during migration and wintering. The Report proposes measures to conduct installation works from May to the end of September, which will eliminate the possibility of affecting migrating and wintering birds within above mentioned area. Adherence to these periods will result in the impact on birds to be considered insignificant.

The potential impact during the operation phase of the planned Project on seabirds will be related to local habitat/feeding area modification. Destruction of benthic communities in the cable

laying/burying strip will result in a temporary reduction in the area of bird feeding grounds, primarily for long-tailed ducks. This impact, due to the proximity of water bodies with an abundant food base, was considered insignificant.

Sand hooper

Due to the implementation of the trenchless passage through the coastal zone, using HDD technology, and the lack of interference with the beach and dune region, it was concluded that the planned Project, both during the construction and operation phases, will not affect the beach sand hopper.

Summary impact on Wildlife

The analysis of the impact on wildlife showed that the potential impacts of the planned Project relate only to the construction phase, during which moderate impacts are expected on biotic components of the marine environment, i.e. phytobenthos, macrozoobenthos, ichthyofauna, marine mammals and birds. For ichthyofauna, impacts on anadromous species were considered likely to cause significant negative impacts.

The most onerous impact during the construction phase of the planned Project will be noise and vibration, as well as an increase in the concentration of suspended sediment, which will entail periodic changes within the habitats, especially in the context of ichthyofauna, where cumulative impacts (accumulation of noise, increased vessel traffic, turbidity of the water depth) may occur, related to the conduct of works within the migration corridor of Atlantic salmon. In the area of direct interference with the bottom, there will be destruction of macroalgae and macrozoobenthos habitats with a total area of 0.61 km² (including 0.09 km² for phytobenthos, 0.52 km² (including 0.1 km² - during dumping of dredged material - optional) for macrozoobenthos), which will be successively restored after construction works. During the operation phase, the Project's impacts on all components of the marine environment are classified as insignificant.

Impact on protected sites (including Natura 2000), ecological corridors and biodiversity

The planned Project implemented in the marine part will affect Natura 2000 areas:

- PLC990001 Ławica Słupska,
- PLB990002 Przybrzeżne wody Bałtyku,
- PLH220052 Dolina Słupi.

A full assessment of the impact on Natura 2000 sites, in accordance with the European Commission's guidance, has been carried out in Appendix 7 (TOM IV) of this Report. The main conclusions of the assessment are presented below.

The assessment did not identify the possibility of significant negative impacts on Natura 2000 sites that cannot be eliminated or minimized. Therefore, the assessment was completed at Stage 2 Appropriate Assessment. Minimization measures were formulated that made it possible to eliminate or significantly reduce the occurrence of negative impacts on habitats and species of conservation concern in these areas.

PLC990001 Ławica Słupska

The implementation of the planned Project involves interference with the Slupsk Shoal area on the section:

- 19.4 km - two cables from OWF Bałtyk II,
- 12.4 km - two cables from OWF Bałtyk III,
- 21.2 km - connector between OWF Bałtyk II and OWF Bałtyk III (considered for future implementation).

The Report analyzed the possibility of interference with fragments of protected habitats and habitats of wintering and migratory birds, which may cause impacts during the construction phase, such as temporary fragmentation of habitats and deterioration of their quality.

Due to the dominant share of long-tailed duck (98.9% share) in the seabird grouping within the planned Project, only two objects of conservation that may be affected by the planned Project, i.e:

- habitat 1110 Sublittoral sandbanks under the sea (the planned Project crosses a fragment of the habitat at a distance of about 2.3 km),
- long-tailed duck.

The small scale of interference with habitat 1110 (up to about 0.007% of the habitat area) and the fact that it will be a reversible and medium-term impact - it is assumed that the area will be recolonized by benthic organisms in about 2 years - allow the planned Project's impact on the environment to be considered insignificant. However, the condition for insignificant impact is the execution of the cable passage through the habitat using the jetting method. In this section, protection of the cables by stone surcharge or concrete slabs should be ruled out, as this will permanently change the nature of the habitat in this section. The use of such protection is unlikely, however, due to the sandy bottom.

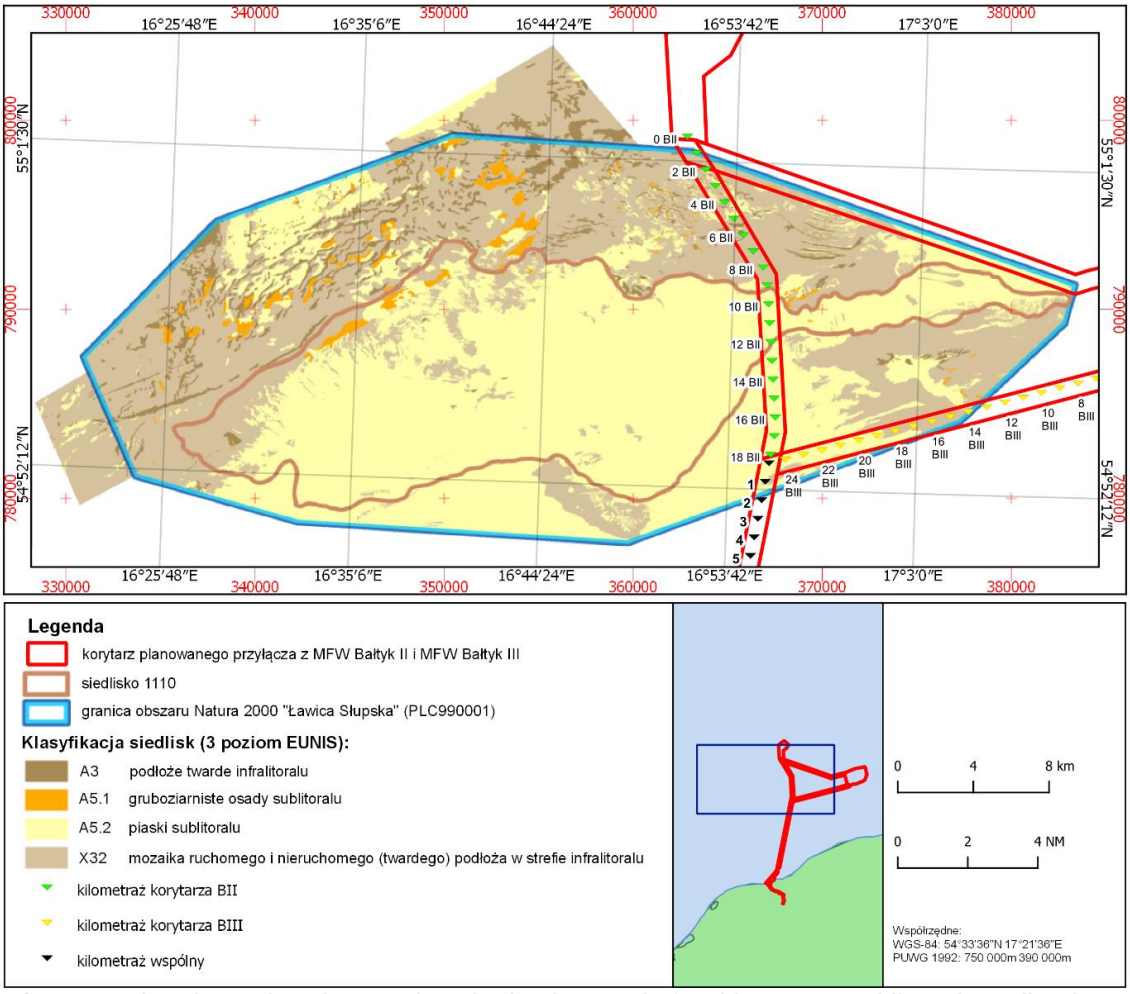

Figure 6. *The planned Project against the background of Habitat 1110 Sublittoral sandbanks*

The identified potential impacts of the planned Project on the lodge are related to the possibility of bird scaring and periodic depletion/disturbance of the food base associated with bottom interference. These impacts will be:

- local, i.e. affecting the immediate vicinity of the Project;
- short-term - their effects will be noticeable for a relatively short period after the completion of the works associated with the planned Project (recolonisation of benthic organisms is assumed to occur within 2 years);
- reversible - i.e. on its own, the receptor will be able to return to its original state.

In addition, the proposed minimisation measures for wintering and migratory birds, i.e.:

- carrying out the works outside the birds' migration and wintering period, i.e. in the months from 1 May to 30 October, will allow to eliminate the impacts related to bird scaring;

- carrying out construction works with the use of modern vessels, equipped with internal combustion engines meeting modern emission standards;

will eliminate disturbance of birds and disturbance of the food base associated with water turbidity through appropriate timing of the works. Therefore, they will not result in an increase in bird mortality and deterioration of the conservation status of the species in the Natura 2000 site in question. As these impacts will be local and of short duration, they will not be cumulative with similar impacts in the POM.

In the case of habitat 1110, no minimization measures were proposed - the impact was considered insignificant provided that alternative methods of cable protection i.e. stone bedding, concrete mattresses, etc. are not used along the habitat passage section.

The course of the cable corridor in the basins established in the POM Plan meets the condition included in the draft Conservation Plan of Ławica Słupska PLC990001. Therefore, no impacts are expected in the integrity of the Ławica Słupska PLC990001 area. The planned Project is in accordance with the findings of the draft Plan of Protection of the area PLC990001 Ławica Słupska and the Plan POM.

In the context of coherence of the Natura 2000 network (the protection of seabird populations), the crucial features of the Ławica Słupska PLC990001 area are:

- the location of these areas on the migration route of Eurasian seabird populations to their wintering sites;
- the availability of these areas for populations of wintering and resting birds during migration;
- suitable habitat conditions that make these areas attractive as wintering grounds or resting places during the autumn or spring migration of seabirds.

The Ławica Słupska area is located on the migration route of Eurasian seabird populations to their wintering sites. The distribution of birds on these sites and the abundance of birds is mainly due to the availability of food. Seabirds show a strong attachment to their wintering site and are reluctant to move longer distances. This fact is also confirmed by migration studies of local birds wintering at nearby planned offshore wind farms. Radar surveys of migrating birds have shown that bird species wintering in this part of the Baltic Sea move in all directions without a clear pattern, indicating short flights to feeding grounds rather than long-distance movements. The highest number of recorded flights was documented in the strip between the Natura 2000 sites PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku.

In the context of maintaining coherence within the Natura 2000 network, it is particularly important to maintain the possibility of movement between areas of seabird populations, without threatening significant depletion of population status or significant energetic inputs that may affect the ecology and biology, including survival of individuals from these populations. The project characteristics do not envisage the construction of permanent structures protruding from the water that would act as a barrier to the long-tailed ducks as they migrate between feeding and/or resting areas during migration. In addition, it is recommended to carry out works that may frighten birds outside the period of migration and wintering of birds. Therefore, no impacts on the coherence of the Natura 2000 network are anticipated.

In conclusion, the possibility of negative impacts on the objects of conservation, on the integrity of the site and on the coherence of the Natura 2000 network has not been identified with the proposed minimization measures, including, first and foremost, the elimination of the possibility of conducting works in the IP corridor during the period of migration and wintering of birds.

PLB990002 Przybrzeżne wody Bałtyku

The project will be carried out within the boundaries of a Natura 2000 site, therefore the possibility of interference with the habitat of wintering and migratory birds is analized, which may cause impacts during the construction phase, such as: temporary deterioration of the food base and crowding.

Based on the available PMŚ studies, data from other investors (BC-Wind, Baltic Power) and our own research, it can be concluded that no large groupings of birds are recorded in the analyzed area. Both individuals and their habitats occur in great dispersion in many places in this Natura 2000 area. Of

the bird species that are the subject of protection within the PLB990002 Przybrzeżne wody Bałtycku area, long-tailed ducks were observed in the area covered by the planned Project in the greatest numbers. The remaining species occurred sparsely (single individuals): uhla, guillemot, razorbill, silvery gull and scoter.

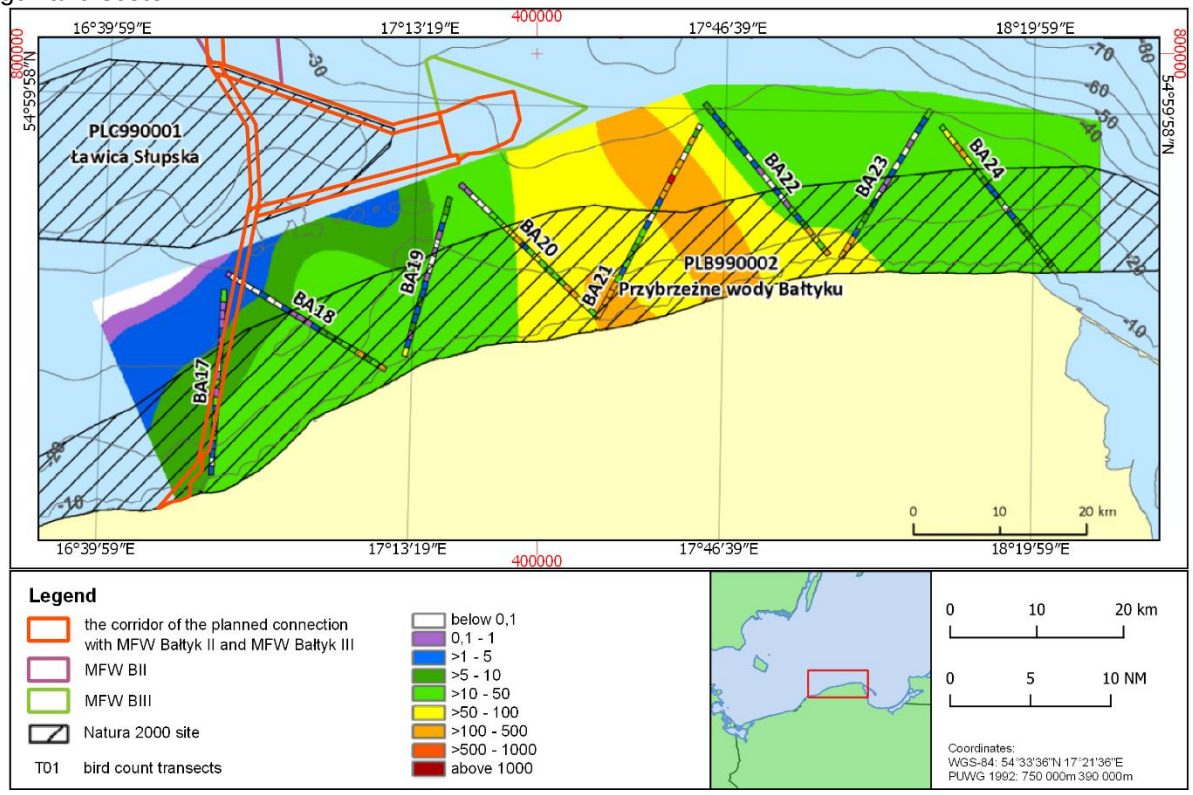

Figure 7. *ECI of OWF Bałtyk II and OWF Bałtyk III on the marine birds denticity during offshore surveys carried out in years 2018-2019 within Natura 2000 area Przybrzeżne wody Bałtyku for the purpose of the EIA Report for OWF Baltic Power*
(violet: 0,1–1 individual/km^2; blue: 1-5 individual /km^2; dark green: 5-10 individual /km^2; light yellow: 10-50 individual/km^2)

Źródło: Raport o oddziaływaniu Infrastruktury Przyłączeniowej Morskiej Farmy Wiatrowej BALTIC POWER na środowiska, MEWO S.A., 2021

Impacts on the objects of protection of the PLB990002 Przybrzeżne wody Bałtycku area are considered insignificant, mainly due to the fact that the species of conservation concern are spread over a wide area and due to the nature of impacts caused by the planned Project, which will be local, short-term and reversible. The area of interference with the seabed in connection with the Planned Project will cover 0.02% of the area of the PLB990002 Przybrzeżne wody Bałtycku area, and works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one cable, in case a deeper excavation is required for the trenchless passage.

With a view to reducing the impact of the construction phase as much as possible, minimization measures have been proposed that will apply to all species of conservation concern, i.e.:

- reduce the possibility of impact on the objects of protection (migratory and wintering birds) by increasing the intensification of the pace of work during the period when the number of birds in the Baltic coastal waters is the lowest, i.e. from May 1 to September 30;
- conducting construction work using modern vessels that meet modern noise emission standards;

the possibility of negative impacts on the conservation objects, on the integrity of the site and on the coherence of the Natura 2000 network has not been identified.

PLH220052 Dolina Słupi

The subject of protection in this area is, amongst others, the spawning population of Atlantic salmon *Salmo salar* and the river lamprey *Lampetra fluvialis*. In terms of ichthyofauna, there is a spawning migration route for Atlantic salmon, sea trout and the river lamprey in the coastal zone,

approximately to 4 miles. These species use the River Słupia as a breeding ground, especially in autumn.

For ichthyofauna, negative effects of the works (especially in the coastal zone, in autumn) on spawning migration of Atlantic salmon and sea trout are possible, and in spring (March) for river lamprey especially for the population using the River Słupia as a breeding site. This could represent a potential negative impact on these species.

Accordingly, a proper assessment was carried out in Volume IV, Annex 7 for Atlantic salmon *Salmo salar* and the river lamprey *Lampetra fluvialis.*

The planned project does not generate threats to the integrity of the Natura 2000 Dolina Słupi PLH220052 site or to the coherence of the network. The works will be carried out at a considerable distance from the site, and the only potential short-term and reversible impacts are related to the burial/plunge of cable laying in the coastal zone, i.e. up to 4 Mm from the shore.

The proposed minimisation measures:

- carrying out works relating to cable burial/dredging and dredger/refuller operations, including spoil disposal (excluding HDD drilling works), in the coastal zone up to 4 Mm outside the spawning migration period in the months from 15 September to 15 November and from 1 March to 15 April,
- ichthyological supervision of the timing of the works, completely eliminate the possibility of disturbance to spawning migrations of Atlantic salmon entering the Słupia River.

In conclusion, the possibility of negative impacts on the objects of conservation (with the application of minimising measures), on the integrity of the site and on the coherence of the Natura 2000 network has not been identified.

Impact on ecological corridors

In the case of birds, the planned Project passes through the Natura 2000 areas PLC990001 Ławica Słupska and PLB990002 Przybrzeżne wody Bałtyku, which are located on the migration route of Eurasian seabird populations to their wintering sites.

In terms of ichthyofauna, in the coastal zone, there is a route for the spawning migration of Atlantic salmon, sea trout and river lamprey at a distance of about 4 nautical miles from the shore. These species use the Slupia River as a breeding ground, especially in the autumn.

During the construction phase, vessel traffic is expected to increase due to construction work. Conducting these works may create underwater physical barriers, both for fish and bird migration. However, these barriers will be point-like (at the site of the current works), so migrating fish and birds will be able to avoid it.

In the case of ichthyofauna, negative effects of the works (especially in the coastal zone, during the autumn period) on the spawning migration of Atlantic salmon, sea trout and river lamprey are possible, especially with regard to the population using the Slupia River as a breeding site. This could represent a potential negative impact on these species. The impact is considered to be significant.

The Report proposes an action to eliminate the impact of the planned Project on the passage of migration corridors, both for birds and ichthyofauna. Conducting construction work outside the periods of migration and wintering of seabirds, i.e. from October to the end of April, and selected works during spawning migration of anadromous species, i.e. from September 15 to November 15 and from March 1 to April 15 in the 4 nautical mile coastal zone, will allow the impacts to be considered insignificant.

During the ECI operation phase, the extent and significance of impacts on migratory routes will be much less compared to the construction phase. Possible interference may occur due to the magnetic field generated by the cables and will affect only ichthyofauna. Considering the magnitude of the emitted magnetic field of the planned ECI, the impact will be local and will occur in the immediate vicinity of the cables. With regard to anadromous fish species (Atlantic salmon, sea trout), which move in the depths of the water, usually at a considerable distance from the bottom, the impact of the magnetic field on migration routes will be marginal. Taking the above into account, it should be considered that the magnetic field generated by the cables will not disturb the migration of anadromous fish. The impact was considered insignificant.

Assessment of the impact on biodiversity

The corridor designated for the planned Project crosses Natura 2000 protected areas, i.e. PLC990001 Ławica Słupska and PLB990002 Przybrzeżne wody Bałtyku, characterized by moderate natural value, and only in places high (Chapter 7.4.7.), bypassing the most valuable fragments of the bottom in the POM area.

Impacts of the construction phase of the planned Project on biodiversity will be a composite of all impacts identified for individual biotic elements of the marine environment (Chapters 9.4.1. - 9.4.6.) and will be primarily related to:

- direct interference with the seabed associated with construction works,
- increased intensity of ship traffic and underwater noise emissions, in connection with works involving the laying and burying of cable lines.

The most negative impact of the planned Project that may affect biodiversity is the destruction of benthic habitats, including phyto- and macrozoobenthos. During construction activities, there will be a complete removal of phytobenthos and macrozoobenthos habitats along the route of the planned Project. During the dumping of excavated material, there will be burial of macrozoobenthos habitats on the soft bottom in a bottom area of 0.1 km². This will be a direct, negative, medium-term and reversible impact. Habitats will be restored, and re-colonization of the bottom and restoration of habitat structure and function, will be possible due to the presence of the same species in areas adjacent to the ECI. For phytobenthos, the restoration of communities will most likely take several years. For zoobenthic habitats, once the construction work is completed, the first recolonization will probably take place within a few or several weeks. Achievement of a similar size structure of mussels prior to the Project will occur in about 2 years after the cessation of works. Considering the above, impacts on biodiversity in the context of benthos, were considered moderate. For other biotic components, the impact will be insignificant.

The Report proposes minimization measures at the route design stage, recommending avoiding, where possible, vegetation-covered bottoms and boulder aggregations covered with valuable mussel colonies.

The impact of the operation phase of the planned Project on biodiversity was assessed as negligible. This is because the only permanent impacts on the marine environment relate to emissions of magnetic fields and temperature, the effects of which on living organisms were assessed as negligible in the previous chapters on individual components of animate nature.

Impact on underwater cultural heritage

According to the current state of knowledge, within the boundaries of the ECI corridor of the planned Project, there is no protected object or body of water, established under the regulations on the protection and care of historical monuments. In view of the above, it was concluded that no impacts affecting cultural heritage are expected to occur.

Impact on climatic conditions and air quality

The planned connection infrastructure (submarine cables) is a necessary element for the commissioning of offshore wind farms OWF Bałtyk II and OWF Bałtyk III. Through the cables, electricity will be supplied to the National Electricity System. It is estimated that indirectly the planned Project will contribute to the reduction of about 4.5 to 8 million tons of CO2 per year as a result of the production of "clean" electricity and its replacement with energy produced from burning coal. The above will contribute to reducing the effect of exacerbating climate change. Thus, the primary impact of the planned Project on the climate should be considered as positive.

ECI of OWF BII and BIII will not be a source of permanent emissions of pollutants into the atmosphere and will not exacerbate the effect of progressive climate change.

During the construction phase, the only source of air emissions will be the internal combustion engines of vessels and equipment used for construction work. For the purpose of the assessment, the maximum daily exhaust emissions generated from the combustion of diesel fuel by small vessels engaged in 10 h/day operation and medium and large vessels engaged in 24 h/day operation were estimated.

Impact on the acoustic climate

Acoustic impacts will occur only during the construction phase and will be related to ship traffic and the operation of equipment and underwater vehicles used for construction work. The extent of the impact on the acoustic background will be limited in time to the period of cable installation work and in space, as a result of noise attenuation by water. Taking into account the number of vessels used for ECI construction and the level of noise they generate, it was considered that the impact on the acoustic background will be short-term, local and insignificant.

In the context of impacts on marine organisms, periodic changes in noise levels that will occur during the construction phase of the planned Project will affect fish and marine mammals, and the magnitude and extent of impacts will be dictated by the noise sensitivity thresholds of each species. The assessment of noise impacts on living organisms is included in the Report in Chapters: 9.4.3 - impact on ichthyofauna, 9.4.4 - impact on marine mammals, and 9.4.5 - impact on seabirds.

During the operation phase of the planned Project, noise sources will be vessels used for technical inspections. Inspections of the state of burial/securing of the cable will be carried out by the Investor using seismoacoustic methods, in the first, third and fifth years, and every 5 years thereafter, after the completion of construction works. For the aforementioned purpose, it is planned to use catamarans (medium-sized vessels). Considering the above, both the intensity of ship traffic and the level of noise generated will be sporadic, short-term and reversible. The impact is considered insignificant.

Electromagnetic fields

The potential impact of the planned Project related to the generation of electromagnetic fields concerns only the operational phase and will be related to the generation of electromagnetic fields by submarine cables. As the electrical component will be shielded by conductive cable sheaths, the connection infrastructure will be the source of only the magnetic component of the electromagnetic field.

In the context of assessing the impact of the magnetic field generated by the ECI, there are currently no clearly defined standards in Polish legislation establishing its permissible values in the marine environment. Taking into account the small values of electromagnetic field generated by HVAC cables considered in model studies and in the literature and its spatial variability, it was concluded that the volume of emissions generated during the operation phase of the planned Project will not affect abiotic elements of the marine environment, and with a minimum distance between cables of 25 m, there will be no accumulation of values of these fields. The magnetic field emitted by the cables will be much smaller than the Earth's magnetic field. Thus, the impact was considered insignificant.

Thermal effects

The operation phase of the planned Project, in connection with the transmission of power through power cables, will be associated with the emission of heat to the environment. The impact assessment was carried out based on model tests for a cable buried at a depth of 1.5 meters, referring to the actual conditions prevailing in the sediments and bottom waters of the Baltic Sea. The focus was primarily on temperature changes in the near-surface layer of sediments to a depth of about 20 cm, where most benthic fauna species live.

The analysis showed that in the case of the planned Project, where the minimum depth of burial will reach about 1 m, and the average velocities of water currents at the bottom reach 0.1 m/s, no temperature increase will occur in the near-surface layer of sediments at a depth of 20 cm. In areas where the cable will be buried deeper (up to about 5 m), the temperature increase in the analyzed layer will be significantly lower. In areas of the bottom where alternative methods of cable protection, i.e. concrete mattress or rock dumping, will be used, there will be no excessive heating, either of the bottom surface or of the rock dumping or mattresses. The constant contact of the cable with seawater with a high convection coefficient and good thermal conductivity, as well as the mentioned water flows near the bottom, will effectively reduce the temperature of the working conductor to that of seawater.

In summary, the thermal impacts of the operation phase were considered local, limited to the direct vicinity of the cable, and insignificant.

The effects of emissions on the geochemical profile of the sediments and the benthic organisms in them are described in Chapters 9.2. and 9.4.2. of the Report, respectively.

Impact on material assets

There are no material assets or objects of cultural value in the area of implementation of the planned Project. Therefore, the assessment of impacts was waived.

Impact on the fishery use of water areas

The potential impact of the planned ECI on fisheries relates mainly to the construction phase and will be related to restrictions on fishing vessel traffic in the vicinity of the cable installation vessels.

Given the relatively short construction time and the occupation of only a small part of the area at any given time of the work, the impact on fisheries during the construction phase in the occupied fishing quadrants i.e.: BL5, BL6, BL7, BL8, BM7, BM8, BN7 and BN8 were determined to be negligible. The impact of the planned Project on the food resources of ichthyofauna and populations of commercially exploited fish species, taking into account the amount of interference with the bottom within the above-mentioned fishing quadrants, was determined to be insignificant/minor.

During the operation phase, it is expected that the Director of the Maritime Office in Gdynia will establish a protection zone for the cable lines. This will restrict the use of bottom fishing gear in the area of the location of the ECI in question. This will be a permanent impact of local nature.

Given the minor importance of the area of the planned Project as a fishery for major species of economic importance, the indicated impacts during the construction and operation phases on fishing were considered negligible.

Impact on maritime transport and shipping

The planned Project is associated with a minor increase in ship traffic, primarily during the construction phase of the Project.

A significant impact of the construction phase is the conduct of works in areas with the most intensive ship traffic, i.e. TSS Ławica Słupska and in the area of the port of Ustka. Also, anchoring of installation vessels may cause temporary difficulties in ship traffic.

In order to maintain safety, the entity responsible for the implementation, prior to the start of the installation works, will develop a navigation safety plan with a schedule taking into account the division of labor and areas of activities, the implementation of which will ensure the safe conduct of cable laying along the entire route, including the most sensitive section of TSS Ławica Słupska, and increasing the speed of cable laying to the highest possible, will allow faster installation of cables, reducing the time of works.

Given the above, the impact was considered to be short-term, limited to the site and duration of the work, and therefore insignificant.

The operation phase will not result in an increase in vessel traffic, as inspections of the buried/secured condition of the cables are planned once every five years, with the first three inspections planned in the first, third and fifth years, following completion of construction.

According to the POM plan, a safety zone will be designated in the area of the connection infrastructure after the Project, where anchoring will be prohibited, except for emergency anchoring and those related to maintenance work. The above will not cause a threat to current and future vessel traffic in the area of the Project. The exemption for emergency anchoring of ships will not cause a deterioration in the degree of safety of navigation in the area.

Impacts on transportation during the operation phase are considered insignificant.

Impact on human life and health

The body of water in the Project area is used for fishing, shipping and maritime transport, as well as for tourism and recreation. In addition, it is used by the Navy. The Report analyzes the impact of the construction and operation of the cable lines on the aforementioned forms of development and use of the basin.

The Report analyzed impacts on:

- Fishing: for the duration of construction, in order to provide a protection zone during cable installation, excerpts fishing quadrants through which the planned Project passes will be excluded from fishing. Due to the low fishing productivity within the aforementioned quadrants against the POM, it was concluded that the impediments associated with the construction phase will be insignificant.
- Navigation: For the duration of construction, vessels sailing along the TSS route and the usual route to and from the ports of Gdynia and Gdansk, during the construction phase, will have to modify their sailing course due to the presence of vessels involved in the construction of the cable lines, which may involve increased fuel use and/or increased sailing time. Given the progressive nature of the work, it was concluded that the impediments will be minor and the extent of the impact on shipping will be local and short-term.
- The waterways of the Polish Navy i.e.: 0025, 0026, 0208, 0209, as well as Zone No. 6, where military activities are carried out (P-20 training ground). It was noted that during construction work there will be a temporary restriction of use of the above areas.
- Limited access to the coastal zone during the stage of trenchless crossing: It was found that there may be a temporary exclusion from use of this zone, which is used for tourism and recreation.

The above difficulties will be short-term and will cease immediately after construction. Impacts on human health and life during the construction phase were considered insignificant.

During the operation phase, the impact on the use and development of the basin will result almost exclusively from the establishment of a safety zone for cable lines by the Director of the Maritime Office in Gdynia, within which prohibitions and restrictions on use will be in place to protect submarine cables from damage or destruction.

Of the existing uses of the basin, the safety zone will restrict fishing (bottom fishing) the most, as bottom fishing gear will most likely be banned within the safety zone. Given the low fishing productivity on these POMs in the occupied quadrants, it was considered that the impact on fishing would be negligible.

Waste management

The planned Project involves the generation of waste at each of its stages. The anticipated types and quantities of waste generated during the construction, operation and decommissioning phases have been presented in the form of a table, with names and codes in accordance with applicable regulations. The Report also indicates how the generated waste will be handled, citing the relevant provisions of the Waste Act and implementing acts.

Impact during decommissioning

Two ways of implementing the decommissioning phase are assumed - decommissioning by inactivation and leaving the Connection Infrastructure at the bottom (the way preferred by the Investor) and decommissioning by complete dismantling of the ECI (cutting the cables into sections and pulling them on board the CLV).

If the cables are left in the bottom, no impacts on biotic and abiotic elements of the marine environment are expected. In the case of dismantling, the impacts and their significance will mostly be the same as those identified for the construction phase, due to the assumed scope of dismantling work being very similar to construction work.

The final decision on how the Project will be decommissioned will be made after the operation of the Connection Infrastructure is completed.

10. IDENTIFICATION OF IMPACT OF THE INVESTOR'S VARIANT ON THE TERRESTRIAL ENVIRONMENT

The Investor's variants that were analyzed in the assessment of impacts on the land environment are: the eastern variant of ECI landfall using HDD guided drilling, underground 220 kV cable line, ONS onshore substations and underground 400 kV cable line.

The potential impacts of the planned Project are mainly related to the construction phase (the impacts of the decommissioning phase are similar to those of the construction phase) and are associated with:

- necessary interference with the ground surface, in connection with the excavation of open trenches and entry and exit chambers in the sections planned for passage by trenchless methods;
- logging in the construction corridor;
- dewatering of excavations
- leveling works for stations (ONS), marine and land cable connection sites, access roads;
- traffic of heavy construction equipment and periodic emissions of exhaust fumes into the atmosphere and noise.

The planned Project in the operation phase is virtually unmanned, limited to maintenance and repair activities, and is primarily associated with the operation of the ONS stations and the use of access roads. The main impacts during the operation phase and will be related to noise emissions from substations.

For the purpose of identifying impacts during operation phases, the following were performed: calculations of noise emissions, electromagnetic fields and thermal emissions, which are included in the attachments in Volume IV.

Impact on the land surface

The structure of the shore will not be disturbed because of the trenchless technology. Therefore, the impact of the construction phase on the shore (i.e., within approximately 160 m of the shoreline) will not occur.

The impact of the construction phase on the land surface and relief, outside the seashore zone, will be related to the excavation of the open trenches necessary for the laying of the cable lines and the entry and exit chambers/pits in the sections to be traversed by trenchless methods, the construction of temporary access roads and a permanent access road to the ONSs.

During construction phase will be the temporary occupation of land for a construction corridor, approx. 30-32 m wide. In this strip, an access road will be constructed, a trench will be excavated with a depth of approx. 3 m and a width of approx. 10 m, and humus and soil from excavations will be stored.

It is assumed that the execution of a approx. 1 km section of the route (open excavation) will take approximately 12 weeks. Excavation works will be conducted on approx. 80% of the connection route. Remaining 20% will be trenchless crossings through areas that are valuable in terms of nature and roads/railways (e.g., Struga Lędowska, a provincial road, a local railway line). The deepest trenchless drilling up to 25 m below sea level is planned for the cable crossing under the area of the Naval Centre in Ustka, and when crossing wetlands.

The total length of the trenchless crossing sections proposed in the preliminary design phase is approximately 1.47 km.

The development of the planned Project will require levelling of the substation site (ONS). The soil will be used within the ONS area, and any excess will be handed over to specialist companies for development in accordance with current legislation.

As the maximum depth of excavation along the majority of the route of the underground cable line (approx. 11 km) will not exceed several metres, and the planned cable chambers and the manoeuvring area are small in size and they are planned in an already transformed area, the construction of the planned Project will have a moderate impact on changes to the ground surface, and the levelling works will have minor extent.

Due to the presence of a dune in close proximity to the planned construction works at the cable landfall the impact of the construction phase is considered to be moderate.

At the stage of exploitation of the planned Project, no impact which may adversely affect the ground surface and the relief of the terrain is anticipated, also in the zone of the shore and the dune belt.

Impact on geological structure and deposits

During the construction of the planned Project, no works affecting the geology will be carried out. Only works, which will affect the surface formations will be performed and they will be related to the excavation of open trenches and levelling works.

The most vulnerable areas for the construction phase of the planned Project are dune areas and areas with high groundwater table. In the case of crossing areas with a high water table or poorly drained, which are difficult to cross by open excavation, trenchless methods will be used, with a maximum drilling depth of 5 m below ground level. Only in the case cable crossing under military areas, drilling depths of up to 25 m below ground level are planned.

In the light of the analysis of the geological conditions of the underground cable line, offshore and onshore cable connection stations, access roads and onshore substations, the planned Project does not pose a threat to the geological structure.

The impact of the construction phase of the planned Project on the geological structure and deposits will be insignificant.

During the operation phase of the planned Project, no impacts that may adversely affect the geological structure and deposits are anticipated.

Impact on soils

The main impact on soils during the construction phase will be related to open excavation and dewaterings, levelling works, traffic of heavy construction and installation equipment, preparation of launching and exit chambers for trenchless crossings and occupation of land.

In addition, the impact will be related to aeolian erosion and potential contamination of soils with grease, oil, etc.

In a section of approx. 11 km, i.e., approx. 80% of the route, the land will be transformed within the construction corridor with a width of up to 32 m. This will be an area where the soil profile will be permanently disturbed. After closure of the excavation and decommissioning of the access road, the area will be restored to its original state and further use of agricultural areas will be possible.

Hydrogenic soils are the most sensitive in terms of impacts resulting from the construction phase of the planned Project. The pumping of water in the wetlands in connection with the construction works will lead to a temporary lowering of the water table in the close vicinity of the excavation, causing periodic drying and intensification of decay processes and plant death.

The impact of the construction phase of the planned Project on soils will be moderate. These will be reversible impact, as properly executed land restoration should not result in a long-term reduction in the fertility of the restored soil. There will be no change to land use for non-agricultural purposes, or take the land out of production.

The moderate negative impact on soils during the operational phase will mainly relate to the permanent occupation of land for ONS substations up to a total area of 16 ha and the exclusion of high-quality soils from agricultural use.

Impact on surface and groundwater and flood risks

The projected impact of the construction phase of the planned Project on water resources will involve crossing of watercourses (Struga Lędowska and Pogorzeliczka) and ditches, dewatering of excavations and levelling and hardening of the area.

The impact of the construction phase on the Struga Lędowska watercourse is expected to be local and short-term and with the use of a trenchless crossing will not lead to disturbance of the hydrological conditions of Modła Lake. Soil and water contamination is unlikely and will be only related to the short-term construction phase of the underground cable lines. Furthermore, the application of the proposed solutions will reduce the possibility of the formation of a depression cone and drainage of the hydrogenic soils present here.

Due to its uniqueness and sensitivity to changes in hydrological conditions of the Modła lake, the abstraction of water necessary for the drilling fluid (in connection with the planned trenchless HDD passage) from the Modła Lake and the discharge of water into this lake and its neighbouring watercourses is prohibited. The construction equipment used may additionally pose a potential pollution risk due to equipment failure and leakage of hazardous substances from construction vehicles and machinery. In this aspect, care should be taken to ensure its condition and only technically sound equipment should be allowed to work.

The Pogorzeliczka watercourse can be crossed by open excavation, as this does not require interference with the watercourse over the entire width of the construction corridor only over a width of about a few metres. If crossing the watercourse by open excavation and land drainage is difficult, the HDD method is acceptable. The assessment showed that the impact of the construction phase on the Pogorzeliczka watercourse will be local and short-term.

The laying of the underground cable lines is associated with land levelling. The planned levelling will be local and will not contribute to changes in the infiltration of rainwater and snowmelt.

The impact of the construction phase of the planned Project on groundwater will involve the need for trench dewatering (up to approximately 4 km of the route in the northern part of the ECI) In this case, pumps, needle-filters or additional dewatering trenches will be used. Water from dewatering will be discharged off-site into existing drainage ditches (beyond Struga Lędowska) according to the permit of their administrators and current legislation.

The impact of the construction phase of the planned Project on surface water will be moderate, with the exception that works in the area of Struga Lędowska must be carried out using the proposed solutions: it is forbidden to take water necessary for drilling mud from the Modła lake and to discharge water into this lake and the neighbouring watercourses.

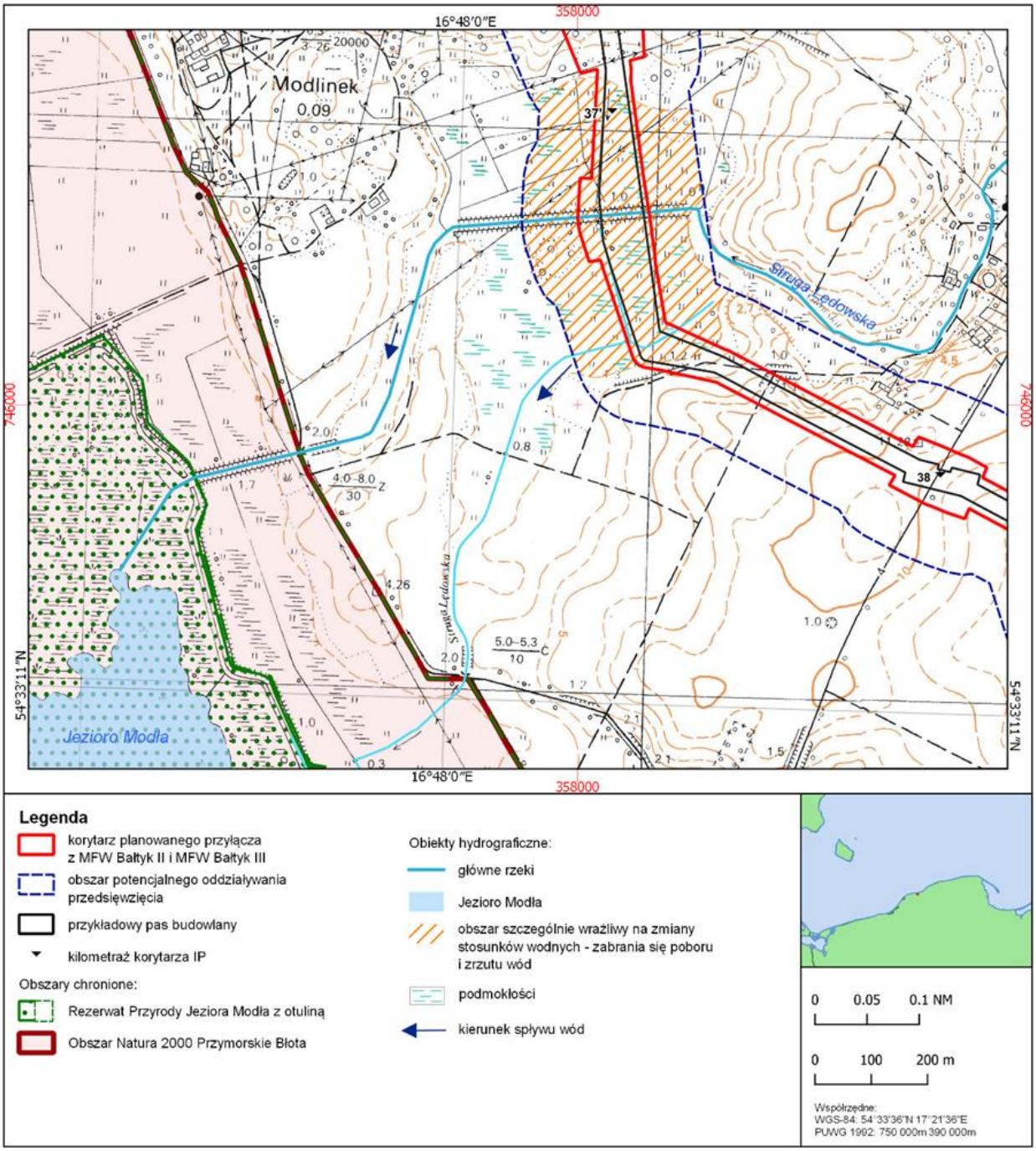

Figure 8. *Ecosystem of the Struga Lędowska watercourse and the Modła Lake*

The impact of the operation phase of the planned Project on water resources will be insignificant - the operation of the planned Project is a nearly maintenance-free process for the underground cable line.

The implementation of the planned Project does not threaten the achievement of the environmental objectives indicated in 'Odra River Basin Management Plan', adopted by the Regulation of the Minister Infrastructure of 16 November 2022. (Journal of Laws 2023.335).

The planned Project, in the coastal zone, is fragmentarily located within areas of special flood risk (construction site for the cable landfall and cable chambers). The trenchless crossing of the coastal zone, effectively eliminates flood risks from the sea.

Impact on nature

Impact on vegetation and habitats

The main impacts of the construction phase on the vegetation and natural habitats will be related to the temporary occupation of land for a construction corridor. It will be the area where the surface layer of soil will be damaged and trees and bushes will be cut down.

The vegetation and natural habitats occurring in most parts of the planned Project's area are relatively resistant and easily regenerated.

Due to the implementation of the trenchless passage, there will be no interference in the area of the most valuable natural habitats: white dunes (habitat 2120) and grey dunes (habitat 2130).

To reduce the impact on protected species, metaplantation of *Orchidaceae* and *Caprifoliaceae.*

The impact of the construction phase of the planned Project on vegetation and habitats will be moderate, due to the transformation and occupation of land and the removal of vegetation and natural habitats in the construction strip. These impacts can be significantly reduced by implementing trenchless crossings and metaplanting.

The impact of the operation phase on vegetation and natural habitats will be moderate and will primarily concern the change in species composition and the possibility of the appearance of invasive plant species. In order to limit the impact of the exploitation phase on vegetation and habitats, it is proposed to include the post-construction environmental monitoring of the technological corridor in terms of the expansion of invasive plant species.

Impact on forests

In connection with the implementation of the planned Project, there will be a cut in the construction corridor, the area of which will not exceed 23.1 ha.

The impact of the construction phase of the planned Project on forests will be moderate, reduced as a result of the trenchless crossings.

During the period of operation in the technological strip with a width of 20 m for 400 kV lines and 10-31 m for 220 kV lines, there will be no possibility of afforestation in this area - vegetation will be regularly removed. At the stage of the construction project, the Investor will strive to reduce the width of this belt. The impact on the forests during the operation phase was assessed as moderate. The negative impact on forests will primarily concern secondary succession in a deforested area, and thus increasing the pressure of non-forest species (including invasive species) on other forest phytocoenoses. In order to limit the impact of the operation phase on forests, it is proposed to include the technological corridor in terms of the expansion of invasive species.

Impact on biota of macrofungi and lichens

The main impacts of the construction phase on the biota of macrofungi and lichens will be related to the temporary occupation of land for a construction corridor. It will be an area where the top layer of soil will be permanently destroyed, which will result in the removal of ground taxa sites (forest, bristle and reindeer moss).

The impact will be moderate and it will mainly concern the temporary transformation and occupation of the area and can be limited by protecting the trunks of the trees on which they occur. In the case of protection of ground lichens, it is required to limit the construction site to the smallest possible area, and the soil from the excavation should be placed on a protective foil spread over the surface.During the operation of the planned Project, potential negative impacts on the biota of macrofungi and lichens may be related to the destruction of habitats and microhabitats as a result of the cyclical cutting of greenery in the technological corridor.

The impact will be insignificant.

Impact on invertebrates

During the construction phase, invertebrates will be scared off and their habitats will probably be destroyed. The species found during the nature inventory can be considered as common nationally (red wood ant, bumblebees).

Habitats and breeding sites of herpetofauna located in the construction strip will be the most vulnerable to impacts associated with construction activities.

The impact of the construction and operational phases of the planned Project on invertebrate fauna will be insignificant.

Impact on ichthyofauna

Due to the poor composition of the ichthyofauna of the Lędowska Struga no significant impacts of the planned Project (at any stage) on the ichthyofauna should be expected.

Impact on herpetofauna

Impacts during the construction phase will mainly include destruction of breeding sites, migration routes and habitat conversion, habitat destruction or fragmentation. The impact during the construction phase on herpetofauna is rated as moderate**.** These impacts, after the application of minimising and compensating measures, will be reduced.

During the exploitation phase of the planned Project, potential negative impacts on herpetofauna may be associated with habitat destruction as a result of cyclic vegetation clearing.

The impact during the operation phase on herpetofauna has been assessed as insignificant and limidet after the application of minimizing and compensating measures.

Birds

Impacts during the construction phase will mainly consist of environmental transformation, due to habitat destruction, such as through deforestation of the construction corridor, construction of new access roads, occupation of land for ONS stations, and habitat fragmentation caused by deforestation and construction of access roads. These will be moderate impacts.

During the operation phase of the planned Project, potential impacts on birds may be related to changes in habitat conditions and cyclical green felling and maintenance work. These will be insignificant impacts.

Terrestrial mammals

Small mammals as the European mole and the common squirrel, occupying habitats that will be eliminated during construction, will be the most vulnerable to the work associated with the construction phase. The earthworks, which are being carried out, will periodically hinder the migration of mammals, especially ungulates. However, the aforementioned species are common in the country and region.

The impact during the construction and operational phase of the planned Project on terrestrial mammals will be insignificant.

Bats

The impact during the construction phase of the planned Project on bats will be moderate. This impact can be minimised by, inter alia, performing construction works outside the bat wintering period, i.e. from 1 April to 15 November, or by carrying out works under the supervision of a chiropterologist.

In the operation phase of the planned Project, potential impacts on bats may be related to scaring during maintenance works and periodical greenery cutting. After completion of the construction works, the area within the technological strip will undergo succession processes. New habitats will be created that can be used by animals, which will mitigate the effects of land transformation and fragmentation during the construction.

The impact of the operation phase of the planned Project on bats will be insignificant.

Impact on protected areas

Impacts on the Protected Landscape Area during the construction phase will mainly concern temporary transformation and occupation of the area, elimination of forests, vegetation and periodic disturbance of fauna. These impacts can be reduced by introducing the minimization measures proposed for the various elements of nature, including the implementation of trenchless crossings. The planned project is a public purpose investment and, in accordance with Article 24 of the Law of April 16, 2004 on Nature Protection (Journal of Laws 2021.1098, as amended), the prohibitions indicated in the Resolution do not apply to it.

Due to the nature of the planned Project, including primarily the underground route, no significant impact is expected on the landscape which is the subject of protection of the Protected Landscape Area Pas Pobrzeże to the west of Ustka. The impact of the operation phase will be moderate, associated with the appearance of a deforested area of about 10-31 meters in width over a length of about 1.5 km.

Impact on the Natura 2000 sites

The potential for significant negative impacts on Natura 2000 sites has not been identified at any stage of the planned Project.

Impact on ecological corridors

The impact during the construction phase of the planned Project on the ecological corridors will be insignificant.

The planned project in the variant of the Investor's variant at the stage of exploitation will not affect the following ecological corridors: Pobrzeże Słowińskiego (a corridor of national importance), Nadmorski (a corridor of supra-regional importance) or the East Atlantic bird migratory route.

After the cessation of the construction phase, the site will be restored to its original state, with the exception of the ONS substation and technological corridor from underground cable lines:

- 220 kV with a width of 10-31 m,
- 400 kV with a width of 20 m.

The areas within the boundaries of the aforementioned strips will be permanently deforested in the forest part. The agricultural areas will revert to their original state and be used for agriculture.

The impact of the operational phase on the ecological corridors will be neutral.

Impact on biodiversity

Construction and operation phase

The planned Project does not pose a threat to biodiversity. The most valuable area (with the greatest biodiversity) is located within the boundaries of the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki. Its function is impaired due to the transformation of this space associated with the facilities that have been operating here for years (the Naval Centre).

Negative impacts on the Protected Landscape Area during the construction phase will mainly relate to temporary transformation and occupation of the site, removal of forests, vegetation and periodic disturbance of fauna.

The impact of the construction phase of the planned Project on biodiversity will be moderate, mainly related to the transformation and occupation of land and the removal of vegetation in the construction strip. These impacts can be mitigated by implementing the minimisation measures proposed for the various nature elements, including the implementation of trenchless crossings.

Due to the nature of the planned Project, including primarily the underground route, no negative impact on biodiversity is expected. After the cessation of the construction phase, the site will be restored to its original state, with the exception of a technological corridor 20 m wide for the 400 kV line and 10-31 m for the 220 kV line, which will be permanently deforested. Plants with shallow root systems will be allowed to return to these areas. There will be secondary succession towards oak and grassland habitats and species. Agricultural land will revert to its original state and be used for agriculture. Negative impacts

on biodiversity will mainly relate to succession and the possibility of invasive plant species. A positive aspect is the creation of new habitats that can be used by animals.

The impact of the operational phase on biodiversity will be neutral.

Impact on landscape

The impact of the planned Project on the landscape during the construction phase will be related to the necessity to remove trees and shrubs in the construction corridor of 32 m with local widening up to 50-100 m in the area of trenchless crossings and in the area of the construction site in the vicinity of the connection of offshore and onshore cables, construction work, the presence of construction machinery and equipment, excavations being carried out, and will cease upon completion of the work.

The construction of the ONS substations will take place in an agricultural-industrial landscape. The ONS stations will be built on agricultural land, in close proximity to the MOWI S.A. fish processing plant.

The impact during the construction phase on the landscape will be moderate and mainly relate to the temporary transformation and occupation of land and cuttings. These impacts can be reduced by implementing trenchless crossings.

Due to the type of planned Project - underground power cables - no significant negative impact on the landscape, including the protected landscape area, during the operation phase is expected.

During the operation phase, the negative impact will be related to permanent deforestation (this will occur during the construction phase, but the effects will be visible during the operation phase) in a permanent corridor of 10-31 m - for 220 kV cables and 20 m - for 400 kV cables.

The impact of the operation phase on the landscape will be moderate and will mainly concern the onshore substations, which will become a permanent feature in the agricultural and industrial landscape of the Ustka municipality,but will not be a dominant landscape feature in this area. The use of trenchless methods and the lack of cutting will reduce the impact of the planned Project on the landscape.

Impact on monuments

In the corridor of the planned Project there are 2 sites numbered 503 and 504 (gun emplacements) and site number 511 - crew shelter 503 and 504 forming part of the 9th Fixed Artillery Battery in Lędów. In this area, it is planned to locate the HDD passage launching chamber, the location of cable wells and further open excavation. Remnants of fortifications are located here. In addition, on satellite maps and also on hypsometric maps, there is a facility described as a school fire station within the ECI corridor boundary, which is not included in the conservation area

Pursuant to Article 36 of the Act of 23 July 2003 on the protection and care of historical monuments (Journal of Laws 2022.840, as amended), carrying out construction works at the monument and in its surroundings, as well as undertaking other actions which could lead to the violation of the substance or change of the appearance of the monument entered in the register requires the permission of the provincial conservator of monuments.

Prior to construction, the developer will apply to the Provincial Conservation Officer for the relevant approvals. According to the preliminary opinion of the Pomeranian Voivodship Conservator of Monuments (ZND.5183.438.2022.KM), it is possible to locate the planned infrastructure from the conservation-protected gun emplacement No. 4 at a minimum distance of 10 m from its foundations.

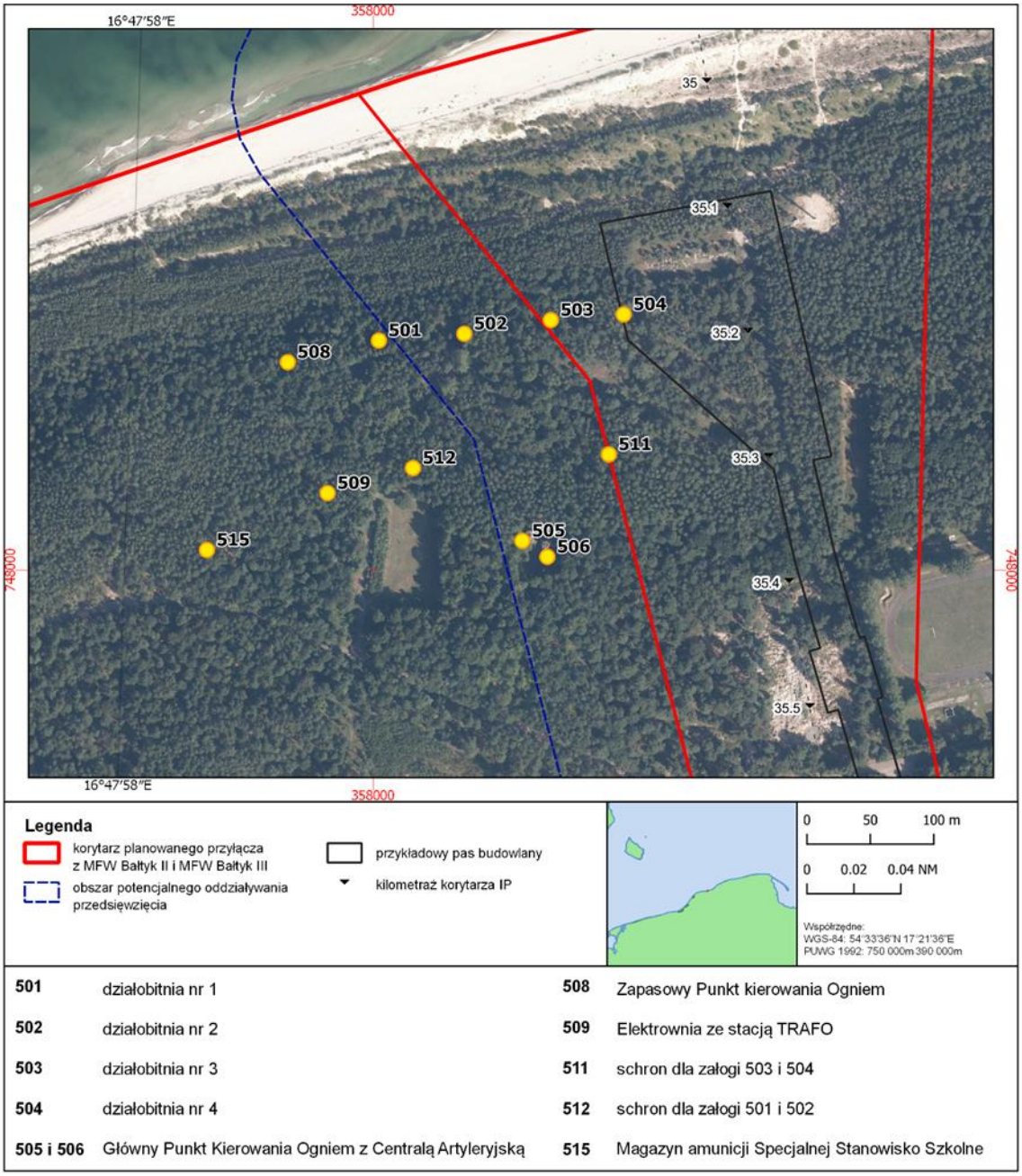

Figure 9. *Location of the planned Project in the Investor's variant on the background of the fortification complex of the 9th Battery of Standing Artillery in Lędów (9BAS)*

Source: own compilation based on data provided by the Association of Fortress Enthusiasts

According to the "Study of the Conditions and Directions of Spatial Development of the Municipality of Ustka", it has been classified as a cultural asset. The crossing of the historic railway line is not yet determined at this stage, two options are being considered: trenchless crossing and open excavation. The construction works may disrupt the existing use of the area (currently used as a recreational horse and pedestrian route) and in the future may affect the restriction of development and use of the historic railway line depending on the selected crossing option. The impact of the construction phase will be local and short term. However, it requires agreement with the Ustka Municipality.

During the operation phase, the planned Project will have no impact on archaeological sites, the historic buildings of the Naval Training Centre and the Gajki 1 Forester's Lodge. The operation of the planned Project is a virtually maintenance-free process, limited to maintenance and servicing works. Due to the nature of the works, the impact will be neutral.

Impact on climate and atmospheric cleanliness

The planned Project will not have a significant impact on the climate during the construction phase, while the impact on air quality will be minor. This impact will be insignificant.

There will be no significant sources of air emissions during the operation phase, these will only be associated with maintenance and servicing works and will be limited to specific locations. Impact of the planned Project in the operation phase on the state of atmospheric air and climate is assessed as positive in connection with the construction of offshore wind farms Bałtyk II I Bałtyk III and obtaining energy from wind.

Impact on the acoustic climate

The impact on the acoustic climate during the construction phase will be generated by vehicles and machinery used during construction and will vary depending on the phase of the Project and the type of equipment used.

The results of the model calculations (Annex 4 Volume IV) showed that an operating station, all of whose noise source equipment will operate continuously (24 h/day) at maximum acoustic power, will not cause an exceedance of the sound level limit set for the nighttime (40 dB) in the area of the nearest planned protected development (the forest area located near the station, to the northeast, designated for residential development in the Local Development Plan). These will be moderate impacts.

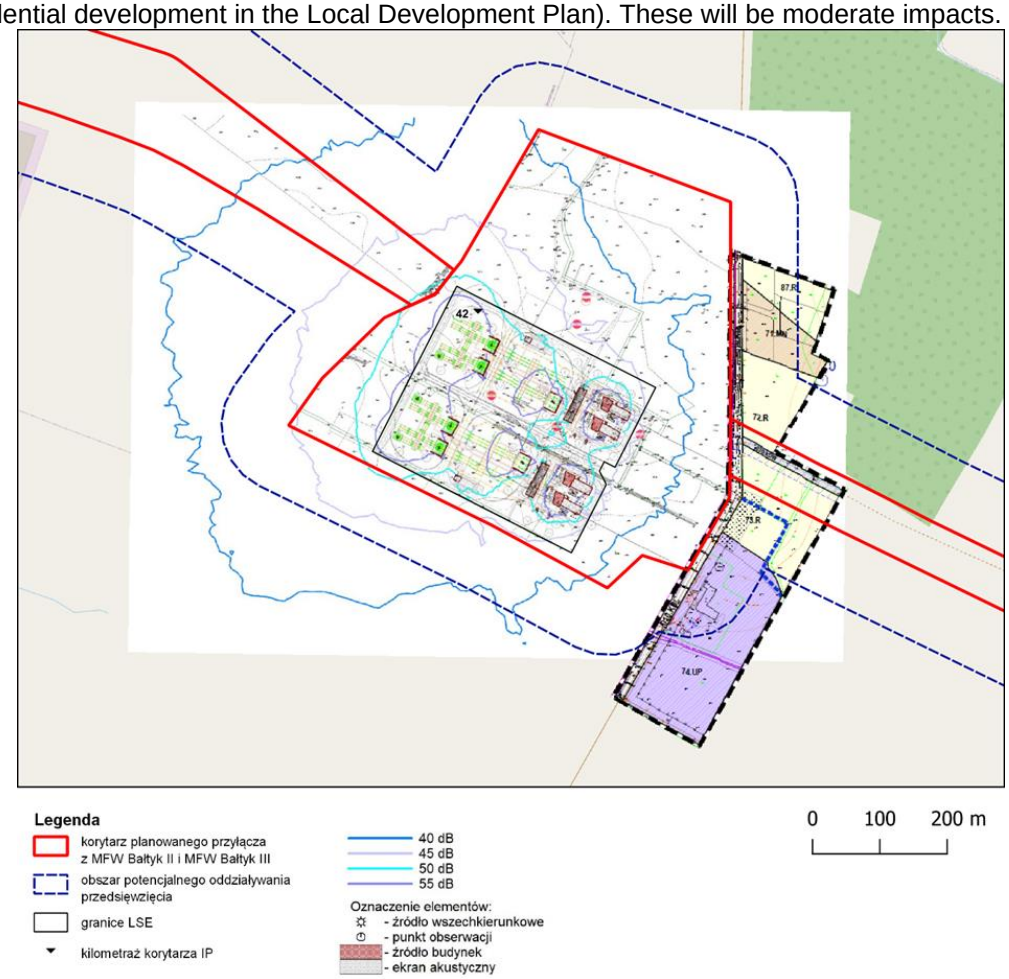

Figure 10. *Visualisation of the results of daytime and night-time calculations - with reference to the LDP*

Source: Noise emission calculation (Volume IV, Annex 4).

Impact on electromagnetic fields

The impact on electromagnetic fields applies only to the operational phase. The conducted estimates (Annex 5 Volume IV) clearly indicate that even with the maximum load of individual cable lines, and consequently the entire cable run, the permissible value of the magnetic field strength (60 A/m), will not be exceeded above the ground level, in particular at the height of 2.0 m above the area level. This means that the presence of people (environmental exposure) even directly above the cable lines will be allowed without any time limits.

Oddziaływania pól magnetycznych od podziemnych linii kablowych uznano za neutralne.

Thermal impacts

Thermal impacts apply only to the functional phase. As a part of the development of the EIA Report for the planned Project, calculations of the temperature distribution in the surroundings of the designed cable tracks were carried out for different geometrical configurations of the cable system (Annex 6 Volume IV).

The performed calculations for the assumed conditions for laying cable lines with a voltage of 220 kV and 400 kV show that the thermal effect of the cables introduces slight changes in temperature at the ground surface in the area above the cables.

Thermal impacts from underground cable lines were considered neutral.

Impact on human health and life and material assets

The main potential impact on people and their living conditions and on material assets will be related to the construction phase.

The impact of the construction phase of the planned Project on people, health and living conditions and material assets will be insignificant and will mainly relate to nuisance related to noise, emissions, pollution and increased traffic, and restrictions on access to agricultural land and forests. Positive impacts will be related to the potential increase in employment for residents and the development of services during the construction period. With regard to material assets, impacts will mainly be related to the use of existing road infrastructure.

The planned Project is maintenance-free in the operation phase; periodic service works may be conducted. During the operation phase, there will be the permanent noise emissions from the ONS and small heat emissions from underground cables. In addition, the Project will have potential benefits for people during operation, socio-economic related to improved energy security and financial benefits from land rent and taxes.

Waste management

The planned Project will generate waste at each of its stages. The predicted types and quantities of waste generated during the construction, operation and decommissioning phase are presented in Subchapter 10.13.

Restricted areas

Negative impacts during construction will be related to emissions of noise, pollutants and vibrations from heavy machinery. In the exploitation stage, apart from the permanent felling of trees and the lack of possibility to build a permanent technological corridor (except for plot 359), no other negative impacts are expected. Impacts during the construction and operation phases on restricted areas have been assessed as negative insignificant.

Impacts of the decommissioning phase

The negative impact of the planned Project on the ground surface, relief, geological structure and soils in the decommissioning phase will be possible only in case of a decision on removal of the transmission cables located under the ground surface. It will be the same as the impact of the planned Project at the construction phase. The exceptions are components such as the landscape, for which the decommissioning of the ONS will allow the restoration of the original agricultural use of the land, and people, for whom the impacts associated with thermal, noise and magnetic field emissions will be reduced.

11. IDENTIFICATION OF THE ENVIRONMENTAL IMPACT OF THE RATIONAL ALTERNATIVE

The alternative is the western landfall and 400 kV overhead cable line connecting the Investor's substation (ONS) with PSE Słupsk Wierzbięcino substation. The remaining elements of the Project are unchanged compared to the Investor's variant. Therefore, this chapter focuses on assessing the impact on individual environmental components of two aspects: different route at the western landfall and related environmental impacts during the construction phase, and impacts of the construction and operation phase of the 400 kV overhead line along the approx. 6 km section between the planned ONS substations and the PSE Słupsk Wierzbięcino substation. The components whose assessment is different from the Investor's variant are presented below.

Impact on land surface

Implementation of the alternative option in a wide strip of Wydmy Lędowskie (Lędowskie Dunes) overgrown by mixed woods and coniferous forests and the existing and planned cuttings, as well as due to the significant altitude differences occurring here, may intensify eolian processes. As a result of the activation of these processes, significant changes in the character of the relief may occur both within the construction corridor and in neighbouring areas. Dune processes may significantly affect adjacent habitats. These will be significant impacts.

The impact during the construction and operation phase of the alternative option on the land surface and relief will be significant, due to the high probability of aeolian processes being triggered in the area of Lędowskie dunes.

Impact on nature

Vegetation and natural habitats

The implementation of the overhead line as well as the underground line requires tree felling in a strip of up to approximately 32 m in width. Nevertheless, due to the western landfall of the cables there are differences due to the width of the individual natural habitats that will be elimiminated.

the impact of the construction phase of the alternative option on the vegetation cover and natural habitats will be significant and will relate to the permanent transformation and occupation of the site and the removal of vegetation cover and natural habitats, which may lead to the initiation of eolian processes.

Permanent deforestation of the technological corridor due to the operation of the 400 kV power line with a width of approx. 32 m will have a permanent impact in the form of discontinuation of a patch of habitats: sub-Atlantic oak-hornbeam (9160) and fertile beech-hornbeam (9130), disappearance of species characteristic for a given natural habitat and the encroachment of habitat-indifferent species, which on the one hand may translate into an increase in biodiversity in a given section also through the increase of the area of shrubs in the forest edge, and on the other into the degeneration of patches of natural habitat.

The impact of the operation phase of the alternative option on vegetation and natural habitats will be moderate. Negative impacts on vegetation and natural habitats, as in the case of the Investor's option, will mainly concern succession and the possibility of invasive plant species appearing.

Forests

The alternative in the area of the western landfall of the cables increases the proportion of natural habitats of forests on coastal dunes (habitat 2180) and acid beech forests (habitat 9110) in relation to the option indicated by the Investor. In connection with the implementation of the planned Project in the alternative option, there will be tree felling in the construction corridor with an estimated maximum area of 19.3 ha.

The impact during the construction phase on forests will be significant due to the fact that deforestation of the mixed forest and coniferous forest habitat on coastal dunes (2180) may intensify eolian processes.

The operation of the 400 kV mid-forest overhead line involves permanent tree felling in a strip of approximately 32 m wide. This is a factor that differentiates the scale of the planned works, as in the case of the 400 kV underground cable lines (Investor's option), a 20 m wide permanent tree felling is

required. During the operation phase in the Investor's option, the cuttings will occupy 14.2 ha. Whereas in the alternative option: 18 ha.

The impact during the operation phase of the alternative option on forests will be moderate and will mainly concern increased pressure of non-forest species (including invasive species) on the remaining forest phytocoenoses.

Biota of macrofungi and lichens

During the construction phase of the alternative option the main impacts on the biota of macrofungi and lichens will be the same as for the option indicated by the Investor.

The impact during the construction phase on the biota of Macrofungi and lichens will be moderate and will primarily relate to the temporary transformation and occupation of the site, mainly habitat 2180.

Birds

The selection of the western option for the ECI landfall, due to the greater extent of the impact and the presence of less transformed forests will result in impacts on a greater number of bird sites. The impact of the construction phase of the alternative option on birds will be moderate.

During the operation phase of the planned Project, potential impacts on birds may be related to the occurrence of collisions of flying birds with overhead power infrastructure, i.e. with hanging wires or pole structures of the 400 kV line. This will be a long-term impact that will have a decidedly negative, permanent impact on birds, primarily related to their collisions with overhead lines and permanent habitat fragmentation. The impact during the operation phase on birds will be significant.

Impact on the protected landscape area

Impacts of the construction phase on the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki will be similar to those identified in the Investor's variant. In the area of the landfall of the cables (between 35' and 37' km) there is a wide strip of mixed forest and dune coniferous forest habitat. Due to the planned HDD guided drilling the deforestation of a habitat area of approximately 0.85 ha and significant levelling of this area will be required. Unlike in the Investor's option, the site is not developed.

The impact during the construction phase on the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki was assessed as significant due to the transformation and occupation of the **area**, especially the habitat of mixed forests and coniferous forest on dunes (2180), which may intensify eolian processes. In addition, there will be loss of forest, vegetation cover and periodic disturbance of fauna.

The impact during the operation phase of the alternative option on the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki has been assessed as significant, due to permanent changes to the landscape caused by cutting within the habitat of forests and coastal forests (2180), which may intensify aeolian processes.

Impact on ecological corridors

The construction phase, as in the Investor's option, will be associated with the felling of trees, the realisation of excavations and the laying of the cable line and the construction of the ONS substation and will result in a temporary interruption of spatial continuity within:

- Pobrzeże Słowińskie corridor of national importance,
- Nadmorski (coastal) corridor of supra-regional importance,
- eastern Atlantic migratory bird route .

In addition, a 400 kV overhead line of approximately 6 km will be constructed to connect the ONS stations with the PSE S.A. station. (42.4 'to 47.7' km) within the above-mentioned ecological corridors. As construction works will generally be carried out during the daytime, in a given section over a period of several days, scaring of animals will cause a minor and short-lived reduction in the functionality of ecological corridors.

The impact during the construction phase on the ecological corridors has been assessed as moderate. Negative impacts on the ecological corridors during the construction phase will primarily relate to land transformation and its occupation, especially in the coastal strip due to the construction of

infrastructure for the landfall of cables from the sea. In addition, they will be related to forest clearing, removal of vegetation and periodic scaring of fauna.

Once the construction phase has ceased, the site will be restored to its original state, with the exception of the technological corridor for underground 220 kV cable lines with a width of 10-31 m and 400 kV power line with a width of 32 m. These areas will be permanently deforested. The agricultural areas will be returned to their original state and used for agriculture.

The creation of a deforested space with the dominance of an overhead line and 2-track poles will result in the discontinuation of the spatial continuity of the ecological corridors. In the area of the planned Project runs a part of one of the most important bird migratory routes in Central Europe - of the eastern Atlantic migratory route. In this context, a high collision of birds with the planned 400 kV overhead power line is forecast. Collision with the 400 kV overhead power line will also affect local birds nesting in the area.

The impact during the operation phase on the ecological corridors has been assessed as significant, due to the location in the area of the eastern Atlantic migration route corridor, which poses a risk of high bird mortality caused by the planned high voltage line.

Impact on biodiversity

The impact of the alternative option on biodiversity will be greater than that of the Investor's option due to the presence of mixed forest and woodland on coastal dunes (habitat 2180) in the area of the western landfall of the cables. This is not a transformed area as in the case of the Investor's option.

The implementation of the planned Project will be significant for protected plant species, habitats, forests and birds. The greatest impacts will be associated with the construction phase. Due to permanent habitat and forest clearance, impacts on breeding birds and bat breeding habitat will be long-term and permanent. The operation of the mid-forest 400 kV overhead line will have definite negative, permanent impacts on birds, primarily related to their collisions with overhead lines and permanent habitat fragmentation.

The most valuable area (with the greatest biodiversity) is located within the boundaries of Protected Landscape Area Pas Pobrzeża na Zachód od Ustki.

Impacts of the construction phase on the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki are assessed to be significant due to transformation and occupation of the area, particularly the habitat of mixed forests and coniferous forests on dunes (2180), which may intensify eolian processes. In addition, there will be the removal of forests, vegetation cover and periodic scaring of fauna. Therefore, the impact on biodiversity can also be considered significant.

Once the construction phase has ceased, the land will be restored to its original state, with the exception of a technological corridor of approximately 10-31 m for the underground 220 kV line and 32 m for the 400 kV overhead line. Negative impacts on biodiversity will mainly relate to succession and the possibility of invasive plant species.

The impact during the operation phase of the alternative option on biodiversity has been assessed as moderate, due to tree felling within the coastal woodland and forest habitat (2180) and the potential for invasive plant species.

Impact on landscape

Impacts on the landscape of the alternative option during the construction phase will be similar to those identified in the Investor's option. The greatest impacts will occur due to the foundation of the drill exit chamber through the coastal zone. Unlike the Investor's option, this is not a developed area. Transformation in this area of such a large scale may result in intensification of eolian processes. Therefore, the impacts of the construction phase in the area of the western landfall of the cables will be negative, direct, secondary, long-term, permanent and local. The sensitivity has been determined to be high. The impact can be considered significant.

During the construction phase of the 400 kV overhead line, the main impact on the landscape will be the periodic, specific appearance of the construction area, primarily in the area of pole stands

involving construction machinery and equipment. After completion of the construction works, the areas around these posts will be restored to their original use.

The impact during the construction phase on the landscape has been assessed as significant. Negative impacts on the landscape during the construction phase will primarily relate to tree felling in the area of the western exit of the cables to the counters, which may result in the initiation of eolian processes.

Permanent landscape changes will occur as a result of the implementation of the western landfall of the cables and in the mid-forest sections of the power line route. Around 15-20 power poles with a maximum height of 100 m are planned along the entire length of the line. The 400 kV overhead line will be a new linear landscape feature in the mid-forest and in the agricultural-industrial and forest surroundings. The interference with the landscape will be significant, with a supra-local scope. The tall electricity poles and the planned ONS will be visible from a long distance and will become a dominant landscape feature in the area.

The impact during the operation phase on the landscape has been assessed as significant. Negative impacts will mainly relate to very high (several tens of metres) power poles and onshore substations, which dominate the landscape.

Impact on human health and life

Impacts during the operation phase will be similar to the Investor's option, differing at the location of the 400 kV overhead power line. The most significant nuisances associated with the operation of the line relate to noise emissions and electromagnetic radiation. In addition, the metal poles will cause a problem for the owners of the plots, as the existing use of the land will not be possible due to the presence of the poles. As part of the Report, the electromagnetic field distributions from the 400 kV overhead power line were calculated (Annex 5, Volume IV), which showed that there are no exceedances of the permissible values set in the applicable regulations for places accessible to people and areas intended for residential development. However, the results of the sound level distribution calculations (Annex 4, Volume IV), in the vicinity of the 400 kV double-circuit overhead line designed as an alternative option, indicate that in the vicinity of the system of parallel 400 kV overhead lines, the implementation of residential development, due to the possibility of exceeding the permissible noise level (45 dB), is not possible in an area with a width of 78 m (2 x 39 m).

During operation, the overhead line will be a dominant feature in the surrounding area and will cause some restrictions on the daily use of agricultural and forest land.

The impact of the operation phase of the alternative variant on human health and life was assessed as significant due to the potential reduction in the quality of the acoustic climate along the entire route of the 400 kV overhead line.

12. CUMULATIVE IMPACT

In accordance with regulations of the EIA Act, an assessment of the cumulative impact should cover the projects executed, being executed and planned to be executed within the range of the implementation and impact of the project. Determination of the existing and planned projects in the area of the planned Project was based on data collected in 2022. The sources of data are as follows:

- issued and pending environmental decisions,
- findings on the basis of the official portal of the maritime administration - SIPAM (applications and issued PSZW and PUUK decisions);
- information from the Investor.

The possibility of cumulative impacts has been assessed for 7 offshore and 7 onshore projects. The vast majority of the projects with potential cumulative impact concern the power transmission cable lines - SWEPOL Link and the planned power connections from offshore wind farms, which connect either to the Słupsk Wierzbięcino substation or to the planned Krzemienica substation. Due to the lack of negative impacts during the operation phase, no accumulation of negative impacts is forecast.

13. TRANSBOUNDARY IMPACT

Due to the location and method of implementation of the planned Project, it is not expected that its implementation, at any stage, will cause the occurrence of transboundary impact on the environment. The distance of the construction site of the planned Project to the maritime border, i.e. the Polish exclusive economic zone is about 35 km.

14. RISK OF A MAJOR FAILURE OR RISK OF A NATURAL OR CONSTRUCTION-RELATED DISASTER

Major failure

Potential major emergencies that may occur during construction, operation and decommissioning of the offshore part of the Project are: incidents at sea, spills of petroleum substances, explosions of unexploded munitions and unexploded military ordnance, mechanical damage of the cable lines, release of waste or domestic sewage, introduction of biocides into water. The risks associated with the above risks resulting from offshore events, due to the preventive measures in place, have been assessed as negligible. At the stage of exploitation of the Project there is a risk of failure of the connection infrastructure as a result of mechanical damage to the cable line. This risk should be considered negligible.

The main environmental risks during construction, operation and decommissioning of the onshore part of the ECI are potential leakage of harmful substances (sewage, petroleum products), atmospheric emissions, fires. Adequate supervision of machinery operation and maintenance, as well as proper management of the investment process and subsequent operation of the ECI, virtually eliminate the above risks. Fires occurring in stations are rare; the use of the latest technology and warning systems make it possible to fully prevent this type of event. The use of the most modern equipment and procedures also prevents the emission of gaseous substances into the atmosphere.

Natural disasters

As a result of the chosen installation technology, the risk of damage to the cable line as a result of strong winds, ice phenomena, seismic phenomena should be considered negligible.

Taking into account natural disasters resulting from climate change such as lightning, droughts, changes in temperature, changes in wind speed, icing, an analysis has been prepared with the possibility of their impact on the operation of the planned Project. None of the above risks will adversely affect the operation of the Project.

During the construction, operation and decommissioning phases of the planned Project, the occurrence of a natural disaster should be considered negligible and unlikely.

Construction disasters

The planned Project, due to its nature (submarine and underground cable lines) is not a potential source of construction catastrophes and hazards for the immediate environment, including people. The probability of a construction disaster occurring during the operation of the Project is negligible taking into account the requirements of the applicable regulations, standards, technical approvals and technical conditions. The use of modern technologies planned by the Investor is intended to ensure the safety and reliability of electricity transmission and to meet the relevant standards and environmental requirements**.**

15. SUMMARY OF SIGNIFICANCE OF THE IMPACT AND COMPARISON OF OPTIONS

Offshore part

The analysis of the impacts of the planned Project showed that there will be no significant impacts on the abiotic components of the marine environment, including water body use and human health and life, during either the construction or operational phases. Moderate to significant impacts are expected in the context of animate nature.

In the case of animate nature, reversible changes have been identified for most components during the construction phase, and the significance of these impacts is moderate at best. The impacts with the largest range - supralocal - relate to ichthyofauna and marine mammals, while those with a local range relate to birds.

During the operational phase, all impacts on biotic components have been identified as insignificant.

In order to reduce the impacts occurring during the construction phase, a number of measures have been proposed to minimise the impact of the planned Project on the marine environment (Chapter 16).

Onshore part

The analysis of environmental data showed the possibility of implementing the Project in the Investor's variant. The implementation of this variant, as shown in the identification of impacts in Chapter 10 will be more beneficial for the environment compared to the implementation of the alternative variant.

The Investor's variant differs from the alternative variant in the location of the cable exit to the shore and the technology of power exit from the ONS. The rational alternative includes the option of a landfall further west (western option) using a trenchless HDD method and the construction of a 400 kV overhead line from the ONS to the PSE substation, instead of the underground cables proposed by the Investor.

In the case of construction of the alternative, significant activities have been identified, mainly due to the planned foundation of the exit chamber of the trenchless passage in the area of forest habitat. Activities planned in the area of the western landfall of the cables are classified as significant for components such as land surface, vegetation and habitats, forests and biodiversity. Also with regard to the landscape and the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki, the impacts will be significant.

The construction of the mid-forest 400 kV overhead line under alternative variant would involve clearing in a 35 m wide strip, over a distance of approximately 6 km and the establishment of a 70 m wide technological corridor from the 400 kV line (35 m each from the line axis in both directions) during the operation phase. The LV power line is a source of electromagnetic field and noise emissions, which was assessed as significant.

During the construction phase of the Investor's variant, changes of a short-term, reversible nature were mostly identified, within the limits of the ONS, and the significance of impacts is at most moderate. Moderate impacts have been classified in relation to soils, due to the permanent occupation of the site for ONS substations. For forests, negative impacts will mainly relate to tree felling. The planned Project will be a source of noise from the ONS substation during the operation phase. However, its operation will not cause an exceedance of the sound level limit.

The implementation and operation of the Investor’s variant will not have a significant impact on the environment, both during the construction and operation phases. Impacts associated with the operation phase will be long-term but will be limited to the extent within the boundaries of the ED. To reduce impacts, a number of measures have been proposed to minimize the environmental impact of the planned Project (Chapter 16).

Due to the lower risk to the environment, including natural assets and people, the Investor's option is the more favourable variant for the environment.

16. PROPOSAL FOR MINIMIZATION MEASURES

The Report includes proposed mitigation measures for the **design, construction, and operational phases** for those elements of the marine and terrestrial environment that require their application to mitigate or eliminate the potential negative impact of the Project, which have been identified and analysed in Chapters 9 and 10 of this Report.

Maritime area

The most important recommendations for the design phase:

- where possible go around clusters of vegetation, i.e. large boulders and clusters of stones in sections where valuable phytobenthos habitats were found (where vegetation cover was in the 70-90% range and protected species were present) – only 3 stations within ECI corridor from OWF Bałtyk II;
- in the habitat crossing section 1110 Piaszczyste ławice podmorskie (Sandbanks that are slightly covered by sea water) lay the cable in a trench, do not use alternative methods to protect the cable (e.g. stone bedding, concrete mattresses) to avoid altering the nature of the habitat - only ECI corridor from OWF Bałtyk II;
- bypass, if possible, sections where mussel assemblages were found - ECI corridor from OWF Bałtyk II; OFW Bałtyk III and connector.

The most important recommendations for the construction phase:

- within the Ławica Słupska Natura 2000 site, it is obligatory to carry out works related to cable burial/dredging outside the bird migration and overwintering period from 1 October to 30 April;
- for the section km 25,3 ECI corridor to km 35 ECI corridor (4 Nm offshore), it is obligatory to conduct works related to cable burial/dredging and dredger/refuller operations, including spoil disposal (excluding HDD drilling works), outside the Atlantic salmon and river lamprey spawning migration period from 15 September to 15 November and from 1 March to 15 April;
- a 'soft start' procedure should be applied prior to the commencement of construction work by starting the work with little and increasing underwater noise (e.g., starting underwater equipment initially at idle run and gradually increasing power), allowing fish to escape from the area directly affected by the seabed intervention works and avoiding direct mechanical impact;

Recommendations for the operational phase

No recommendations because no significant impacts were recognised.

Terrestrial environment

The most important environmental conditions to which mitigation measures are addressed are presented on maps below (fig. 11a-11d).

The most important recommendations for the design phase:

- To design trenchless crossings– it is no interference:
  - within the technical zone established by the order of the Director of the Maritime Office),
  - at the point of crossing of Struga Lędowska (km 37.2 of the ECI corridor),
  - at points of conflict with major roads and railways: provincial road nr 203, local railway line to the Naval Center (km 36.5 of the ECI corridor);
- At the stage of detailed routing of cable as far as technically possible and as far as the availability of land will allow an amphibian breeding habitat (forest pond) at km: 43.6 of the ECI corridor, should be bypassed or the construction site should be limited as much as possible;
- At the stage of detailed routing of cable routes, as far as technically possible and the availability of land will allow, a bat wintering site (complex of the 9th Fixed Artillery Battery in Lędów Gun emplacement No. 504 - cannon stand No. 4) should be bypassed;
- The conditions for carrying out works within the historic railway line - "Route of the rolled-up tracks", should be agreed upo with the Office of the Municipality of Ustka; in the case of an open trench crossing, the construction strip should be narrowed as much as possible.

The most important recommendations for the construction phase:

- The exclusion of any interference within Lędowskie Wydmy and to the north of the dunes (i.e. north of the border of the technical zone established by the order of the Director of the Maritime Office in Gdynia, excluding the transformed part of the site;
- Soil stockpile divided into humus and bedrock, together with proper restoration of the soil profile. To protect the humus from contamination, temporary covering with plastic sheeting is recommended (to prevent weeds); once the excavation is closed, restore the soil profile, and spread the humus with the correct compaction factor, after cleaning it first;

- Prohibition of water abstraction for drilling fluid as well as water discharge to the Lędowska Struga watercourse, the Modła Lake and smaller watercourses and ditches flowing into the Modła Lake along the ECI corridor from 36.9 km to 37.5 km;
- Transplanting specimens with an appropriate portion of the substrate (metaplanting), outside the construction corridor of direct impacts with natural for the following protected plant:
  - Orchidaceae (the broad-leaved buckthorn),
  - Caprifoliaceae (the Pomeranian honeysuckle;

  replanting should be done to patches that are identical or similar in habitat (under the supervision of a botanist), optimally between April 15 and May 31 (or any other period indicated by a botanist);
- During earthworks within habitat *Dry heaths* - it is recommended that the turf be removed and stored in the corridor of works and re-established after completion of the construction works in the same place; this measure will enable the heathland to recover spontaneously;
- If it is necessary to destroy amphibian breeding habitats at km 43.6 and km 47.2-47.3 , this should be done between 16 October and 28 February. In the case of a different date, it will be necessary to catch herpetofauna specimens and move them to substitute habitats. Carry out activities under supervision of a herpetologist;
- Setting up temporary protective fencing, i.e., during the migration and breeding period for amphibians and reptiles (1 March to 15 October) on both sides of the construction corridor, around open excavation;
- Tree and shrub felling in forest areas outside the bird breeding season, i.e., outside the period from March 1 to August 31 (confirmed by an ornithologist, as breeding periods may start later or end sooner);
- Suggested as an action to compensate for the loss of hollow trees - hanging 23 different types of nesting boxes;
- Felling trees from forested areas at the bats breeding site, i.e. km 46 to 46.8, should be carried out outside the period of reproduction and peak activity, i.e. outside the period of June 1 - September 15, and under environmental supervision – by a chiropterologist;
- Construction works, in the area of close residential development of Lędowo, Pęplin and Gajki i.e. km: 37.7-38.2; 44.9-45.4; 45.6-46.1 of the ECI corridor, conduct only during daytime hours, excluding Sundays and holidays (except for work that must be performed continuously, such as drilling;
- To limit intensive transport through villages with tourist functions: Lędowo, Duninowo and Modlinek in the period July - August (ensuring traffic flow, aiming to reduce vibrations and noise as much as possible);
- To ensure smooth access to MOWI S.A with consideration of work shifts. It applies to the access road to MOWI S.A (road number: D 101202G-1) and provincial road 203.

The most important recommendations for the operational phase:

- Botanical inspection of the technology corridor in forest areas (i.e., the area where afforestation cannot be reintroduced) for the expansion of invasive plant species;
- Monitoring should be carried out at a frequency of once a year for three consecutive growing seasons. In case of an outbreak of invasive plants, the plants and their seedlings should be uprooted and then disposed of in a manner appropriate for bio-waste in the municipality. An outbreak of invasive plants is considered a grouping of more than 10 individuals in an area of 10 m^2;
- Prohibit the control of shrub and woody vegetation formed as self-sowing along the course of the planned Project with total herbicides, causing the destruction of all plants, including those providing concealment, especially for fauna and avifauna;
- The use of annual mowing of grasses and herbaceous vegetation in the technology corridor (outside the arable land) from August 1 to September 30, which will prevent the strong growth of shrub and woody vegetation and promote the maintenance of a belt of melliferous plants and "weeds" that are hiding places not only for reptiles, but also for invertebrates, small mammals and birds. Part of the mowed biomass, such as 25%, can be left in place as hiding places for reptiles and entomofauna and other small vertebrates.

Natural conditions of the course of the connection to MFW Bałtyk II and MFW Bałtyk III
scale
1:10 000

Legend

- corridor of the planned connection with MFW Bałtyk II and MFW Bałtyk III
- area of potential impact
- IP corridor kilometre points adopted for the purposes of this Report

Nature Protection:

- Nature Reserve
- buffer zone of the Nature Reserve
- Natura 2000 Birds Directive Sites
- Natura 2000 Habitats Directive Sites

Environmental conditions:

- Historic railroad "Trail of the rolled-up tracks"
- local railroad line to the Naval Center
- Struga Lędowska (Węda)
- small watercourses and ditches in the area Struga Lędowska (Wędy)
- Modła lake
- hydrogenic soils
- conservation protection - cannon-battery No. 4 (bat wintering site)

Bird habitats proposed for bypass:

- common beech
- oak
- pedunculate oak
- black alder
- scots pine

Nature inventory

Habitats:

- Acidophilous oak woods (Quercion robori-petraeae)
- Mixed forests and coniferous forests on coastal dunes
- Dry heaths (Calluno-Genistion, Pohlio-Callunion, Calluno-Arctostaphylion)
- Fertile beech forests (Dentario glandulosae-Fagenion, Galio odorati-Fagenion)

Vascular plants:

- Broad-leaved helleborine (EpiHel)
- Callitriche hamulata (CalHam)
- Callitriche verna (CalVer)
- Sand sedge (CarAre)
- Black crowberry (EmpNig)
- Rusty-red buckthorn, Sand sedge (EpiAtr, CarAre)
- Broad-leaved buckthorn (EpiHel)
- Pomeranian honeysuckle (LonPer)

Bryophytes:

- Pin cushion moss (LeuGla)
- Neat feathermoss (PsePur)
- Springy turf-moss (RhySqu)
- Dilated scalewort(FruDil)
- Crisped pincushion moss (UloCri)
- Red-stemmed feathermoss (PleSch)
- Neat feathermoss (ThuTam)

Lichens:

- Valley oakmoss lichen (EvePru)
- Ridged ramalina lichen (RamFra)
- Dotted ramalina lichen (RamFar)
- green reindeer lichen
- green reindeer lichen, gray reindeer lichen

Amphibians:

- existing and potential amphibian breeding sites

Birds:

- Northern lapwing (DryMar)
- Red-backed shrike (LanCol)
- Woodlark (LulArb)
- Red-breasted flycatcher (FicPar)
- Common redstart (PhoPho)
- Western yellow wagtail (MotFla)
- Whinchat (SaxRub)
- Corn bunting (EmbCal)
- Tawny owl (StrAlu)
- Common crane (GruGru)

Bats:

- bat breeding habitat

Figure 11a. *The most important environmental conditions within EIC corridor - LEGEND*

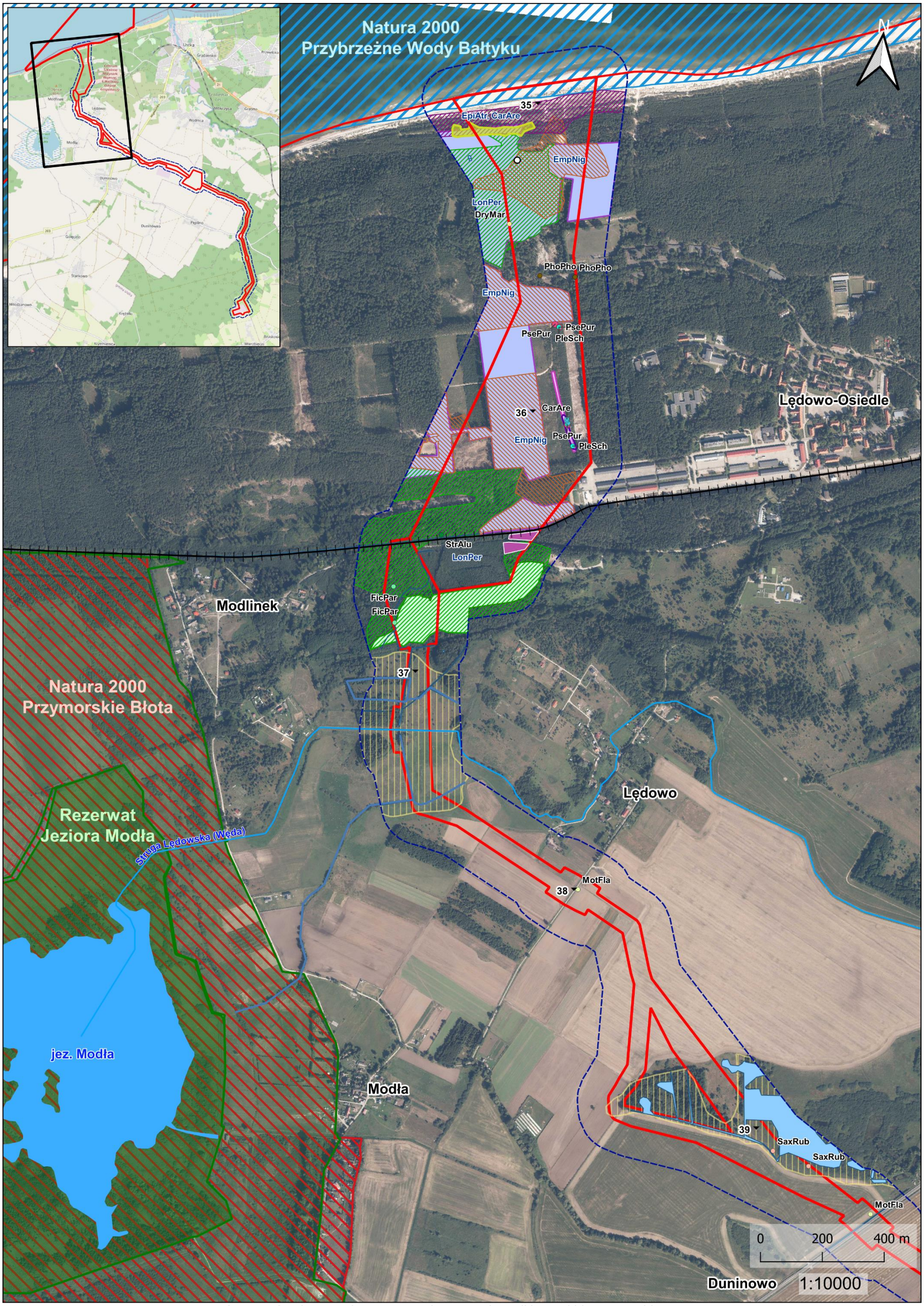

Figure 11b. *The most important environmental conditions within EIC corridor -part 1*

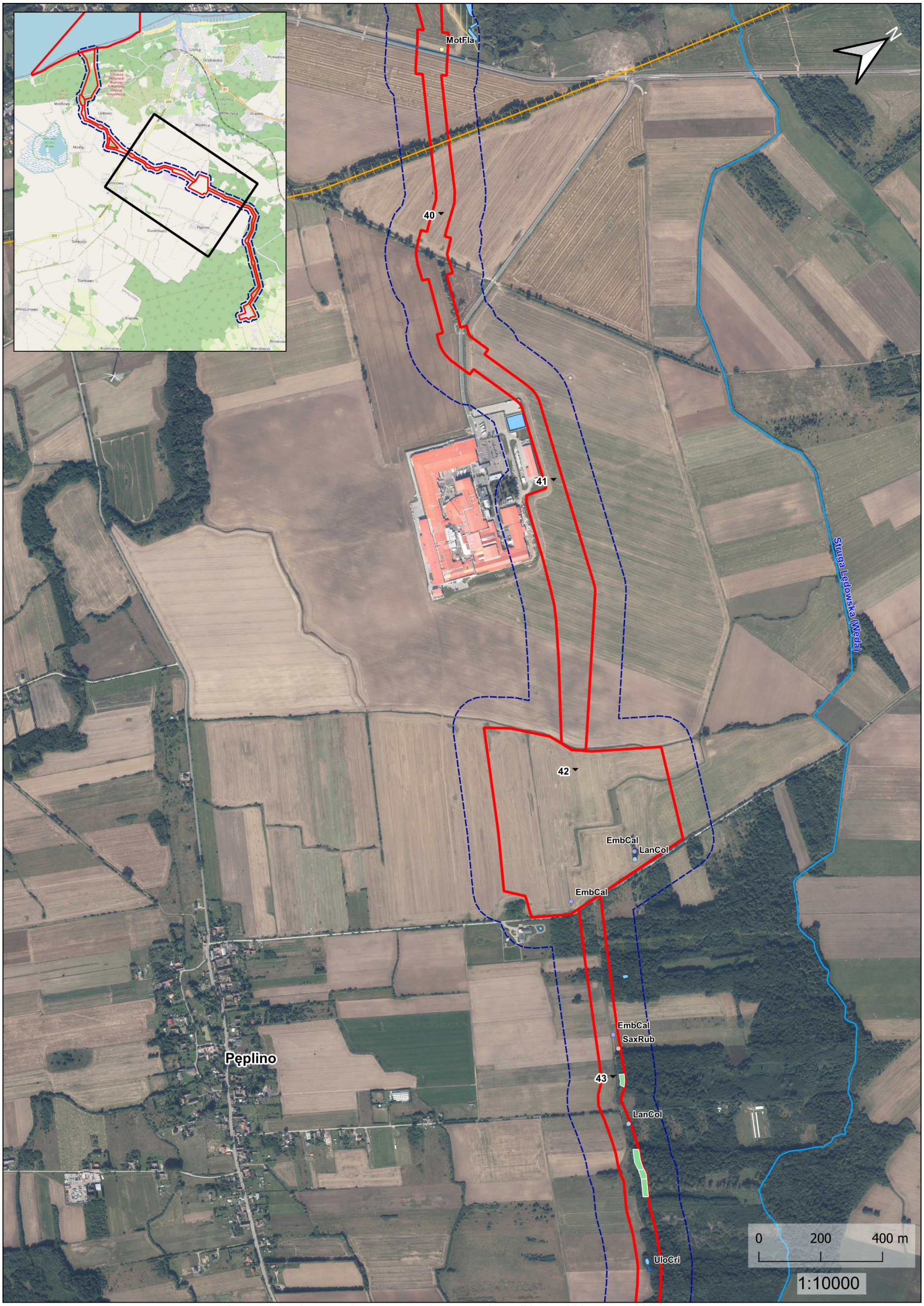

Figure 11c. *The most important environmental conditions within EIC corridor -part 2*

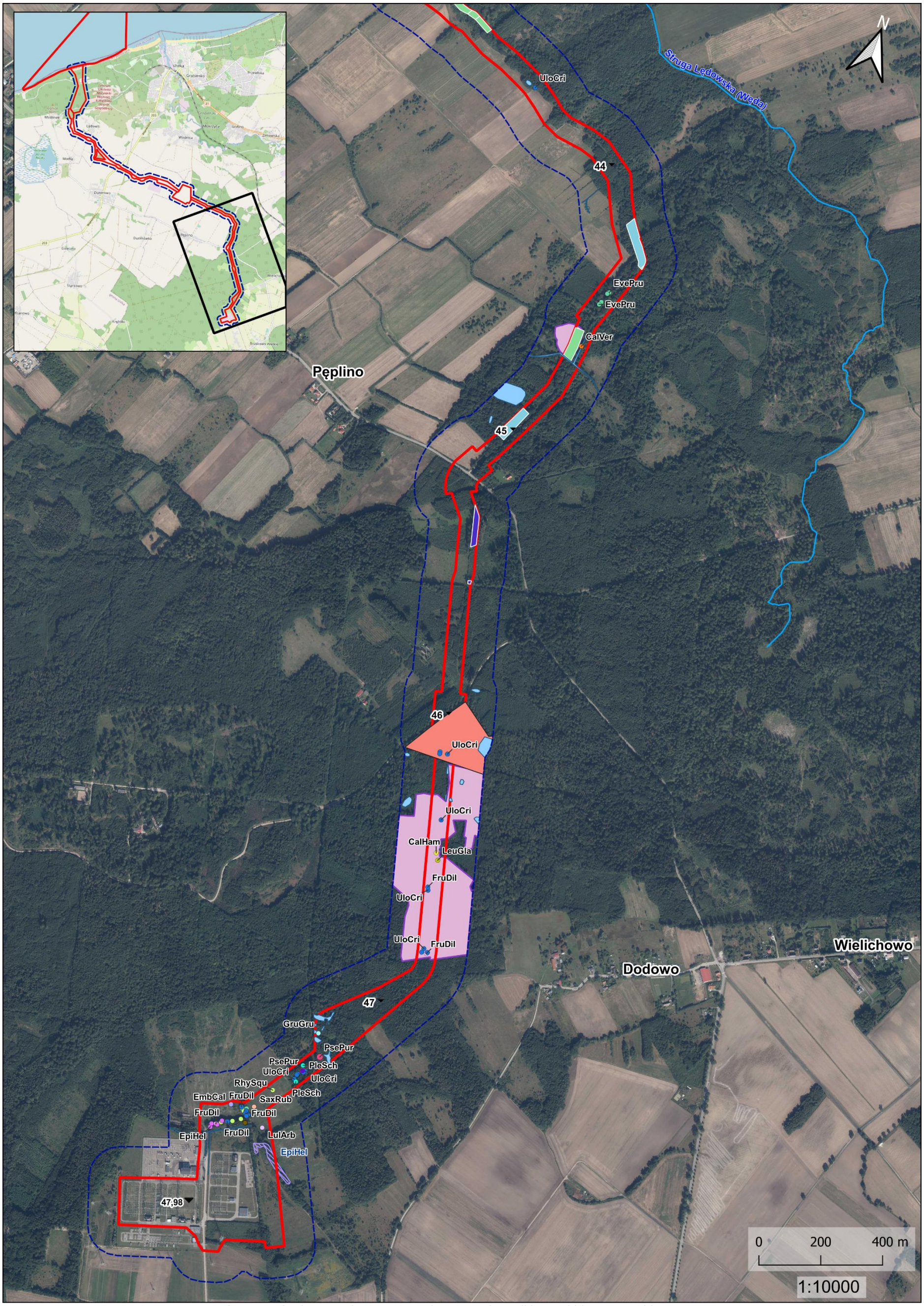

Figure 11d. *The most important environmental conditions within EIC corridor -part 3*

17. PROPOSAL FOR MONITORING

Construction phase

As time constraints have been introduced for the construction phase works, it will be primarily necessary to monitor the timing of the works, taking into account:

- offshore:
  - the exclusion of the birds migration and wintering period from works within the Ławica Słupska Natura 2000 site (1 October - 30 April),
  - the exclusion of the bi-environmental species migration period (15 September - 15 November) at the section from the shore up to 4 Mm from cable burial/dredging works and dredger/refuller operations, including spoil disposal;
- onshore:
  - tree felling in forest areas outside the bird breeding season (i.e. from 1 March to 31 August),
  - felling of trees in the place of identified breeding habitats for bats - a section of approx. 800 m - in the period from 1 June to 15 September,
  - removal of ponds - amphibian breeding habitats during the amphibian wintering period, i.e. from 16 October to 28 February,
  - transplanting broad-leaved buckthorn and Pomeranian honeysuckle into substitute habitats between 15 April and 31 May - the optimum period, or at any other time indicated by a botanist.

In addition, the tasks of environmental supervision should include:

- Adjacent to the Natura 2000 Przymorskie Błota site:
  - controlling water intake's source for drilling mud and the handling of water from trench and chamber dewatering and drilling mud, including a prohibition of the abstraction and discharge of water into the Lędowska Struga and other watercourses and ditches flowing into the Modła lake;
  - controlling the location of storage yards and temporary construction facilities outside the wetlands in the vicinity of the Modła lake.
- In other areas, control over:
  - the use of the "soft start" method for offshore works,
  - the prohibition to go beyond the construction corridor of the Maritime Office, outside the existing paved area,
  - the carrying out of soil deposition with the division into humus and bedrock and the protection of humus,
  - the method of replanting protected vascular plants (metaplanting),
  - the cleanliness of the construction site in terms of entomological traps,
  - the method of draining water from excavation dewatering, with a view to limiting the amount of suspended matter discharged into water and the ground,
  - the timing and method of setting up temporary fences for amphibian control buckets,
  - the method of fencing off trees and shrub clusters which are adjacent to the construction strip and which are not to be felled,
  - unscheduled felling of individual trees and shrubs under the supervision of an ornithologist,
  - places for hanging nest boxes and bat boxes,
  - the protection of slopes against colonisation by sand martins,
  - carry out works in the vicinity of residential buildings during daytime on working days,
  - locate construction and storage yards on paved areas, outside the Lędowskie Wydmy, wetlands, protected areas and outside acoustically sensitive areas.

Operational phase

As a result of the environmental impact assessment and analyses carried out, the authors of the EIA Report recommend monitoring measures for the onshore section:

- nature monitoring, including checks within the technology corridor in forest areas (i.e. land that cannot be reafforested):

  - for the expansion of invasive plant species;
  - with regard to the manner of combating shrub and tree vegetation created as self-sown vegetation along the course of the planned Project;
  - the annual mowing of grasses and herbaceous vegetation in the period from 1 August to 30 September;
  - for roosting of bats and birds in the first and third year after completion of the construction works; check after the breeding season (clean the roosts on occasion);
- taking measurements of the magnetic component of the field over the cable ducts; the measurements should be made before the facility is put into use (in the commissioning period) in accordance with the requirements specified in the Regulation of the Minister of Climate of 17 February 2020 on ways of verifying compliance with the permissible levels of electromagnetic fields in the environment (Dz.U.2020.258 as amended);
- performing noise measurements from the LSE station. Measurements prior to the commencement of use of the facility (during the start-up period) in accordance with the requirements specified in the Regulation of the Minister of the Environment of 30 October 2014 on the requirements for conducting measurements of the volume of emissions and measurements of the amount of water taken (Journal of Laws 2019.2286 as amended).

18. POST-IMPLEMENTATION ANALYSIS

A post-implementation analysis is recommended to verify the effectiveness of the minimisation measures adopted in this report for the construction and operational phases.

The post-implementation analysis should be carried out about 3 years after the building and commissioning phase will be finished and should include:

- results of monitoring the effectiveness of metaplanting of the Pomeranian honeysuckle and the Broad-leaved buckthorn (photographic documentation of transplantations, map and coordinates of metaplanting locations and documentation of effectiveness, according to a botanist's guidelines);
- place and date of hanging bird nesting boxes and bat boxes (photographic documentation, location maps, coordinates of locations and results of monitoring of bird/bat occupation of boxes);
- possibly: conclusions from the environmental monitoring carried out during construction, which may be useful for other EIA reports indicating e.g. whether the proposed measures were effective and whether they needed to be modified (e.g. concerning the migration times of amphibians, the presence of protected species in the construction strip, etc.);
- the results of the monitoring proposed in the operational phase in forest areas together with the obtained results and possible recommendations for further use (including information on the expansion of invasive species and their removal, information on how to remove seedlings, photographic documentation and timing of annual grass mowing).

19. THE BEST ENVIRONMENTAL OPTION

The Investor's variant was considered the most environmentally favorable because:

- according to the impact assessment performed for both variants, the eastern exit of the cables to land was considered less intrusive to the environmental conditions identified here. The existing investment in the surrounding area (the Naval Center), the partially paved road and the transformation of the area facilitate the location of the connection infrastructure. Such a location is far more environmentally favorable than the transformation of natural habitats of forests,
- the foundation of underground cable lines will have far less environmental impact than the optional overhead line. The permissible value of magnetic field strength will not be exceeded, and the thermal impacts of the cables introduce insignificant temperature changes near the ground surface,
- the route of the ECI passes through forest and agricultural land and will not cause environmental impacts or restrictions on agricultural use after construction,
- the ECI route does not pose a threat to natural values and biodiversity, because it because it bypasses valuable areas.

Investor's variant, can be considered the most environmentally favorable, assuming the application of the minimizing measures discussed in Chapter 16 of this Report.

20. ANALYSIS OF POSSIBLE SOCIAL CONFLICTS

The planned implementation of two independent sets of power output facilities from the two offshore wind farms MFW Bałtyk II and MFW Bałtyk III, is in line with the EU's goals on climate change mitigation. It can be assumed, based on practically no negative impact of the planned Project in the operation phase and spatially and temporally limited negative impact of the construction phase, that the execution of the planned Project is characterised by a low risk of a conflict. Offshore wind energy is a sector that represents an opportunity of great development for the Polish economy, in particular for the Pomeranian region.

In order to provide information to the public and counteract possible conflict situations, the Investor carried out an education and information campaign on the MFW Bałtyk II and MFW Bałtyk III project in 2015-2016. The aim of the campaign was to familiarise all stakeholders, in particular local communities and users of the Baltic Sea, with the offshore wind farm projects and to raise awareness of the potential environmental impact of the investments and mitigation measures to reduce or eliminate this impact. Community projects organised by the Investor include educational activities related to environmental protection and offshore wind energy. Dialogue with local residents and other stakeholders is maintained during the planning of the Project.

21. COMPARISON OF THE TECHNOLOGY USED WITH A TECHNOLOGY COMPLYING WITH THE REQUIERMENTS OF ARTICLE 143 OF THE ENVIRONMENTAL PROTECTION ACT

The planned project in the onshore and offshore part will meet the requirements referred to in Article 143 of the Environmental Protection Act, because:

- all substances, materials used during the construction and operation of the planned Project will not cause serious threats to the environment, and their selection will comply with the highest standards and norms for this type of installations,
- realisation of both connections at the same time ensures optimisation of use of raw materials, materials, fuels and energy connected with the construction process,
- the technical solutions applied in the implementation of the Project will be the best available techniques and technologies currently used in the world, characterised by safety and high efficiency,
- the adopted technologies and materials, which will be used during the construction of the planned Project, will correspond to world and European requirements and standards, will meet all safety requirements,
- by using modern technical solutions, e.g. cables with low leakage currents, rational energy consumption will be ensured during the operation phase,
- the operation of the underground power line will not generate waste, apart from small quantities associated with maintenance or emergency repairs.

22. RESTRICTED USE AREA

In the case of the planned Project there is no need to establish a restricted use area within the meaning of the provisions of the Act of 27 April 2001. - Environmental Protection Law (Journal of Laws 2022.2556 consolidated text, as amended).

The calculations of electromagnetic fields from underground cable lines clearly indicate that even at the maximum load of individual cable lines, the permissible value of the magnetic field strength (60 A/m) will not be exceeded above the ground level, in particular at the height of 2.0 m above sea level. This means that the people's presence even directly above the cable lines will be allowed without any time restrictions (Annex 5 Volume IV).

The Investor ensures that the ONS substations will be designed in such a way that the noise-emitting equipment will be located as far as possible from areas designated for single-family housing.

23. IDENTIFICATION OF DIFFICULTIES DUE TO TECHNICAL OR SCIENTIFIC DEFICIENCES

The current state of engineering knowledge relating to the laying of cable lines (under the seabed and on land) should be considered sufficient to assess the environmental impact, so no difficulties have been encountered in the preparation of this Report that might be caused by shortcomings in technology.

Despite the existing gaps in contemporary knowledge, in the context of predicting impacts related to emissions of undersea noise, dispersion of suspended solids and emissions of heat and magnetic fields (during the operational phase), the available natural and literature data and the application of the precautionary principle enabled the formulation of potential environmental impacts and the addressing of minimising measures that ensure the protection of the most valuable fragments of the marine ecosystem.

24. SUMMARY AND CONCLUSIONS

This EIA Report was prepared for the Project involving the construction of connection infrastructure for offshore wind farms MFW Bałtyk II and MFW Bałtyk III. The Investors are two special purpose vehicles established for the preparation and implementation of offshore wind farm projects MFW Bałtyk II and MFW Bałtyk III. The projects are jointly implemented by the companies: Polenergia and Equinor.

Because both planned connections are located in a single corridor on land and partially share a common route in the sea, and due to the probable implementation of both connections at the same time, it was decided to apply for a single environmental decision.

The place of connection of both farms to the NPS is the "Slupsk Wierzbięcino" substation.

The Project is located in the marine part within the Exclusive Economic Zone, territorial sea and coastal marine waters, within the boundaries administered by the Maritime Office in Gdynia, and in the land part in the area of the municipalities of Ustka and Slupsk (Slupsk County, Pomeranian Voivodeship).

The connection of offshore wind farms MFW Bałtyk II and MFW Bałtyk III to the NPS has already been subject to an environmental impact assessment (issued in March 2019). The Investor decided to conduct the procedure for issuing the environmental decision again, because, some elements of the Project were significantly modified, including primarily within the onshore section, i.e.: the addition of a new location for the landfall of the cable lines, an increase in the area of land provided for the implementation of the LSE, the widening of the onshore corridor and a partial change in the course of the onshore corridor for the cables.

The Project qualifies for the so-called second category of projects, and the necessity to prepare this EIA Report results from the decision of RDOŚ in Gdańsk of August 4, 2022 ref: RDOŚ-Gd-WOO.420.40.2022.AM.9.

The planned Project is a public purpose investment in accordance with Article 6 of the Act of August 21, 1997 on Real Estate Management (Journal of Laws 2021.1899, as amended) and Article 2 para. 5 of the Act of March 27, 2003 on spatial planning and development (Dz.U.2021.741 t.j., as amended). In addition, in accordance with Article 3a of the Law of July 24, 2015 on the preparation and implementation of strategic investments in transmission networks (Dz.U.2022.273 t.j., as amended), the planned Project is a strategic investment in transmission networks.

The planned Project consists primarily of line infrastructure, including cable lines installed under the bottom of the sea (2 lines from each wind farm) and under the ground (4 cable tracks, for a 220 kV cable line and 2 cable circuits of a 400 kV line, consisting of three conductors each), as well as the object part - i.e. 2 onshore substations (one for each connection) where the conversion of current from 220 kV to 400 kV will take place. The landfall will be between 236.5 and 237.5 km of the coastline (according to the Maritime Office's kilometerage) without disturbing the coastal zone (using the trenchless HDD method).

The route of the cables in the offshore section runs partly through an area of special natural values, i.e. Ławica Słupska, but outside the most valuable habitats of the Bank, and within the designated infrastructure corridor, in accordance with the provisions of the Spatial Development Plan for Polish Maritime Areas. Except for the section where the connection from MFW Bałtyk II crosses Ławica Słupska and the connection from MFW Bałtyk III runs on the border of the area, the route passes through an area poor when it comes to benthic organisms.

The cable route in the land section runs outside areas of natural value, at a considerable distance from buildings. Partly these are military areas, partly agricultural and forest areas. The direct vicinity of the planned two onshore substations is the largest industrial plant in the Municipality of Ustka - the fish processing plant MOWI S.A., which employs about 4 000 workers, so it was planned in an agricultural and industrial landscape.

As a result of the environmental survey, the most valuable section of the route on land was considered to be the coastal zone, including the zonal system of dune vegetation, as well as forest sections and ecological connectors of local importance. The most valuable section of the coastal zone will be crossed using a trenchless method (HDD), which eliminates the risks associated with its destruction.

The main environmental impacts will occur during the construction phase and are associated in the marine section with periodic occupation of the seabed with a width of up to 20 m (for each of the four submarine cables), while in the onshore section they are associated with periodic occupation of land for a construction corridor with a width of about 32 m (up to about 50 - 100 m in the area of trenchless crossings) and for the construction site of the trenchless crossing of cables from sea to land (with an area of about 0.85 ha), where there will be destruction of the top layer of soil, removal of trees and shrubs. The implementation of two onshore substations will involve permanent occupation of land with a total area of about 16 hectares. The onshore construction phase will also involve periodic and local inconvenience to residents neighboring the site. Due to the considerable distance of the planned Project from residential development, this impact can be considered as insignificant.

The permanent impacts of the operation phase of the planned Project both offshore and onshore are related to minor emissions of heat and electromagnetic radiation, which are considered insignificant based on the available literature.

The planned two onshore substations, on the other hand, will be a source of constant noise emissions. Noise dispersion modeling performed on the basis of preliminary conceptual assumptions showed no exceedances of permissible noise levels in relation to existing and planned residential development.

The Project will be partially implemented within the marine Natura 2000 areas: PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku. The possibility of a significant negative impact on these areas has not been identified, but following the precautionary principle, minimizing measures have been proposed, including conducting cable laying works outside the period of migration and wintering of birds, which are the objects of protection in these areas.

The possibility of a cumulative negative impact on the migration corridor (section up to 4 nautical miles from the shore) of Atlantic salmon and River lamprey ascending to the Slupia River for spawning, where these species are the subject of protection of the PLH220052 Slupia Valley area, has been identified. Accordingly, a measure has been proposed to eliminate the possibility of such an impact by excluding, in the period from September 15 to November 15 and form 1 March to 15 April, the conduct works, that can interrupt migration: these are: cable burial and dredger/refuller operations, including spoil disposal. HDD works are excluded from this obligation.

The identification of the natural, marine and terrestrial environment, based on the annual inventories carried out by the Investor and the available environmental data, made it possible to identify the most valuable natural areas and to propose minimization measures that allowed the maximum reduction of the possible environmental impact of the Project, which is primarily related to the construction phase.

Measures to minimize and eliminate possible environmental impacts have been proposed separately for the connection from offshore wind farm Baltic II and separately for the connection from offshore wind farm Bałtyk III, which will enable the Investor in the future to proceed separately with follow-up decisions to the environmental decision, including primarily the location decision and the construction permit. Since the connector between the farms is also subject of the Environmental Decision, minimizing measures were formulated for it as well.

The conducted environmental impact assessment of the Investor's variant and the alternative variant, which was considered to be the western landfall of the cables (location variant) and the 400 kV overhead line on the section from the planned onshore substations to the PSE Słupsk Wierzbięcino substation (technology variant), showed that the Investor's variant is environmentally more favorable.

In conclusion, the Investor's variant should be considered the most environmentally favorable, including the impact minimization measures proposed in this EIA Report, the proposed environmental supervision, for proper implementation during the construction phase, and monitoring of the impacts of the operation phase in terms of noise emissions and electromagnetic fields.

VOLUME II. EIA Report - TEXT

Environmental Impact Assessment Report for:

External Connection Infrastructure of the MFW Bałtyk II and MFW Bałtyk III

Gdańsk, March 2023

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EIA Report layout

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- Annex 1.2. Geology and sediments
- Annex 1.3. Coastal morphodynamics processes
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- Annex 1.11. Natural and anthropogenic obstacles
- Annex 1.12. Acoustic background

Annex. 2. Onshore environment

VOLUME IV. Other attachments to the EIA Report

Annex 1. Decision of the Regional Directorate of Environmental Protection in Gdańsk on the obligation to prepare the EIA Report and its scope

Annex 2a. Analysis of dispersion of suspended solids

Annex 2b. Annex to the analysis of dispersion of suspended solids

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Annex 4. Calculations of noise emissions

Annex 5. Calculations of electro-magnetic emissions

Annex 6. Calculations of thermal emissions

Annex 7. Assessment of the impact on Natura 2000 area

Annex 8. Opinions of authorities on cultural heritage and monuments

Gdańsk, 22 marca 2023 r.

Dane podmiotu składającego oświadczenie:

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OŚWIADCZENIE

kierującego zespołem autorów „Raportu o oddziaływaniu na środowisko Przedsięwzięcia pn.: Infrastruktura przyłączeniowa morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III"

Oświadczam, że spełniam wymagania określone w art. 74a ust. 2 ustawy z dnia 3 października 2008 roku o udostępnianiu informacji o środowisku i jego ochronie, udziale społeczeństwa w ochronie środowiska oraz o ocenach oddziaływania na środowisko (Dz.U.2022.1029 t.j. z późn, zm).

Jestem świadoma odpowiedzialności karnej za złożenie fałszywego oświadczenia.

Raport o oddziaływaniu na środowisko Przedsięwzięcia pn.: „Infrastruktura przyłączeniowa morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III"

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ABBREVIATIONS

Abbreviations	Description
AC	Alternating current
BDL	Bank Danych o Lasach/Bank Danych Lokalnych (Forest Data Bank/Local Data Bank)
BP	BP - Best Present - a system of marking years used in geology and archaeology to mark past events
BSAP	Baltic Sea Action Plan
CLV	Cable laying vessel
CWA	Chemical Warfare Agents
DC	Direct current
ECC	Earth continuity conductor
ECI	External Connection Infrastructure
ED Environmental Decision	Decision on the environmental conditions of an approval of a project, issued under the EIA Act
EIA Act	Act of 3 October 2008 on providing information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws 2022.1029)
EIA Report	Environmental Impact Report
EMF	Electromagnetic field emissions
EU	European Union
GES	Good Environmental Status
GIOŚ	Główny Inspektorat Ochrony Środowiska (Chief Inspectorate of Environmental Protection)
GWB	Ground Water Body
GWP	Global Warming Potential
GZWP	Główny zbiornik wody podziemnej (Primary Groundwater Reservoir)
HDD	Horizontal Directional Drilling
HELCOM	Baltic Marine Environment Protection Commission – an international organisation established by the Helsinki Convention as its executive body
IMGW	Instytut Meteorologii I Gospodarki Wodnej (Institute of Meteorology and Water Management)
ITOPF	International Tank Owners Pollution Fereration Limited
JCW	Jednolite części wód (Surface water)
KPOWM	Krajowy program ochrony wód morskich (National Programme for the Protection of Marine Waters)
KSE	Krajowy System Elektroenergetyczny (National Power System)
LDP	Local Spatial Development Plan
LDP	Local Spatial Development Plan
MFW	Morska Farma Wiatrowa (Offshore Wind Farm)
MSFD/RDSM	Marine Strategy Framework Directive
OFS	Offshore Substation
ONS	Onshore Substation
PekP 2030	Polityka Ekologiczna Państwa do roku 2030 (National Environmental Policy until 2030)
PenP 2040	Polityka Energetyczna Państwa do roku 2040 (National Energy Policy until 2040)
PLA	Protected landscape area
PLB	Post Lay Burial method of laying cables
PMŚ	Państwowy Monitoring Środowiska (State Environmental Monitoring)
POM	Polish maritime areas
POM Plan	Regulation of the Council of Ministers of 14 April 2021 on the adoption of the Spatial Development Plan of Internal Sea Waters, Territorial Sea and Exclusive Economic Zone in the scale of 1:200 000 (Journal of Laws 2021.935)
PSE S.A.	Polskie Sieci Elektroenergetyczne S. A. (Polish Power Grid Company)
PSZW	Permission to erect artificial islands and structures
PUUK	Permission to install and maintain submarine cables
RBMP	River Basin Management Plan
RDLP	Regionalna Dyrekcja Lasów Państwowych (State Forest Regional Directorate)
RDOŚ	Regionalna Dyrekcja Ochrony Środowiska (Regional Directorate for Environmental Protection)
RES	Renewable Energy Resources
RUA	restricted use area
RZGW	Państwowe Gospodarstwo Wodne Wody Polskie Regionalny Zarząd Gospodarki Wodnej (State Water Holding Polish Waters Regional Water Management Board)
SDF	Standard Data Form for Natura 2000 sites
SF_6	Sulphur hexafluoride - insulating gas

Abbreviations	Description
SIPAM	System Informacji Przestrzennej Administracji Morskiej (Maritime Administration Spatial Information System)
SLB	Simultaneous Lay and Burial method of laying cables
SN	Medium voltage overhead line
SUiKZP	Studium Uwarunkowań i Kierunków Zagospodarowania Przestrzennego (Study of Conditions and Directions for Spatial Development)
SWB	Surface Water Body
UDT	Office of Technical Inspection
UDT	Office of Technical Inspection
UMG	Urząd Morski w Gdyni (Maritime Office in Gdynia)
UXO	Unexploded Ordnance
WFD	Water Framework Directive

1. INTRODUCTION

1.1. INTRODUCTION

This EIA Report of the Project entitled 'External Connection infrastructure for offshore wind farms MFW Bałtyk II and MFW Bałtyk III' was prepared by EKO-KONSULT Sp. z o.o. in Gdańsk on the basis of the order of MFW Bałtyk II Sp. z o.o. and MFW Bałtyk III Sp. z o.o. (hereinafter referred to as the 'Investors' or the 'Companies') in Warsaw under the agreement No. 466619, signed on 14 January 2022.

Investors:

Offshore wind farm project MFW Bałtyk II:	**Offshore wind farm project MFW Bałtyk III:**
MFW Bałtyk II Sp. z o.o. ul. Krucza 24/26 00-526 Warszawa	MFW Bałtyk III Sp. z o.o. ul. Krucza 24/26 00-526 Warszawa

The Companies were established in order to prepare and execute the projects of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III, together with the necessary connection infrastructure. The projects are implemented jointly by Polenergia and Equinor.

The purpose of the planned Project is to transmit the power from the offshore wind farms MFW Bałtyk II and MFW Bałtyk III to the National Power System (KSE). The place of connection of both farms to the KSE is the 'Słupsk Wierzbięcino' substation.

The Project will be located in the corridor shown in figure 1.1 and will consist of:

- two independent electricity export systems within the meaning of the Act of 17 December 2020 on the promotion of electricity generation at offshore wind farms (Journal of Laws 2022.1050, as amended) from:
  - offshore wind farm MFW Bałtyk II,
  - offshore wind farm MFW Bałtyk III;
- optional cable connection between offshore wind farm MFW Bałtyk II and offshore wind farm MFW Bałtyk III, hereinafter referred to as the 'Connector';

together with the infrastructure necessary for their implementation and operation.

Each electricity export system will consist of:

- a submarine export cable system,
- onshore underground cables,
- an Onshore Sub Station (ONS) with energy storage systems (potentially).

As both external connections will be located in one corridor on land (and partly offshore) and it is assumed that they will be implemented at the same time, it has been decided to apply for a single decision on environmental conditions (Environmental Decision).

The planned Project will be implemented:

- within maritime coastal waters, territorial sea and the exclusive economic zone within the limits administered by the Maritime Office in Gdynia,
- on the territory of the Ustka municipality, in Słupsk district, Pomeranian voivodeship,
- on the territory of the Słupsk municipality, in Słupsk district, Pomeranian voivodeship,
- within the boundaries of water bodies administered by the State Water Holding Polish Waters Regional Water Management Board in Szczecin (RZGW),
- within the limits of the competence of RDOŚ in Gdańsk,
- within the Modlinek and Pęplino Forestry Districts (Forest Inspectorate of Ustka, Regional Directorate of State Forests in Szczecinek – RDLP),
- within the closed areas of the Ministry of Defence.

The location of the onshore part of the planned Project on the background of administrative units is shown in figure 1.2.

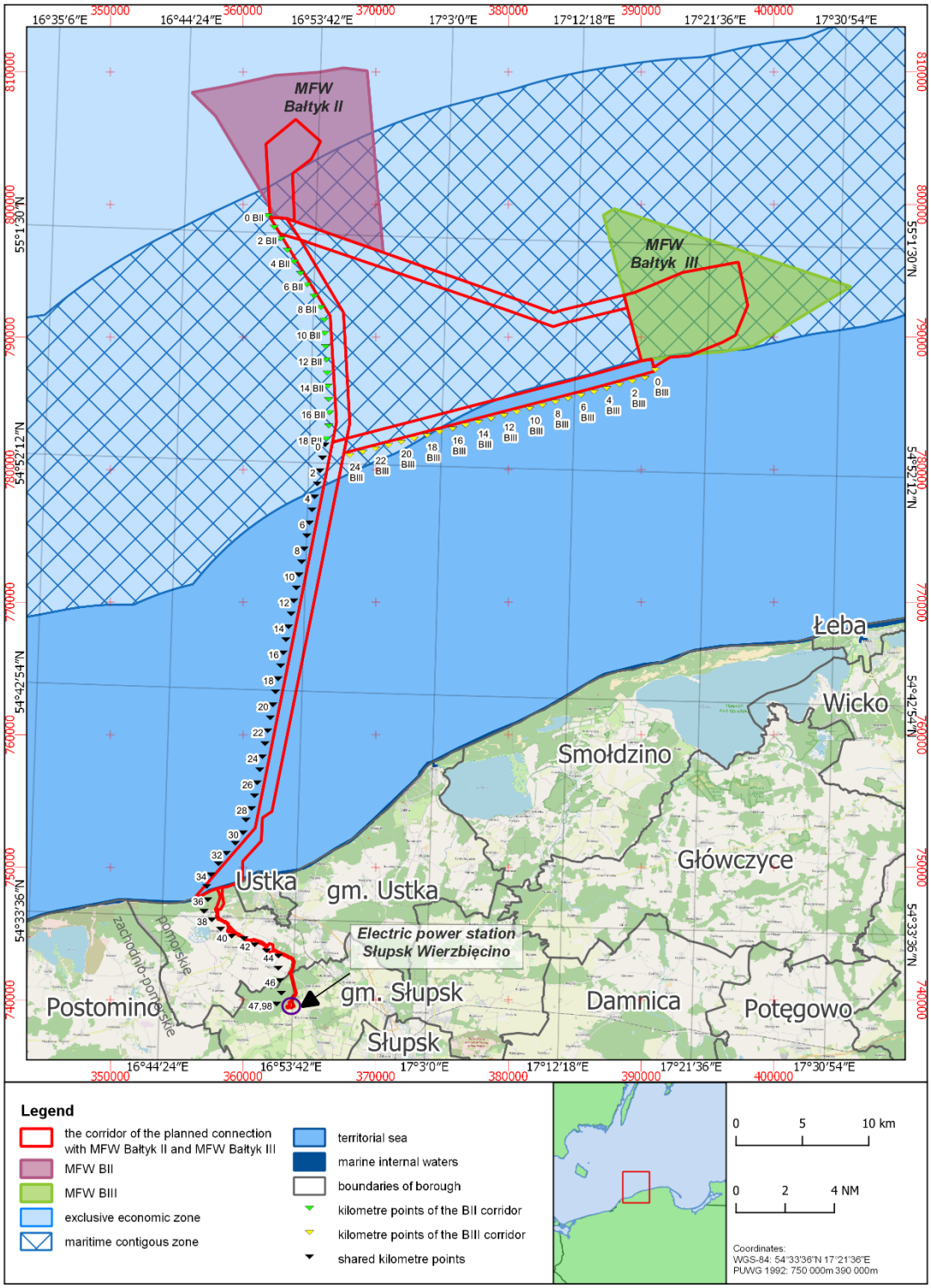


Figure 1.1. *Location of the connection infrastructure corridor of offshore wind farms MFW Bałtyk II and MFW Bałtyk III*

Source: In-house study

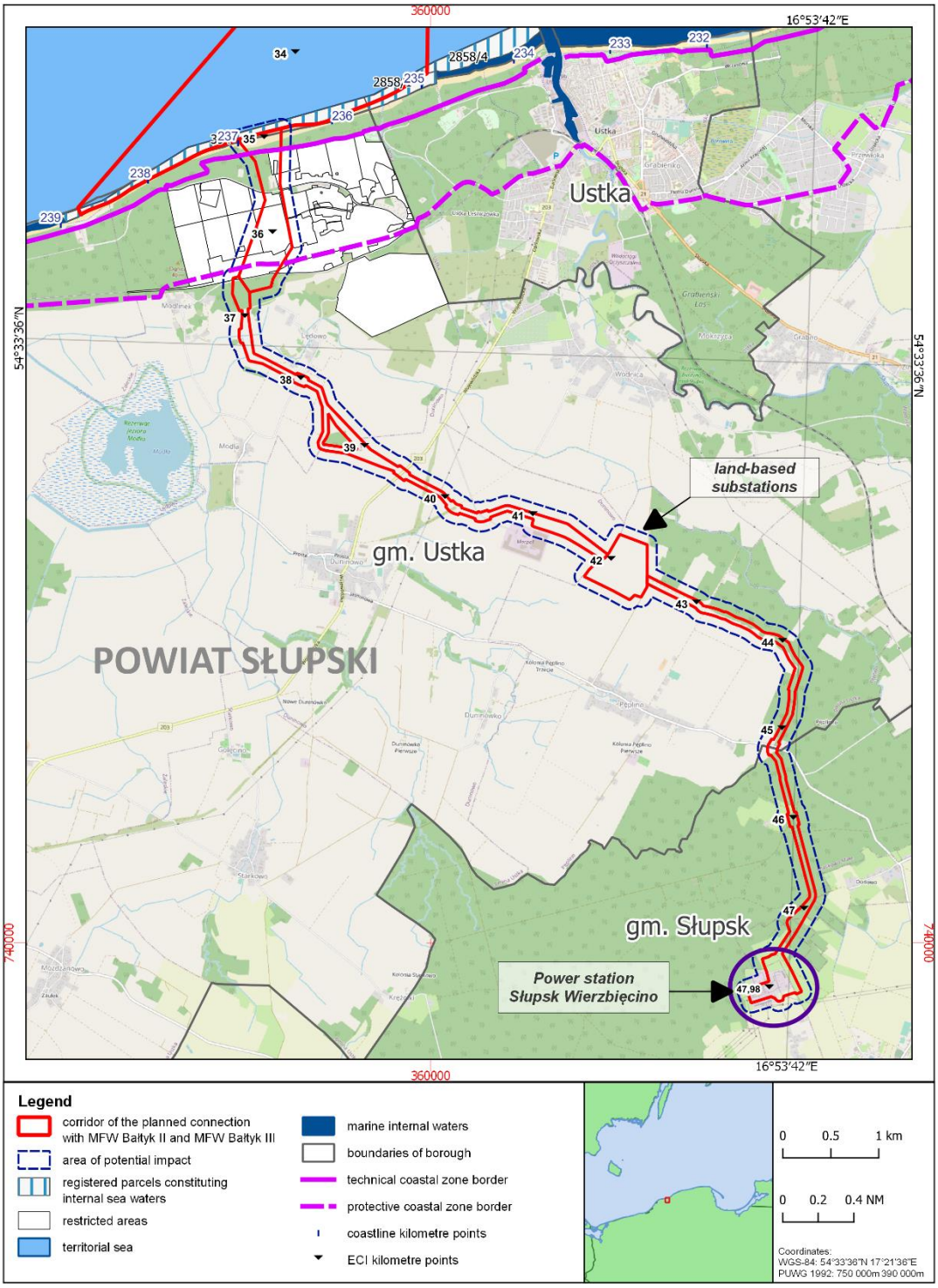


Figure 1.2. *Location of the onshore part of the planned Project on the background of administrative division*

Source: In-house study

In the zone immediately adjacent to the shore, the cable route crosses closed areas established by Decision No. 80/MON of the Minister of National Defence of 8 June 2022 on the determination of closed areas in the national defense ministry. These are the following plots 357/8, 357/24, 359, 89/4, 89/5, 90/6, 113/2, 113/3, 114/3, 115/5, 117/5, Lędowo precinct (Ustka municipality).

1.2. PURPOSE AND SCOPE OF THE EIA REPORT

The purpose of the Report is to determine the environmental consequences of the implementation, operation and decommissioning of the planned connections of MFW Bałtyk II and MFW Bałtyk III. The Report assesses the impact on the following components: people, animals, plants, sea, surface and underground waters, land surface, material assets, monuments and landscape, including cultural landscape, protected and naturally valuable areas, aerosanitary conditions, acoustic conditions, electromagnetic fields and mutual interaction between the above mentioned components.

The purpose of the environmental impact assessment process is primarily:

- to determine the environmental-spatial conditions of the construction, operation and future decommissioning phases of the Project and potential emergency events;
- to determine the character, significance and range of potential environmental, spatial, landscape and social effects associated with the implementation and operation of the cable lines and the equipment necessary for its operation;
- to determine possibilities to limit a potential adverse impact;
- to identify opportunities to mitigate an adverse impact and the extent of monitoring during construction and operation.

This report on the environmental impact of the planned Project is an element of the EIA procedure - the necessity to prepare the report results from the decision of RDOŚ in Gdańsk on results from the decision of RDOŚ in Gdańsk of August 4, 2022, ref. RDOŚ-Gd-WOO.420.40.2022.AM.9. The scope of the Report specified by RDOŚ in Gdańsk, the Director of the Maritime Office in Gdynia and the Commander of the Military Center for Preventive Medicine, resulting from the decision, is presented in full in table 1.2. The State Border Sanitary Inspector in Gdynia also expressed the opinion that an environmental impact assessment of the project should be carried out, and the report should be prepared within the statutory scope.

To simplify the navigation of the Report, due to the large volume of text, annexes and maps, the layout of the Report is divided into following volumes:

VOLUME I Summary

VOLUME II EIA Report

VOLUME III Nature inventories

Annex 1. Marine environment

Annex 2. Onshore environment

VOLUME IV Other attachments to the EIA Report

Annex 1. Screening decision

Annex 2a. Analysis of dispersion of suspended solids

Annex 2b. Annex to the analysis of dispersion of suspended solids

Annex 3. Navigation analysis

Annex 4. Calculation of noise emissions

Annex 5. Calculations of electro-magnetic emissions

Annex 6. Calculation of thermal emissions

Annex 7. Assessment of the impact on Natura 2000 area

The EIA Report was prepared in accordance with Art. 66 of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessment (Journal of Laws 2022.1029, as amended) - the EIA Act.

The content of the EIA Report in relation to the scope of the Report established in Art. 66 of the EIA Act is summarised below - table 1.1.

Table 1.1. *The content of the EIA Report in relation to the scope of the Report established in Art.62 and 66 of the EIA Act*

Content of Article 62 and 66 of the EIA Act	Chapter numbers corresponding to the requirements of Article 62 and 66 of the EIA Act
Analysis of criteria listed in Article 62(1): The EIA process shall identify, analyse and assess the direct and indirect impact of a project on:	
a) the environment and the population, including human health and living conditions	Volume I, Volume II Chapters 9.14 and 10.12
b) material assets	Volume I, Volume II Chapters 9.11 and 10.12
c) monuments	Volume I, Volume II Chapters 9.6 and 10.8
d) landscape, including cultural landscape	Volume I, Volume II Chapters 10.6.1 and 10.7
e) interaction between these components	Volume I, Volume II Chapters 7, 8, 9, 10
f) availability of mineral deposits	Volume I, Volume II Chapters 7.2.and 8.2
g) risks of major accidents and natural and construction disasters	Volume I, Volume II Chapter 14
h) possibilities and measures to prevent and reduce the negative impact of the Project on the environment	Volume I, Volume II Chapter 16
i) required scope of monitoring	Volume I, Volume II Chapter 17
Analysis of the criteria listed in Article 66(1): The report on the environmental impact of the project shall contain information making it possible to analyse the criteria listed in Article 62(1) and shall include:	
A description of the planned project, in particular:	
a) characteristics of the whole project and the conditions of use of the area during the implementation and operation or use phases, including with regard to the areas at particular risk of flooding	Volume I, Volume II Chapter 3
b) main characteristics of production processes	Volume I, Volume II, Chapter 3
c) predicted types and quantities of emissions, including waste, from the construction and operation or use phases of the planned project,	Volume I, Volume II Chapters 3, 9.15 and 10.13
d) information on biodiversity, use of natural resources, including soil, water and land surface	Volume I, Volume II Chapters 3.3, 7.4.7 and 8.6.3
e) information on energy demand and consumption	Volume I, Volume II Chapters 3.3 I 3.5
f) information on demolition work for projects which may have a significant impact on the environment	Volume I, Volume II Chapters 10.12 and 10.13, 10.15
g) the risk, assessed on the basis of scientific knowledge, of major accidents or natural and man-made disasters, taking into account the substances used and the technologies employed, including risks associated with climate change	Volume I, Volume II Chapter 14
Description of natural components of the environment covered by the scope of predicted impact of the planned project on the environment, including	Volume I, Volume II Chapters 7 and 8
a) environmental components protected under the Act of 16 April 2004 on Nature Conservation and ecological corridors within the meaning of that Act	Volume I, Volume II Chapters 7.5, 8.6, Volume IV Annex 7
b) hydromorphological, physico-chemical, biological and chemical parameters of waters	Volume II Chapters 7.3 and 8.4
c) results of the nature survey	Volume II Chapters 7.4 and 8.5, Volume III
d) other data used to describe the natural components	Volume II Chapter 1.4
e) description of existing monuments in the vicinity or in the direct range of the impact of the planned project, protected on the basis of regulations on the protection and maintenance of monuments	Volume I, Volume II Chapters 7.6 and 8.8
f) description of the landscape in which the project is to be located	Volume I, Volume II Chapter 8.7
g) information on connections with other projects, in particular on the accumulation of impacts of executed, completed or planned projects, for which the decision on environmental conditions was issued, located in the area where the project is planned to be executed, and in the area of the impact of the project or whose effects are within the area of impact of the planned project - to the extent to which their effects may accumulate with the impact of the planned project	Volume I, Volume II Chapter 12

h) description of the predicted impact on the environment if the project is not undertaken, taking into account available environmental information and scientific knowledge	Volume I, Volume II Chapter 5
Description of alternatives taking into account the specific characteristics of the project or its impact, including	
a) the variant proposed by the Investor and a reasonable alternative	Volume I, Volume II Chapter 4
b) the rational and environmentally preferable variant and the reasons for its selection	Volume I, Volume II Chapter 19
c) determination of the predicted impact of analysed variants on the environment (including the case of a serious industrial accident and a natural and construction disaster), their impact on the climate, including greenhouse gas emissions and interactions significant from the point of view of adaptation to climate change, as well as the possible cross-border impact on the environment;	Volume I, Volume II Chapter 11
Comparison of the analysed alternatives' impact on:	
a) people, plants, animals, fungi and natural habitats, water and air	Volume I, Volume II Chapter 11
b) land surface, including earth movements, and landscape	Volume I, Volume II Chapter 11
c) material assets	Volume I, Volume II Chapter 11
d) monuments and the cultural landscape, covered by existing documentation, in particular the register or record of monuments	Volume I, Volume II Chapter 11
e) forms of nature conservation referred to in Article 6 (1) of the Act of 16 April 2004 on Nature Conservation, including the objectives and subject of protection of Natura 2000 sites, and the continuity of ecological corridors connecting them	Volume I, Volume II Chapter 11
f) components listed in Article 68(2)(2)(b) when included in the environmental impact report or when required by the competent authority	Volume I, Volume II Chapter 11
g) interaction between the components referred to in points a to f	Volume I, Volume II Chapter 11
Justification of the variant proposed by the Investor, including the information referred to in points 6 and 6a Art. 66 point 1 of the EIA Act	Volume I, Volume II Chapter 4
Description of the forecasting methods used by the Investor	Volume I, Volume II Chapter 1.4
and a description of predicted significant effects of the planned project on the environment, including direct, indirect, secondary, accumulated, short-, medium- and long-term, permanent and momentary impact on the environment, resulting from a) existence of the project, b) use of natural resources, c) emissions.	Volume I, Volume II Chapters 9 and 10
Description of predicted measures aimed at avoiding, preventing, limiting or natural compensation of a negative environmental impact, in particular on forms of nature conservation referred to in Article 6 (1) of the Act of 16 April 2004 on Nature Conservation, including the objectives and subject of protection of Natura 2000 sites, and the continuity of ecological corridors connecting them, together with the assessment of their effectiveness respectively at the stages of project's implementation, operation, use or decommissioning	Volume I, Volume II Chapter 16
If the planned project involves the use of an installation, the comparison of the proposed technology with the technology complying with the requirements referred to in Article 143 of the Act of 27 April 2001 - Environmental Protection Law	Volume I, Volume II Chapter 21
Reference to environmental objectives resulting from strategic documents relevant for the implementation of the project	Volume I, Volume II Chapter 2
Justification for meeting the conditions referred to in Article 68 points 1, 3 and 4 of the Act of 20 July 2017 - Water Law, if the project affects the possibility of achieving the environmental objectives referred to in Article 56, Article 57, Article 59 and Article 61(1) of that Act	Not applicable - the project will not affect the possibility of achieving the environmental objectives - according to the results of the impact assessment for the water body
Indication whether the establishment of the limited use area for the planned project is necessary, as specified in the Act of April 27, 2001 - Environmental Protection Law, and determination of the boundaries of such area, restrictions on the use of the land, technical requirements for buildings and ways of using them; it does not apply to projects involving the construction or reconstruction of roads and projects involving the construction or reconstruction of railway lines or public use airports	Volume II, Chapter 22 - no need for a limited use area has been identified
Presentation of the issues in graphical form	Volume I - IV

Presentation of the issues in cartographic form at a scale corresponding to the scope and detail of the issues analysed in the report and enabling a comprehensive presentation of the analyses of the environmental impact of the project	Volume I - IV
Analysis of possible social conflicts related to the planned project	Volume I, Volume II Chapter 20
Presentation of proposals for monitoring of the impact of the planned project at the stage of its implementation and operation or use, in particular on the forms of nature conservation referred to in Article 6 (1) of the Act of 16 April 2004 on Nature Conservation, including on the objectives and subject of protection of Natura 2000 sites and the continuity of ecological corridors connecting them, and information on the available results of other monitoring which could be significant for the determination of obligations in this respect	Volume I, Volume II Chapter 17
Indication of any difficulties encountered in the preparation of the report due to technical deficiencies or gaps in contemporary knowledge	Volume I, Volume II Chapter 23
A non-specialist summary of the information contained in the report for each component of the report	Volume I
The date of the report, the name and signature of the author and, where the report is produced by a team of authors, the name and signature of the leader of that team, and the names, surnames and signatures of the members of the team of authors	Volume II Title page
Declaration of the author, and in case when the report is made by a team of authors – the declaration of the leader of this team, on meeting the requirements referred to in Article 74a(2) - attached to the report	Volume II First page
Information sources used to prepare the report	Volume II Chapters 1.3.3, 1.4, 25
If it is determined that a project may have a significant impact on a Natura 2000 site, the environmental impact report should also contain data making it possible to determine the lack of alternative solutions and information making it possible to determine whether requirements of overriding public interest support the implementation of the project	Not applicable - no significant impacts on Natura 2000 sites were identified - an assessment of impacts on Natura 2000 sites is included in Annex 7 of Volume IV
If the planned project is a linear public purpose investment or a non-linear public communications investment, and the variant proposed by the Investor runs through a national park or a nature reserve, the report on the environmental impact of the project should also contain data making it possible to determine the lack of alternative solutions	Not applicable
If the possibility of a cross-border environmental impact is identified, the information referred to in paragraph 1, points 1-16 should take into account the determination of the impact of the planned project outside the territory of the Republic of Poland	Volume II, Chapter 13 - no transboundary impacts identified
If the planned project requires the establishment of a limited use area, the report should be accompanied by a copy of the cadastral map certified by the competent authority with the marked boundary line of the area where the establishment of the limited use area is necessary	Volume II, Chapter 22 - no restricted use area was found necessary
If the planned project involves the use of an installation which is subject to an integrated permit, the environmental impact report shall contain a comparison of the proposed technique with the best available techniques	Not applicable
The EIA report should take into account the impact of the project at the stages of construction, operation or use and decommissioning	Volume II, Chapters 9 and 10
The EIA report should take into account the environmental information resulting from the strategic environmental assessment relevant to the project	Volume II, Chapter 2

Source: In-house study

***Table 1.2.** Scope of the EIA Report resulting from the decision of RDOŚ in Gdańsk*

The scope of the EIA Report imposed by the Decision of RDOŚ in Gdańsk	**Numbers of chapters fulfilling the imposed conditions**
Regional Director of Environmental Protection in Gdańsk:	
Description of the planned project, in particular: the characteristics of the entire project and the conditions of use of the site during the execution of the works of its implementation and operation; the main characteristics of the characteristic technological processes, including indications of the method of cable burial; the expected types and amounts of pollution, resulting from the implementation of the project;	Volume II, Chapter 3

Analysis of the impact of the planned technological variants of the project on individual elements of the environment;	Volume II Chapters 9, 10 and 11
Natural characteristics of the project site and the area within the range of its impact, taking into account the species of plants, fungi and animals and their habitats, protected under the provisions of the Act of April 16, 2004 on nature protection (unified text Journal of Laws of 2022, item 916), as well as species and habitats of species from Annex I of the EP and Council Directive 2009/147/EC and habitats from Annex I and species from Annex II of the Habitats Directive 92/43/EEC, being the subject of protection in the areas Ławica Słupska PLC990001 and Przybrzeżne Wody Bałtyku PLB990002, along with presentation of issues in graphic and cartographic form;	Volume II Chapters 7 and 8
Assessment of the direct and indirect impact of the investment and the technologies used in it on the status and preservation, at the stage of implementation and operation: • species and their habitats and natural habitats, which are objects of protection in the Natura 2000 areas: Ławica Słupska PLC990001 and Przybrzeżne Wody Bałtyku PLB990002; • natural habitats, habitats of species protected under the aforementioned Law on Nature Protection, occurring and potentially occurring on the project site and in its vicinity;	Volume II Chapters 9.4, 9.5, 10.5 and 10.6 Volume IV Annex 7
Characteristics of the direct and indirect impact of the project on the environment, in particular, on the protection objectives of the Natura 2000 areas Ławica Słupska PLC990001 and Przybrzeżne Wody Bałtyku PLB990002;	Volume IV Annex 7
• Characteristics of direct and indirect impact of the project on the protection objectives of Natura 2000 areas: • Przymorskie Błota PLH220024, located about 300 meters west of the planned project, • PLH320068 Jezioro Wicko i Modelskie Wydmy, about 1.4 km west of the planned project, • PLH220052 Dolina Słupi distant about 1.5 kilometers east of the planned investment;	Volume IV Annex 7
Assessment of the impact of the investment (at the stage of implementation and operation) after the application of all possible measures to mitigate the negative impact, together with an assessment of the significance of impacts for individual objects of protection in the above-mentioned Natura 2000 area, as well as the possibility of implementing conservation measures and achieving the objectives of protection established in the plans of conservation tasks for these areas;	Volume II Chapters 9, 10, 16, Volume IV Annex 7
Description of the hydrological system of the area covered by the project and within the range of influence of the project, together with an analysis of the impact of the project on this system;	Volume II Chapters 7.3, 8.4, 9.3 and 10.4
Analysis of the cumulative impact of the project with other planned and implemented projects of a similar nature, located in the vicinity, on various elements of the environment, including Natura 2000 areas: Ławica Słupska PLC990001 and Przybrzeżne Wody Bałtyku PLB990002;	Volume I, Volume II Chapter 12
Presentation of proposals for monitoring the impact of the planned project at the stage of its operation, in particular, on the objectives and objects of protection of the above-mentioned Natura 2000 areas and their integrity;	Volume I, Volume II Chapter 17
Assessment of the impact of the planned project on the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki;	Volume I, Volume II Chapter 10.6.1
Inventory of trees and shrubs to be cut down;	Volume II, Section 10.5.2 includes information on the estimated area of felling in forested areas, along with an indication of the dominant tree species in each section of the corridor of the planned Project. The inventory of trees and shrubs will be performed after the design of the route is completed, i.e. at the stage of the construction project
Analysis of the project's impact on historical monuments and tourism and boating;	Volume II, Chapters 9.6, 9.13, 10.8 and 10.12
Provide a detailed description of the methods and materials used in preparing the environmental impact report for the project;	Volume I, Volume II, Chapter 1.4

Analysis of the impact of the planned investment on the ecological corridors within its range of influence;	Volume I, Volume II Chapters 9.5.2 and 10.6.3
Analysis of possible social conflicts related to the implementation of the project - to determine whether the variant chosen for implementation is optimal not only for the investor, but also for the owners of neighboring properties, and to determine how the investor intends to counteract social conflicts in connection with the planned investment.	Volume I, Volume II Chapter 20
Director of the Maritime Office in Gdynia:	
Analysis of the impact of the construction and operation of electricity connection infrastructure of offshore wind farms MFW Bałtyk II and MFW Bałtyk III on the forms of nature protection, located within the range of impact of the investment;	Volume I, Volume II Chapters 9.5, 10.6, Volume IV Annex 7
Analysis of the impact of the planned works on the coastal zone at the cable landing site, including morphodynamic and lithodynamic processes occurring in the coastal zone and the state of the coastal protection system;	Volume I, Volume II Chapters 10.1 and 10.2
Analysis of the cumulative impact of the planned project with other planned, ongoing and existing projects in the vicinity of the subject project, including offshore wind farms, cables, other infrastructure;	Volume I, Volume II Chapter 12
Presentation of proceedings in case of emergencies during the implementation of the project.	Volume I, Volume II Chapter 14
Commander of the Military Preventive Medicine Center:	
Description of the planned project, in particular: • characteristics of the entire project and the conditions of use of the site during the construction and operation or use phases; • determination of the predicted environmental impact of the analyzed variants, including the case of a major industrial accident, as well as the possible transboundary environmental impact;	Volume I, Volume II Chapters 3, 9, 10, 11, 13, 14
Presentation of issues in cartographic form at a scale that corresponds to the subject matter and particularity of the issues analyzed in the report, and that allows a comprehensive presentation of the conducted analysis of the environmental impact of the project;	Volume I - IV
Summary in a non-specialist language of the information contained in the report, for each element of the report.	Volume I

Source: in-house study

1.3. FORMAL AND LEGAL ASPECTS

The planned Project is a public purpose investment in accordance with:

- Article 6 of the Act of 21 August 1997 on real estate management (Journal of Laws 2021.1899, as amended) – the public purpose is the construction and maintenance of lines and equipment for the transmission or distribution of electricity, as well as other facilities and equipment necessary for the use of these lines and equipment,
- Article 2 p. 5 of the Act of 27 March 2003 on spatial planning and development (Journal of Laws 2021.741, as amended) – defines public purpose investments as: (…) activities of local (municipality) and supralocal (district, voivodeship and national) importance, as well as national (including international and supra-regional investments) and metropolitan (including metropolitan area) importance, regardless of the status of the entity undertaking these activities and the sources of their financing, constituting the implementation of the objectives referred to in Article 6 of the Act of August 21, 1997 on real estate management…".

In addition, in accordance with Article 3a of the Act of 24 July 2015 on the preparation and implementation of strategic investments in transmission networks (Journal of Laws 2022.273 i.e., as amended), the planned Project is a strategic investment in the field of transmission networks. Article 3(13) of the Act of December 17, 2020 on the promotion of electricity generation in offshore wind farms (Journal of Laws 20212022.234 1050 i.e., as amended). Connection infrastructure of offshore wind farms MFW Bałtyk II and MFW Bałtyk III is a set of equipment for power derivation, defined as a separate set of equipment and structures both connected and not permanently connected to the ground, including the seabed, used for power derivation from offshore wind farms from the terminals of the upper voltage

side of the transformer or transformers located on the substation or substations located in Polish maritime areas to the place of property demarcation specified in the preliminary connection conditions or connection conditions. Both of the aforementioned laws contain provisions on the environmental decision for the Project.

The connection of offshore wind farms MFW Bałtyk II and MFW Bałtyk III to the KSE has already been the subject of an environmental impact assessment. In 2016, a report on the environmental impact of the Project was prepared (an EIA Report), and then a decision on environmental conditions for both connections was issued by the Regional Director for Environmental Protection in Gdańsk (RDOŚ) (No. RDOŚ-Gd-WOO.4211.12.2016KSZ/AJ.29) on 12 March 2019.

The investor decided to repeat the procedure for issuing the environmental decision due to the significant modifications to some elements of the Project, mainly within the onshore section, since the preparation of the EIA Report and issue of the Environmental Decision. Following modifications were introduced:

- adding a new location of the landfall of the cable lines which is currently the variant proposed by the Investor;
- increasing the area available for construction of onshore substations;
- widening of the onshore corridor, where the external connection infrastructure of offshore wind farms MFW Bałtyk II and MFW Bałtyk III will be located and the construction sites necessary for its execution allowing to limit the risk of unexpected changes at the stage of further design works and arrangements with the land owners;
- partial modification of the route of the onshore corridor for cables.

In case of the offshore corridor, its spatial extent has not changed, because adding a new, landfall location of the connection infrastructure (to the east from the one initially indicated in the earlier proceedings), has not resulted in the necessity to extend the analysed maritime area – the proposed changes of location are within the borders of the previously obtained permit to lay and maintain the cables. The only change refers to the way of presenting fragments of the connection infrastructure of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III located inside the maritime areas – from a purely descriptive to a graphic form.

Due to the necessary changes, the Investor decided to prepare a new Project on the basis of the existing decisions – permits for laying and maintaining cables (PUUK), and on the basis of the available environmental data:

- the inventory of the marine environment carried out in 2013-2014, updated with publicly available data,
- the on land inventory carried out in 2013-2014, updated and extended in 2021-2022.

For the purposes of the environmental impact assessment, available environmental data, spatially adjusted to the boundaries of the planned Project, from the land-based nature inventory, carried out in 2021-2022, was used.

For the MFW Bałtyk II project, the Investor has so far obtained:

- the permission to erect and exploit artificial islands, water structures and equipment in Polish maritime areas (PSZW) for the offshore wind farm project Bałtyk Środkowy II, issued by the Minister of Transport, Construction and Maritime Economy (Decision No. MFW/2/2013 of 15 January 2013, amended by Decision No. MFW/2a/13 of 29 April 2013);
- the terms of the connection to the electricity grid issued by PSE S.A. – formulated in Agreement No. DS/MFW10/2021/BAŁTYK ŚRODKOWY II for connection the offshore wind farm Bałtyk Środkowy II[1] to the transmission grid of 31 January 2013 (Słupsk – Wierzbięcino substation);
- the decision on environmental conditions for the project entitled: 'Construction of the offshore wind farm Polenergia Bałtyk II' of 27 March 2017 No.: RDOŚ-Gd-WOO.4211.26.2015.KSZ.20 issued by RDOŚ in Gdańsk, amended by the decision of RDOŚ in Gdańsk of 26 October 2021, No.: RDOŚ-Gd.WOO.420.3.2021.KSZ.14 zpo.

For the MFW Bałtyk III project, the Investor has so far obtained:

[1] *currently the offshore wind farm MFW Bałtyk II*

- the permission to erect and exploit artificial islands, water structures and equipment in Polish maritime areas (PSZW) for the offshore wind farm project Bałtyk Środkowy III[2], issued by the Minister of Transport, Construction and Maritime Economy (Decision No. MFW/2/2012 of 30 March 2012);
- the terms of the connection issued by PSE S.A. in Agreement No. DS/MFW/2012/BAŁTYK III for connection the offshore wind farm Bałtyk Środkowy to the transmission grid of 7 August 2014 (Słupsk – Więrzbięcino substation);
- the decision on environmental conditions for the project entitled: 'Construction of the offshore wind farm Bałtyk Środkowy III' of 7 July 2016 No: RDOŚ-Gd-WOO.4211.12.2015.KP.22 issued by RDOŚ in Gdańsk, amended by the decision of RDOŚ in Gdańsk dated 8 November 2022, mark: RDOŚ-Gd-WOO.420.41.2022.AM.6 .

In addition, for the corridor in which submarine export cables from offshore wind farms MFW Bałtyk II and MFW Bałtyk III will be laid, the investor obtained:

- Decision of the Director of the Maritime Office in Słupsk No. 4/14 of 19 March 2014 on the permit to lay and maintain within the territorial sea borders submarine cables being part of the maritime electricity transmission infrastructure from the MFW Bałtyk Środkowy II and the MFW Bałtyk Środkowy III to the onshore Słupsk Wierzbięcino substantion[3,4];
- Decision of the Minister of Transport, Construction and Maritime Economy of 19 July 2013, No. GT7/pb/62/14823/decyzja/2013[5] on the location of laying and ways of maintenance of the submarine cables in the exclusive economic zone for the Project 'External connection infrastructure of the offshore wind farm'.

In terms of onshore conditions, the reference point is the connection agreements signed by PSE S.A.

The decisions and terms obtained by the Investor determine the route and characteristics of the planned Project.

1.3.1. Qualification of the Project

In accordance with § 3. section 1. of the Regulation of the Council of Ministers of 10 September 2019 on investments that may have a significant impact on the environment (Journal of Laws 2019.1839) is presented below:

"*54) industrial buildings, including photovoltaic systems or storage buildings, with associated infrastructure, with a built-up area of not less than:*

a) 0.5 ha on areas covered by forms of nature protection referred to in Article 6(1)(1)-(5), (8) and (9) of the Act of 16 April 2004 on Nature Protection, or in the buffer zones of the forms of nature protection referred to in Article 6(1)(1)-(3) of that Act,

b) 1 ha in areas other than those referred to in point a);"

two onshore substations **of a maximum area of 16 ha, outside areas covered by forms of nature conservation**, will be implemented as a part of the planned Project;

"62) hard-surfaced roads with a total length exceeding 1 km other than specified in § 2 subsection 1 items 31 and 32 or bridges in the course of a hard-surfaced road, excluding reconstruction of roads or bridges used to service power stations and located outside areas covered by forms of nature conservation referred to in Article 6 subsection 1 items 1-5, 8 and 9 of the Act of 16 April 2004 on Nature Conservation;"

the planned Project will include the construction of a hardened access road to the ONS with a length of more than 1 km;

"88) modification of forest, other land with a continuous surface area of at least 0.10 ha covered with forest vegetation – trees and bushes and undergrowth – or uncultivated land into agricultural use or deforestation aiming at changing the use of the land:

[2] *currently the offshore wind farm MFW Bałtyk III*
[3] *the decision includes, in addition to the corridor for the connection from MFW Bałtyk III and MFW Bałtyk III, a corridor for the connection between Bałtyk II and Bałtyk III farms*
[4] *amended by Decision of the Director of the Maritime Office in Gdynia of 27.04.2022.*
[5] *amended by the Decision of the Minister of Infrastructure of 11.02.2022.*

a) if it concerns floodplain forests, alder woods or forests with wetland habitats,
b) if it concerns enclaves within agricultural land or uncultivated land,
c) c) on areas covered by forms of nature protection referred to in Article 6 (1) (1)-(5), (8) and (9) of the Act of 16 April 2004 on Nature Conservation, or in the buffer zones of the forms of nature conservation referred to in Article 6 (1) (1)-(3) of that Act,
d) within the administrative boundaries of cities/towns,
e) an area of not less than 1 ha, other than those mentioned in points (a) to (d);"

the execution of the planned Project on land will require permanent deforestation of more than 1 ha.

Moreover, as a variant, it should be assumed that sections of the connection infrastructure between the ONS and the Słupsk Wierzbięcino substation will be constructed as 400 kV overhead power lines, no longer than 6 km. In this context, the planned Project may be qualified in accordance with § 3. par. 1 of the above mentioned regulation as:

"7) overhead electrical power lines with a voltage of at least 110 kV other than those mentioned in § 2 section 1 point 6".

1.3.2. Formal and Legal Aspects of EIA Report

The main legal acts that formed the basis of this Report are listed below:

- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Birds Directive) (OJ L 20, 26.1.2010);
- Council Directive 92/43 /EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) (OJ L 206 , 22.07.1992);
- Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005 on ship-source pollution and on the introduction of penalties for infringements (OJ L 255, 30.9.2005);
- Convention on Biological Diversity, signed in Rio de Janeiro on 5 June 1992 (Journal of Laws 2002 No. 184 item 1532);
- Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws 2022.1029 consolidated text);
- Act of 16 April 2004 on nature protection (Journal of Laws 2022.916 consolidated text, as amended.);
- Act of 21 March 1991 on maritime areas of the Republic of Poland and maritime administration (Journal of Laws 2022, item 457 consolidated text, as amended);
- Act of 27 April 2001 Environmental Protection Law (Journal of Laws 2022.2556, consolidated text, as amended);
- Act of 27 March 2003 on spatial planning and development (Journal of Laws 2022, item 503 consolidated text, as amended);
- Act of 28 March 2003 on the establishment of the long-term programme 'Programme for the protection of sea shores' (Journal of Laws 2016.678);
- Act of 14 December 2012 on waste (Journal of Laws 2022.699, consolidated text as amended);
- Act of 16 March 1995 on the prevention of pollution from ships (Journal of Laws 2020, item 1955 consolidated text, as amended);
- Act of 17 December 2020 on the promotion of electricity generation in offshore wind farms (Journal of Laws 2022.1050 consolidated text, as amended);
- Act of 21 August 1997 on real estate management (Journal of Laws 2021.1899 consolidated text as amended);
- Act of 24 July 2015 on the preparation and implementation of strategic investments in transmission networks (Journal of Laws 2022.273 consolidated text, as amended);
- Act of 7 July 1994 Construction Law (Journal of Laws 2021.2351 consolidated text as amended);
- Act of 9 June 2011. - Geological and Mining Law (Journal of Laws 2022.1072 consolidated text, as amended);
- Act of 23 July 2003 on the protection and maintenance of historical monuments (Journal of Laws 2022.840 consolidated text).

In addition, the formal and legal conditions included in the Report are:

- Regulation of the Council of Ministers of 10 September 2019 on projects that may have a significant impact on the environment (Journal of Laws 2019.1839);
- Regulation of the Minister of Environment of 9 October 2014 on the protection of plant species (Journal of Laws 2014.1409);
- Regulation of the Minister of Environment of 16 December 2016 on the protection of animal species (Journal of Laws 2016.2183 as amended);
- Regulation of the Council of Ministers of 14 April 2021 on the adoption of the spatial development plan of internal sea waters, territorial sea and exclusive economic zone at scale 1:200 000 (Journal of Laws 2021.935);
- Regulation of the Minister of Infrastructure of 25 February 2021 on the adoption of an update of the set of environmental objectives for marine waters (Journal of Laws 2021.569);
- Regulation of the Council of Ministers of 11 December 2017 on the adoption of the National Programme for the Protection of Marine Waters (Journal of Laws 2017.2469);
- Regulation of the Minister of Infrastructure of 16 November 2022 on the Odra River Basin Management Plan (Journal of Laws 2023.335);
- Regulation of the Minister of Climate of 2 January 2020 on the catalogue of waste (Journal of Laws 2020.10);
- Regulation of the Minister of Infrastructure of 21 December 2002 on port waste and cargo residue from ships management plans (Journal of Laws 2002 No. 236 item 1989);
- Regulation of the Minister of Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws 2014.112 consolidated text);
- Regulation of the Minister of Environment of 24 August 2012 on levels of certain substances in the air (Journal of Laws 2021.845 consolidated text);
- Regulation of the Minister of Transport and Maritime Economy of 1 June 1998 on technical conditions to be fulfilled by maritime hydrotechnical structures and their location (Journal of Laws 1998 No. 101 item 645);
- Regulation of the Minister of Health of 17 December 2019 on permissible levels of electromagnetic fields in the environment (Journal of Laws 2022.2630 consolidated text);
- Regulation of the Minister of Economy of 21 December 2005 on the essential requirements for equipment used outdoors in respect of noise emission into the environment (Journal of Laws 2005.263.2202 as amended);
- Order No. 12 of the Director of the Maritime Office in Gdynia of 9 November 2021 on defining the borders of the technical zone in the area of the City and Municipality of Ustka;
- Order of the Regional Director for Environmental Protection in Gdańsk and the Regional Director for Environmental Protection in Szczecin of 25 September 2014 on establishing a plan of protection actions for the Natura 2000 site Przymorskie Błota PLH320024 (Official Journal of the Zachodniopomorskie Voivodeship 2014, item 3620; Official Journal of the Pomorskie Voivodeship 2014, item 3239);
- Resolution No. 318/XXX/16 of the Sejmik of Pomorskie Voivodeship of 29 December 2016 on the adoption of a new spatial development plan for Pomorskie Voivodeship and the spatial development plan for the Tri-City metropolitan area, which is part of it;
- Resolution No X/42/81 of the Voivodeship National Council in Słupsk of 8 December 1981 on establishing the 'Dolina Słupi' Landscape Park and protected landscape areas;
- Resolution No. 259/XXIV/16 of the Sejmik of Pomorskie Voivodeship of 25 July 2016 on protected landscape areas.

The competent authority to issue the environmental decision (pursuant to Art. 75 (1)(1)(k) is the Regional Director for Environmental Protection in Gdańsk. Pursuant to Art. 77 (1) and (4) of the EIA Act, prior to issuing the EIA decision it is necessary to consult with:

- Director of Maritime Office in Gdynia,
- SWH Polish Waters Regional Water Management Authority in Szczecin,
- State Voivodeship Sanitary Inspector in Gdańsk,
- State Voivodeship Sanitary Inspector in Słupsk,
- Military Preventive Medicine Centre in Gdynia.

1.3.3. The Project Data Sources

The source of information about the basic parameters of the Project, necessary for the environmental impact assessment, was the data provided by the Investor:

- Technical Description of MFW Bałtyk III and MFW Bałtyk III Export System for Environmental Impact Assessment. C256-EQ-A-FD-00002_02, developed in February 2022 (Technical Description),
- "Preliminary concept of onshore civil construction and cable installation works" (in original: Onshore civil construction & cable installation study. Final Concept Report. C256-EP-Z-RS-00001-C02"), prepared in April 2022 (hereinafter: Preliminary Concept).

1.4. METHODOLOGICAL ASSUMPTIONS AND BASIC SOURCES OF ENVIRONMENTAL DATA

The environmental impact during the construction and operation phases of the planned Project requires a different approach depending on whether one assesses the marine or terrestrial environment. Therefore, the characteristics of the marine environment, including protected areas established at sea, will be discussed separately, as well as the characteristics of the terrestrial environment, where three tasks, with various degree of impacts, will be carried out i.e:

- the landfall of the cable lines using the trenchless method;
- the construction of underground cable lines to ONS and from ONS to the Słupsk Wierzbięcino KSE substation;
- the construction of two ONSs in the Pęplin area together with the access road.

Assumptions on the scope and extent of the environmental analyses

The area covered by the marine enivironment surveys, the same as the area covered by the DWA application was a corridor, about 1 km wide, with an area of approximately 174.63 km^2, however the anticipated seabed interference will affect a much smaller area - i.e. a an about 5 m wide for each of the planned cables.

The area covered by the onshore environmental surveys reached a total of about 15.88 km^2, while the corridor inside, where the Project will be located (area covered by the ED Application), is an area of approximately 1.83 km^2. Within the boundaries of this corridor, covered by the application for an environmental decision, the following objects will be constructed:

- landfall of cable lines – an area covering a maximum 0.85 ha;
- underground cable lines located in a corridor of approximately 60 m width, however during the construction phase it will be approximately 30 - 32 m (locally widened in places of trenchless crossings to approximately 50 m - 100 m);
- two onshore substations (ONSs) of approximately 8 ha each;
- approximately 1.5 km long access road to the ONS.

The characteristics of the marine environment will cover the basin within the boundaries of the EIA application together with the close surroundings. The terrestrial environmental characterisation will cover the area covered by the application and the boundaries of the Project's potential impact, which are a strip of land located up to 100 m from the boundaries of the area covered by the application.

For the purposes of this Report, the working kilometre points of the corridor covered by the ED application were adopted, as presented in Figure 1.3. It should be emphasised that those are not the kilometre points of the cable, but the kilometre of the probable course of the corridor in which the Project will be located. Therefore, the kilometrage referred to in the Report is indicative. The target kilometrage of the cable lines will be the result of the further design process, which will take place in the further preparation phase of the Project, as shown in the diagram (figure 1.4).

The assumed width of the corridor allows for the avoidance of terrain obstacles that may be identified during the design stage.

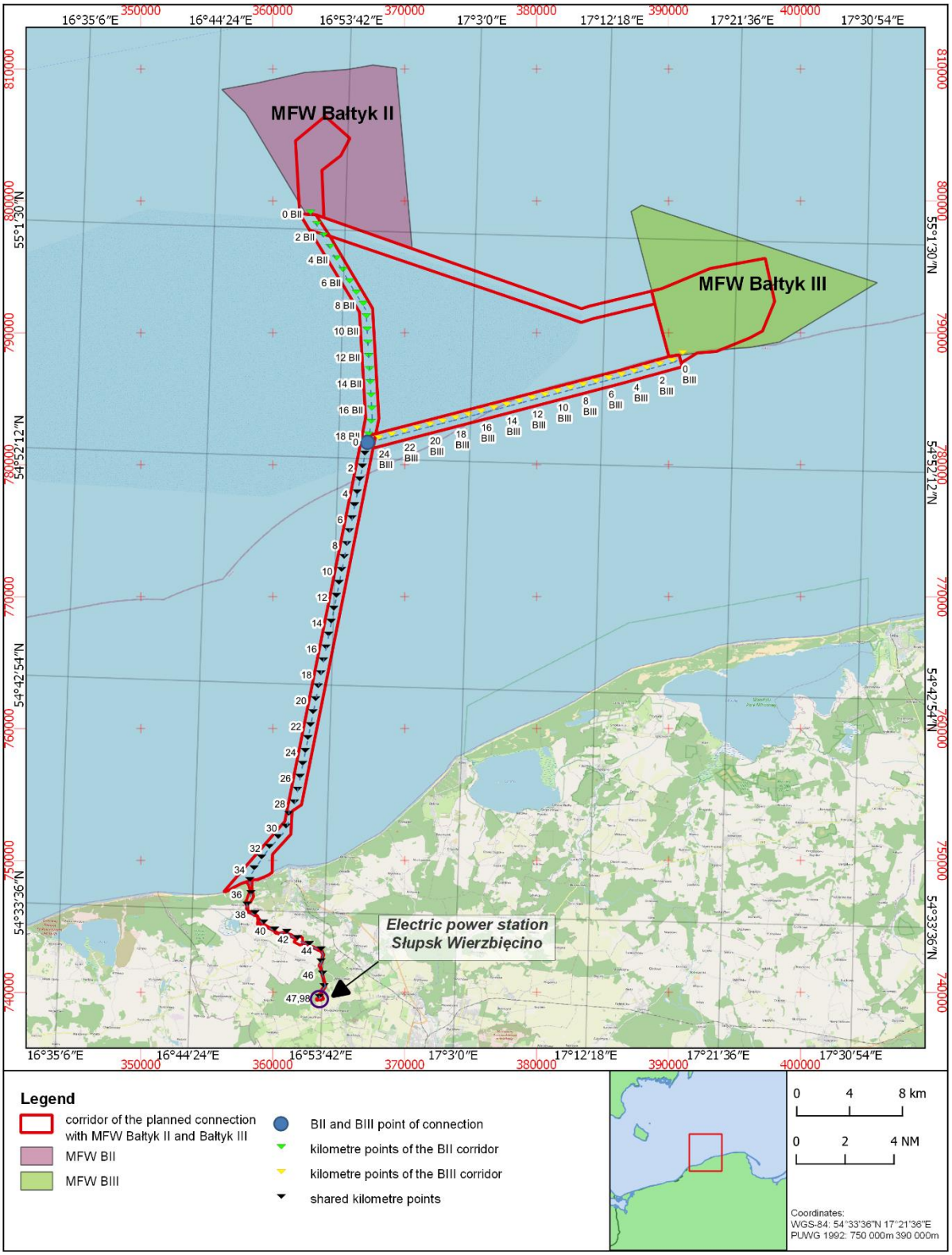


Figure 1.3. *Kilometre points assumed for the purpose of the description of the environment*

Source: In-house study on the basis of the Investor's data

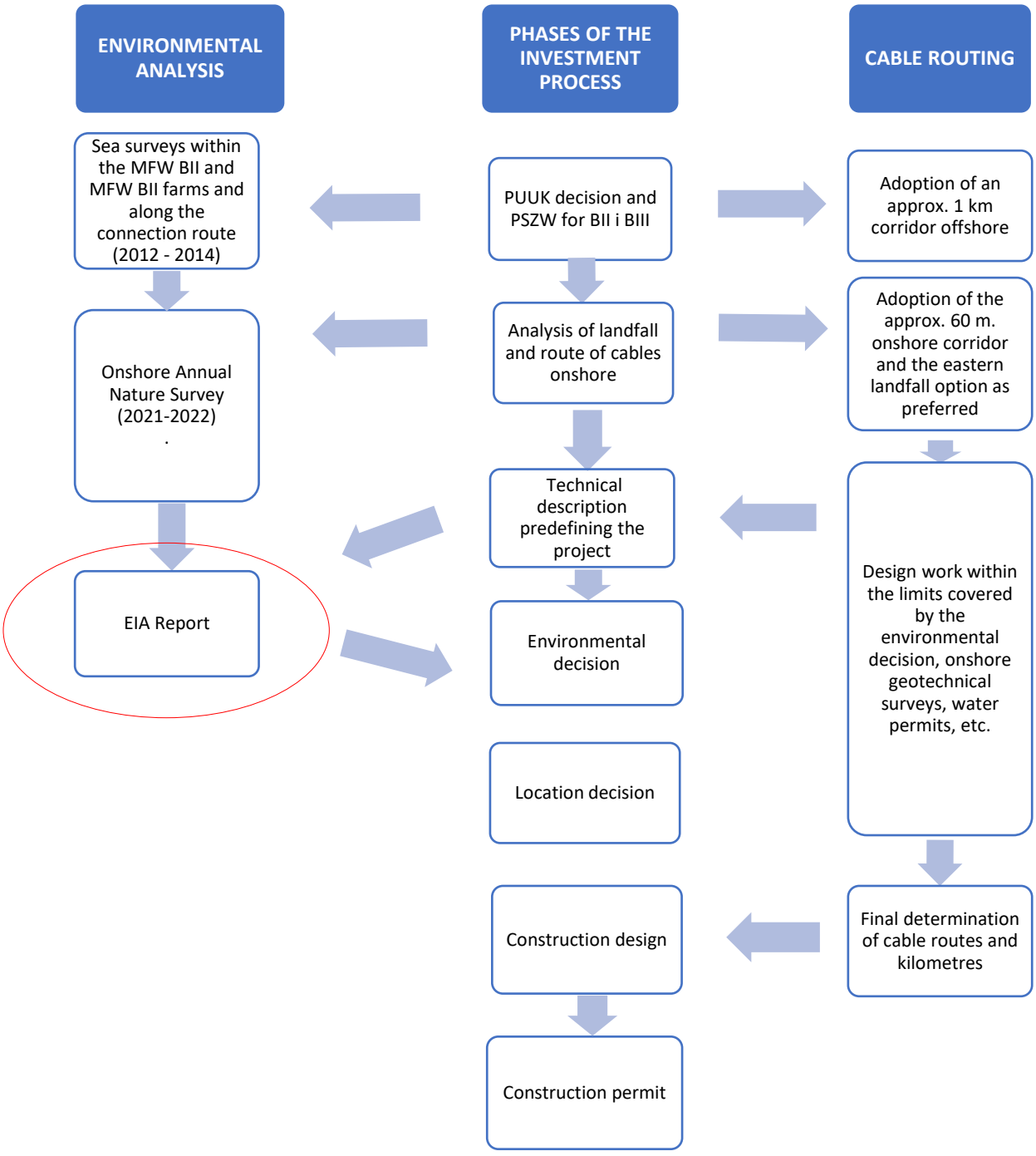


Figure 1.4. *Scheme of the investment process for power transmission from offshore wind farms MFW Bałtyk II and MFW Bałtyk III in the context of environmental analyses and cable routing*

Source: In-house study

Spatial scope of the impacts adopted in the Report and their graphical depiction

The figure below (figure 1.5) is an extract from the map showing the boundaries addressed in this Report.

The red continuous line shows the area covered by the application for an environmental decision, i.e. defining the boundaries of the planned Project; (Other terms used in the Report are cable

corridor, ECI[6] corridor and planned connection. The blue dotted line shows the boundaries of the potential impact i.e. a strip. 100 m from the border of the Project.

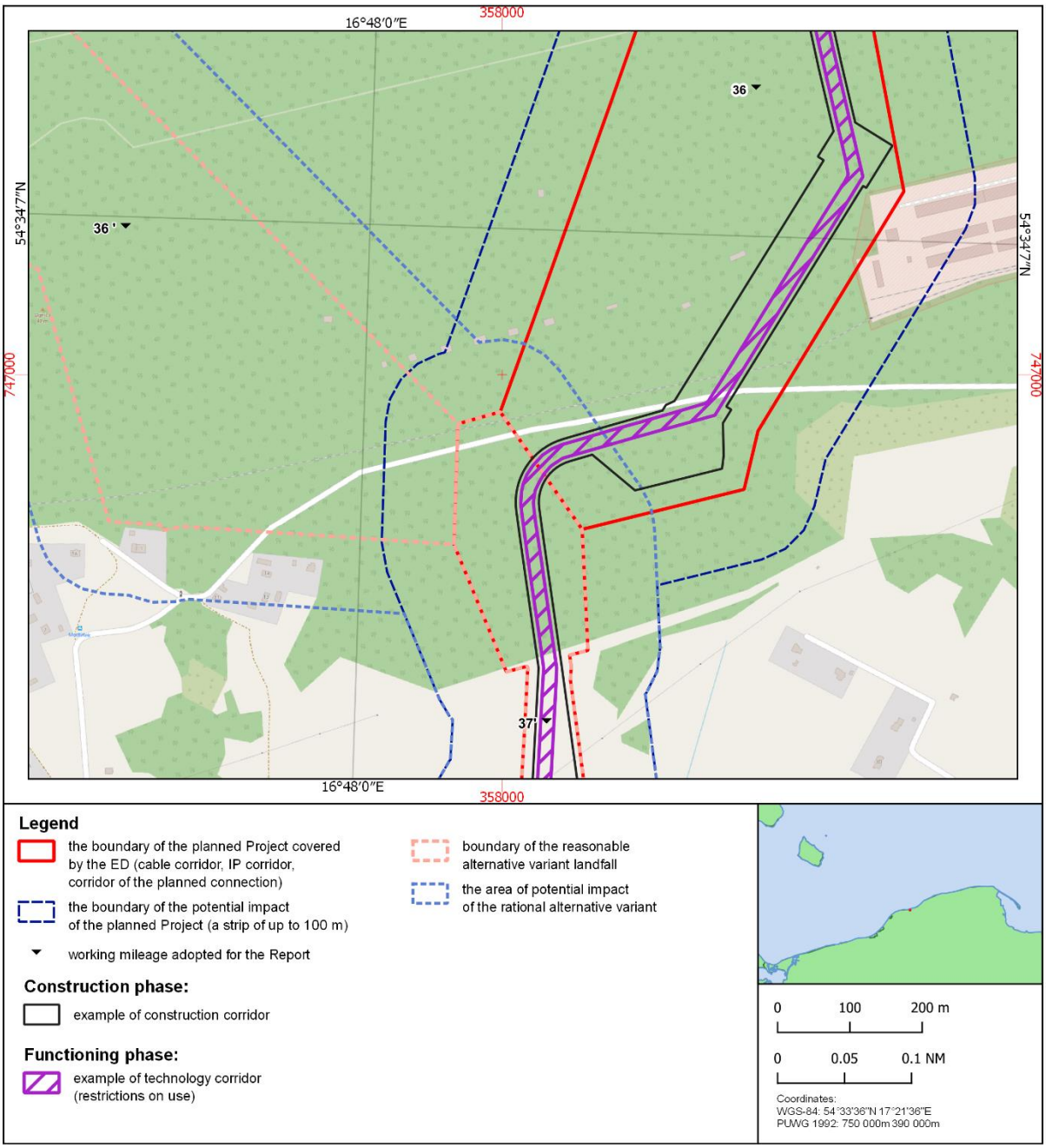


Figure 1.5. *Boundaries as a reference point for assessing the impacts of the construction and operation phases of the onshore part of the planned Project*

Source: In-house study

The possible extent of environmental interference will affect a much smaller area than the area covered by the ED application. The land transformation will concern the construction corridor, which together with the trenchless passage construction site and the ONS station construction site, were pre-designated in the "Preliminary Concept"[7] and included in the EIA as a reference point for identifying the significance of impacts. The construction corridor is shown in black in figure 1.5.

[6] *External Connection Infrastructure*
[7] *Onshore civil constructiom & cable installation study. Final Concept Report. C256-EP-Z-RS-00001-C02, April 2022.*

The operation phase of the planned Project will be related with a limitation of land use over the cables; this is known as the technology belt with a width:

- 20 m for 400 kV lines,
- 10 - 31 m for the 220 kV line.

which has been taken into account in the assessment of the impacts of construction phase (violet dashed line in figure 1.5). At the stage of development of the construction design, the developer will aim to reduce this strip. Permanent deforestation will be required where the cable route will pass through forest land. It will be possible for plants with a shallow root system to return here. Agricultural land, on the other hand will be used unchanged.

Alternative option - adopted spatial extent of potential impact of construction and operation phase

The reasonable alternative is defined for the purposes of this Report as an alternative location of the landfall of the cables and as a 400 kV overhead power line serving as a connection of the ONS substation with the PSE S.A Słupsk Wierzbięcino substation. The alternative is shown in the Figure 1.5 with a light red dashed line together with the area of potential impact (light blue dashed line). For the assessment purposes, the working corridor kilometrage of the variant has been entered with a 'prim' designation (e.g., 35' km).

The construction of the mid-forest 400 kV overhead line would involve clearing a 35 m wide strip of land over a distance of approximately 6 km. The operation phase would be associated with the establishment of a 70 m wide technological corridor (35 m on each side of the line's axis), excluding the construction of residential buildings.

Assumptions on the potential impact

The potential impact of the planned Project mainly concerns the construction phase[8] will be short-lived and related to:

- offshore:
  - the necessary interference with the seabed during the laying of the cable lines and the associated increase in suspended solids in the water;
  - the emission of underwater noise from vessels and equipment necessary for the laying of the cable line
  - the temporary disturbance of migrating and wintering birds;
  - the restrictions on the movement of vessels, including fishing vessels;
  - the temporary emissions to the atmosphere from vessels engaged in laying the cables;
- onshore:
  - the deforestation required for the construction site for the HDD crossing as well as for laying of cable lines;
  - the land leveling and destruction of topsoil during construction of trenchless crossings (construction sites, entry and exit chambers), cable lines, substations and access roads;
  - the necessary dewatering of excavations;
  - the temporary local emissions of noise and atmospheric emissions from construction equipment and vehicles.

During the operation phase, the impact on the marine area will be considered as insignificant – it is mainly related to heat emission and magnetic field, but based on the literature review[9], these effects can be considered negligible. Potential positive impact may also be pointed out, connected with the formation of refugees in places where cables may be covered with stone bedding by, for example, increasing the diversity of the bottom structure. In the table 1.3 (below) previous experience and results of research on the impact of seabed cables on the marine environment are gathered, taking into account the way of laying them: buried in the seabed, laid on the bottom or suspended in the sea (this option is not considered in the case of the planned Project), divided into the stage of construction, maintenance, decommissioning, and operation.

[8] *the impacts of the decommissioning stage are similar to those of the construction phase*
[9] *Taormina et al. 2018*

Table 1.3. *Example of potential impacts of submarine cables during construction, operation and decommissioning phases*

	Physical habitat				Invertebrates				Fish				Diadromous Fish				Marine mammals		
	Installation/Decommissioning/Maintenance																		
	Bur	LD	Dyn		Bur	LD	Dyn		Bur	LD	Dyn		Bur	LD	Dyn		Bur	LD	Dyn
Seabed disturbance	1	1	n		1	1	n		2	1	n		n	n	n		n	n	n
Sediment resuspension	1	n	n		1	1	n		1	1	n		1	1	n		n	n	n
Chemical pollution	n	n	n		1	1	1		1	1	1		1	1	1		1	1	1
Underwater noise	n	n	n		2	2	2		1	1	1		1	1	1		1	1	1
	Operation																		
	Bur	LD	Dyn		Bur	LD	Dyn		Bur	LD	Dyn		Bur	LD	Dyn		Bur	LD	Dyn
Reef effect	n	1	2		n	1	2		n	1	2		n	1	2		n	n	n
Reserve effect	1	1	1		1	1	1		1	1	1		1	1	1		1	1	1
Chemical pollution	n	n	n		1	1	1		1	1	1		1	1	1		1	1	1
Electromagnetic fields	n	n	n		3	3	3		2	2	3		2	2	3		n	n	2
Heat emission	n	n	n		2	1	1		n	n	n		n	n	n		n	n	n
Entanglement	n	n	n		n	n	n		n	n	2		n	n	2		n	n	2

Cable installation — Bur - buried SPC — LD - Laid-Down SPC — Dyn - Dynamic SPC

Extent of impact — n - No impact — Negligible — Low — Medium — High

Uncertainty — 1 - Low — 2-Medium — 3 - High

Source: Taormina et al. 2018

The impact of the planned Project on the terrestrial environment during the operation phase will be mainly related to the electromagnetic radiation, heat and noise emission (from the ONS substation), long-term landscape changes (forest clearing, construction of the ONS substation) and long-term changes in land use in the immediate vicinity of the cable routes (cable joints, LSE substations, access roads and connection to PSE S.A. substations.).

1.4.1. Methodology for assessing the impact scale and significance

For the purposes of the Report, typical methods used in environmental impact assessments were applied, adjusted to the specificity and scale of the analysed Project.

The main methods used in the environmental impact assessment of the planned Project:

- **screening and scoping** – detailed analysis of all potential negative effects by a team of specialists; screening was conducted at an early stage of the Report in order to focus the in-depth analyses on those components of the environment which may be at risk as a result of the Project.
- Screening and scoping were part of the formal EIA procedure, which aims to indicate the possible need to prepare an EIA Report and clarify its scope; RDOŚ in Gdańsk issued a decision on 4 August 2022, case no: RDOŚ-Gd-WOO.420.40.2022.AM.9. on the necessity to prepare a Report and its scope for the planned Project.
- **annual environmental inventories with environmental assessment** were prepared for the maritime corridor in 2013-2014 and for the land corridor in 2021-2022, as well as ecological surveys carried out within BII and BII area in years 2013-2014 and 2012-2014;
- **GIS analyses, the map overlay method, visualisations** - were used to show spatial conflicts, to study local environmental conditions, to analyse the significance of the impact, including cumulative impact, and for landscape analyses;
- **analysis of the findings of planning and spatial documents** - strategic documents and environmental impact forecasts on the national, regional and local level were analysed in order to refer to the environmental objectives arising from strategic documents; collisions and conflicts and recommendations included in environmental impact forecasts were identified;
- **information search for a cumulative impact analysis** - a data search was conducted in order to identify a possible cumulative impact, i.e.; information obtained from RDOŚ in Gdańsk and Commune Offices in Ustka and Słupsk (issued and pending environmental decisions), findings on the official maritime administration portal - SIPAM (applications and issued PSZW and PUUK decisions), information on MFW Bałtyk II and MFW Bałtyk III in the ED and on MFW Bałtyk I (Investor's data);
- **field research** - among others, local inspections were conducted in the municipalities through which the planned Project will run in order to identify spatial collisions;
- **mathematical modelling** - was used to determine the range of potential impact of noise, thermal and electromagnetic emissions and possible dispersion of suspended solids;
- **analysis of AIS data** to determine fishing and transport activities in the area of the planned Project;
- **expert methods** - the main assessment methods used in this Report in terms of impact identification and its significance.

Assessment of the significance of predicted impacts

In the assessment of the significance of predicted impacts 3 aspects will be taken into account:

- the character of the impact as described belowe, i.e. the type of changes caused by the activities carried out as part of the implementation of the planned Project,
- spatial range of the impact showing the scale of changes caused by the activities carried out as part of the planned Project,
- sensitivity of the environment (susceptibility of the environment) to the impact caused by the execution and operation of the planned Project.

All three aspects of the significance assessment are described in detail below.

Character of impacts

In the first step the impact will be classified as positive or negative; in the next step, depending on the environmental component, its type will be divided according to the following:

- direct, indirect,
- short, medium, long-term,
- temporary, permanent,
- reproducible, reversible,
- local, supra-local, regional.

A cumulative, secondary and synergistic impact are also possible.

The definitions of each type of impact are set out below:

- **positive -** introducing a new desirable factor,
- **negative -** an impact that causes an unfavourable change to the baseline situation or introduces a new undesirable factor,
- **direct** - an impact which results from a direct interaction between the activity and the environmental component on which it is addressed,
- **indirect** – an impact, which is not a direct result of the execution of the Project, referred to as the second or third level impact,
- **simple** - impacts that do not transfer to other components of the environment or within one component of the environment do not transfer to their elements,
- **secondary** – an impact resulting from the complexity of natural processes and the necessity to take into account many aspects of biology of particular taxons,
- **synergic** – occurs when two types of impact result, due to the mutual interaction, in the creation of a new type of impact, of a scale greater than the sum of the component factors,
- **long-term** - an impact, the effects of which are noticeable permanently or cyclically, for more than 3 years after the completion of works connected with the planned project, or an impact connected with the operation phase, but which will cease when the operation phase is finished,
- **medium-term** - an impact with effects observable continuously or periodically for 1-3 years, or 1-3 vegetation cycles, after the completion of the works related to the planned Project,
- **short-term** - an impact, the effects of which are noticeable for a relatively short period of time after the completion of the works associated with the planned project, and persist for no more than one year or vegetation cycle after the completion of the activity,
- **permanent** – an impact, the effects of which are visible for a long time in the environment, and which will not cease once the activity connected with the planned project is finished; it causes a permanent change in a component of the environment,
- **temporary** – an impact lasting for a limited, short period of time (up to several days),
- **reversible** - the affected component of the environment is able to return to its previous state on its own or through the application of mitigation measures,
- **restorable** - the affected environmental component returns to a state close to its initial state after the application of mitigation measures,
- **cumulative** - taking into account changes caused by past, present or foreseeable actions, the impact of which may cumulate with the impact connected with the execution of the planned Project.

Spatial extent of impact has been assumed as:

- within the boundaries covered by the application for the ED),
- local - it goes beyond the construction zone and the construction site, but affects the immediate vicinity of the Project - up to approx. 50 m - 100 m from the borders of the Project (e.g. noise during the construction phase),
- supra-local - the impact may be dispersed over considerable distances - in the case of the planned project in Inwestor variant such impact does not occur at the construction and operation phases; it may only refer to turbidity of the water during the laying of cables, emergency situations, water pollution, and temporary sub-sea noise associated with the construction phase.

Scale of environmental sensitivity/ uniqueness that has been adopted:

- large - unique environment/component, very susceptible to change, characterised by a lack of adaptability, even slight changes cause disruption to its functioning,
- medium – environment/component less susceptible to changes, it has the ability to adapt, however, it is sensitive to changes but its proper functioning is not quickly disturbed,

- low – environment/component not very susceptible to changes, even considerable transformations do not cause disturbances in its functioning.

Summery – method of assessing the significance of negative impacts of the planned Project

Character of impacts	
Neutral/Negative	**(0)/(1)**
Direct/Indirect	**(3)/(1)**
Synergic/Secondary/Simple	**(3)/(2)/(1)**
Long-term/Medium-term/Short-term	**(3)/(2)/(1)**
Permanent/Restorable/Reversable	**(3)/(2)/(1)**
Spatial extent of impact	
Supra-local/Local/within Environmental decision area	**(3)/(2)/(1)**
Sensitivity/ uniqueness of the environment	
Large/Medium/Low	**(5)/(3)/(1)**

Significance of the impact will classified as:

7-11	**12-16**	**17-21**
Non-significant	**Medium**	**Significant**

Positive impacts will not give a scale of significance, as was done above for negative impacts. The Report will use a descriptive definition of positive impacts

Impacts will be analysed separately for the construction phase (separate assessment table) and for the operation phase (separate table). The following will be discussed separately: the decommissioning phase, cumulative impacts and potential consequences of emergency events

Taking into account the above mentioned aspects of the expert assessment, each sub-chapter in which the impact on a given environmental component has been assessed provides a descriptive summary relating to the character of the impact, its spatial extent and environmental sensitivity.

An important issue is the question of mitigation of an adverse impact identified in the environmental impact assessment process. If moderate or significant potential environmental impacts are identified for particular environmental components, measures to eliminate, minimise or compensate these impacts will be proposed.

1.4.2. Methodology for environmental inventories

The environmental inventories carried out by the Investor along with a description of the methodology are included in *Volume III. Nature surveys*. In case of marine surveys, results of studies conducted in 2012-2014 (within the MFW Bałtyk II and MFW Bałtyk III) and in 2013-2014 (within the corridor where the seabed cables will be laid) are included in Volume III. Results of marine research conducted by other investors in the close vicinity have also been used:

- within the Baltica 2 offshore wind farm located between Bałtyk II and Bałtyk III (data from 2016-2017)[10];
- within the FEW Baltic II offshore wind farm located to the west of the MFW Bałtyk II (data from 2017-2018)[11];
- in the corridor of the FEW Baltic II cable power connection, directly adjacent to the Project, carried out in 2017-2018[12].

Figure 1.6 provides a schematic illustration of the data sources used to characterise the marine environment. Each of the indicated MFW areas was studied together with a buffer zone, therefore the areas of these studies overlapped in many places.

[10] *Raport o oddziaływaniu na środowisko Morskiej Farmy Wiatrowej Baltica, 2017, zał. 1.*
[11] *Raport o oddziaływaniu na środowisko morskiej farmy wiatrowej FEW Baltic II, Tom. II. Zał. 3 Wyniki monitoringu ichtiofauny i ichtioplanktonu*
[12] *Raport o oddziaływaniu na środowisko przedsięwzięcia pn. „Infrastruktura Przyłączeniowa FEW BALTIC II", EKOZAPAS, 08 2022 (Tom II A. Uwarunkowania środowiskowe w części morskiej)*

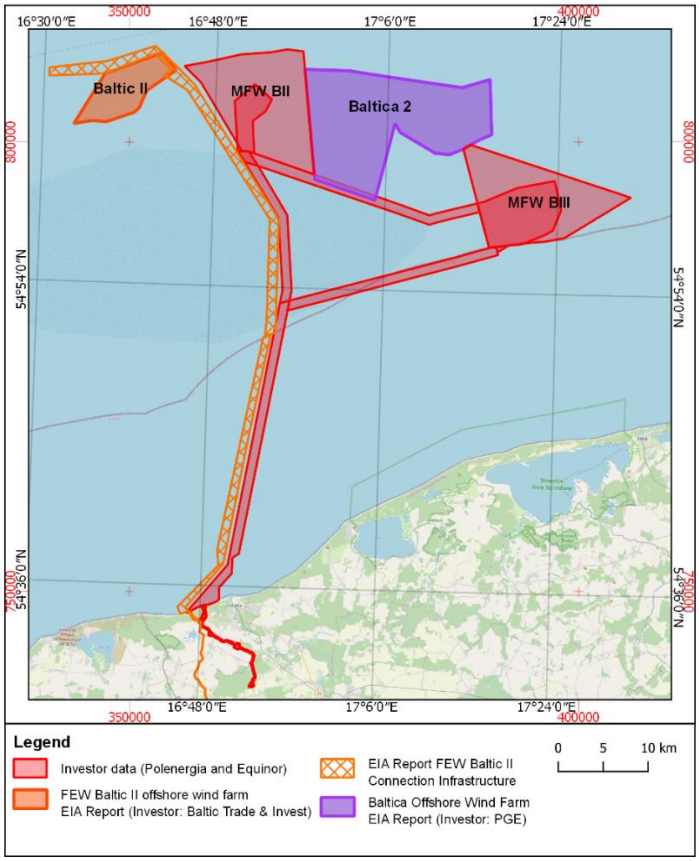


Figure 1.6. *Location of projects for which marine surveys used in this Report have been carried out*

Source: In-house study

This chapter include the key data on the timing and scope of the terrestrial and marine environmental surveys included in table 1.4. and table 1.5.

Table 1.4. *Marine environment methods and dates of surveys and analysis*

Component	Year	Scope/character of research and analysis
Surveys and analysis carried out within EIC corridor		
Hydrological conditions	2013-2014	Measurements of: waving, • the tide in the vertical profile, • the bottom water temperature Detailed measurements were made in two vertical profiles IPZ1_10 and IPZ1_15 at water depths of 10 and 15 m respectively
Seabed	2013-2014	• bathymetric surveys, • bottom sculpture (occurrence of ripple marks, sand waves and stones) • surface sediments, including examination of sediment cleanliness (e.g. nitrogen and phosphorus contents and heavy metal concentrations) • deep structure (taking core samples with a depth of 4 - 6m) • magnetometry research (detection of anomalies in the bottom)
Archaeology	2013-2014	• geophysical surveys, • sonar surveys, • core sampling
Coastal morphodynamics	2013-2014	• geodetic measurements (height measurements along designed profiles - combination of two methods: RTK DGPS satellite levelling and geometric levelling by means of a total station) • LIDAR

Component	Year	Scope/character of research and analysis
		• measurements of bathymetric profiles with the use of echo sounder, performed every 20 metres, in accordance with the assumptions of the IHO Hydrographic Survey Manual
Sand hopper *Talitrus saltator*	08.2015	Sampling of polygons (3 polygons) and profiles (15 profiles) distributed along a 3.8 km stretch of beach between km 238.77 and 234.95 of the seashore
Phytobenthos	2013-2014	• 34 video locations - filming of the bottom along a route of minimum 150 m • use of ROV • identification of areas with phytobenthos, assessment of the degree of phytobenthos coverage of the bottom, species composition • 3 qualitative samples - 1 in 3 locations - collected by a diver.
Macrozoobenthos	2013	• 92 quantitative sampling by van Veen scoop (0.1 m²) • in residual form, poor quantitative structure • BII – 48 samples • BIII – 79 samples
Ichthyofauna	2013-2014	Coastal zone: • 4 research stations based on depth zones: 0-3 m (station 0), 3-5 m (station 1), 5-10 m (station 2), 10-15 m (station 3) Deepwater zone: • 6 research stations
Thermal conductivity of sediments	06.2014	Assessment of the suitability of the sediments for cable burial in specific sections of the corridor: • core sampling, • in situ and laboratory resistivity and conductivity measurements
Marine mammal survey	2013-2014	• passive acoustic monitoring with C-POD recording devices in the area of MFW Bałtyk II and MFW Bałtyk III • aerial flights
Surveys carried out within MFW Bałtyk II and MFW Bałtyk III		
Hydrological and hydrochemical conditions	2013-2014	• sampling of water in a net of density - 1 sample per 5 km^2 - surface and bottom (20 m above the bottom) • sampling of water in standard vertical profiles from the depth: surface layer, 2.5 m, 5 m, 10 m, 15 m, and then every 10 m, at five measurement points (test stations) • analyses performed: – pH, alkalinity, suspended solids; – biogenic substances: ammoniacal nitrogen, nitrite nitrogen, nitrate nitrogen, total nitrogen, mineral N, phosphates, total phosphorus; – oxygen conditions: dissolved oxygen, five-day oxygen demand (BOD5), total organic carbon (TOC); – metals: nickel (Ni), lead (Pb), cadmium (Cd), chromium (Cr-org), chromium (VI), arsenic (As), mercury (Hg); – particularly harmful substances: phenols, free and bonded cyanides; – caesium 137 (137 Cs); – strontium 90 (90 Sr); – mineral oil index; – polycyclic aromatic hydrocarbons (PAH); – polychlorinated biphenyls (PCBs); • analysis of marine hydrological conditions (currents, surface wave action, temperature and salinity) and meteorological conditions • continuous recording of surface waves and water flows in the whole depth section with the use of the Doppler measuring instrument: AWAC (2 stations for each MFW) • continuous recording at the height of about 5 m above the sea surface: wind speed and direction, temperature, air

Component	Year		Scope/character of research and analysis
			pressure and humidity and intensity of solar radiation (meteorological station in the central part of MFW Bałtyk II and MFW Bałtyk III) • conductivity, temperature and depth measurements with the Citadel CTD-NV oceanographic sensor
Seabed surveys	2013-2014		• bathymetric (depth) measurements • geophysical surveys (recognition of the deep structure) • sonar surveys (recognition of the nature of the bottom surface) - a basis for the determination of sedimentary structures, rocks, types of sediment, underwater objects • collection of shallow core samples (up to 3 m in length): – MFW Bałtyk II – 63 samples, – MFW Bałtyk III – 67 samples; • analysis of sediment samples, i.e. granulometric analysis, water content, colour, carbonate content
Sediments	2013-2014		• testing of physico-chemical indicators – MFW Bałtyk II - analysis of 160 samples – MFW Bałtyk III - analysis of 193 samples
Phytobenthos	MFW Bałtyk II	2013	• hard-bottom research (boulders, pebbles): – 20 locations - video filming of the bottom on the route of min. 150 m, 2 qualitative tests (1 each at 2 locations) – using an ROV, a diver • identification of areas where phytobenthos - macroalgae occur, assessment of the degree of bottom coverage by macroalgae, species composition
		2013	• hard- hard-bottom research (boulders, pebbles): – filming at 7 stations, 7 qualitative samples of periphyton – using a hand-held camera, a diver • identification of areas where phytobenthos - macroalgae occur, assessment of the degree of bottom coverage by macroalgae, species composition
	MFW Bałtyk III	2013	• hard-bottom research (boulders, pebbles): – 20 locations - video filming of the bottom on the route of min. 150 m, – using an ROV, a diver • identification of phytobenthic areas, assessment of the degree of phytobenthic bed coverage, species composition
Macrozoobenthos	MFW Bałtyk II	2013	• soft-bottom research (gravels, sands): – 97 quantitative samples / 1 repetition per station – use of the van Veen scoop (0.1 m²) • determination of species composition, abundance, wet weight of macrozoobenthos, shell length of bivalves • determination of natural valuation of the MFW BII area together with the one-mile buffer zone based on the evaluation of macrozoobenthos communities
		2014	• hard-bottom research (boulders, pebbles): – 20 quantitative samples of peryphiton (fauna) from stone surfaces – use of an ROV with a stone grabber • determination of the number, wet weight and length of mussel shells of *Mytilus trossulus* • determination of natural valuation of the MFW BII area together with the one-mile buffer zone based on the evaluation of macrozoobenthos communities
	MFW Bałtyk III	2013	• soft-bottom research (gravels, sands): – 170 quantitative samples / 1 repetition per station – use of the van Veen scoop (0.1 m²) • determination of species composition, abundance, wet weight, shell length of mussels

Component	Year	Scope/character of research and analysis
		• determination of natural values of the MFW BIII area together with the one-mile buffer zone, based on the evaluation of macrozoobenthos communities
	2013	• hard-bothard-bottom research (boulders, pebbles, clays): – 2 quantitative samples/1 repetition per station 3 qualitative samples – use of the DAK instrument (grip area 0.04 m²) • determination of species composition, abundance, wet weight, shell length of mussels • determination of natural values of the MFW BIII area together with the one-mile buffer zone, based on the evaluation of macrozoobenthos communities
Ichthyofauna	2012-2013	• determination of the characteristics of the ichthyofauna community, in particular: – species composition and abundance of ichthyoplankton, – occurrence and relative biomass densities of pelagic fish, – occurrence and productivity of demersal fish • pelagic fish community surveys: hydroacoustic surveys, pelagic check hauls, ichthyoplankton surveys • studies on demersal fish community using groundfish test net sets (6 sets on each farm) • sampling of ichthyoplankton (8 test stations at each farm) • underwater observations carried out by divers on sandy and stony bottoms in areas where, due to the nature of the bottom, investigations using other methods were difficult (complementary works) • undertaking a total of 10 research cruises, in all seasons, including 5 targeting pelagic fish (mainly herring and sprat) and ichthyoplankton and 5 targeting demersal fish (mainly cod and flatfish)
Sea birds	2012-2013 2013-2014	• number of cruises: 31- MFW Bałtyk II, 24 - MFW Bałtyk III • research period - annual cycle: summer, autumn migration, wintering and spring migration • counting all birds flying and swimming along transects • counting birds flying using the "snap-shot" technique (noting birds in flight at a given moment in the transect zone)
	2012-2014	• research on Ławica Słupska • counting all birds flying and swimming along transects • counting birds flying using the "snap-shot" technique (noting birds in flight at a given moment in the transect zone)
Migrating birds	2013	• four survey methods (MFW BII and MFW BIII): – visual observations: species identification and estimation of bird flight rates during daylight hours; additionally, collection of information on flight altitude and direction of bird migration – horizontal radar during daylight hours: characterisation of species-specific flight trajectories of migratory birds (flight directions); – vertical radar during night hours: characteristics of the flight height of nocturnal migrants; – acoustic detections during night hours: recording the relative intensity of migration of nocturnal migrants making noises during flight.
Marine mammals	2013-2014	MFW Bałtyk II: • annual passive acoustic monitoring using C-POD detectors - 3 stations

Component	Year	Scope/character of research and analysis
		• aerial visual monitoring - flight route along 6 parallel transects, each 10 km apart
	2012-2013	MFW Bałtyk III: • annual passive acoustic monitoring using C-POD detectors - 3 stations • aerial visual monitoring - flight route along 6 parallel transects, each 10 km apart
Bats	2013-2014	• acoustic observations on transects covering the whole field area and acoustic observations at selected listening points • inspections in the maritime areas in periods of expected seasonal migration of bats • spring migration period - monitoring cruises (for MFW BII - 12, for MFW BIII - 13), with listening sessions • autumn migration period - monitoring cruises (for MFW BII - 9, for MFW BIII - 9), with listening sessions at the points; • during autumn migration - two monitoring cruises - listening sessions in 2-4 hours before sunset.
Archaeology	2013-2014	• analysis of archival data and search of available literature to identify potential cultural resources in the study area • analysis of material from geological surveys - shallow geological cores • analysis of acoustic data - sonar materials • verification of objects determined as a result of analysis of sonar and seismo-acoustic data with the use of an ROV underwater vehicle
Vessel traffic	2013-2014	• installation of a measuring set on a buoy in the central parts of the MFW fields, containing an AIS (Automatic Identification System) sensor together with a recorder, which enables the measurement and recording of AIS signals from vessels visible to the receiver • recording of AIS reports of vessels staying in the area of MFW BII and MFW BIII • number of observations - 343 days (for MFW BII), 326 days (for MFW BIII)

Source: In-house study

The characterisation and assessment of the natural elements was prepared on the basis of the annual nature inventory for the "Connection Infrastructure of the offshore wind farm MFW Bałtyk II and the offshore wind farm MFW Bałtyk III" (Volume III, Annex 2). The nature inventory and analysis of protected areas was conducted within a 1000 m corridor (after 500 m from the borders of the planned Project).

Table 1.5. *Terrestrial environment*

Component	Date	Scope	Method
Biota of macrofungi and lichens	June 2021 – June 2022	Approximately 1 km wide strip	The inventory was carried out based on the commonly used marshalling method targeting species protected under the Regulation of the Minister of Environment of 9 October 2014 on the species protection of fungi (Journal of Laws of 2014, item 1408) and those listed in the Red List of Plants and Fungi of Poland and endangered species of bryophytes
Vegetation and habitats	June 2021 – June 2022	Approximately 1 km wide strip	The inventory was carried out based on the commonly used marshalling method targeting species protected under the Regulation of the Minister of Environment of 9 October 2014 on the species protection of fungi (Journal of Laws of 2014, item 1408) and those listed in the Red List of Plants and Fungi of Poland and endangered species of bryophytes

Invertebrate faun	June 2021 – June 2022	Approximately 1 km wide strip	The main methods of collecting material were: • the "on the lookout" (spotting) method - many aquatic animals (mainly snails, bivalves, aquatic insects and their larvae) can be collected in shallow and clear water using this method • Methods that use various types of field equipment to collect a piece of the environment (sample) together with the organisms that inhabit it, e.g. casserole, bottom scraper. Surveys targeting protected species
Ichthyofauna	October 2021	In the Struga Lędowska River near Modlinek	Fish were caught in agreement with the general methods used by the Chief Inspectorate of Environmental Protection used in studying river ichthyofauna for the needs of State Environmental Monitoring (Prus and Adamczyk 2020) by the method of single electrofishing with a 3.8 kW electric aggregate adapted to catching fish acc. to Polish Standard PN – EN 14011 "Water quality. Sampling fish with electrofishing", equivalent to European Standard EN 14011:2003 Study site was 120 m long and 3 m wide making an area of 360 m^2
Amphibians and Reptiles	June 2021 – June 2022	Approximately 1 km wide strip	The following methods were used in the inventory of herpetofauna: • observation method - active search in the field for individuals (alive or dead) adults, juvenile forms and eggs, depending on the group, terrestrial (reptiles) or terrestrial and aquatic (amphibians) environments were penetrated, • capture and temporary holding for the purpose of marking an individual to a species or higher taxon, • listening for and recording in the field the voices of mating amphibians (in the case of anurans) • searching for amphibian eggs laid in a variety of ways by different species (e.g. in the vicinity of submerged vegetation - tailed amphibians) • inspection of random natural and artificial field traps, such as: wells, holes dug in the ground, etc.
Birds	June 2021 – June 2022	Approximately 1 km wide strip	*Breeding birds:* selected elements of a combined mapping method that exploits the fact that males/pairs of most bird species are attached to a territory; the method consists of successively inspecting the area of the study area and assigning individual bird sightings to locations on a map; *Migration rates and wintering grounds*: point observations
Terrestrial Mammals	June 2021 – June 2022	Approximately 1 km wide strip	The following methods were used: • penetration of the study area in search of signs of mammal habitation, i.e. finding tracks, shelters, droppings, signs of foraging and other activity, • direct observation (including listening) by day and night, • monitoring of roads and railways to find mammals killed in collisions with vehicles. Targeted surveys for protected species.

Bats	June 2021 – June 2022	Approximately 1 km wide strip	As part of the nature inventory, the following were carried out: • bioacoustic surveys of nocturnal bat activity • searches for summer roosts, breeding colony formation sites, swarming, mating (swarming) and transitional roosts, and winter roosts.

Source: In-house study

1.4.3. Methodology for assessing impact on Natura 2000 sites

Assessment of the impact of the planned project on Natura 2000 sites:

- PLC990001 Ławica Słupska
- PLB990002 Przybrzeżne wody Bałtyku
- PLH220024 Przymorskie Błota,
- PLH320068 Jezioro Wicko i Modelskie Wydmy,
- PLH220052 Dolina Słupi.

will be carry out taking into account the recommendations of the European Commission's manual "Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC', European Commission DG Environment, 2001.

According to the guidelines, the assessment is divided into 4 stages:

Stage 1: Screening:

- Management of the site,
- Description of the project or plan,
- Characteristics of the site,
- Assessment of significance,
- Outcomes;

Stage 2: Appropriate assessment:

- Information required,
- Impact prediction,
- Conservation objectives,
- Mitigation measures,
- Outcomes;

Stage 3: Assessment of alternative solutions

- Identifying alternative solutions,
- Assessing alternative solutions,
- Outcomes;

Stage 4: Assessment where no alternative solutions exist and where adverse impacts remain

- Identifying compensatory measures,
- Assessment of compensatory measures,
- Outcomes.

The assessment of the impact of the planned Project on Natura 2000 sites is likely to be completed at *Stage 2 Appropriate Assessment* as the possibility of significant negative impacts is not likely to be identified and it is not necessary to go through Stages 3 and 4.

According to the Act on Nature Conservation (Journal of Laws 2021.1098 - consolidated text as amended) it is forbidden excluding art. 34, to undertake activities that may, separately or in combination with other activities, have a significant negative impact on the conservation objectives of the Natura 2000 area, in particular:

1) deterioration of natural habitats or the habitats of plant and animal species for which conservation Natura 2000 site was designated
2) negative impact on species for which conservation Natura 2000 site was designated
3) deterioration of the integrity of Natura 2000 area or its connection to other areas.

The assessment was carried out for those species and habitats that are protected in the area, according to the applicable SDF, and the favourable conservation status of species and habitats and threats were assumed for the following studies and documents:

- Draft Regulation on the establishment of a protection plan for the Natura 2000 area PLC990001 Ławica Słupska (https://www.ums.gov.pl/projekty_unijne/natura2000_LS/Natura_2000_LS.pdf);
- Documentation of the Plan of Conservation Tasks of the Natura 2000 area Jezioro Wicko i Modelskie Wydmy PLH320068
- Order of the RDOŚ in Gdańsk and RDOŚ in Szczecin dated September 25, 2015 on the establishment of a plan of conservation tasks for the Natura 2000 area Przymorskie Błota PLH220024 and:
  - Complementary knowledge on natural habitats 6410 and 6510 in the Natura 2000 site Przymorskie Błota PLH220024, Snopowiązałka Foundation, Polkowo 2021,
  - Draft SDF update of the Przymorskie Błota Natura 2000 site,
- Order of RDOŚ in Gdańsk and RDOŚ in Szczecin of 25 September 2015 on the establishment of a conservation task plan for the Natura 2000 area Przymorskie Błota PLH220024.

While assessing whether the impact will be significant, a reference was made to favourable conservation status as defined in the Nature Conservation Act:

- **the favourable conservation status of a species** - the sum of the impact on a species, which may affect the distribution and abundance of its population within the country or the Member States of the European Union or the natural range of that species in the foreseeable future, where the data on the dynamics of the population of that species indicate that the species is a stable component of its proper habitat, the natural range of the species is not diminishing or will not diminish in the foreseeable future, and a sufficiently large habitat for the maintenance of the population of that species exists and will probably continue to exist (Article 5 (24) of the Nature Conservation Act);
- **the favourable conservation status of a natural habitat** - the sum of the impact on a natural habitat and its typical species that may affect in the foreseeable future the natural distribution, structure, functions or survival of its typical species within the national territory or the Member States of the European Union or the natural range of that habitat where the natural range of a natural habitat and the areas occupied by that habitat within its range do not change or increase, the structure and functions which are necessary for the long-term maintenance of the habitat exist and are likely to continue to exist and the species typical of that habitat are in a favourable state of conservation (Article 5 (25) of the Nature Conservation Act);

and assessed the impacts on the integrity of the Natura 2000 site and the coherence of the Natura 2000 network. The full assessment of the impacts on Natura 2000 sites can be found in Annex 7 (Volume IV) of this Report.

1.4.4. Methodology for the calculation of electromagnetic field emissions

The methodology for calculating the emissions of electromagnetic fields is presented in Volume IV, Appendix 5.

1.4.5. Methodology for the calculation of noise emissions

The methodology for calculating noise emissions is presented in Volume IV, Annex 4.

1.4.6. Methodology for thermal calculations

The methodology for calculating heat emission from operating power cables is presented in Volume IV, Appendix 6.

1.4.7. Methodology for calculating the dispersion of suspended solids

The methodology for calculating the spread of suspended solids is presented in Volume IV, Appendix 2a and 2b.

2. CONDITIONS RESULTING FROM STRATEGIC AND PLANNING DOCUMENTS

This chapter refers to the international, national and regional documents that relate to offshore wind energy development strategies and formulate environmental protection objectives that may indirectly affect the manner of implementation and operation of the planned Project. The second set of documents are planning documents, whereby, in accordance with Article 3a of the Act of 24 July 2015 on the preparation and implementation of strategic investments in transmission networks (Dz.U.2022.273 consolidated text, as amended), the planned Project is a strategic investment in transmission networks, which, in accordance with Article 80(2) of the EIA Act, are not subject to the requirement to state the compliance of the location of the Project with the provisions of the local spatial development plan. However, the compatibility analysis was performed in order to identify possible conflict and conflictogenic sites.

2.1. INTERNATIONAL DOCUMENTS

European Green Deal

Communicated by the European Commission on 11 December 2019. The European Green Deal (COM(2019) 640 final) is the European Union's wide-ranging action plan to achieve zero greenhouse gas emissions (net) by 2050.

The plan identifies the necessary investments and actions for sectors of the European economy, including:

- investing in environmentally friendly technologies,
- helping industries to innovate,
- introducing cleaner, cheaper and healthier forms of private and public transport,
- decarbonising the energy sector,
- making buildings more energy efficient,
- working with international partners to improve global environmental standards.

One of the actions planned under the European Green Deal is to reduce the EU's dependence on external energy sources. The European Commission has identified wind energy as the dominant power generation technology by 2050, planning to install offshore wind power up to 450 GW. Installations in the Baltic region could reach 85 GW by 2050. The planned Project is directly in line with the objectives of the European Green Deal.

The Taxonomy Regulation

Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment aims to facilitate the identification and classification of investments supporting sustainable development. The regulation sets out the criteria that an economic activity must meet in order to be classified as sustainable. An undertaking must meet all four conditions:

1. It makes a significant contribution to at least one of the environmental objectives:
   - climate change mitigation,
   - climate change adaptation,
   - the sustainable use and protection of water and marine resources,
   - the transition to a circular economy,
   - pollution prevention and control,
   - the protection and restoration of biodiversity and ecosystems.
2. It does not cause serious harm to any of the environmental objectives.
3. It provides minimum guarantees concerning social security and management.
4. It meets the technical eligibility criteria.

The proposed Project meets all conditions.

The 8th Environmental Action Program

This is another EU document adopted by Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a global EU Environment Action Programme to 2030 (OJ EU.L.2022.114.22), that indicates the EU's environmental policy goals until 2030, taking into account the European Green Deal. The document aims to accelerate the green transition in a fair and diverse way. Its long-term goal – 'Living well, within the limits of our planet' - was already set out in the 7th Programme.

The eighth update of the Programme identifies six priority thematic objectives: reduction of greenhouse gas emissions, adaptation to climate change, a growth model that generates more benefits for the planet than it loses, zero emissions, protection and restoration of biodiversity, and reduction of the greatest environmental and climate pressures related to production and consumption. It pays particular attention to ensuring that the findings of the EU's climate and environmental policy are effectively implemented.

The planned Project is in accordance with the environmental objective related to reducing greenhouse gas emissions.

Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM)

Helsinki Convention - Convention on the Protection of the Marine Environment of the Baltic Sea Area, signed in Helsinki on 9 April 1992 (Journal of Laws of 2000, No. 28 item 346). The Convention defines the principles of co-operation of all the Baltic Sea states on comprehensive protection of the Baltic Sea against all types of pollution and its implementing body is Helsinki Commission (HELCOM) located in Helsinki. .

The work of the Commission is primarily based on 5 permanent working groups, including working groups: on the state of the environment and its protection (STATE & CONSERVATION), on the implementation of the ecosystem approach (GEAR) and on the reduction of pressures from the Baltic Sea catchment area (PRESSURE), as well as three temporary ones, including: HELCOM-VASAB MSP – the Marine Spatial Planning Working Group. The activities performed under the Helsinki Convention resulted in the Baltic Sea Action Plan 2021 (BSAP), which was updated in October 2021.

HELCOM groups that may be relevant to impacts caused by offshore wind farms include the PRESSURE group dealing with underwater noise and the VASAB MSP group, dealing with spatial planning.

2.2. NATIONAL DOCUMENTS

The National Energy Policy until 2040 (PEnP 2040)

The Polish Energy Policy until 2040, approved by the Council of Ministers on 2 February 2021, indicates that the implementation of offshore wind energy, together with the implementation of nuclear energy and increasing the role of scattered sources of electricity, will be the main way to reduce the carbon emissions level of the energy sector. According to the provisions of the PEnP 2040 , offshore wind farms will play a special role in achieving at least 23% share of RES in gross final energy consumption in 2030. The incorporation and transmission of the power generated by MFW will be implemented through the development of a transmission grid in northern and north-western Poland.

The objective of the national energy policy is to create the conditions for providing energy security while at the same time ensuring the competitiveness of the economy, energy efficiency and reducing the environmental impact of the energy sector. The specific objectives cover the entire energy supply chain - from its generation to its sale. Poland's energy transformation will be based on three pillars, including Pillar II: Zero emission energy system including investments in offshore wind energy.

The planned project is consistent with the goals and objectives of the Energy Policy of Poland until 2040.

Strategic Environmental Impact Assessment of the draft Polish Energy Policy until 2040.

The authors of the forecast point out, among other things, the development of offshore wind farms promoted in PEnP 2040 and define the possibility of disturbance to the marine environment:

- temporary increase in suspended solids and biogenic substances and organic matter,
- increased turbidity and decreased transparency of water,
- deterioration of oxygen conditions in the area of works.

The document indicates that the greatest impact of the wind farms located at sea will be associated primarily with their construction, when the marine environment will be disturbed. At the operational stage, it will concern, above all, the introduction of restrictions on the use (navigation, fishing, water sports) of occupied maritime areas. In case of the execution of the offshore wind farms the transformation of the seabed surface will occur. The planned Project will have a much smaller impact on the seabed than the offshore wind farms, as the connections cover a much smaller area and the construction process takes less time.

The National Environmental Policy until 2030 (PEP 2030)

The National Ecological Policy 2030 (hereinafter: PEP 2030, Monitor Polski 2019.794) is the most important strategic document in the area of environment and water management. The main objective of this document is defined in the Strategy for Responsible Development: Development of the potential of the environment for citizens and entrepreneurs. Specific objectives were formulated on the basis of trends observed in the area of the environment and include such issues as: improving environmental quality and environmental safety, sustainable management of environmental resources, climate change mitigation and adaptation, and disaster risk management.

The indicators for the implementation of the objectives of the Environmental Policy concern the quality of the components of the environment, such as, for example the status of water bodies, forest cover, the dynamics of greenhouse gas emissions, and others.

The document assumes that the development of photovoltaics and offshore wind farms will play a key role in achieving the target in the electro-energy sector.

Strategic Environmental Impact Assessment of the National Environmental Policy until 2030

The subject of offshore wind farms is the subject of analyses and strategic directions of actions specified in the Strategic Environmental Assessment of the PEkP 2030. Their implementation will result in the need to monitor the exceedance of the applicable noise exposure limit, at a distance from the noise source, both during construction and operation of these installations.

National Programme for the Protection of Marine Waters (KPOWM)

The KPOWM approved by the Regulation of the Council of Ministers of 11 December 2017 on the adoption of the National Programme for the Protection of Marine Waters (Journal of Laws 2017.2469) together with the update of the environmental objectives for marine waters (Resolution of the Council of Ministers No. 170 of 13 February 2019) was developed as part of the implementation of the Marine Strategy Framework Directive. The action programmes within the KPOWM aim to recover and maintain the good ecological status of the Baltic Sea. The programme sets out a path towards achieving the environmental objectives defined in the *Set of Environmental Objectives for Marine Waters*.

The document contains a number of measures that aim to achieve a good ecological status of the Baltic Sea, primarily focused on fisheries and nature conservation.

The planned Project is located in sub-area 36 Open waters of the Bornholm Basin and 38 Polish coastal waters of the Bornholm Basin (figure 2.1.).

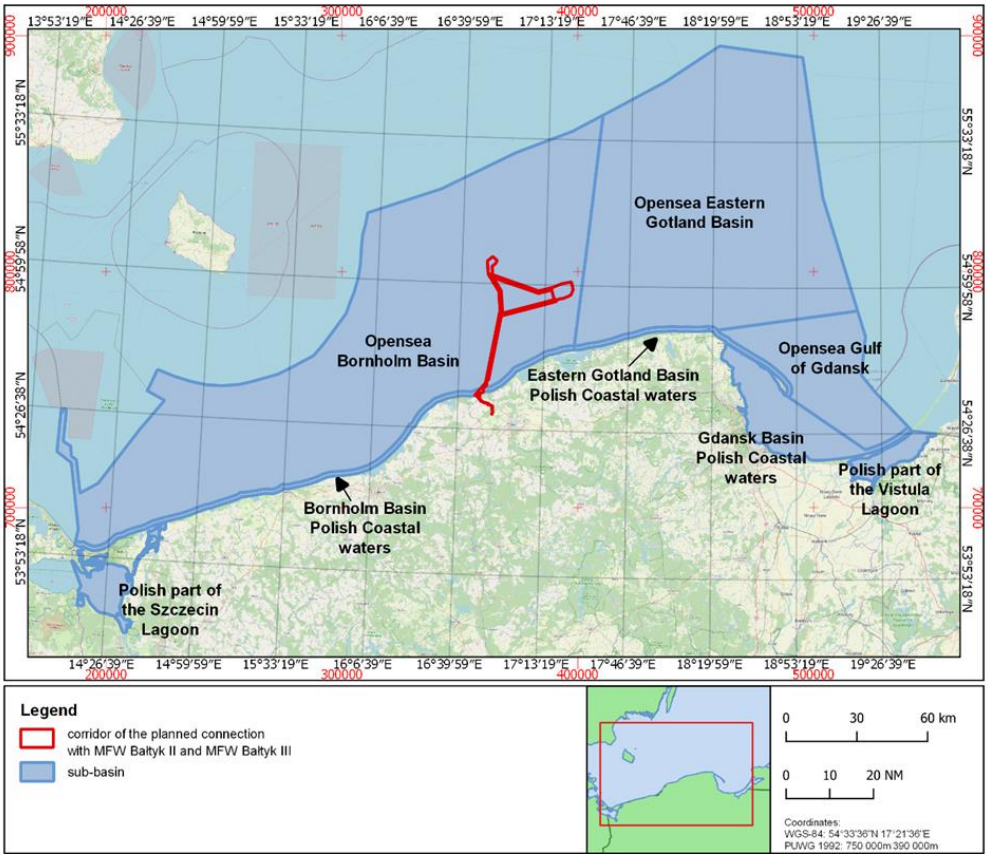


Figure 2.1. *Location of the marine part of the planned Project in the KWOWM sub-areas (RDSM planning areas)*

Source: In-house study

An update of the marine water protection programme (aPOWM) is currently under procedure. In accordance with the Water Law, the Minister responsible for water management has agreed the final draft of the programme update with, among others, the Minister for Agriculture and the Minister for the Environment. The document received the required approval of the members of the Council of Ministers. The next formal step was to submit the results of the completed project to the European Commission in the form of a special report. The European Commission has six months to issue its opinion on the submitted report. After this period - in the absence of a negative opinion - the document will be adopted in the country in the form of a decree of the Council of Ministers.

The Programme for the Protection of Sea Shores

The document was adopted by the Act of 28 March 2003 establishing a long-term 'Programme for the protection of sea shores' (Journal of Laws 2016.678 consolidated text) and contains a list of undertakings aimed at securing sea shores. The planned Project will be implemented between 236.5 km and 237.5 km of the sea shore (according to the kilometrage of the Maritime Office), for which no tasks have been provided for implementation until 2023.

2.3. REGIONAL DOCUMENTS

The Odra River Basin Management Plan (RBMP)

The new RBMP was adopted by the Regulation of the Council of Minister of Infrastructure of 16 November 2022 (Journal of Laws 2023.355) and was developed as a part of the planning cycle for the period 2022-2027.

The River Basin Management Plans implement the objectives of Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive). The water resources of a river basin are: inland surface waters and groundwaters,

internal marine waters and transitional and coastal waters located within the river basin area, divided into surface water bodies (SWBs).

The planned Project is located within coastal water bodies (figure 8.13 in chapter 8.4):

- CW60001WB3 - Polskie wody przybrzeżne Basenu Bornholmskiego,
- CW20001WB2 - Polskie wody przybrzeżne Basenu Gotlandzkiego (in a small part),

In addition, the onshore section passes through the catchment areas of surface water bodies (SWBs) (figure 8.14 in chapter 8.4):

- RW6000104716129 Pogorzeliczka,RW60001746729 oszczeniczka (at a considerable distance from the main watercourse),

CW60001WB3 - direct catchment area of the sea - no watercourses,,and through the so-called "remaining area of the JCWP," where the planned corridor crosses the Struga Lędowska River - this area is the catchment area of Lake Modła, code LW90084.

The planned Project is located within the groundwater body (GWB) PLGW600010.

The location of the planned Project on the background of the catchment areas of lake, coastal and river water bodies, the environmental objectives set for the water bodies and the assessment of the risk of failure to meet the environmental objectives are presented in the section 8.4.

The Odra River Basin Flood Risk Management Plan

The flood risk management plan for the Odra river basin area was adopted by the Regulation of the Decree of the Council of the Minister of Infrastructure dated October 26, 2022 (Journal of Laws 2012.2714). The main objective of the flood risk management plan is to reduce the potential negative impacts of flooding on human life and health, the environment, cultural heritage and economic activity by implementing measures to minimise the identified risks. These actions will lead, among other things, to a reduction of flood losses, to curb the increase in flood risk and improve the management system.

The planned Project in the coastal zone passes through a special flood hazard area.

Pomorskie Voivodeship Development Strategy 2030

The strategy adopted by the Sejmik of Pomorskie Voivodeship with the Resolution No. 376/XXXI/21 of 12 April 2021 is the basic strategic document setting out the directions for the development of Pomorskie Voivodeship. The strategy sets three strategic objectives of general character:

1. Sustainable Security,
2. Open Regional Community,
3. Resilient Economy.

These objectives are operationalised through 12 operational sub-objectives. The planned project contributes to operational sub-objective 1.2 'Energy security' through the development of offshore wind energy and the development of renewable energy sources.

The Regional Strategic Program, which details the provisions of the Pomorskie Voivodeship Development Strategy, is also an essential tool for its implementation, in terms of environmental and energy security, as one of the priorities recognises the development of low-carbon energy sources. Within the framework of specific objective 2: Energy security, the programme assumes taking actions to increase energy generation based on renewable sources, including offshore wind energy, but also local distributed generation, and development of intelligent systems for transmission, distribution and storage of fuels and energy.

The Project is in accordance with the objectives of Pomorskie Voivodeship Development Strategy 2030.

2.4. PLANNING DOCUMENTS

Pomorskie Voivodeship Spatial Development Plan 2030 (PZPWP) was adopted by Resolution No. 318/XXX/16 of the Assembly of Pomorskie Voivodeship of 29 December 2016. One of the directions of the spatial policy of Pomorskie Voivodeship development is, i. a. 'K.2.5. Increasing the degree of energy security and efficiency of the systems of production, transmission and distribution of electricity and heat...', including an increase in electricity production from sources located in the area of the voivodeship, the region becoming a national leader in the production of green energy and development of electricity transmission and distribution networks.

Among activities included in the spatial policy of the voivodeship, the following are listed: the construction of transmission and distribution networks and substations for power from the new system and renewable energy sources (wind farms, including offshore), and the expansion of the 400/110 kV Słupsk substation, as well as the reconstruction of 110 kV power line: Sławno - Słupsk -Wierzbięcino, Słupsk Poznańska - Słupsk Wierzbięcino.

The planned Project, which is the derivation of power from a renewable energy source such as an offshore wind farm, has been taken into account in the findings of PZPWP 2030.

The Spatial Development Plan of Polish Maritime Areas in the scale of 1:200 000 (POM Plan) was adopted by the Regulation of the Council of Ministers of 14 April 2021 on the adoption of the Spatial Development Plan of the internal marine waters, territorial sea and the exclusive economic zone in the scale of 1:200 000 (Journal of Laws 2021.935, as amended). The planned Project is in line with the findings of the POM Plan and runs through 7 basins and sub-basins with function I - technical infrastructure (figure 3.1):

- **POM. 16.Pw** – sub-area 16.201.I, 16.206.I,
- **POM.27.B** – sub-area 27.915.B, 27.206.I, 27.311.Ip, 27.505.C, 27.800.S,
- **POM.28.Ip** – sub-area 28.206.I, 28.506.C, 28.915.B, 28.926.B,
- **POM.29.T** – sub-area 29.926.B, 29.206.I,
- **POM.34.T** – sub-area 34.206.I**,** 34.926.B,
- **POM. 42.O** – sub-area 42.206.I, 42.201.I, 42.926.B,
- **POM. 45.E** – sub-area 45.201.I.

The infrastructure corridor runs through water bodies whose leading functions are: Pw - Reserve for future development with mining permitted, B - Defence and national security, T - Transport, ECI - Operation of a port or harbour, O - Environmental and nature protection and E – Generation of renewable energy. In each of the basins, an infrastructure corridor has been delimited in the form of sub-basins, i.e. areas of the plan which constitute a separate part of the basin in which allowable functions I - technical infrastructure have been defined:

a) the possibility of locating telecommunications cables, substation infrastructure and laying and maintaining power cables, including internal and external connection infrastructure for offshore wind farms…

The following table (table 2.1.) presents the characteristics of the basins and sub-basins of the POM Plan through which the connection from MFW Bałtyk II and III passes.

Table 2.1.*Characteristics of water areas and sub-areas of the POM Plan through which the ECI from MFW Bałtyk II and MFW Bałtyk III runs (the location of the planned Project on the POM basin is shown in figure 3.1).*

		Basic function	Sub-area	Acceptable functions	Provisions concerning the location of technical infrastructure in the water area	Public purpose investments
Water area	**16.Pw**	Pw – Reserve for future development, with mining permitted	16.201.I 16.206.I	1) aquaculture (A); 2) scientific research (N); 3) cultural heritage (D); **4) technical infrastructure (I)**; 5) defence and national security (B); 6) searching, recognising mineral deposits and extracting minerals from deposits (K); 7) fishing (R); 8) artificial islands and structures (W); 9) transport (T); 10) tourism, sport and recreation (S).	**for technical infrastructure:** a) throughout the water area: − functions shall be limited to those not threatening the safety of navigation; − it is required to lay new linear elements of technical infrastructure under the surface of the seabed, and if it is not possible due to environmental or technological reasons, other permanent safeguards ensuring navigational safety should be used; **other:** a) after the completion of the investment, in the sub-areas intended for the installation and maintenance of linear elements of the technical infrastructure, it is required to establish around them a safety zone by the territorially competent director of the maritime office, in which anchoring is prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works.	1) Sub-area 16.201.I is established - intended for the installation and maintenance of line elements of the technical infrastructure - external connection infrastructure of offshore wind farms, including the planned direct current connection between Poland and Lithuania; 2) Sub-area 16.206.I is established for laying and maintaining of line items of technical infrastructure - power cables (including the existing SwePol Link)
	45.E	E - Renewable energy generation	45.201.I	1) aquaculture (A); 2) scientific research (N); 3) cultural heritage (D); **4) technical infrastructure (I)**; 5) searching, recognising mineral deposits and extracting minerals from deposits (K); 6) fishing (R); 7) artificial islands and structures (W); 8) transport (T); 9) tourism, sport and recreation (S).	**for technical infrastructure:** a) throughout the water area: − the implementation of functions shall be limited: to infrastructure necessary for energy generation functions; to means not threatening the ecological function of spawning grounds and survival of early life stages of fish (eggs and larvae) of commercial species; − it is required to lay the linear elements of the technical infrastructure in the manner ensuring the economical use of space, under the surface of the seabed, and if this is impossible due to environmental or technological reasons other permanent protection should be used, which will enable safe use of anchored floating nets; **other:** a) after the completion of the investment, in the sub-areas intended for the installation and maintenance of linear elements of the technical infrastructure, it is required to establish around them a safety zone by the territorially competent director of the maritime office, in which anchoring is prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works.	1) Sub-area 45.201.I is established for the installation and maintenance of line items of technical infrastructure - including external connection infrastructure for offshore wind farms and the planned DC connection between Poland and Lithuania; 2) the planned investment involving the laying of a submarine cable and the establishment of DC connection between Poland and Lithuania outside the designated sub-areas.
	42.O	O - Environmental and nature protection	42.201.I 42.206.I 42.926.B	1) scientific research (N); 2) cultural heritage (D); **3) technical infrastructure (I)**; 4) defence and national security (B); 5) fishing (R); 6) artificial islands and structures (W); 7) transport (T); 8) tourism, sport and recreation (S).	**for technical infrastructure:** a) laying of linear elements of technical infrastructure outside the separated sub-areas **42.201.I** and **42.206.I** is prohibited; − the implementation of functions to means not threatening the ecological function of spawning grounds and survival of early life stages of fish (eggs and larvae) of commercial species; − the implementation of functions to means not significantly affecting the well-being of wintering and resting birds during migration and during the period of their high occurrence from the beginning of November until the end of April; b) the laying of new linear elements of technical infrastructure under the seabed surface is required, and if this is impossible due to environmental or technological reasons, other permanent protection should be used; **other:** a) after the completion of the investment, in the sub-areas intended for the installation and maintenance of linear elements of the technical infrastructure, it is required to establish around them a safety zone by the territorially competent director of the maritime office, in which anchoring is prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works.	1) Sub-area 42.201.I is established - intended for laying and maintenance of linear elements of technical infrastructure - integrated network infrastructure; 2) Sub-area 42.206.I is established - designated for the laying and maintenance of linear elements of technical infrastructure - integrated network infrastructure (including the existing SwePol Link).
	34.T	T- Transport	34.206.I 34.926.B	1) scientific research (N); 2) cultural heritage (D); **3) technical infrastructure (I)**; 4) defence and national security (B); 5) seashore protection (C); 6) searching, recognising mineral deposits and extracting minerals from deposits (K); 7) fishing (R); 8) tourism, sport and recreation (S).	**for technical infrastructure:** a) throughout the water area: − the implementation of functions shall be limited to means not threatening the ecological function of spawning grounds and survival of early life stages of fish (eggs and larvae) of commercial species; − the laying of new linear elements of technical infrastructure under the seabed surface is required, and if this is impossible due to environmental or technological reasons, other permanent protection providing navigational safety should be used;	1) Sub-area 34.206.I is established for the laying and maintenance of linear elements of technical infrastructure - external connection infrastructure of offshore wind farms and other power cables (including the existing SwePol Link);

		Basic function	Sub-area	Acceptable functions	Provisions concerning the location of technical infrastructure in the water area	Public purpose investments
					b) in sub-area 34.628.C, functions are limited to means that do not disturb accumulations of sand for artificial recharge of the seashore; **other:** a) after the completion of the investment, in the sub-areas intended for the installation and maintenance of linear elements of the technical infrastructure, it is required to establish around them a safety zone by the territorially competent director of the maritime office, in which anchoring is prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works.	
	29.T	T- Transport	29.206.I 29.926.B	1) scientific research (N); 2) cultural heritage (D); **3) technical infrastructure (I)**; 4) defence and national security (B); 5) seashore protection (C); 6) searching, recognising mineral deposits and extracting minerals from deposits (K); 7) fishing (R); 8) tourism, sport and recreation (S).	**for technical infrastructure:** a) throughout the water area: − the implementation of functions shall be limited to means not threatening the ecological function of spawning grounds and survival of early life stages of fish (eggs and larvae) of commercial species; not significantly affecting the well-being of wintering and resting birds during migration and during the period of their high occurrence from the beginning of November until the end of April; − laying of new linear elements of technical infrastructure under the seabed surface is required, and if this is impossible due to environmental or technological reasons, other permanent protection providing navigational safety should be used; b) in sub-area 29.625.C, functions are limited to means that do not disturb accumulations of sand for artificial recharge of the seashore **other:** - after the completion of the investment, in the sub-areas intended for the installation and maintenance of linear elements of the technical infrastructure, it is required to establish around them a safety zone by the territorially competent director of the maritime office, in which anchoring is prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works. - defence and national security: a) sub-areas 29.924.B for the K-8 anchorage and 29.926.B for the Polish Navy fairways (0025, 0026, 0208, 0209) are designated. Modification of their existing zoning status requires agreements with the Minister of National Defense. During the period of activities carried out by the Polish Armed Forces, realisation of the remaining functions in the sub-areas may be prevented.	1) Sub-area 29.206.I is established for the installation and maintenance of linear elements of technical infrastructure - external connection infrastructure of offshore wind farms;
	28.Ip	Ip - Operation of a port or harbour	28.206.I 28.506.C 28.915.B 28.926.B	1) scientific research (N); 2) cultural heritage (D); **3) technical infrastructure (I);** 4) defence and national security (B); 5) seashore protection (C); 6) searching, recognising mineral deposits and extracting minerals from deposits (K); 7) fishing (R); 8) artificial islands and structures (W); 9) transport (T); 10) tourism, sport and recreation (S).	**for technical infrastructure:** a) throughout the water area: − laying of linear elements of technical infrastructure in the area of anchorages and in places where dredged material is deposited, and in the area of approach fairways in such a way as to threaten the safety of navigation is prohibited; − the implementation of functions shall be limited to means: not significantly affecting the well-being of wintering and resting birds during migration and during the period of their high occurrence from the beginning of November until the end of April; not threatening the ecological function of spawning grounds and survival of early life stages of fish (eggs and larvae) of commercial species; − laying new linear elements of the technical infrastructure: as far as possible at right angles to the shoreline; below the surface of the seabed are required, and if this is not possible due to environmental or technological reasons, other permanent protections ensuring navigational safety should be applied; minimum 3 m below the average depth of the bottom between submarine sand dunes; − crossing of linear elements of technical infrastructure is prohibited unless it is impossible for technological reasons; b) in sub-area 28.800.S, realisation of functions is limited to means meeting the requirements of safety of bathing and places used for bathing as well as recreation and water sports; c) in sub-area 28.709.R, realisation of functions is limited to means that do not threaten the function of the fish migration corridor and take into account the necessity to secure bidirectional fish migration; **other:** - after the completion of the investment, in the sub-areas intended for the installation and maintenance of linear elements of the technical infrastructure, it is required to establish around them a safety zone by the territorially competent director of the maritime office, in which anchoring	3) Sub-area 28.206.I is designated for the laying and maintenance of linear elements of technical infrastructure - integrated network infrastructure;

		Basic function	Sub-area	Acceptable functions	Provisions concerning the location of technical infrastructure in the water area	Public purpose investments
					is prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works.	
	27.B	B - Defence and national security	27.206.I 27.915.B 27.311.Ip 27.505.C 27.800.S	1) scientific research (N); 2) cultural heritage (D); **3) technical infrastructure (I);** 4) defence and national security (B); 5) seashore protection (C); 6) searching, recognising mineral deposits and extracting minerals from deposits (K); 7) fishing (R); 8) artificial islands and structures (W); 9) transport (T); 10) tourism, sport and recreation (S).	**for technical infrastructure:** a) throughout the water area: − the installation of linear elements of technical infrastructure is limited to the separate sub-area 27.206.I, with the exclusion of elements serving the functions of national defense and security; − the implementation of functions is limited to means: meeting the requirements of safety of bathing and places used for recreation and water sports; not threatening the ecological function of spawning grounds and survival of early development stages of fish (eggs and larvae) of commercial species; b) in sub-area 27.505.C laying new linear elements of the technical infrastructure: as far as possible at right angles to the shoreline; below the surface of the seabed are required, and if this is not possible due to environmental or technological reasons, other permanent protections ensuring navigational safety should be applied; minimum 3 m below the average depth of the bottom between submarine sand dunes; − crossing of linear elements of technical infrastructure is prohibited unless it is impossible for technological reasons; c) in sub-area 27.709.R and 27.718.R, realisation of functions is limited to means that do not threaten the function of the fish migration corridor and take into account the necessity to secure bidirectional fish migration d) in sub-area 27.800.S realisation of functions is limited to means meeting the requirements of safety of bathing and places used for bathing as well as recreation and water sports; **other:** - after the completion of the investment, in the sub-areas intended for the installation and maintenance of linear elements of the technical infrastructure, it is required to establish around them a safety zone by the territorially competent director of the maritime office, in which anchoring is prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works. - defence and national security: sub-area 27.915.B is designated as a protective zone of a closed area in order to enable a safe use of the military complex K-4175 Ustka; - for the functioning of the port or the harbour: sub-areas are delimited intended for maintenance of port or harbour functions: 27.310.Ip for the sea port in Jarosławiec and 27.311.Ip for the sea port in Ustka.	1) sub-area 27.206.I is established for the laying and maintenance of line items of technical infrastructure - external connection infrastructure of offshore wind farms and other power cables

Source: In-house study based on detailed arrangements of the POM Plan

Study of Conditions and Directions for Spatial Development

- Ustka Municipality
  The study foresees the necessity of locating the connection infrastructure from the offshore wind farms to the Słupsk-Wierzbięcino station (update adopted with the Resolution No. XXVIII.338.2013 of the Ustka Municipality Council dated 24 May 2013 on accession to update the Study of Conditions and Directions for the Spatial Development of the Ustka Municipality).
- Słupsk Municipality
  The development directions of the municipality include the following: development of GPZ 110/15 kV in Wierzbięcin (in accordance with the Resolution No. XXXV/389/2021 of the Council of the Słupsk Municipality of 1 June 2021 on adopting amendments to the Study of Conditions and Directions for the Spatial Development of the Słupsk Municipality).

Local Spatial Development Plans

The area of the planned Project is covered by the following local spatial development plans (figure 2.2.):

- Ustka Municipality:
  - 'Amendment to the local spatial development plan of the Ustka municipality in the area covering plot No. 358/2 located in the geodesic area of Lędowo' (Resolution No. III/19/2002 of 10 December 2002, Journal of Laws 2003.42.600 of 21.03.2003), which partly includes corridor, where the Project will be located,
  - "Local Spatial Development Plan for the Municipality of Ustka" (adopted with Resolution No. XXXIV.437.2021 on 24 November 2021), the planned Project fragmentarily crosses the MPZP area in the area designated as "4E", which establishes the principles of land use for electrical power equipment, including the location of an underground extra-high voltage line with a technological corridor;
  - "Local plan of spatial development for a part of the area located within the geodesic area of Duninowo PGR, Ustka commune" (adopted by Resolution No. XXV/330/2017 on 10 February 2017. Dz.U.2017.869 of 3 March 2017), which includes the area of the company MOWI POLAND S.A., in the vicinity of which the ECI corridor is located, including the area intended for the construction of the ONS;
  - "Local spatial development plan for a part of the area located within the geodesic area of Pęplino, Ustka commune" (adopted by Resolution No. XLV.564.2018 on 26 October 2018. OJ.U.2018.4663 of 27 November 2018), the subject of the plan's findings are the areas of technical infrastructure - power engineering, which are located in the corridor of the planned Project, precisely in the area of the planned ONSs,
    "Local spatial development plan for the area covering the geodesic precinct of Pęplino, Ustka commune (adopted by Resolution No. XL.514.2022 on 19 May 2022). which includes areas behind the planned ONSs, i.e. agricultural areas, the area of the existing Poliart printing company, roads, service areas, areas of single-family residential development and forests.
- Słupsk Municipality:
  - 'Amendment to the local general plan of spatial development of the Słupsk municipality regarding the power transmission system' (Resolution No. XXI/156/97 of the Słupsk Municipality Council dated 30 June 1997, Journal of Laws 1997.19.116 dated 28 July 1997). The document designates the area intended for the location of a substation in Wierzbięcin and the location of power lines, both cable and overhead ones.
  - 'Local plan of spatial development in parts of geodesic precincts Bruskowo Leśnictwo and Bruskowo Wielkie' (Resolution No. XLV/560/2018 of the Council of Słupsk Municipality of 27 June 2018, Journal of Laws 2018.3110 of 31 July 2018), which establishes a zone of technical infrastructure - power infrastructure, where implementation of cable or overhead power lines of high WN or highest LV voltage together with accompanying infrastructure is possible, connecting the high voltage power line designed in the area with the Main Power Supply Point (GPZ).
  - "Amendment to the local general spatial development plan of the Słupsk municipality for 110 kV power line". (Resolution no. XXI/130/2000 of the Słupsk Municipality Council of 16 February

2000). The plan amendment concerned the continuation of the overhead line leading from Kobylnica municipality to the PSE Wierzbięcino substation.

- Local plan of spatial development of the section of the route of the 2x400 kV overhead double-circuit power line Żydowo Kierzkowo - Słupsk on the territory of the Słupsk municipality" (Resolution no. XXXIV/428/2017 of the Słupsk Municipality Council of 12 September 2017, Journal of Laws 2017.3499 of 12 October 2017), which allows for the realisation of a public purpose investment, which is the construction of a 2x400 kV overhead double-circuit power line Żydowo Kierzkowo, which outputs power from the PSE Wierzbięcino substation.

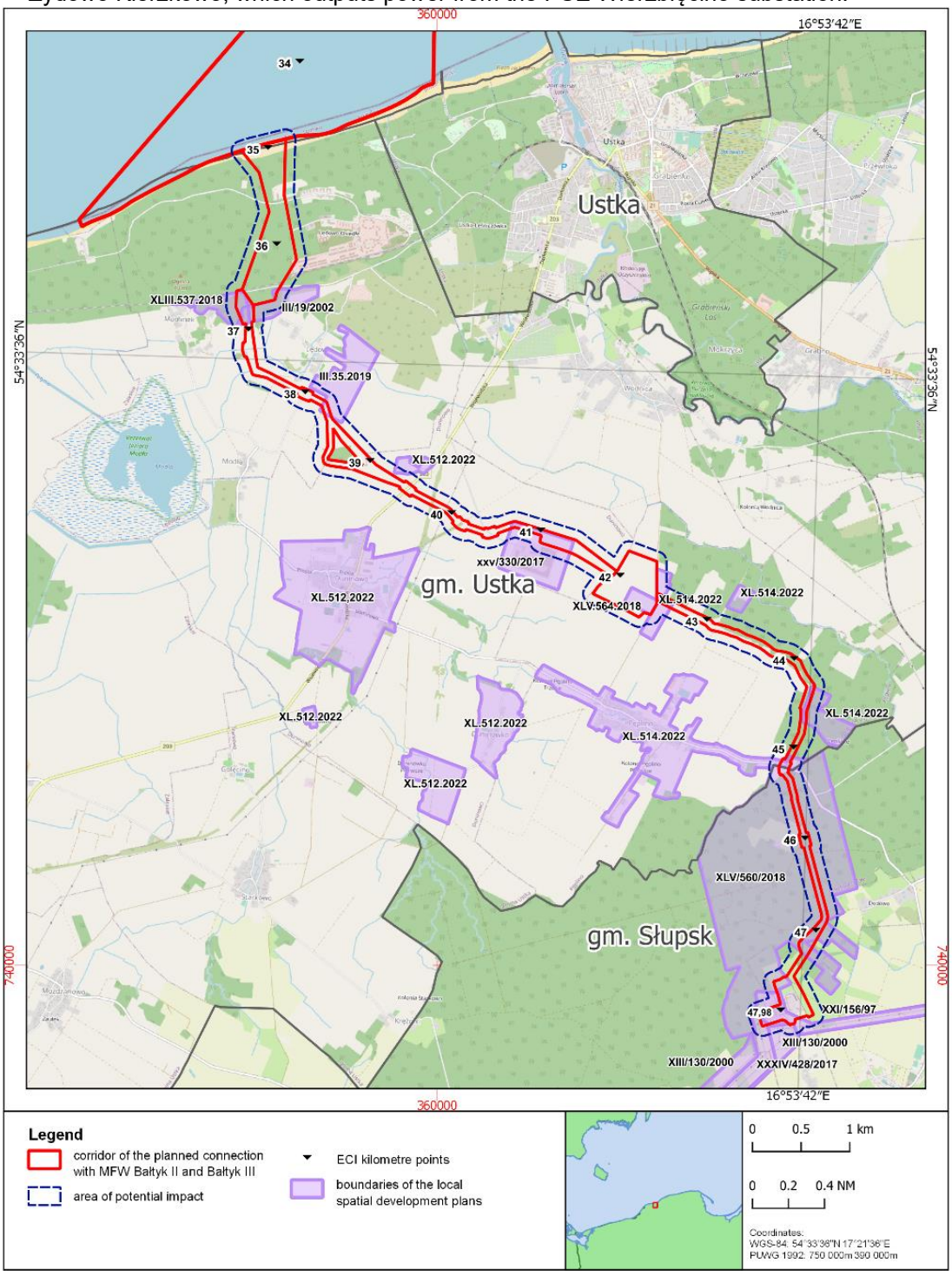


Figure 2.2. *Location of the land part of the planned Project on the background of the MPZP*

Source: In-house study based on https://sip.gison.pl/ustkagmina and https://slupsk.e-mapa.net/

3. CHARACTERISTICS OF THE PLANNED PROJECT - INVESTOR'S VARIANT

3.1. BACKGROUND, LOCATION AND MAIN TECHNICAL PARAMETERS

3.1.1. Background

The planned Project includes two independent electricity export systems from offshore wind farms MFW Bałtyk II and MFW Bałtyk III with the necessary infrastructure for their implementation and operation and, optionally, a cable connection between the offshore farms. The set of equipment for power derivation from the offshore wind farm OWF Baltyk II, together with the infrastructure necessary for its execution and operation, will be implemented by OWF Baltyk II Sp. z o.o. In turn, the set of equipment for power evacuation from the offshore wind farm OWF Bałtyk III together with the infrastructure necessary for its implementation and operation, as well as the optional cable connection between OWF Baltyk II and OWF Bałtyk III will be implemented by OWF Bałtyk III Sp. z o.o.The route and technical parameters of the planned Project are determined by the location and parameters of the wind farms, from which the produced energy is to be transmitted, as well as the place and conditions of connection to the KSE – in accordance with the agreements on the connection to the transmission grid of the planned farms, concluded between the Investors and Polskie Sieci Elektroenergetyczne S. A. (PSE S.A.).

The Project includes the following components (figure 1.1, figure 1.2):

- offshore:
  - 2 AC submarine export cables from the offshore substation (OSS) within the MFW Bałtyk II area to the landfall, each approximately 60 km long,
  - 2 AC submarine export cables from the offshore substation (OSS) within the MFW Bałtyk III area to the landfall, each approximately 67 km long;
  - optional cable connection between MFW Bałtyk II offshore wind farm and MFW Bałtyk III offshore wind farm with a length of approx. 30 km – a corridor being a reserve for possible future laying of export cables and optical fibre;
- HDD trenchless crossing of the coastal zone with all cable lines between 236,5 and 238,5 kilometre point of the Polish seashore (according to the kilometre points of the Maritime Office);
- onshore:
  - 4 underground AC export cable sets from the landfall to 2 planned onshore substations (ONS), approximately 8 km long- 2 lines for each MFW;
  - 2 substations ONS in the area of Pęplino with a total area of approximately 16 ha (approximately 8 ha for each);
  - 2 underground AC export cables from the ONS substation in the area of Pęplino to designated points of common coupling at the Słupsk Wierzbięcino KSE substation (Transmission substation) with a length of approx. 6 km (one line for each station).

Moreover, the Project includes the infrastructure necessary for the service of connections and offshore wind farms. i.e. fibre optic lines, which can be an integral part of the offshore cables (onshore, they are laid in the trench for the power cables) and an access road to the substations ONS in the area of Pęplin. Optionally, storage facilities may be constructed within the ONS in the next stage.

It is assumed that both connections will be constructed at the same time, in order to minimise the costs and impact of the construction phase. However, this does not exclude the possibility of implementing the connections separately.

The cables will be introduced from the sea to land using the trenchless HDD method. The interface between the offshore and onshore sections, i.e. the so-called landfall of the cable lines, will be located between 236.5 and 237 km of the seashore (according to the Maritime Office's kilometrage). At the current stage, additional technological channels can be included, which will enable future installation of the cable line for the MFW Bałtyk I project. In the case of execution of the aforementioned technological channels within the framework of the Project, the future execution of the connection infrastructure of the MFW Bałtyk I will require less interference in the onshore coastal zone. As the set of equipment for power evacuation from the MFW Bałtyk I is not the subject of the present documentation and will be executed at a later date, the Investor stipulates that the drillings for the

evacuation of the seabed cables from the MFW Bałtyk I may also be performed at a different time, within a separate construction process.

The length of the connection infrastructure corridor in the offshore part is approx. 60 km (ECI MFW Bałtyk II) and approx. 67 km (ECI MFW Bałtyk III) plus an additional offshore corridor connecting the two wind farms which is about 30 km. The maximum width of the corridor is 1,000 m, except for the southern part where the corridor narrows and then widens towards the coastline.

The onshore part of the power distribution system will run on the territory of the Ustka municipality and the Słupsk municipality (Słupsk county, Pomorskie voivodeship) along a section approximately 14 km, in a corridor of a width up to approximately 60 m, with local widening in the area of the connection infrastructure landfall and crossings under roads or other terrain obstacles. The actual land occupation during construction and operation within the corridor will be significantly smaller. On land, the power cables will be laid in a flat layout, in a maximum of four cable tracks. A fibre-optic cable will be laid in each cable track.

The connection infrastructure also includes onshore substations (one station within each connection). The planned stations will be located on parcels No. 148/3 and 148/4, Pęplino district, Ustka municipality. The section connecting each of the planned ONS with the Transmission Substation will be an underground power line. The end point of the planned investment is the Point of Interconnection (POI) at the Transmission Substation.

For the operation, monitoring and servicing of the offshore wind farms together with the power derivation units, a service and maintenance base will be organised in Łeba. The base will consist of an office, a control room and a warehouse with coastal facilities. The organisation of the base in Łeba is not included in the scope of this Report. It will constitute a separate activity of the Investor.

3.1.2. Location

The location of the planned Project is a combination of conditions resulting from the earlier stages of spatial planning at sea and already obtained decisions and conditions for connection on land, as well as the advancement of work on technical designs, and obtaining the land owners' consents.

The location of the planned Project has been characterised in 2 parts:

- offshore,
- onshore, including landfall.

Offshore

Offshore, cable lines will be laid from the OSS in the MFW Bałtyk II area and from the OSS in the MFW Bałtyk III area, then the corridors from both farms will converge below the Ławica Słupska in one corridor to the landfall to the west of Ustka.

The planned connection infrastructure from offshore wind farms MFW Bałtyk II and MFW Bałtyk III is located within the exclusive economic zone, the maritime adjacent zone, the territorial sea and internal sea waters administered by the Maritime Office in Gdynia (figure 1.1) in the infrastructure corridor designated in the Regulation of the Council of Ministers of 14 April 2021 on the adoption of the Spatial Development Plan for Inner Sea, Territorial Sea and Exclusive Economic Zone in the scale 1:200 000 (Journal of Laws 2021.935, as amended) – the POM Plan (figure 3.1). Moreover, the additional section between the farm areas of the MFW Bałtyk II and MFW Bałtyk III is located in the exclusive economic zone and the maritime adjacent zone in the infrastructure corridor, according to the POM Plan.

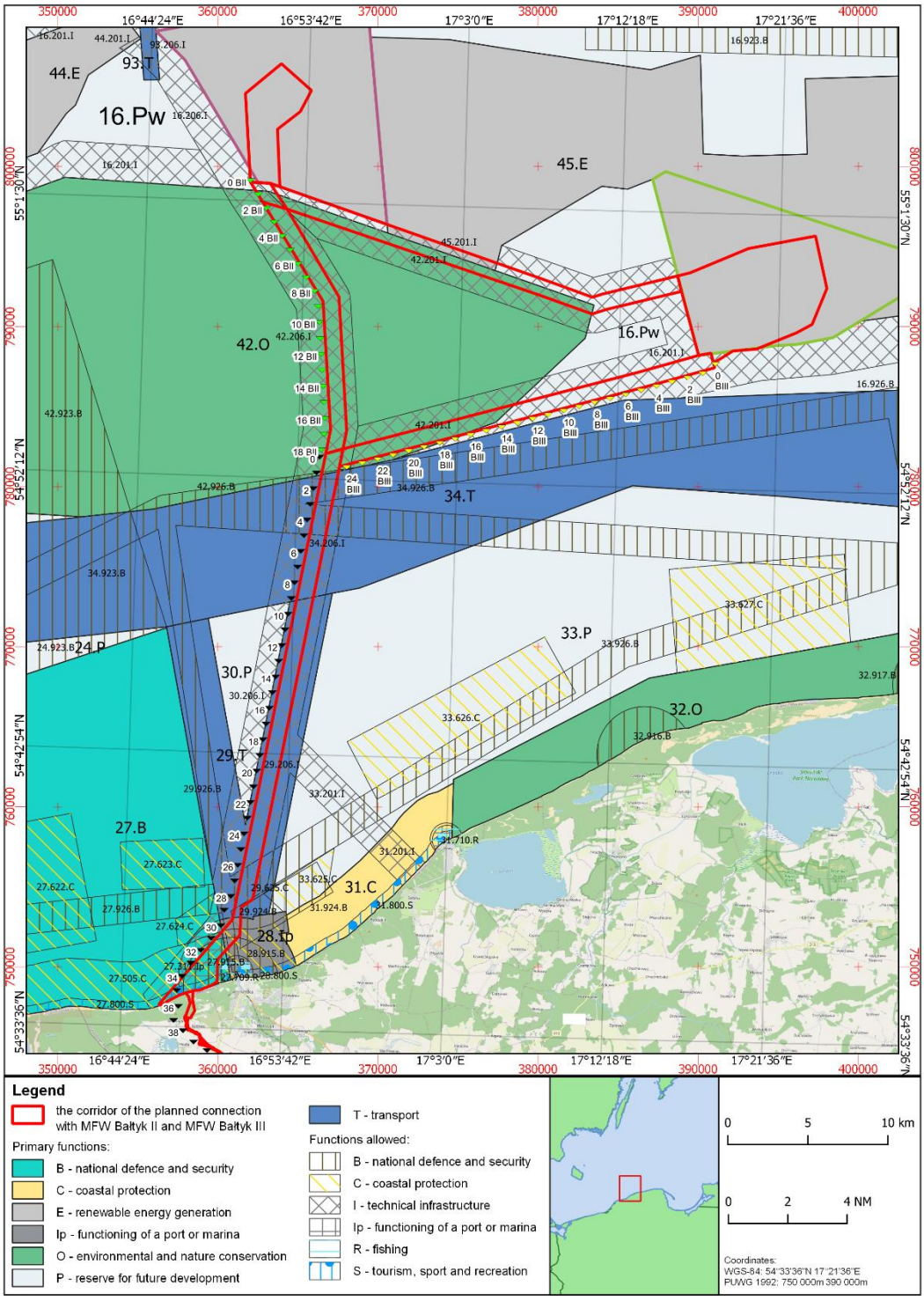


***Figure 3.1**. Location of the planned Project against the background of the POM Plan*

Source: In-house study on the basis of the POM Plan

The borders of a corridor within which the offshore Project will be located are defined by the geographical coordinates (in the WGS84 system), separately for the ECI of MFW Bałtyk II and ECI of MFW Bałtyk III including the planned 'connector' between the farms (table 3.1 and table 3.2), and the figure shows the locations of the breakpoints (figure 3.2 i figure 3.3). The place where the offshore and onshore parts of the Project meet is determined by the southern borders of plots constituting internal sea waters, i.e.: 394 Lędowo precinct (Ustka municipality) and 2858/4 Ustka precinct (Town of Ustka).

Table 3.1. *Geographical coordinates of the points delimiting the ECI of MFW Bałtyk II*

Point ID	Longitude (WGS84) [° ' "]	Latitude (WGS84) [° ' "]
1	16° 46' 37.71"	54° 34' 18.26"
2	16° 50' 42.69"	54° 37' 16.55"
3	16° 54' 47.93"	54° 51' 15.68"
4	16° 55' 19.40"	54° 53' 03.38"
5	16° 55' 33.72"	54° 53' 52.36"
6	16° 54' 53.92"	54° 58' 11.06"
7	16° 51' 10.79"	55° 01' 28.14"
8	16° 50' 26.36"	55° 02' 07.46"
9	16° 49' 58.84"	55° 05' 06.17"
10	16° 52' 02.38"	55° 06' 08.48"
11	16° 53' 51.03"	55° 05' 16.42"
12	16° 53' 13.82"	55° 04' 32.87"
13	16° 51' 55.53"	55° 03' 55.94"
14	16° 52' 10.10"	55° 01' 59.95"
15	16° 51' 49.78"	55° 02' 03.66"
16	16° 51' 35.53"	55° 02' 06.26"
17	16° 52' 37.93"	55° 01' 15.10"
18	16° 55' 49.46"	54° 58' 20.84"
19	16° 56' 30.13"	54° 53' 51.31"
20	16° 56' 19.31"	54° 53' 14.07"
21	16° 56' 08.91"	54° 52' 38.20"
22	16° 55' 50.33"	54° 51' 34.78"
23	16° 51' 50.95"	54° 37' 58.37"
24	16° 51' 12.00"	54° 37' 42.00"
25	16° 51' 10.03"	54° 36' 45.53"
26	16° 49' 54.99"	54° 35' 54.71"
27	16° 49' 56.12"	54° 35' 09.55"
Between points 1 and 27, the course follows the boundary defined by the shoreline referred to in Article 220 of the Act of 20 July 2017 - Water Law (Journal of Laws of 2021, item 2233 as amended)		

Source: Investor data, May 2022

Table 3.2. *Geographical coordinates of the points delimiting the boundaries of the ECI of MFW Bałtyk III, together with the connector between MFW Bałtyk II and MFW Bałtyk III*

Point ID	Longitute (WGS84) [° ' "]	Latitude (WGS84) [° ' "]
1'	16° 46' 37.71"	54° 34' 18.26"
2'	16° 50' 42.69"	54° 37' 16.55"
3'	16° 54' 47.93"	54° 51' 15.68"
4'	16° 55' 19.40"	54° 53' 03.38"
5'	16° 56' 19.31"	54° 53' 14.07"
6'	17° 07' 32.02"	54° 55' 06.32"
7'	17° 13' 28.70"	54° 56' 05.43"
8'	17° 16' 57.43"	54° 56' 42.42"
9'	17° 15' 51.80"	54° 58' 50.80"
10'	17° 11' 28.64"	54° 58' 10.42"
11'	17° 10' 40.12"	54° 58' 00.56"
12'	17° 07' 31.85"	54° 58' 36.18"
13'	16° 52' 37.93"	55° 01' 15.10"
14'	16° 51' 10.79"	55° 01' 28.14"
15'	16° 50' 26.36"	55° 02' 07.46"
16'	16° 49' 58.84"	55° 05' 06.17"
17'	16° 52' 02.38"	55° 06' 08.48"
18'	16° 53' 51.03"	55° 05' 16.42"
19'	16° 53' 13.82"	55° 04' 32.87"
20'	16° 51' 55.53"	55° 03' 55.94"
21'	16° 52' 10.10"	55° 01' 59.95"
22'	16° 51' 49.78"	55° 02' 03.66"
23'	16° 51' 35.53"	55° 02' 06.26"
24'	17° 07' 49.15"	54° 59' 07.13"
25'	17° 10' 39.67"	54° 58' 34.43"
26'	17° 11' 14.79"	54° 58' 41.50"
27'	17° 15' 36.56"	54° 59' 21.89"
28'	17° 16' 20.04"	54° 59' 28.69"
29'	17° 19' 43.45"	55° 00' 20.72"
30'	17° 23' 38.22"	55° 00' 49.09"
31'	17° 24' 22.30"	54° 59' 03.73"
32'	17° 23' 33.54"	54° 57' 50.51"
33'	17° 22' 39.89"	54° 57' 32.87"
34'	17° 20' 19.87"	54° 56' 57.93"
35'	17° 18' 57.51"	54° 56' 52.93"
36'	17° 17' 50.31"	54° 56' 27.65"
37'	17° 17' 40.57"	54° 56' 47.38"
38'	17° 17' 55.01"	54° 56' 18.14"
39'	17° 13' 43.61"	54° 55' 34.40"
40'	17° 03' 14.58"	54° 53' 49.40"
41'	16° 56' 08.91"	54° 52' 38.20"
42'	16° 55' 50.33"	54° 51' 34.78"
43'	16° 51' 50.95"	54° 37' 58.37"
44'	16° 51' 12.00"	54° 37' 42.00"
45'	16° 51' 10.03"	54° 36' 45.53"
46'	16° 49' 54.99"	54° 35' 54.71"
47'	16° 49' 56.12"	54° 35' 09.55"
Between points 1' and 47', the course follows the boundary defined by the shoreline referred to in Article 220 of the Act of 20 July 2017 - Water Law (Journal of Laws of 2021, item 2233 as amended)		

Source: Investor data, May 2022

In addition, the planned Project is located in sub-area 36 Open waters of the Bornholm Basin and 38 Polish coastal waters of the Bornholm Basin (figure 2.1), in accordance with the division of the Baltic Sea into water bodies for which the environmental status is determined in accordance with HELCOM and the Marine Strategy Framework Directive (MSFD).

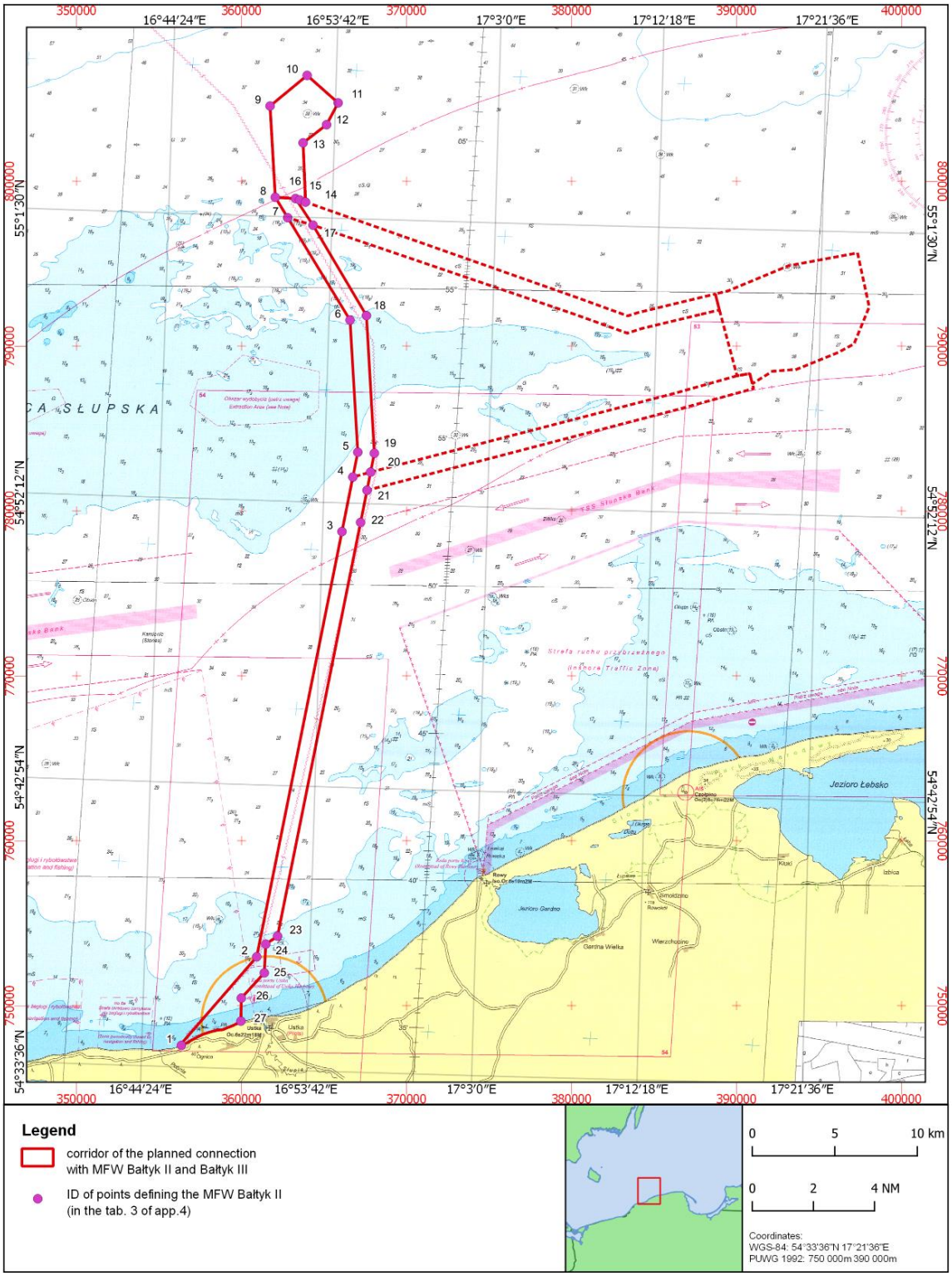


Figure 3.2. *Nautical map with the course of the Project in the offshore part, with marked coordinates for the ECI of MFW Bałtyk II*

Source: In-house study

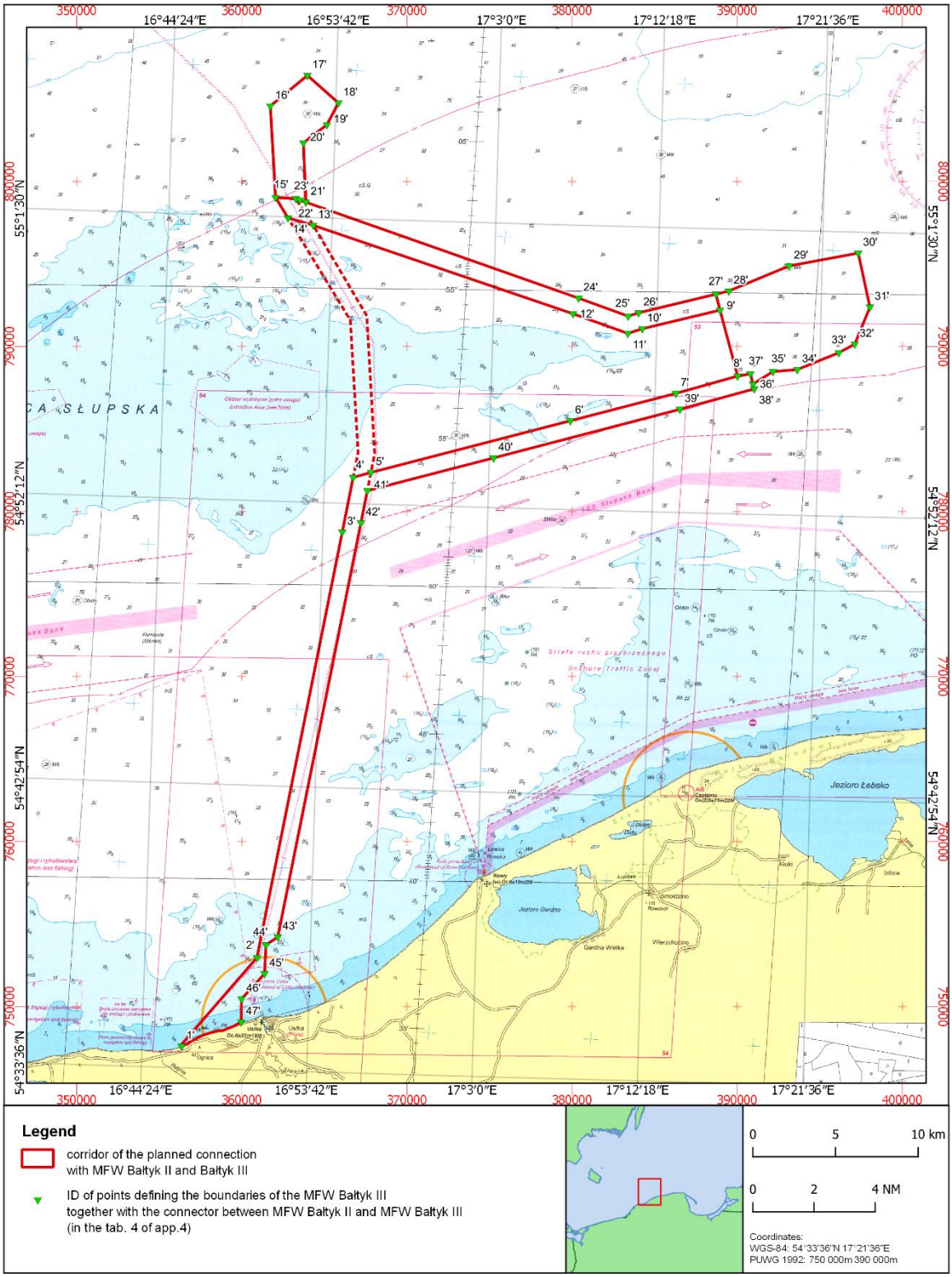


Figure 3.3. *Nautical map with the course of the Project in the offshore part, with marked coordinates for the ECI of MFW Bałtyk III*

Source: In-house study

Onshore

The connection infrastructure from MFW Bałtyk II and MFW Bałtyk III will enter the land between KP 236.5 and KP 237 of the seashore (according to the kilometrage of the Maritime Office) – figure 1.2, crossing the coastal strip established by the order of the Director of the Maritime Office in Gdynia

according to the Act of 21 March 1991 on maritime areas of the Republic of Poland and maritime administration (Journal of Laws 2022.457, as amended) including:

- a technical zone - a zone of mutual direct influence of the sea and the land, destined to maintain the shore in a condition compliant with the requirements of environmental safety and protection;
- a protective zone - covering the area where human activity has a direct impact on the condition of the technical zone.

In the zone immediately adjacent to the shore (in the western variant), the cable route crosses closed areas established by Decision No. 80/MON of the Minister of National Defence of 8 June 2022 on the determination of closed areas in the national defense ministry. These are the following plots: 357/8, 357/24, 359, 89/4, 89/5, 90/6, 113/2, 113/3, 114/3, 115/5, 117/5 Lędowo precinct (Ustka municipality).

The cables will be brought ashore from the sea using a trenchless method, horizontal directional drilling (HDD).

The onshore part of the Project will be located within a corridor running through plots located in the Ustka municipality (districts: Lędowo, Duninowo PGR and Pęplino) and in Słupsk municipality (districts: Bruskowo Leśnictwo, Wielichowo, Bruskowo Wielkie and Bruskowo Małe).

The placement of the onshore corridor has been determined on the territory of the Ustka municipality and the Słupsk municipality (Słupsk county, Pomorskie voivodeship) along a section of up to 14 km. The corridor runs partly through forests administered by the Regional Directorate of State Forests in Szczecinek within the boundaries of the Forest District of Ustka and the Forest Divisions of Modlinek and Pęplino, through a military training ground (Western variant) and through agricultural areas (figure 1.2).

The connection infrastructure of the offshore wind farms MFW Bałtyk II and Bałtyk III also includes 2 onshore substations in the area of Peplino, on parcels No. 148/3 and 148/4, Pęplino district, Ustka municipality.

The section connecting each of the planned ONS with the Transmission Substation will be an underground power line, about 6 km long. The end point of the planned Project is the Point of Interconnection at the PSE S.A. Słupsk Wierzbięcino substation.

3.1.3. Main Parameters of the Project

Table 3.3. *Basic parameters characterising the planned Project*

Parameter	Value/description	
	ECI MFW Bałtyk II	**ECI MFW Bałtyk III**
Length of the offshore connection infrastructure	approximate 60 km	approx. 67 km in the case of implementation of the IP of MFW Bałtyk III or approx. 97 km in the case of implementation of the IP of MFW Bałtyk III and the connection between MFW BII and MFW BIII (additional 30 km of the connector)
Length of the onshore connection infrastructure	approximate 14 km	
Type of offshore power cables	High Voltage Alternating Current (HVAC) multicore submarine cables	
Type of onshore power cables	Export ground cables consisting of 3 separate single-core cables in AC technology (HVAC)	
Power cable voltage between the offshore and onshore substations	220 kV	
Power cable voltage between the onshore substation and Słupsk Wierzbięcino substation	400 kV	
Maximum number of offshore cables	2 single cable lines	2 single cable lines

Maximum number of onshore cables	2 cable lines, each consisting of 3 separate single-core cables	2 cable lines, each consisting of 3 separate single-core cables
The landfall solution	Horizontal directional drilling HDD (optionally, HDD with a short section of deeper cable foundation - to the exit behind the last reef).	

Source: data from Investor

3.1.4. Water and land occupancy during the Project's construction and operation phase

The area covered by the application for the environmental decision is a corridor within which the planned Project will be implemented (figure 1.1 and figure 1.2). The area of the corridor is approximately 174.63 km^2 offshore and 1.83 km^2 onshore. The offshore part of the corridor is approximately 1,000 m wide (except for the southern part, where the corridor widens towards the shoreline). The onshore part of the corridor is approximately 60 m wide with local widening (up to approx. 50 - 100 m) at the locations of the planned trenchless crossings. In addition, the application area includes the onshore construction site of the trenchless crossing through the coastal zone and two ONS substations.

It is to be noted that the corridor covered by the application for an environmental decision is not the same as the area in which the Project will be implemented, which will be significantly smaller. The reason for including an area larger than the area necessary for the construction and operation of the Project is the need to ensure, at the stage of designing, the possibility to optimise the location of the Project and the technical solutions, e.g. due to the necessity to bypass the identified terrain obstacles or to take into account the requirements resulting from the obtained decisions and permits. The entire investment process, in the context of the current stage of obtaining the environmental decision and the degree of advancement of the routing of the line part of the Project, is showed schematically in figure 1.4 (Subchapter 1.4.).

The area of direct seabed interference associated with the preparation and cleaning of the seabed and the laying of the cables will only occupy a strip of approximately 5 m for each cable and will amount to a total of approximately 1.55 km² for the 4 cable lines, which is 0.89% of the area covered by the application for the environmental decision. The estimated average trench width per cable will only be approximately 1.5 m. In addition, small sections of the bottom will be occupied periodically for vessel anchoring.

In the case of a trenchless passage using HDD technology, a short section of subsea trench 4 - 5 m deep is optionally considered (maximum length 800 m - up to the exit beyond the last reef). In this short section, the seabed intervention can be larger (in a strip of approx. 20 m per cable) and cover an area of up to approx. 0.064 km^2. This would result in a total seabed intervention area of up to approximately 1.61 km², or 0.92% of the area covered by the application for the environmental decision.

In the onshore part, the land occupation during the construction phase will be related to the implementation of the following elements of the planned Project:

- cable line landfall - construction site with a maximum land occupation of 0.85 ha;
- a construction strip of the underground cable lines with a width of approx. 30 - 32 m (widened to approx. 50 to 100 m in places of possible trenchless crossings);
- two onshore substations (ONSs), each with an area of approx. 8 ha;
- an access road to the ONS substations of approximately 1.5 km in length.

During the operation phase, the land occupation will be smaller than during the construction phase and will only cover the immediate vicinity of the cable route, where certain restrictions are imposed to protect the cables from damage, and the ONSs area with an access road.

According to the POM Plan, a safety zone is required to be established by the territorially competent director of the maritime office around areas intended for the installation of line items of technical infrastructure. In this zone, anchoring will be prohibited, with the exception of emergency anchoring and anchoring related to installation and maintenance works.

In the case of land along the cable route, this will be a total zone with approximately from approx. 10 m to approx. 31 m in width for both connections.

More detailed data on land occupancy during the construction and operation phases is presented in the table below (table 3.4).

Table 3.4. *Basic information about the Project and estimated area occupation during construction phase and operational phase*

Components of the Project and their land occupancy	**ECI MFW Bałtyk II**	**ECI MFW Bałtyk III**
Construction phase		
Offshore cable line length	approx. 60 km x 2 lines - total of approx. 120 km	approx. 67-97 km x 2 lines (including 30 km with the potential cable connection between MFW Bałtyk II and MFW Bałtyk III) - total of approx. 194 km
Average seabed occupation associated with bottom preparation and laying of one cable (there will be 4 cables in total)	approx. 5 m wide strip for one cable	
Seabed surface directly related to the preparation of the seabed	approx. 0.3 km^2 x 2 lines - total approx. 0.46 km2	approx. 0.5 km^2 x 2 lines - total approx. 1 km^2
Offshore average trench width (for one cable)	1.5 m	
Offshore average depth of the trench	1.5 m	
Depth of the trench at the TSS Ławica Słupska crossing	2.5 m	
Width of trench at passage through rev* zone	20 m	
Depth of trench at passage through rev* zone	4-5 m	
Construction and installation site for trenchless crossing for the cable landfall Horizontal directional drilling HDD	Approx. 8 500 m^2	
Onshore cable line length	14 km	
Width of construction and installation zone for cables on land	approx. 30-32 m	
Width of construction belt where trenchless crossings are organised (e.g. crossing of the provincial road, Struga Lędowska, etc.).	approx. 50-100 m	
Onshore cable trench depth	1.3-5 m (unless local conditions indicate the need for deeper excavations, e.g. when solving collisions with terrain obstacles)	
ONS substation – construction site	approx. 8 ha	
Construction site for a new access road to ONS substation	approx. 10 000 m^2	
Operation phase		
Offshore - restrictions on the use (prohibition of anchoring except for emergency anchoring and for installation and maintenance work)	in accordance with the POM Plan The corridor width will be established by the territorially competent director of the maritime office	
Onshore - restrictions on the use (no buildings or tree plantings allowed)	The corridor of the width from approx. 10 m to approx. 31 m (depending on the section of the cable corridor)	
Area covered by ONS substations	approx. 8 ha	approx. 8 ha
New road to the ONS	approx. 10 000 m^2	

**optional solution to be used when HDD trenchless passage does not exit beyond the last reef - deeper subsea excavation for a maximum length of 800 m*

Source: Investor's data

3.2. Construction Organisation and Conditions of Land Use During the Construction phase

3.2.1. Offshore cable lines

At the present stage of project implementation, it is assumed that the cable will be buried at an average depth of approx. 1.5 m (table 3.5). For the landfall section of the cable, the requirements of the Maritime Area Development Plan, concerning the crossing of the reef zone (shallow coastal zone), in which it is required to lay new linear elements of technical infrastructure a minimum of 3 m below the average depression of the bottom of the intertidal troughs (table 3.5.). The bathymetry of the seabed is shown in figure 3.4.

Table 3.5. *Anticipated burial depth of cables depending on type of seabed and method of use*

Type of bottom and its use	Anticipated burial depth of cables
Shallow coastal zone - up to the exit beyond the last reef	at least 3 m according to POM Plan
Navigation route TSS Ławica Słupska	approx. 2 – 2.5 m
Other sections of the route	approx. 1 – 1.5

Source: In-house on the basis of Investor's data

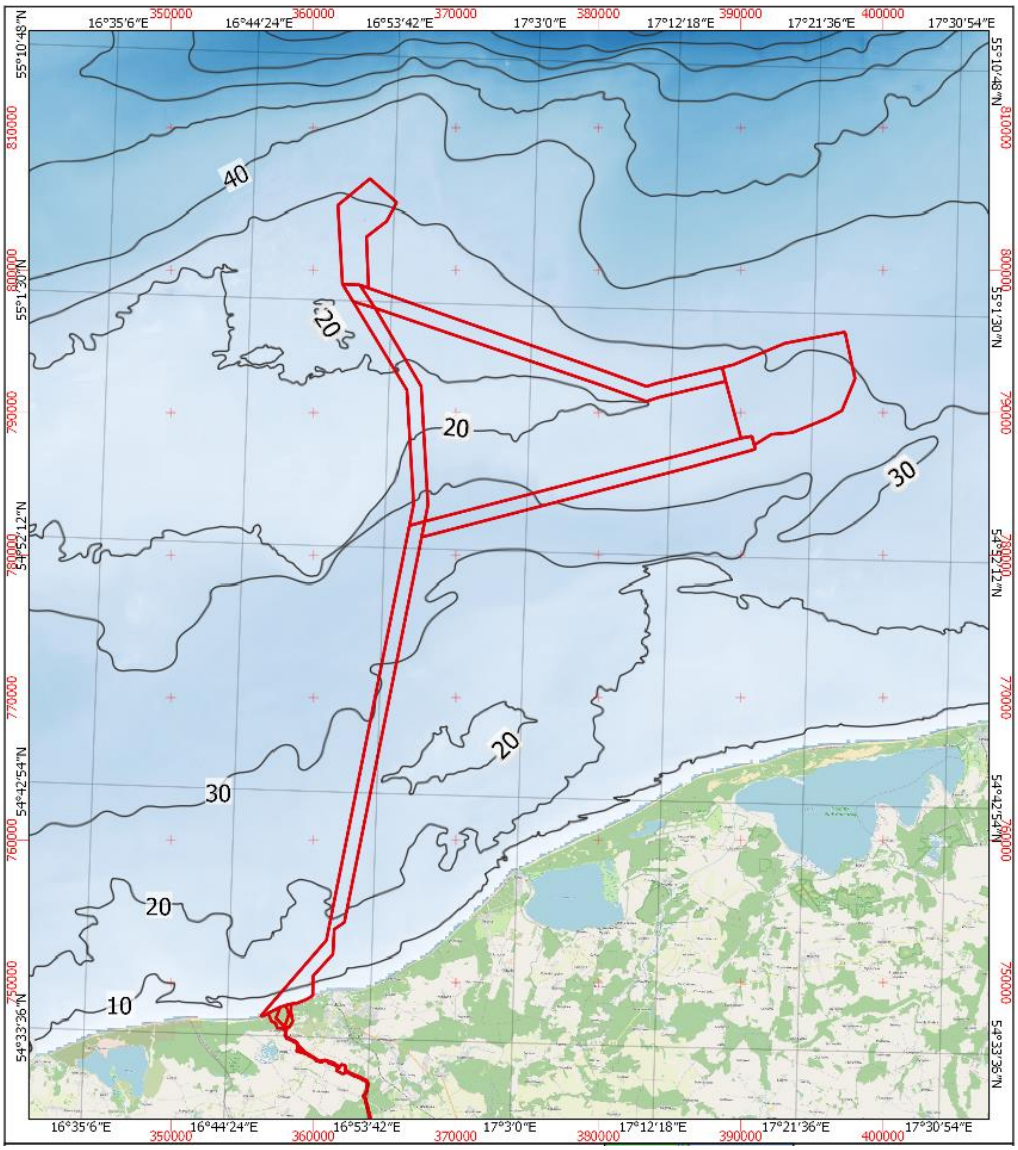


Figure 3.4. *Bathymetry in the area of the planned Project*

Source: sipam.gov.pl

The cables will be laid at a safe distance from each other, which will allow adequate manoeuvring space for vessels performing maintenance or repair work. The distance between cables for the same connection is approximately 25 m, while the distance between cables of individual connections varies, depending on the width of the route section.

Electricity in the offshore part will be transmitted through 4 multicore power cables (2 cables from each of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III) using High Voltage Alternating Current (HVAC) with an operating voltage of 220 kV. Furthermore, offshore substations of the MFW Bałtyk II and Bałtyk III may be connected by cable lines.

The cables are electrical cables of three insulated and shielded copper conductors or aluminium, in steel wire armament and with additional insulation and outer shielding. Inside the cable is a fibre optic cable for communication with the wind farm infrastructure. An example of the cable construction is shown in the figure below (figure 3.5.).

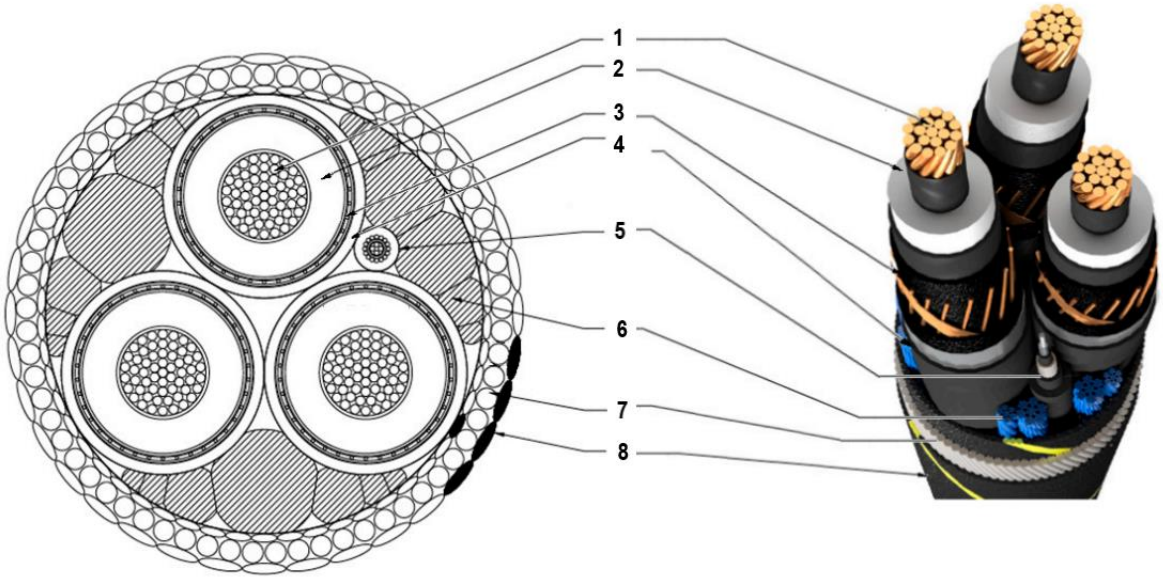


Figure 3.5. *Construction of a three-core cable HVAC – Example (1- conductor, 2 – insulation (XLPE), 3- concentric neutral, 4 – radial barrier outer sheath, 5 – optical fibre, 6 – fillers, 7 – armour, 8 – serving or oversheath)*

Source: Resner and Paszkiewicz 2021

Types of technology for offshore export cable

The burial of a power cable in the seabed can be done using two basic methods[13]:

- SLB (Simultaneous Lay and Burial) – based on simultaneous laying and burial of the cable in the bottom sediment,
- PLB (Post Lay Burial) – based on burying the cable after it has been laid in the trench.

In the case of the SLB method, a single vessel, the cable-laying vessel (CLV, ang. cable laying vessel), is used to lay the cable. The speed of cable laying is controlled by the speed of burial, which depends on the characteristics of the seabed. A long period of favourable weather conditions is required during the operation to lay and bury the entire cable line.

The PLB method, preferred by the Investor due to, among other things, smaller dependence on weather conditions, requires the use of two different vessels, i.e. a vessel for laying (for example a cable vessel or towed cable barge) and a vessel for burial of the cables (usually a service vessel equipped with cable burial equipment).

Two methods of cable burial are considered by the Investor at this stage:

- water jetting - preferred,

[13] *DNV 2014*

- mechanical cutting – optional, in case of more difficult ground conditions.

The scope of applicability of the above-mentioned technology is determined by the geological conditions of the seabed. It is also possible to use the ploughing method to lay the cable, but this is not being considered by the Investor at this stage due to the risk of damage to the cable during the works.

If boulder fields that cannot be avoided are encountered, the cable will be laid on the bottom and protected from damage (not buried in the seabed).

Water jetting involves pumping pressurised seawater under the seabed surface to a required depth (figure 3.6.). Substrate dilution occurs through a combination of high flow and low pressure water streams (e.g. for fluidising and displacing granular sediment) and low-flow/high-pressure water jets (e.g. for cutting and transporting clay lumps). The cable sinks in the channel under its own weight into the fluvial sediment and is self-buried[14].

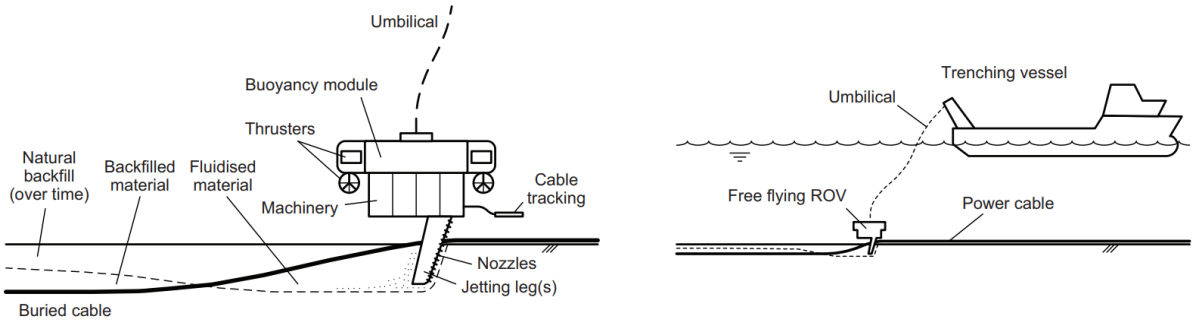


Figure 3.6. *Burying a cable using the water jetting method*

Source: DNV 2014

Mechanical cutting – cutting a narrow trench into the seabed with self-propelled armed equipment with a cutting wheel or an excavation chain as well as scoops to transport the material (figure 3.7.)[15]. In the ground a narrow trench is created into which the cable is lowered. The mechanical cutting method may require additional backfilling of the trench, depending on the depth of the required cover.

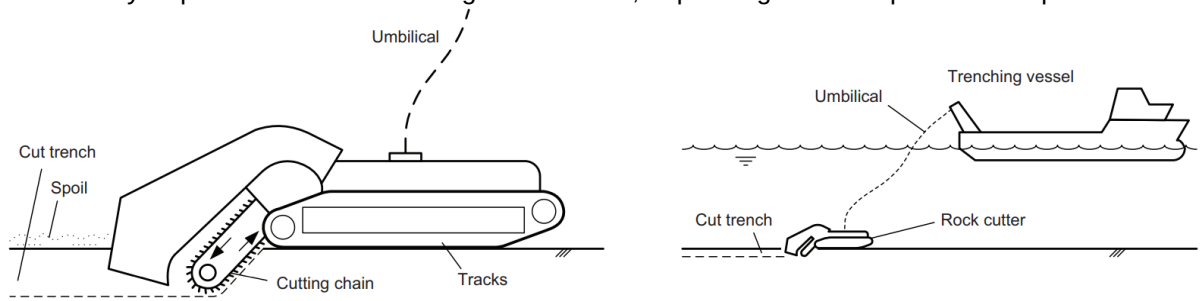


Figure 3.7. *Burying a cable using the mechanical cutting method*

Source: DNV 2014

The Investor considers the use of tracked vehicles travelling on the seabed, fitted with water jetting and/or cutting tools which may be operated and controlled from a support vessel by means of an umbilical cable, or may be self-propelled vehicles controlled by an operator from the vessel (figure 3.8).[16]

[14] *DNV 2014*
[15] *DNV 2014*
[16] *Technical Report 2008*

Figure 3.8. *Example of equipment for cable burial*

Source: https://www.windpowerengineering.com/new-ideas-for-offshore-flexible-trenching/

Cable laying on the bottom

In locations where the ability to bury the cable using the aforementioned technology will be limited,

Sites requiring this type of protection include:

- fields of boulders, pebbles or gravel, or very hard seabed with insufficient sediment thickness where excavation may be impracticable or uneconomical;
- areas of high sediment mobility, especially in the shallow coastal zone (the landfall area) where high water dynamics may lead to exposure of cables;
- location of connection to the OSS to protect the cable from potential bottom dilution;

the use of alternative cable protection methods are considered, that is:

- stone dumping,
- mattress covering (figure 3.9.).

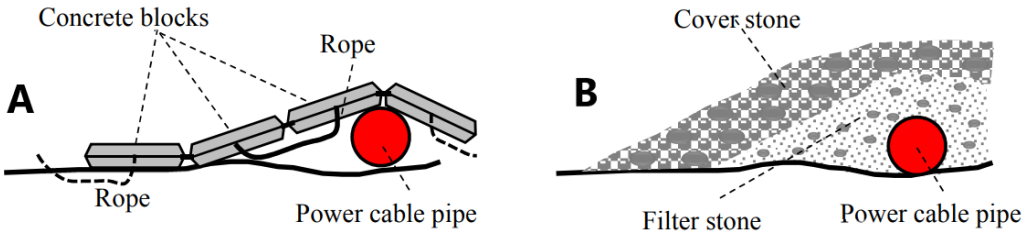


Figure 3.9. *Alternative methods of cable protection (A – mattress covering, B – stone dumping)*

Source: Benato et al. 2018

The final cable protection technology will be made based on:

- geological conditions of the seabed,
- depth of cable burial,
- availability of suitable equipment for laying/burial cable lines,,
- economic conditions,
- logistic conditions.

Organisation of the construction and its maximum duration

The assumed total duration of the works related to the laying of four submarine cables (2 lines for each offshore wind farm) is approx. 130 - 140 days. There is approximately 35 days per cable (installation campaign) whereas there are two phases in the laying of submarine cables:

- seabed preparation - approx. 3-5 days,
- cable laying and burying - approx. 25-30 days.

In the case of two cable lines connecting MFW Bałtyk II to MFW Bałtyk III, it is assumed that laying the cables will take approximately 30 days.

Vessels to be used for submarine cable implementation during one installation campaign:

- Cable Installation Vessel,
- Trenching vessel,
- Local guard vessels – (4 vessels).

Optionally, if four deeper trenches need to be excavated in the shallow coastal zone (up to the exit beyond the last reef), this may additionally extend the duration of the works to 8 days (per cable). A small dredger is planned to be used for the deeper trenches.

Preparatory works

The bottom preparation includes activities associated with cleaning and preparing cable routes for efficient and collision-free installation. Preparation activities include:

- Pre-lay survey Unexploded Ordnance (UXO) detection and Chemical Warfare Agents (CWA) tests;
- possible change of the planned cable route or removal of identified unexploded ordnance and chemical weapons;
- removal of inactive cables - if they interfere with the planned Project;
- removal of boulders or change the planned cable route;
- removal the cable route various types of obstacles such as fishing nets, loose wires – this is usually done shortly before laying the cable and is done with the use of a set of hooks dragged along the bottom (figure 3.10.).

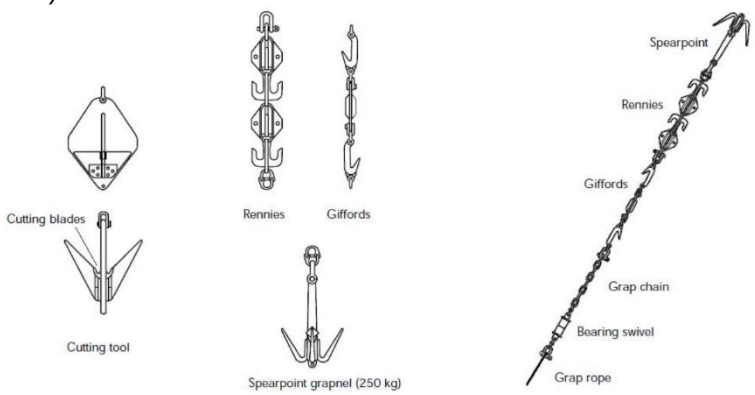


Figure 3.10. *Typical 'grapnel gear' (PLGR – pre-lay grapnel run) used to penetrate seabed*
Source: HKA Submarine Cable - Chung Hom Kok 2018

Preliminary identification of natural and anthropogenic obstacles in the analysed sea area was performed in 2015 by the Maritime Institute in Gdansk. The results of the preliminary reconnaissance are presented in Volume III of this EIA Report, in Attachment 1.11. Acoustic and magnetic methods were used, as well as review of archival materials and optical review of selected objects. Preliminary reconnaissance made it possible to identify pebbles and gravel pits along the ECI route and the location of the SWEPOL LINK cable. No potentially hazardous objects such as torpedoes, mines or wreck sites were found. Anthropogenic objects, occurring along the route of ECI, selected by archaeologists for visual inspection by ROV were only fragments of destroyed fishing equipment.[17]

[17] *Inwentaryzacja przeszkód naturalnych i antropogenicznych na obszarze Morskiej Infrastruktury Przesyłowej 2015*

Cable laying

The submarine power cables will be transported from the producer to the port, which is the main logistical base. The cables will be delivered on a specially prepared vessel CLV.

The installation process, for each individual cable, will be carried out in stages including:

- floating the cable with floats in the area of the trenchless landfall section,
- pulling the cable through the trenchless section onto land,
- laying of the cable on the seabed along the planned route,
- pulling the cable into the OSS
- burying the cable in the seabed.

An example of the technological process of laying a power cable in the offshore section is described below.

After researching the area to lay the cable, the exact route of the cable between the OSS substation and the landfall (trenchless section area) will be determined during the construction design phase. During the construction phase, the cable-laying vessel will position itself along the cable corridor at a depth of approximately 9-10 m. The float removal vessel will be anchored in the trenchless section area. The cable launching will begin by placing the cable on the floats for a length corresponding to the length of the section (figure 3.11). The cable will then begin to be pulled through the trenchless section onto land. The end of the cable will be connected to the pulling cable and, once the floats have been removed, lowered to the bottom of the final drill shaft and pulled ashore (figure 3.11.). Once the cable has reached the transition joint, the work vessel will remove the remaining floats and the cable will be lowered to the seabed.

Figure 3.11. *Offshore cable installation*

Source: Technical Description, February 2022

In the further stage CLV will start laying the Export Cable along the route between the trenchless section (landfall) and the Offshore Substation (OSS) location, during which all important Export Cable parameters will be monitored. Upon approaching the OSS location three options related to pull-in of the Export Cables through the J-tubes exists dependant of the OSS situation on the field:

- wet storage of the Export cables (No foundation / OSS in the field) (base case),
- temporary pull-in and securing of the Export Cables to the OSS foundation structure (OSS foundation structure is installed without the topside),
- complete pull-in, hang-off and connection to the OSS Gas Insulated Switch Gear (GIS) (complete OSS is installed).

Pull-in of the wet stored Export Cables will most probably be performed by a dedicated pull-in vessel and not the CLV since it is expected that there will be no foundation or OSS while laying the Export Cable. However, if the complete OSS is installed by the time the CLV arrives from the start of the installation of the export submarine cables, then the export cables can be pulled in and connected directly from the CLV.

Burial of the cable and its protection (if required) will begin in the next stage. A trenching support vessel (TSV) will be mobilised for this purpose.

3.2.2. Shore crossing technology (for all methods described in Technical Description)

The cables will be brought out of the sea to land using HDD trenchless method and technical solutions for the crossing will be selected based on the results of geotechnical investigations, other local conditions, including the length of the crossing and access to the contractor's facilities.

HDD technology will be used with a drilling length of no more than 1.5 km, with the onshore section being no shorter than 120 m.

The depth of the cable foundation in the offshore section has been assumed in accordance with the POM Plan - a minimum of 3 m below the mean depth of the bottom of the inter-bed gutters. It is presumed that the trenchless crossing will reach behind the last reef. However, if, for technical, technological or other reasons related to e.g. the location of the construction site, the trenchless passage exits before the last reef, a deeper submarine trench - up to a depth of 5 m - will be excavated in this section of the sub-bank. It is assumed that this trench will not be longer than approx. 800 m.

The method involves carrying out horizontal directional drilling with a special drilling head guided by rods towards the designed exit point (figure 3.12.). The planned Project assumes ~~that~~ one drilling will be executed for each of the four cables. One spare drilling will also be executed, in addition to two extra boreholes that can be optionally drilled for the connection from the MFW Bałtyk I offshore wind farm. The execution of horizontal directional drilling (HDD) includes the following stages: pilot drilling, borehole widening, borehole installation, installation of drill pipes, pulling cables into the installed pipe.

Pilot drilling involves drilling a borehole along a predetermined trajectory. The preferred solution is to drill from the land side. Before drilling, the drilling route is analysed and verified against the actual geological conditions and logistical and technical possibilities. A transmitter is placed in the drill head performing the pilot drilling, which allows the exact location of the drill head to be tracked and the direction of drilling to be controlled. During pilot drilling, drilling mud, a mixture of water and bentonite, is injected into the borehole to, among other things, stabilise the borehole walls, reduce the friction coefficient, cool the drilling tool and transport the excavated material out of the borehole. The pilot drilling is stopped just before reaching the final drill point under the seabed, then the drill pipe is withdrawn to the launching chamber.

The drill head is changed to a reamer to expand the drill hole to the planned 700-850 mm diameter, at which point the drill hole is reamed along the entire length of the planned trajectory, including the breakthrough to the seabed surface.

Once drilling is completed, casing pipes will be pulled (or pushed) into the hole to maintain the geometry (stabilisation of the hole). The pipes are usually made of high-density polyethylene (HDPE) or steel. To reduce the thermal impact of the cables, the casing pipes can be filled with bentonite.

To allow drilling from the land side, it may be necessary to excavate a launch chamber for the drill head, lowered by several metres from ground level. In order to reduce the risk of water disturbance and to protect the boreholes from flooding, it is planned to use, for example, sheet piling. The depth of the launch chamber will depend on the geological conditions and the drilling profile.

The construction site for the HDD landfall will be approximately 8,500 m^2. The Investor is also considering drilling from an offshore barge towards land.

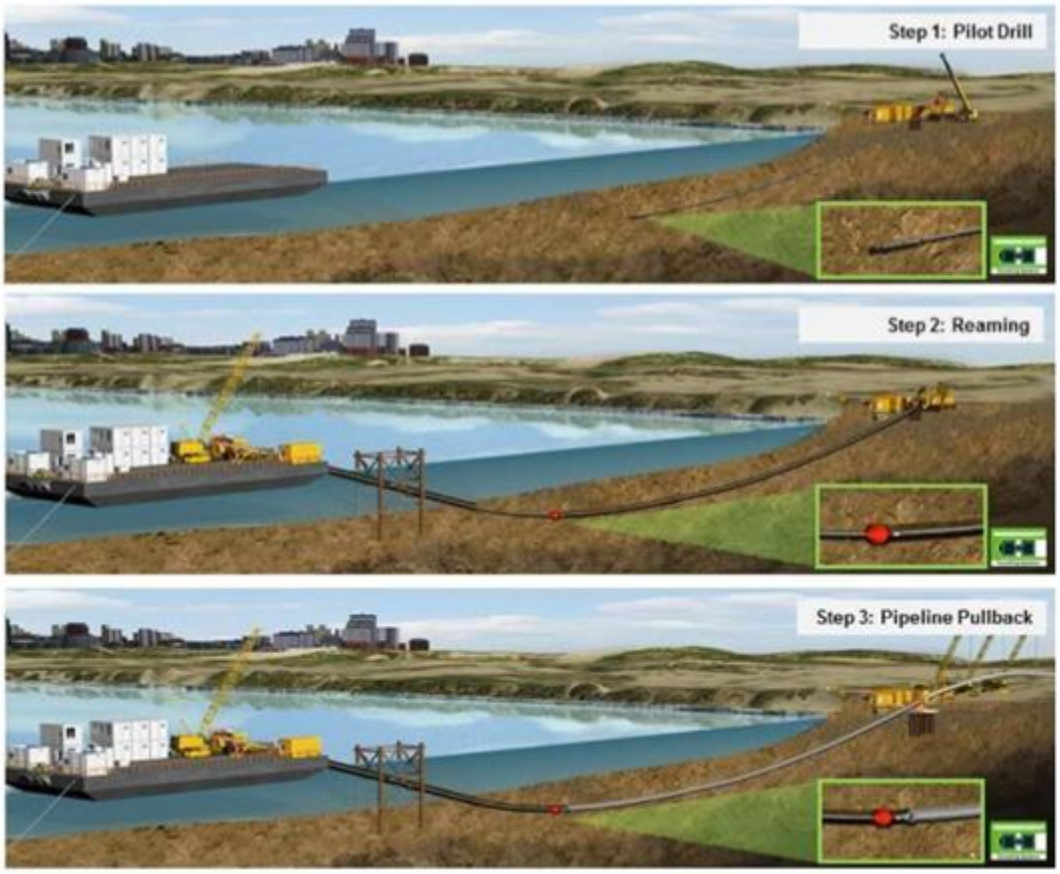


Figure 3.12. *Principle of horizontal directional drilling*

Source: Technical Description, February 2022

The following table (

table 3.6.) summarises the basic assumed parameters characterising the coastal zone crossing technologies presented above.

Table 3.6. *Landfall Technology Parameters**

Landfall technology	Maximum length of drilling [km]	Maximum construction site area [m²]	Depth of the pit [m]	Maximum duration of construction
Horizontal directional drilling (HDD)	approx. 1,5	approx.8 500	approx. 3	approx. 1 year (plus 2 months for site preparation)

** including a potential possibility of implementation of the crossing for ECI of MFW Bałtyk I*

Source: In-house study

HDD plus deeper submarine trench

Due to the considerable length Investor is considering the use of the deeper submarine trench on the section of the foreshore between the HDD exit and the last reef in the case where the trenchless crossing exits before the last reef (as set out in the POM Plan - a minimum of 3m below the inter-revs depression).

At this stage, it has been assumed that a deeper trench (up to approximately 5 m) can be excavated for a maximum distance of approximately 800 m - up to the exit beyond the last reef. The trench will be excavated in two stages. In the first stage, the bottom will be dredged to a depth of approximately 3 m using a dredger (

figure 3.13).

In the second stage, a 1.5 m wide strip of bottom will be excavated to a depth of approx. 2 m in the previously prepared trench, in which the cable will be buried using the jetting method. The excavated spoil is planned to be deposited in small piles within the ECI corridor at a depth of approx. 10-12 m (between 32 and 30 km of the ECI corridor).

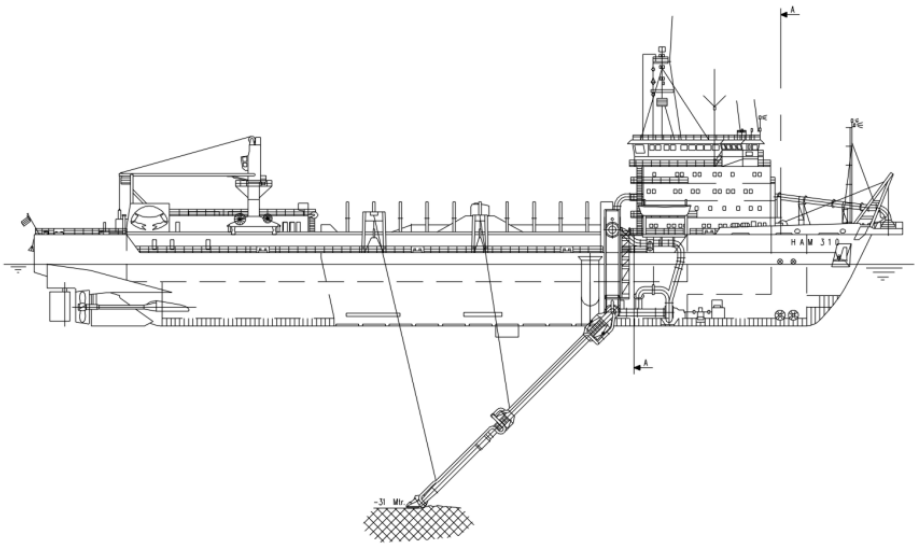


Figure 3.13. *Example of a suction dredger*

3.2.3. Organisation of the construction trenchless crossing through the coastal zone

The execution of the trenchless crossing through the coastal zonewill require appropriate onshore construction site organisation, including: the demarcation of a construction site of approx. 0.85 ha, clearing of the construction site (including tree and shrub felling), necessary land levelling, fencing and securing of the construction site, provision of access (including organisation of temporary access roads), provision of utilities, organisation of construction facilities, storage depots, car parks and welfare facilities.The source of water for the drilling operation and for social and domestic needs will be cisterns or existing water pipelines.

At this stage, a construction site location for the HDD sea-to-shore cable exit has been tentatively identified in the area of 35 km of the ECI corridor. This is a partially deforested and transformed area (paved car park, fragment of military fortification), as shown in the photographs below (photo 3.1). The section of land in question is partly within the construction corridor. Therefore, the possible selection of the above-mentioned location of the construction site will be preceded by a request to the Director of the Maritime Office in Gdynia for conditions of use of the said area (more on this subject in Chapter 3.2.5.). The choice of this area, despite its partial location within the construction corridor of the Maritime Office, is dictated by the fact that it is an already transformed and deforested area.

The works related to the construction of the ECI of the MFW Bałtyk II and MFW Bałtyk III will be performed in accordance with the construction documentation approved at the stage of obtaining the construction permit, including a set of required arrangements.

In addition, the construction works will be carried out in accordance with the developed Works Organisation Plan, according to the established schedule of works including the division into particular types of works and their completion dates.

Photo 3.1. *Planned location of landfall of cables - Eastern variant*

Source: EKO-KONSULT Sp. z o.o.

At this stage, it is assumed that access to the construction site of the ECI landfall at the considered location will be from public roads, including Bosmańska Street, while further, if possible, will follow the existing forest road leading towards the beach (photo 3.2). The forest road is paved for a small section. If for technical and logistical reasons it is not possible to use the existing roads, new temporary access roads will be constructed.

a)

b) c)

Photo 3.2. *a) Bosmańska Street b) the forest path leading towards the beach - the location currently under consideration to the landfall of the cables - paved section c) forest road leading to the landfall of cables - unpaved section*

Source: EKO-KONSULT Sp. z o.o.

3.2.4 Technology of laying onshore cable lines

As part of the planned Project, 4 offshore and onshore cable connection sites will be constructed. These are concrete rectangular objects with a side length of a maximum of a few metres and a depth of approximately 2 metres. From a technical point of view, it is also possible to make the connection of the offshore and onshore cables without building an additional connection site, however, the final technical solutions will be subject to further design work. In addition, the equipment necessary for the proper operation of the cable system, e.g. wells with earthing/crossbonding boxes and for the connection of tele-technical cables, will be installed in the immediate vicinity of the connection.

According to the Standard Technical Specification for 220 kV and 400 kV Cable Lines, prepared by Polskie Sieci Elektroenergetyczne PSE (Polish Power Grid) (2020)[18], extra-high voltage cables outside the substation area should be laid at a depth of not less than 1.3 m, counting from the top surface of the highest cable to the ground surface, in a flat or triangular arrangement (figure 3.14). A section of a cable line with drilling should have the same arrangement of cable laying along its entire length, and the technology of cable laying and cable equipment installation should be in accordance with the recommendations of the cable and cable equipment manufacturer and be carried out under their supervision.

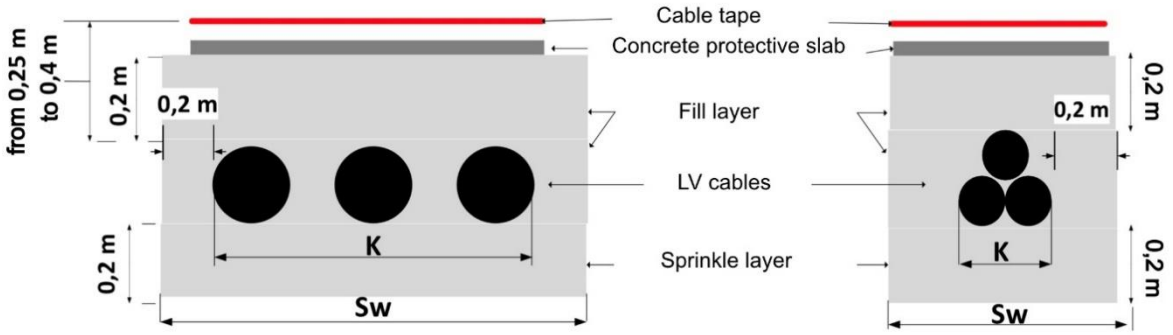


Figure 3.14. *Illustrative layouts of LV cables with minimum dimensions for bedding layers and filling layers, in flat and triangular layouts*

Source: Standard Technical Specification for 220 kV and 400 kV Cable Lines, PSE (2020)

There are four ways of laying an underground cable line:

[18] *The PSE guidelines describe good practices for the design and construction of 220 kV and 400 kV cable lines and are not mandatory.*

1. Underground cable line

Cables are laid in a trench in a wavy line wherever possible, on a compacted bedding layer with a minimum thickness of 0.2 m. When laying multitrack lines in a single trench, the tracks of the line should be separated by concrete protective plates. The minimum horizontal distance between tracks is determined by calculating the thermal interaction between the lines. After laying, the cables are backfilled with a layer of fill to a height of at least 0.2 m above the level of the upper surface of the highest-lying power cable of the line track in the trench. The backfilling material is material, which is a mixture of sand and cement. The structure of the backfill material and the bedding shall not cause damage to the surface of the cable sheath. The remaining area of the excavation is filled with soil cleaned of debris and stones, which must be compacted to prevent the soil from settling. Concrete protective plates are placed on the filling layer above the cable line. A warning tape is placed over the cable.

2. Cable line laid in culverts

Culverts are elements stiffening the cable section, limiting the possibility of mechanical damage and protecting the cable insulation. They are most often used where the cable line crosses other objects such as roads, tracks, other underground infrastructure elements, buildings, etc. Culverts can be made using the open-pit, jacking or drilling methods. Smooth-walled casing pipes made of high-density plastic with a diametral stiffness of the pipe appropriate for the location are used to make the culverts. One cable shall be laid in one culvert. When inserting the cable, care must be taken to ensure that no soil or debris enters the culvert along with the cable. It is permissible to fill the culverts with a material with adequate resistivity and thermal conductivity, e.g. bentonite. It is acceptable to leave at least one reserve culvert for each section of the cable line in the culverts, the ends of which must also be protected against the ingress of water and foreign materials.

3. Cable line laid in a cable duct

This solution is mainly used in substation areas. The dimensions of cable ducts are selected individually for specific cable lines, taking into account the possibility of heat dissipation. Cables belonging to one line are laid in one cable duct, although it is possible to lay more than one cable with the condition that there is no influence of current lines on each other. Cables shall be fixed using dedicated clamps so as to ensure their longitudinal movement under the influence of temperature variations. Cable ducts shall have natural ventilation to ensure adequate cooling conditions for the cables. A cable duct located above the ground water level should have an absorbent bottom, while a duct located below the ground water level or in an area with unfavourable ground conditions (impermeable ground) should be equipped with a drainage system. Cables laid in the duct should have a flame resistant sheath.

4. Cable line laid in a track/cable tunnel

Requirements for the dimensions of tracks or cable tunnels, their construction, method of cable laying and fixing, conditions of forced cooling, and accessibility for maintenance personnel are determined individually for a specific cable line solution (Photo 3.3).Cable tunnels shall have systems for drainage of rainwater and ground water, and cable entries and exits shall have system protection, including protection against water ingress, and natural ventilation providing adequate conditions for cooling of cables in accordance with the assumptions adopted for calculating the long-term current-carrying capacity of the line.

1 2 3 4

Photo 3.3. *Methods of laying underground cable lines: cable lines in the ground (1), cable lines in culverts (2) cable lines in cable ducts (3), cable tunnels (4)*

Source: https://www.istockphoto.com/pl/obrazy/underground-cable

As a part of the planned Project, the 220 and 400 kV cable lines, together with the optical fibre cable, will be laid with up to four cable tracks (ducts).

Crossing of lines with other underground facilities

In accordance with the Standard Technical Specification for 220 kV and 400 kV Cable Lines, prepared by PSE (2020), the crossing of the cable line and the optical fibre cable with other underground facilities must be performed by routing the cable line and optical fibre cable below the object being crossed (figure 3.15 and figure 3.16). In technically justified situations (e.g. deeply buried water pipes, sewage systems), it is permissible to locate the cable line above the object being crossed.

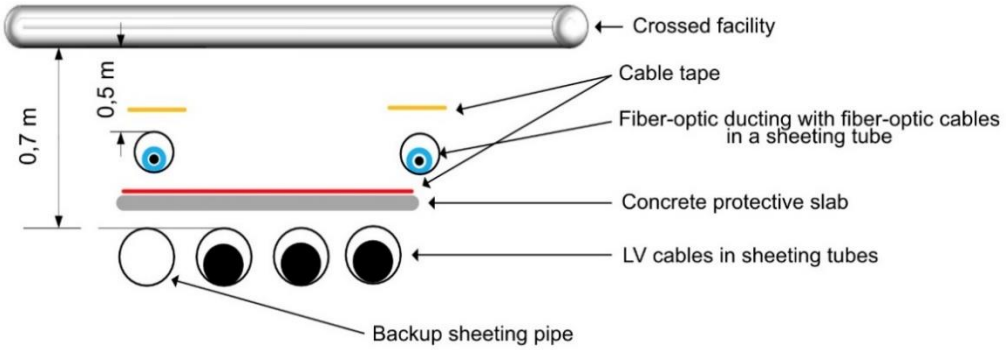


Figure 3.15. *Illustrative method for crossing a cable line including optical fibre cables with other underground facility in an open trench*

Source: Technical Specification for 220 kV and 400 kV Cable Lines, PSE (2020)

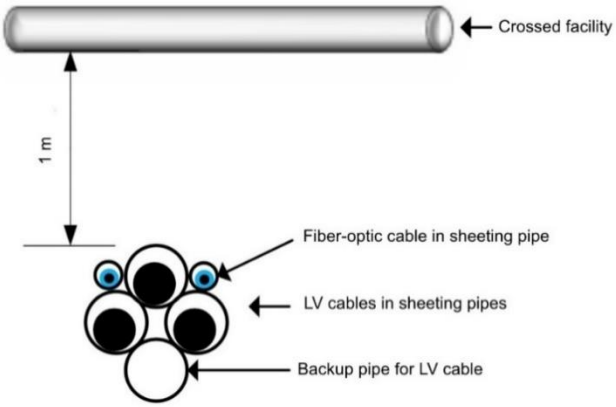


Figure 3.16. Illustrative method of intersection of a cable line, including optical fibre cables, with other underground facilities, using the directional drilling method

Source: Technical Specification for 220 kV and 400 kV Cable Lines, PSE (2020)

3.2.5. Organisation of the construction linear sections on land and its duration

The works related to the construction of the ECI of MFW Bałtyk II and Bałtyk III will be performed in line with the construction documentation approved at the stage of obtaining the construction permit, including a set of required agreements. The documentation will clearly indicate the construction and installation zone for the time of construction of the underground cable lines.

The construction works will be carried out in accordance with the Works Organisation Design, according to the established schedule of works including the division into individual types of works and their completion dates.

The cable line will mostly be laid using the open-cut method. The open-cut method of laying cable lines is generally divided into the following phases:

- clearing trees and bushes along the cable route,
- digging up and securing the trench,
- pouring out the bedding and laying the line system together with the grounding system, together with the necessary infrastructure and mounting elements, i.e.: the fibre optic line, cable joint closures and heads,
- partly backfilling the cable lines with a mixture of sand and cement, followed by partial backfilling of the cable lines,
- laying of protective concrete slabs (laid horizontally in the ground above the cables, on a filling of bentonite material, which is a mixture of sand and cement, below the warning tape and vertically, between cables belonging to different tracks in the same trench),
- laying the warning tape,
- backfilling the trench with appropriate compaction including restoration of the soil profile,
- land reinstatement.

An example of the technological process of laying a power cable in the onshore section is described below.

The cables are delivered to the site on drums, in sections of approximately 1 km in length. Drums with cables are delivered to the place they will be laid on cable trailers (Photo 3.4) If it is not possible to deliver the drum to the place of insertion into the trench, it will be possible to roll the drum over short sections of the route. Cables will be inserted into the cable duct located in the trench directly from the drum positioned at one end of the line section, and will be moved by means of guides on cable rollers, spaced along the entire length of the laid cable section. There will be a trench length of approximately 1 km, and the cable insertion time for this section will be approximately 1 week. The rollers and guides are to prevent the cable from rubbing against the drum discs and the ground. The Investor will allow the drum to be positioned on its side in special cases where right-angled positioning will not be possible. Cables will be pulled mechanically by a cable winch positioned at the end of the route, whose cable will be connected to the end of the cable being laid by a rotary coupling and a pulling

head or cable stocking placed on the end of the cable. In areas preceding bends in the route, manual pulling assistance by workers deployed in the trench is permitted. The investor also plans to use a trenching machine (Photo 3.4). The individual sections of approximately 1 km sections of cable, will be joined together in cable couplers (Figure 3.17). The position of cable couplers, the method of preparing the base for the couplers and securing them, and the dimensions of the position shall be in accordance with the guidelines of the manufacturer of the accessories.

1 2 3 4

Photo 3.4. *Cable drum trailer (1), cable guides (2), trenching machine (3), cable trenching (4)*

Source: Technical Description of the ECI of MFW Bałtyk II and MFW Bałtyk III for the purpose of environmental impact assessment C256-EQ-A-FD-00002_02" , February 2022 (Technical Description).

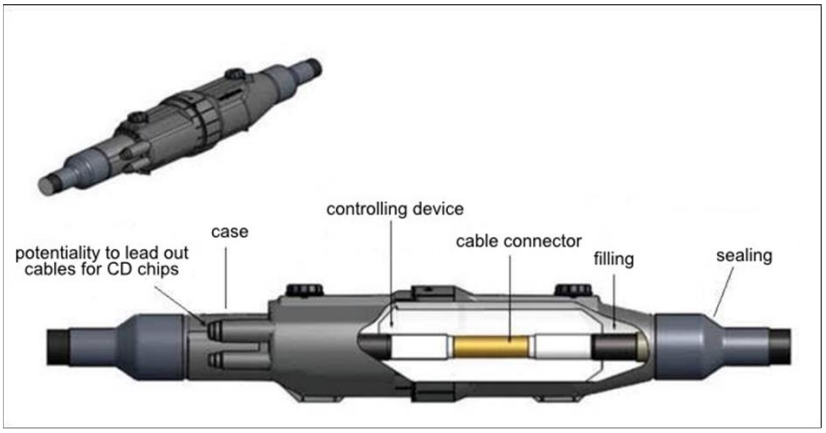


Figure 3.17. *Example of a cable coupler for voltage 110 kV*

Source: Guidelines for inspections, surveys, technical condition assessments and maintenance of equipment, installations and distribution grids, TAURON, 2014

The laying of cables shall be performed in such a manner as to preclude damage to them by excessive bending. Where it is necessary to reduce the frictional force of a sliding cable on the inner surface of a culvert, a sliding material that does not adversely affect the cable sheath or jacket will be introduced into the culvert. In addition, bentonite will be used to increase the current-carrying capacity of the cables laid in the culverts, and to stiffen them.

Construction works will be carried out in a construction zone (Figure 3.18) with a width of approx. 30-32 m with local extensions in the area of trenchless crossings (approx. 50-100 m) and extensions in the vicinity of the offshore/onshore cable connection. A temporary road and an area for the temporary placement of bedrock and humus separately will be designated in the zone. The estimated depth of the trench is approx. 1.3-5 m, depending on the land surface, ground and water conditions, etc. (unless local conditions indicate the need for deeper trenches, e.g. when solving collisions with underground terrain obstacles).

Below is a schematic cross-section through the construction corridor during open excavation.

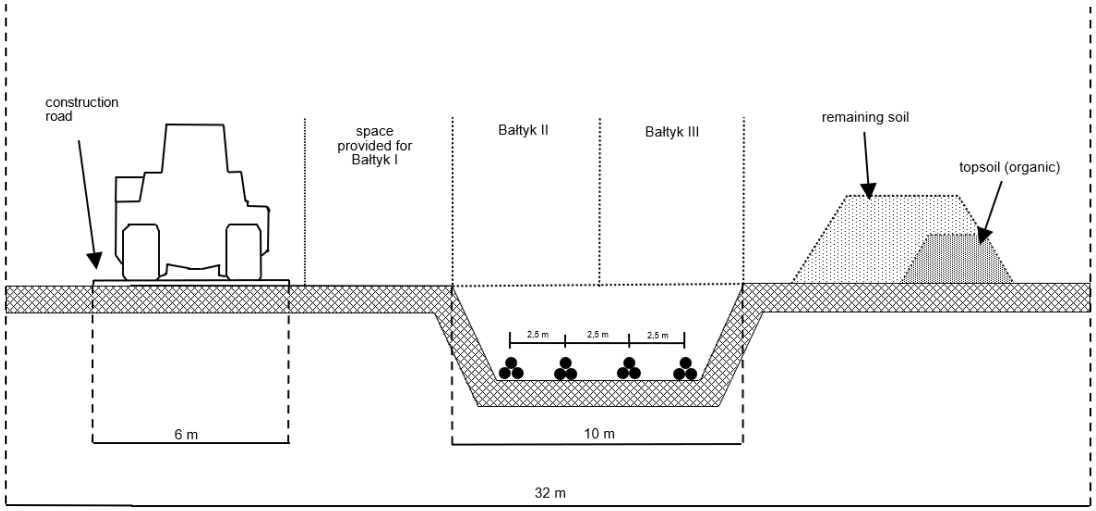


Figure 3.18. *Example scheme of corridor for construction of cables from MFW Bałtyk II and MFW Bałtyk III*

Source: own elaboration based on data from Investor Onshore civil construction & cable installation study, 04 2022

It is anticipated that, depending on ground conditions, the construction will take approximately 14 months.

Within the limits of this construction and instalation corridor, on sections laid in open excavation, tree felling will be necessary, with permanent deforestation due to the risk of damage to the cables by root systems and possible failure covering, depending on the ECI section, a strip of approximately 10 to approximately 31 m. The remaining part of the construction corridor will be able to be re-planted once the construction process has been completed. In the sections where the cables will be laid in the ground using trenchless methods, it will not be necessary to remove the phanerophytes.

In this context, permanent access must also be provided to the marine and land cable connection and coupler stations.

Trench drainage

Underground cable lines will be laid in a dry trench. If it is necessary to dewater the trenches, pumps, needle-filters or additional dewatering trenches will be used.

The dewatering of the inside of the trench consists of installing pumps that will pump the water out of the open trench and discharge it into a receiving tank. The use of additional dewatering trenches allows for the drainage of water from the proper trench and its further flow to reservoirs.

The needle-filter method consists of creating a depression curve by pumping water with special needle-filters located outside the trench (figure 3.19.).

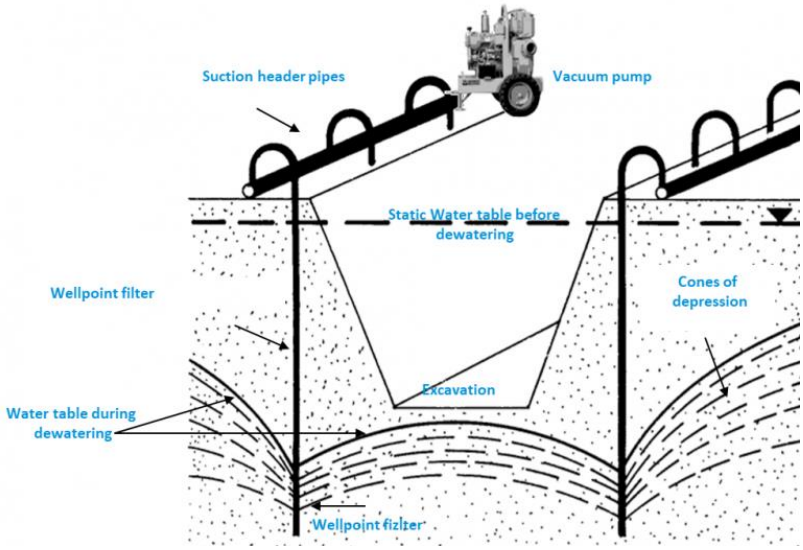


Figure 3.19. *Diagram of trench dewatering with the needle and filter method*

Source: http://iglofiltry.com.pl/Iglofiltry/iglofiltry-jako-metoda-odwadniania

The method of dewatering the trench will be indicated after the analysis of the results of subsoil tests at the stage of the construction design. Regardless of the selected trench dewatering technology, the pumped water will be discharged outside the construction site into the existing watercourses running in the vicinity of the planned Project and in accordance with the applicable legal regulations. Water from the dewatering of the excavations will be spread (dispersed) on neighbouring land where possible, with the consent of the landowner. Dewatering works will be carried out in advance, until the cable lines are laid and covered.

Access roads during the construction phase

In the construction/cable corridor, a temporary road of approx. 6 m will be designated (Figure 3.18), in which works related to the excavation and laying of the cable and transport of materials, raw materials and construction equipment will be carried out. Access to the construction corridor will be carried out using the existing traffic system. In the event that it is not possible to transport materials and equipment along the existing roads, it will be carried out using temporary roads made for the duration of the planned Project's implementation. In the transport zone along the axis of the planned cable tracks, the surface will be partially paved to allow the movement of construction machinery and means of transport. The location of the temporary access roads to the installation strip is not known at this stage. However, it is the intention of the developer to designate the temporary roads in such a way that they interfere with the environment as little as possible. Upon completion of the construction works, the areas designated for the temporary roads will be restored to their original state.

3.2.6. Onshore substation

It is planned to build two separated ONSs of a total area of 16 ha in the area of the Pęplino village - one for MFW Bałtyk II and one for MFW Bałtyk III. The planned stations will be located on plots No. 148/3 and 148/4, Pęplino precinct, Ustka municipality.

The works related to the construction of the ONS substation will be carried out in line with the construction documentation approved at the stage of the construction permit, including a set of required agreements. The construction works will be carried out in accordance with the works organisation plan, according to a defined works schedule that includes a division into individual types of works and their completion dates.

The preparatory works will consist of the preparation of the access road, the cabling of the existing overhead medium voltage line passing through the station area, the removal of the top layer of soil, and possibly the levelling of the area. To provide access to the station and to the construction site the investor plans to use the existing access road to the factory MOWI POLAND S.A. (76-270

Duninowo) and further going in the south-east direction to build a hardened access road to the station area.

Construction works will be carried out by contractors using conventional equipment such as excavators, trucks, wheel loaders, cranes etc. (Figure 3.20).

Heavy equipment will be transported by large trucks and lifted by cranes. Lighter installation materials will be transported by trucks to the collection site.

Substation construction consists of typical civil works:

- earth moving, trenches, levelling,
- preparing internal roads and social facilities,
- trenches for infrastructure,
- formwork, foundations, and concrete floors,
- installing power transformer and bonded cores,
- installing high voltage equipment and connections,
- installing tanks for fuel to emergency generators and water tanks for firefighting purpose,
- hardening of roads, parking places,
- preparing grass areas with 20-30 cm layer of humus,
- installing fences and gates.

Figure 3.20. *Construction of the Onshore Substation*

Source: Technical Description, February 2022

Site preparation for the ONS will take approximately 6 months. No felling of trees is anticipated due to the nature of the site in the area of the planned ONSs - mainly arable land and grassland. The preparatory period will be followed by earthworks, and then the construction of buildings, foundations, etc., taking about a year, followed by the installation of equipment. Construction time is estimated to be around 2 years.

There will be a hardened access road to the Project site, including a hardened access road to allow permanent access to the planned ONS stations.

3.2.7. Conditions for land use in special flood risk areas

The planned Project is located within the area of special flood hazard due to its coastal location and the existence of a technical zone (up to 35,12 km of the ECI corridor). It was defined by the Order No. 12 of the Director of the Maritime Office in Gdynia of 9 November 2021 on defining the borders of the technical zone in the area of the City and Municipality of Ustka. The construction corridor is a zone of mutual interaction of sea and land and is an area intended to maintain the shore in a condition compliant with safety and environmental protection requirements. As mentioned in Subchapter 3.2.2 currently being considered planned location construction site for ECI landfallincludes a partly deforested and transformed fragment of land, in the area of 35,1 km, which is fragmentarily located within the

boundaries of the technical zone. In this case, it is necessary to apply to the Director of Maritime Office in Gdynia for conditions of such usage.

In addition, the area between the shoreline and the natural high shore is at risk of flooding if the storm defence embankment is completely destroyed at sea level H 1%[19]. Forecasts of the magnitude of sea level rise in the Baltic Sea during the 21st century vary widely, depending on modelling approaches, confidence levels and uncertainties, and range from 0.6 to 1.1 m. A very significant effect of climate change will be an increase in the frequency of storm floods and more frequent inundation of low-lying areas and degradation of coastal cliffs and seashore, which will put strong pressure on the infrastructure located in these areas. A trenchless crossing is planned in this section.

3.3. USE OF RESOURCES AND ENERGY DURING THE CONSTRUCTION PHASE

Demand for energy, raw materials and materials

During construction works, electricity will be consumed mainly for the needs of construction machinery and site lighting. The planned Project, due to its specificity, will be implemented using ready-made equipment, elements and construction products.

The following table shows the estimated quantities of basic materials and raw materials that will be used for the construction of the planned Project (table 3.7).

Table 3.7. *Estimated quantities and types of raw materials, fuels and water necessary to the construction of the Project*

Water, raw materials, materials, fuel	Description	Estimated amounts/volumes
Water	Social purposes – offshore part (appr. 600 persons; average use on construction site – 50 l/person/day)[20]	30 m^3/day
	Social purposes – onshore part (appr. 700 persons; average use on construction site – 50 l/person/day)[21]	35 m^3/day
	For drilling mud purposes (max. volume)	17 000 m^3 + 6 000 m^3 (onshore)
HDPE or steel casing/duct pipes	HDPE duct* for HDD option: (710 mm landfall, 3x250 mm + 160 mm onshore)	9 km 710 mm + 7,8 km 160 mm + 23,4 km 250 mm
Mixture of sand and cement	Bentonite as cable bedding and filling around the cable in the case of the open excavation method	i.e 22 000 m^3
Stone-mastic asphalt or concrete cube	Materials for the road construction to ONS	860 tonnes
Aggregate, cement and sand bedding	Materials for the road construction to ONS	2 000 tonnes
Fuel	Offshore equipment and vessels	7 500 m^3
	Onshore equipment and vehicles	1 500 m^3

** Potential for using 508 mm OD steel duct for landfall if necessary*

Source: Investor's data

Moreover total offshore cable length will be about 314 km i.e.:

- approx. 120 km for the ECI MFW Bałtyk II,
- approx. 134 km for the ECI MFW Bałtyk III,
- approx. 60 km for the corridor between MFW Bałtyk II and III,

[19] *areas where the probability of flooding is medium and 1% (once in 100 years)*

[20] *Regulation of the Minister of Infrastructure of January 14, 2002 on determining the average standards of water consumption (Journal of Laws.2002.8.70)*

[21] *Regulation of the Minister of Infrastructure of January 14, 2002 on determining the average standards of water consumption (Journal of Laws.2002.8.70)*

- with total weight approximately 12 000 -13 000 Mg.

Fuel consumption

Vessels to be used for submarine cable implementation during one installation campaign (30 days):
- Cable Installation Vessel – in total approx. 900 m^3 (30 m^3/day),
- Cable dredging/deepening vessel – in total approx. 600 m^3 (20 m^3/ day),
- Local guard vessels – in total approx. 360 m^3 (4 vessels, 3 m^3/day),
- Optionally, dredger - total approx. 25 m^3

Vehicles and equipment used to implement the trenchless crossing of the coastal zone:
- access road construction/improvement machines – in total approx. 50 m^3,
- generators for drilling equipment onshore – in total approx. 400 m^3, where electric drilling equipment is used, hydraulic devices consume significantly more fuel (approx. 50% more = 600 m^3),
- vessels for offshore/landfall operations – in total approx. 50 – 100 m^3,
- construction equipment (excavators, cranes, etc.) – approx. 50 m^3.

Onshore drillings (regardless of techniques) equipment and vehicles:
- access road construction/improvement machines – in total approx. 10 m^3,
- generators for drilling equipment onshore – 300 m^3, where electric drilling equipment is used, hydraulic devices consume significantly more fuel (approx. 50% more = 450 m^3),
- construction equipment (excavators, cranes, etc.) – approx. 25 m^3.

Onshore equipment and vehicles:
- backhoe excavators – in total approx. 800 m^3,
- cranes – in total approx. 55 m^3,
- trucks and vans – in total approx. 650 m^3.

Trenches – offshore

During cable burial using the jetting method, it is assumed that approximately 10 - 35% of the excavation volume will pass into the water tone and be deposited on the bottom in the vicinity of the excavation. The remaining part of the raised material, i.e. 90-65% of the excavated volume, will remain in the excavation.

Expected excavation volume:
- approx. 100 000 - 200 000 m^3 for the connection infrastructure of MFW Bałtyk II,
- approx. 110 000 - 200 000 m^3 for the connection infrastructure of MFW Bałtyk III,
- approx. 50 000 - 100 000 m^3 for the connection between the farms.

Where a trenchless HDD crossing is required with a short section of deeper submarine trench (depths of 4 - 5 m over a maximum length of 800 m), the total spoil volumes will be greater, depending on the length of the section.

The volumes quoted do not include the amount of spoil from making HDD trenchless crossing of the coastal zone.

Crossing the coastal zone by HDD method

The estimated volume of spoil excavated during the execution of the offshore exit shaft will be
- up to approximately 800 m^3. It is anticipated that the backfilling will be no less than 80% of the trench volume.

The volume of material excavated during HDD drilling will be approximately 11,000 m^3 (excavated volume resulting from the drilling itself) + 5,500 m^3 (excavated volume resulting from onshore excavation, including preparation of the launch shaft).

Onshore earth mass balance - excavations:

Excavation requires removal of the top, fertile humus layer and its protection, as well as separate storage of bedrock. Individual soil types will be removed selectively and deposited so that they can be reused after the construction work is completed.
- The humus layer will be removed and deposited at the location specified in the construction organisation design and protected from mixing with the native soil.

- Earth mass balance onshore:
- approx. 265,000 m^3 - total estimated volume of cable excavations;
- approx. 30,000 m^3 - total estimated volume of excavated earthworks for the ONS substation.

Upon completion of the civil works, it is anticipated that the excavations will be backfilled with selected excavated material.

The soil from the excavations will be used for the deeper layer of backfill, while the humus stored separately will form the top layer. Any surplus spoil remaining after backfilling the excavations can be used for landscaping or levelling the works strip. The construction contractor may take some of the excess soil away from the site to be used for landscaping. Pursuant to Article 2 of the Waste Act of 14 December 2012 (Journal of Laws 2022.699, as amended), the provisions of the Act do not apply to 'uncontaminated soil and other naturally occurring materials excavated in the course of construction works, provided that the material is used for construction purposes in its natural state on the site on which it was excavated'. Therefore, the uncontaminated earth masses will be used for trench backfilling and land levelling - they will not be treated as waste.

3.4. ANTICIPATED TYPES AND QUANTITIES OF POLLUTION DURING THE CONSTRUCTION PHASE

The construction of the planned Project will involve:

- periodic emissions to air and emissions of noise from vessels and carrying out construction work (including underwater noise) and vehicles and equipment for the construction of onshore infrastructure;
- occurrences waste and wastewater generated during the construction.

During the construction phase, there will be unorganised emissions of combustion gases (carbon oxides, nitrogen, sulphur and hydrocarbons) and dust associated with the operation of vessels, construction machinery, transport of equipment, materials and people. Due to the limited time of emission, all emitted concentrations of gases and dust will be of trace character and will not cause exceedance of permissible levels resulting from the Regulation of the Minister of Environment of 24 August 2012 on levels of certain substances in the air (Journal of Laws 2021.845 consolidated text) and will meet the requirements of the Act of 16 March 1995 on prevention of sea pollution from ships (Journal of Laws 2020.1955 consolidated text, as amended).

The operation of equipment used during construction will also be a source of noise emissions, the level of which will vary depending on the phase of the Project and the type of equipment used. In addition, noise will be related to the transport of construction materials, equipment and people, and will affect both the areas of direct construction activities and areas in the vicinity of access roads. Due to the linear nature of the investment and the specifics of conducting the works in an open space, the noise will occur only in the section where the works are carried out and will diminish as the construction works progress.

Although the noise level during construction works is not subject to standards under environmental protection regulations, it may constitute a significant nuisance for the areas adjacent to the construction site. The greatest noise nuisance during the construction phase will be associated with the trenchless crossing of the cable lines from sea to land. The second place where such nuisance may occur is the construction site for the planned ONS in the Pęplino area. The planned stations are located in agricultural areas In the corridor of the planned Project, in the area of the infrastructure landfall and the northern section of the cable route, there are some buildings within the closed areas of the Marine Training Centre in Ustka. The planned MFW Bałtyk II and MFW Bałtyk III are located at a distance from dense residential development.

Construction work will be performed with the use of equipment ensuring the most effective possible protection from noise, meeting the requirements of the applicable legislation. According to the guidelines included in the Regulation of the Minister of Economy of 21 December 2005 on the essential requirements for equipment used outdoors with regard to the emission of noise to the environment (Journal of Laws 2005.263, item 2202 as amended), the level of acoustic power of equipment used in

the construction industry is subject to limitations depending on the type of equipment and installed power.

The waste and wastewater generated during the construction phase will be properly stored and secured on the vessels, in accordance with the anti-pollution plan in force on each vessel, drawn up in accordance with the requirements of the Act of 16 March 1995 on the Prevention of Marine Pollution by Ships (Journal of Laws 2020.1955 consolidated text, as amended), and then they will be transferred to port reception facilities and managed in accordance with the applicable port waste and cargo residue management plan from ships (Regulation of the Minister of Infrastructure of 21 December 2002 on port waste and cargo residue management plans from ships (Journal of Laws 2002.236.1989, as amended). On land, waste will be selectively collected in containers and designated places, properly equipped and secured, collected by an entity holding the relevant waste management permits in accordance with the Waste Act of 14 December 2012 (Journal of Laws 2022.699 consolidated text, as amended).

The implementation of the planned Project on land will be a source of waste from typical construction works associated with the trenching of cables and construction of onshore substations. The trenchless crossing from sea to land will generate waste of code 16 10 02 *Hydrated liquid wastes other than those mentioned in 16 10 01.*

In accordance with national legal requirements, the Act of 14 December 2012 on waste (Journal of Laws 2021.779, as amended). Notwithstanding this, the principal has a duty to satisfy himself that the contractor is properly managing waste, the producer of waste generated during construction works is the contractor of these works. He will be obliged to manage waste in accordance with the requirements of the aforementioned Act, i.e. in the first place to prevent the generation of waste, and in the event of its generation to collect it selectively and transfer it to entities holding a permit for the transport or collection of waste. All waste will be:

- sorted in containers on site and transported to the local collection facility by specialised external companies - in accordance with the waste transport and handling permits;
- wastewater will be collected in tanks. Further handling of wastewater will be carried out by companies with appropriate permits.

Transport and further waste management will be the responsibility of specialist companies - in accordance with transport and waste management permits. All generated wastewater will be collected and then delivered to an approved treatment plant in accordance with legal requirements. No direct discharge of wastewater into the environment is anticipated. Waste disposal will be carried out in accordance with the Construction Waste Management Plan that will be developed by the Investor or construction contractors.

In Subchapter 9.15, 10.13, theestimated quantities of waste generated in the construction phase of the offshore and onshore parts of the planned ECI of MFW Bałtyk II and Bałtyk III are presented.

It is assumed that the construction phase will be carried out in the shortest possible time, in accordance with current standards and the cable manufacturer's recommendations, and under ongoing supervision. In this context, the emissions will be local and of short duration when environmental protection solutions are applied.

3.5. OPERATION PHASE

At the operation phase, the planned Project will provide a possibility of transmission of electric energy generated in the MFW Bałtyk II and Bałtyk III to the substation of PSE S.A. Słupsk Wierzbięcino.

The operation of a submarine cable line is an unmanned process. It starts when the cables are connected to the offshore substation and/or the substation is commissioned. For the operation, monitoring and maintenance of the offshore wind farms together with the power derivation units, an operation and maintenance base will be organised in Łeba. The base will consist of an office, a control room and a warehouse with coastal facilities. The planned base at Łeba is not part of the scope of the assessed Project.

During the operation of the submarine cables, surveys of the seabed will be carried out periodically (about once every 5 years), with the first three reviews planned in the first, third and fifth year after construction is completed. Using a special seabed seismic apparatus, the state of burial of the cables in the seabed will be checked.

The operation phase of the underground cable line in the onshore section is also an unmanned process. The maintenance and service base at Łeba will also serve the cable lines and onshore substations. Regular maintenance and servicing is envisaged as part of the operation of the ONS. Maintenance and service work on the onshore substations is foreseen several times a year.

3.5.1. Conditions for land use during the operation phase

The use of the area of the planned Project in the offshore part during the operation phase will be carried out in accordance with the rules established in the POM Plan, including detailed arrangements for particular areas designated for laying linear elements of the technical infrastructure, presented in table 2.1(Chapter 2). According to the above mentioned arrangements, it is required to establish a safety zone around them by the territorially competent director of the maritime office, in which anchoring will be prohibited, with the exception of emergency anchoring and those related to installation and maintenance works.

In order to ensure access to the cable line during the operation phase, a technological zone (a permanent technical zone) will be established in the onshore section. The width of the technological zone will be from approx. 10m to approx.31 m, depending on the section of the cable corridor. The aim is to enable inspection and maintenance along the cable lines. In the immediate vicinity of the cables, i.e. in the technology corridor it will not be possible to plant trees due to the risk of damage to the cables by root systems and possible failure. In the case of non-forest areas such as arable land, meadows and pastures, the current use of the land will be possible.

In the landfall area the occupation of the area for the use of coupler positions - underground structures to secure and provide access to the offshore and onshore couplers connecting the offshore and onshore cables is also planned. It is possible that this area will require fencing and access control - this will be determined at the construction design stage. In addition, permanent land occupation is required for onshore substations.The permanent land transformation will mainly include the planned ONSs - a total of approximately 16 ha of agricultural land on medium and poor quality soils (classes IVa, IVb and V), and the access road to the substation.

During the operation phase of the Project, the main technological operations will be carried out at the ONS substation. As part of the operation of both of the ONS substations, regular maintenance and servicing is foreseen. Service-maintenance is planned to occur several times a year.

In addition, service and maintenance work will be carried out on underground cables. During the visual inspection of cable lines, the following will be particularly monitored[22]:

- the condition of cable line markers,
- the condition of cable track, duct and marine and land-based cable connection stations,
- the condition of line routes and their surroundings;
- the condition of installations in cable tracks;
- the condition of marine and land-based cable connection stations (all covers, flooding with water, backfilling with earth, storage of materials on manholes, and the condition of bulkheads and firewalls)
- the technical condition and corrosion protection of the supporting structures of the cable lines in the tracks and external spaces;
- the state of visible protective coatings of cables, including corrosion protections;
- the condition of cable shields against mechanical damage and against water penetration;
- the condition of cable heads (cracks, leakage of filling compound or oil, level of saturant or oil);
- the condition of grounding connections of cables and terminals at heads;

[22] *Wytyczne dokonywania oględzin, przeglądów, oceny stanu technicznego oraz konserwacji i remontów urządzeń, instalacji oraz sieci dystrybucyjnych (Guidelines for inspections, surveys, technical condition assessments and maintenance of equipment, installations and distribution grids), TAURON, 2014.*

- the condition of surge protection and electric shock protection by assessing the condition of grounding wire connections and clamps;
- that there are no conditions on the route or in the vicinity of the cable lines that could affect their proper operation, e.g. that no trenches are excavated in the vicinity of the routes and that no large and heavy elements are stored on the cable routes, which could obstruct access to the cable.

Inspections of cable lines are a set of technical procedures aimed at maintaining cable lines and associated facilities in a proper technical condition. Dates and scopes of cable line inspections should result from the conducted assessment of the technical condition of the line, preceded by a visual inspection. Based on the assessment of the technical condition, maintenance and repair of the cable network are performed.

3.5.2. Energy and water needs

At the operation phase of the planned Project, electricity will be used to power the necessary technological equipment and the ONS substation. Due to the operation of the substation, the demand for electricity will be met in-house using own needs transformers from the power supply from the OSD or, in emergencies, using a generator.

During the operation phase, the water demand of the ONS substation for social and fire fighting purposes will be low (approx. 0.3 m^3/day). The source of the water supply is likely to be a water pipeline.

Demand for raw materials, fuels and energy, possibly may occur in case of cable failure and repair and maintenance works.

3.5.3. Waste and emission sources

During the operation phase of the planned Project, small amounts of waste will be generated as a result of the operation of the ONS. Such waste will be generated as a result of normal operation of the facilities, as well as waste generated during periodic maintenance and repair work on the cable lines.

The amount of waste generated during the substation's operation phase will be significantly smaller than during the construction phase. Onshore substations are a source of negligible amounts of waste generated during their operation. Small amounts of both hazardous and non-hazardous waste may be generated.

The waste generated will, be stored separately, without endangering the environment, and will be managed in accordance with the current legislation.

In Subchapter 9.15, 10.13., the estimated quantities of waste generated in the operation phase of the offshore and onshore parts of the planned MFW Bałtyk II and Bałtyk III are presented.

3.5.4. Noise emissions and electromagnetic fields

The physical factor, which accompanies the operation of transmission systems, is the electromagnetic field, and in the case of overhead systems also noise. In case of the planned connection infrastructure of the ECI of MFW Bałtyk II and MFW Bałtyk III, the sources of the mentioned factors will be as follows:

In terms of noise emitted to the environment:

- 220/400 kV onshore substations, where the main source of noise in each of them will be two 220/400 kV transformers of approximately 400 MVA, compensation capacitors and bonded cores;
- cooling, ventilation and air-conditioning systems station buildings and for potential energy storage.

The source of electromagnetic field identified in the environment will be the functioning of such elements of the transmission system as:

- 220 kV cables (4 lines), connecting the 66/220 kV offshore substations with the 220/400 kV onshore substations. Regardless of the number of cables, each of them will be the source of the magnetic component of the electromagnetic field only, as the electric component of the field will be shielded by the conductive layers of the cable;

- 400 kV cable lines, connecting 220/400 kV ONS with the 400 kV substation, which is part of the national power system (PSE S.A.); regardless of the number of cables constituting the cable track, it will be the source of the magnetic component of the electromagnetic field only, as the electric component of the field will be shielded by the conductive layers of the cable.
- The noise level generated by the facilities installed at each 220/400 kV substation will depend primarily on the acoustic power of the main transformer with an electrical capacity of approximately 450 MVA. The other equipment and facilities installed at the substation (bus bars which is a source of corona noise, the substation buildings) will affect the level of noise emitted to the environment to a much lesser extent. The primary objective in the design process of these stations will be such selection of equipment and layout of station facilities that the noise associated with the operation of these facilities does not exceed the permissible levels specified in the Regulation of the Minister of Environment of 14 June 2007 on the permissible levels of noise in the environment (Journal of Laws 2014.112 consolidated text) in areas where the noise level is standardised.

The values of the magnetic component of the electromagnetic field whose source will be 220 and 400 kV power cables depend primarily on the load of the cable track (of individual cables forming the cable track), i.e. the current flowing through the cable and the depth of its burial in the ground. The process of designing cable tracks, the load of which depends on the power planned to be transmitted, therefore consists of establishing such a depth of its burial that the values of magnetic field intensity accompanying the operation of all cable tracks identified in the environment, primarily at a height of 2.0 m above sea level, are less than the permissible value (60 A/m) established in the Regulation of the Minister of Health of 17 December 2019 on permissible levels of electromagnetic fields in the environment (Journal of Laws 2019. 2448).

The magnetic field associated with submarine cables can be reduced by their compensating using appropriate cable routing schemes. In the case of AC transmission systems, field is reduced by the use of multi-core cables. This results in almost complete neutralisation of the field on the cable surface as the sum of the voltages and currents of the three phases is zero at any time [23].

The intensity of both magnetic and electric fields identified outside the cable sheath decreases with distance from the cable. Reducing the exposure of sensitive organisms to these fields can be achieved by increasing the burial depth, thus increasing the distance between the organisms and the buried cable [24].

The identification of noise impact of the Investor's variant on the marine environment is presented in Subchapter 9.8, while the summary of calculation results of noise emission in the onshore part is presented in Subchapter 10.10, and the whole study is enclosed as Attachment 4 to the Report. Summary results of the calculations of electromagnetic field emissions are presented in Subchapters 9.9 and 10.11, and the entire study is enclosed as Attachment 5 to the Report.

3.5.5. Thermal effects

The thermal capacity of conductors and the associated rules for protecting conductors against overloads and the effects of short circuits are related to the temperature rise admissible under specified operating conditions and these, in turn, are related to the values of the initial and final temperature characterising the conductor heating process[25].

In the offshore part, the maximum temperature of the cable working vein can reach 90°C. Given the thickness of the insulating material and other reinforcing and sealing layers, the maximum temperature of the outer surface of the cables is much lower and does not exceed 60ºC during their maximum load[26]. Based on theoretical models, it is estimated that the temperature rise in the sediment immediately around the cable may exceed 30ºC. According to guidelines proposed by the German Federal Agency of Nature Conservation (BfN), the tolerable temperature rise above a buried cable should be 2 degrees at a depth of 20 cm. This value was set to protect benthic organisms and benthic

[23] *OSPAR 2012, Annex 14*
[24] *OSPAR 2012, Annex 14*
[25] *Musiał 2008*
[26] *Müller et al. 2016*

habitats from changes caused by temperature increases. The so-called 2 K criterion can be met by an adequate depth of burial of the power cables in the sediment[27,28]. At present, there are no unambiguously defined limit values in Polish legislation for the temperature rise of the seabed in which power cables deriving power from offshore wind farms have been laid.

It is recognised that a trench depth of 1 to 3 m can limit the temperature rise in the surface layer of sediments. In addition to environmental considerations, the thermal properties of the sediment, the type of cable and its transmission capacity should be taken into account when determining the depth of cable burial[29].

On the basis of laboratory and experimental studies, it was concluded that with increasing temperature, changes in the dynamics of geochemical processes (acceleration of reactions) and elemental availability in the vertical profile of the bottom (release of metals from the sediments into the overlying water) could be expected [30]In addition an increase in temperature may cause spatial changes in the communities of benthic organisms. Taking into account the range of heat emission, which is limited to the immediate vicinity of the cable and decreases with distance from the cable axis, and in the indicated sediment layer does not exceed the natural annual variation in sediment temperature, it should be considered that the thermal effect has a very local and insignificant character [31 32].

On land, as in the case of the offshore part, the heat emission generated by the cable lines depends on the way they are laid and the thermal resistivity of the soil and the use of cable backfill. The flat layout, which will be implemented within the framework of the planned Project, is characterised by more favourable conditions for heat transfer to the ground, which allows for a closer arrangement of individual tracks, resulting in a narrower corridor of occupied land.

The identification of the thermal impact of the Investor's variant on the marine environment is presented in Subchapter 9.10, while a summary of the results of the onshore thermal emission calculations is presented in Subchapter 10.11, and the entire study is presented as Attachment 6 to the Report.

3.6. DECOMMISSIONING

The decommissioning process will depend on the decision whether to leave the defunct cable in the ground or remove it. If cables need to be removed, this will be a similar process to the construction phase with the same logistic layout. The offshore section will consist of decommissioning submarine cables. The offshore substations will be drained from their oils and lubricants, will be dismantled and their foundations cut away from the seabed. All parts will be recycled or disposal.

In the case of cables, once de-energized and inactivated, two possible methods of decommissioning are envisaged, either by leaving them in the bottom and in the ground or by removing them. The final decision on how the Project will be decommissioned will be made after the operation is completed.

3.7. PHASING OF THE PROJECT

Due to the restrictions in access to the necessary services and supplies in connection with possible execution of similar investments at the same time, minimising the risk of not meeting the timeframe, economic optimisation of the whole Project, as well as the possibility of comprehensive contracting of the necessary services and supplies, the Investor allows for execution of the planned Project in a continuous process and in phases.

[27] *Meißner et al. 2006*
[28] *OSPAR 2012, Annex 14*
[29] *OSPAR 2012, Annex 14*
[30] *Haiyan Li et al. 2013*
[31] *Meißner et al. 2006*
[32] *Taormina et al. 2018*

4. PROJECT ALTERNATIVES

The basic assumption in the planning and design process is to determine the optimal route of the connection infrastructure, taking into account environmental aspects, technical possibilities, minimising social conflicts and the risk of potential failures, ensuring economic optimisation of the Project.

This chapter discusses the alternative screening carried out to date in terms of location and technology. Both variant phases are relevant to the analysis of the environmental impact of the planned Project. Finally, it is indicated which of the alternatives discussed below are the so-called reasonable alternative options.

4.1. LOCATION VARIANTS

The location of the planned Project is determined primarily by the starting and ending points, which were determined at the stage preceding the obtaining of the environmental decision - the starting point resulting from the location of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III, approved by the issued PSZW decisions, and the end point determined by the conditions issued by PSE S.A. and the connection conditions to the NPS established by PSE S.A. and the signed connection agreement.

For both the MFW Bałtyk II and the MFW Bałtyk III project, as well as external connection infrastructure, the Investor obtained a set of decisions and conditions (see Subchapter 1.3) determining its spatial scope, especially in the offshore part. In addition, the planned Project must comply with the arrangements of the POM Plan, which was adopted by the Regulation of the Council of Ministers of 14 April 2021 on the adoption of the Spatial Development Plan of the Internal Sea, the Territorial Sea and the Exclusive Economic Zone at the scale 1:200 000 (Journal of Laws 2021.935). Works on the draft POM Plan commenced in 2016 and were the result of many years of research on the marine environment. It was guided by the principle that the state and development of marine areas is the result of environmental conditions, as well as the overlap of spatial planning decisions and other management decisions towards marine areas (protection plans for Natura 2000 sites, setting maximum catch quotas, establishing closed zones for shipping and fishing and declaring hazardous zones for shipping and fishing, etc.). The document also includes the necessity to provide maritime space for the construction and maintenance of connection infrastructure of offshore wind farms. Its location is possible in water areas the basic function of which is 'technical infrastructure' (areas with lettering I) and in areas with a different basic function, but where the technical infrastructure was indicated as an acceptable function.

The planned Project is in line with the POM Plan and fulfils the rules and conditions of using water areas determined in it. Moreover, the planned Project has been designed in such a way that it has the shortest possible route with respect to the minimisation of costs. In this context, the shortest route runs through the Natura 2000 protected site PLC990001 Ławica Słupska. However, as shown in Chapter 7.5 *Nature conservation forms and ecological corridors* Protected Areas, the route practically avoids the habitats that are the object of protection of the area. Similarly, the connection from the MFW Bałtyk III and the planned link between the farms do not interfere with the Ławica Słupska, as it is located on the border of the site, outside the habitats that are the subject of protection. In the case of the Natura 2000 site PLB990002 Przybrzeżne wody Bałtyku, there is no possibility of bypassing it, and the route planned in this section, in one corridor for both cables, follows the shortest line.

A particularly important aspect of the location (and technology) variation is the location of the cable ashore. Due to the necessity of ensuring the stability of the seashore, the land entry will be executed using a trenchless method. For the purposes of the Project, two variants for the location of the land entry and the route of the cable infrastructure in the coastal strip area were analysed: west and east. The variant preferred by the Investor (proposed for implementation) is the eastern variant. This variant is described in Chapter 3. In the proposed variant, as a result of the analyses performed, the considered shore crossing technologies were limited to horizontal directional drilling (HDD) and horizontal directional drilling (HDD) combined with offshore trenching. In the western (alternative) variant, due to site location constraints (presence of a closed military training ground) and the

associated necessary drilling length, it is not possible at this stage to exclude the use of two additional trenchless shore crossing technologies: microtunnel or Direct Pipe (DP) (figure 3.20.).

Figure 4.1. *Planned Project in both location options*

Source: In-house study

The western exit of the cable lines to the shore has been considered in this EIA Report as a reasonable alternative option, but no preliminary concept has been developed for this option, which would allow a more detailed technical description and thus an assessment at a similar level of detail as for the Investor's option. It is worth pointing out, however, that the western landfall would require a longer trenchless passage, and thus methods other than HDD, which are more terrain-intensive - the organisation of the construction site for such a passage would take more than twice as much land as for the HDD method. Given that the coastal zone is covered by dense forest complexes, the necessary tree felling would increase significantly, relative to the Developer's option. Chapter 11 assesses a

rational alternative (western location alternative) based on similar construction assumptions as for the Investor's alternative. Data from the previous EIA Report was used for this purpose.

4.2. TECHNOLOGICAL VARIANTS

Selection of technological options is a result of technical possibilities to build the connection infrastructure of offshore wind farms MFW Bałtyk II and MFW Bałtyk III in the available area, based on current technologies available on the market.

The main technological options for taking power out of offshore wind farms involve a choice of cables or an overhead line.

The onshore routing of the planned Project, is based on laying the cables underground and is the preferred option (proposed for implementation). This option is described in Chapter 3. A possible alternative is a 400 kV overhead power line between the ONS substation and the PSE S.A Słupsk Wierzbięcino substation.

In addition, the choice of trenchless crossing of terrain obstacles and the coastal zone, as well as the choice of trenchless crossing technology, are important for the analysis of environmental impacts. The table below shows the methods of trenchless crossing of the coastal zone that were analysed at earlier stages of the investment process, together with an estimate of the amount of land required and the time needed to execute them (table 4.1).

Table 4.1. *Preliminary estimated parameters for trenchless shore crossing technology*

Trenchless crossing technology	Max. drilling length [km]	Max. building site area [m2]	Entry chamber depth [m]	Max. duration
HDD (Horizontal Directional Drilling)	approx. 1,5	approx. 12 000	approx. 0-3	approx. 0-3 approx. 1 year (+ 2 months for site preparation)
Microtunnel	approx. 1,5	approx. 23 000	approx. 3-6	approx. 2 years (+ 4 months for site preparation)
Direct Pipe (DP)	approx. 1,5	approx. 33 000 (including a stretching area of approx. 150 m long and 10 m wide)	approx. 0-3	approx. 2 years (+ 4 months for site preparation)

Source: own elaboration (data presented at the stage of the Project Information Sheet, June 2022)

The HDD method, which involves the least interference with the forested shoreline zone, was selected for further conceptual and design work. The estimated land occupation for the HDD construction site is two to three times less than the other methods, i.e. microtunnel and Direct Pipe.

In this Report, only the HDD method was considered in the assessment, which was analysed in two variants: a shorter section (Variant 1) and a longer section (Variant 2) of the HDD, the final determination of the maximum possible length of the HDD will depend on the results of the geotechnical investigations, which are currently in progress. In addition, a smaller construction site area of 8,500 m^2 was assumed during further conceptual design work, which has been taken into account in this Report.

4.3. RATIONAL ALTERNATIVE VARIANT

The rational alternative option is adopted for assessment in this Report consists of a landfall option further to the west (western option)using the HDD trenchless method and the construction of a 400 kV overhead line from the ONS substation to the PSE substation, instead of the underground cables proposed by the Investor.

The location and technology variant adopted for the assessment is rational, it is feasible to realise it with the current state of the law, the required technical and technological conditions, and the current state of knowledge of the environmental conditions.

The western variant of the landfall of the cables was analysed according to the concept for which the investor obtained the environmental decision in March 2019. The natural data collected at that time, updated to include the results of the nature inventory performed in 2021-2022 and the assumed land occupation paramaters etc. were used in this Report to assess this option.

In the case of an alternative method of connecting the sited LSE substation with the existing PSE Słupsk-Wierzbięcino substation, i.e. running a 400 kV extra-high voltage line over a distance of approximately 4 km (instead of cable lines), the following technical parameters were adopted:

- line length: approx. 6 km,
- number of tracks: 2,
- phase voltage of individual tracks of the line: 400 kV,
- line load current (for each track) = 1250 A,
- maximum load on 1 track of line 1250 A,
- smallest distance of conductors from the ground: 10 m,
- height of poles: max. 100 m.

Basic construction and installation works will include:

- construction of access roads,
- felling of trees and bushes,
- excavation for pole foundations and earthworks (pole excavation dimensions approx. 10 x 8 m, depth approx. 4 m),
- construction of the foundations (pile columns to a depth of 15 m below ground level are planned for weak soils),
- backfilling of foundations with soil compaction,
- pole installation on the foundations,
- installation of fittings and cables on the poles,
- anti-corrosion treatment of the poles,
- restoration of the surroundings of the poles and any temporary access areas to the state prior to the start of construction.

The construction of the mid-forest 400 kV overhead line under alternative variant wouldinvolve clearing in a 35 m wide strip, over a distance of approximately 6 km. The operation phase of the 400 kV overhead line, on the other hand, would be associated with the establishment of a 70 m wide technological corridor from the 400 kV line (35 m each from the line axis in both directions).

The overhead power line is a source of electromagnetic field and noise emissions. In order to perform a comprehensive environmental impact assessment as part of this EIA Report, calculations of noise (Appendix 4, Volume IV) and electric and magnetic field strength distribution in the vicinity of the overhead line (Appendix 5, Volume IV) were performed. The results of the calculations are included in the chapter assessing the environmental impact of the reasonable alternative (Chapter 11).

5. PREDICTED ENVIRONMENTAL CONSEQUENCES OF NOT UNDERTAKING THE PROJECT

Failure to undertake the planned Project is associated with consequences that need to be considered at different levels - from the European level, through the national and regional level.

According to the Energy Policy of the European Union, Poland should aim at the diversification of electricity sources, decarbonisation of the economy and transition to a low-carbon economy in line with the Paris Agreement.

The European Green Deal calls for a series of actions leading to net zero greenhouse gas emissions in 2050. European Council endorsed a new binding EU target to reduce net greenhouse gas emissions by at least 55% by 2030.

The dynamic development of offshore wind energy in the Baltic Sea is to become one of the pillars of Poland's energy system. In the current version of PEP2040, about 11 GW of installed capacity in offshore wind farms is expected to be reached in 2040.

On 29 March 2022, the Council of Ministers adopted the assumptions for updating the ‘Energy Policy of Poland until 2040’ (PEP2040). The Policy update assumes the technological diversification and expansion of capacities based on domestic sources, thus strengthening Poland's energy security and independence.

The planned Project, consisting of the construction of connection infrastructure from the offshore wind farms BII and BIII, is a public purpose investment, i.e. its implementation is important for the achievement of strategic goals of international and national importance.

Offshore and onshore connection infrastructure is an investment necessary for the operation of offshore wind farms. Its purpose is to lead out the produced power and to transmit it to the National Power Grid. Failure to complete the connection infrastructure will result in the loss of essence of functioning of the offshore wind farms and a lack of basis for their execution.

The development of offshore wind energy requires appropriate electricity infrastructure. Failure to undertake the investment will make it impossible to achieve the main climate and energy goals and objectives. Diversification of energy sources, especially those focused on renewable sources, has a significant impact on reducing atmospheric emissions and decreasing dependence on imports. The planned Project will be an element ofthe energy sector.

Failure to undertake the planned Project means that there will be no impact on the marine and terrestrial environment as described in Chapter 9 and 10. This impact is mainly associated with the construction phase and is mostly of local, temporary and in most cases reversible. The lack of implementation of the planned Project does not mean that the natural environment will remain in its present state. Anthropogenic pressure and climate change are external factors that continuously shape regional and local natural conditions.

As the planned Project will not have a significant negative impact on protected natural valuable areas, including Natura 2000 sites, no significant benefits for the protection of these areas are expected if the Project is not implemented (Chapter 9.5.1. Volume IV appendix 7).

6. CURRENT USE OF THE WATER BODY AND LAND IN THE AREA OF THE PLANNED PROJECT

6.1. OFFSHORE

The main applicable source of data on the existing and planned use of water bodies along the route of the planned connections of the MFW Bałtyk II and MFW Bałtyk III is the POM Plan adopted by the Regulation of the Council of Ministers on 14 April 2021 (Journal of Laws 2021.935, as amended). Within the POM Plan, the water bodies have been designated and water body charts for them have been prepared. These charts include information on the existing development and the current use of the water bodies, as well as the planned projects notified to the Maritime Office in Gdynia and Szczecin. The planned Project passes through 7 water areas (the course of the Project is shown in figure 3.1 in Subchapter 3.1). The conditions resulting from the charts of these seven water bodies and the identified compliance of the planned Project with the POM are presented, in more detail, in Subchapter 2.2. Planning Documents.

An equally important source of information on the planned use of water bodies is the portal (sipam.gov.pl) - i.e. the Maritime Administration Spatial Information System (so-called sipam), where information on, i.a., issued permits is posted on an ongoing basis.

For the analysis of the present use of the water bodies, the navigational analysis prepared for this Report and included in Volume IV (Attachment 3) was also used. The data contained therein was used for the analysis of current fishing vessel traffic intensity in the Ustka Port area and traffic intensity on the main navigation route in the Baltic TSS Ławica Słupska.

6.1.1. Fishery (fishery effort and efficiency)

To characterise the fishery in the area of the planned Project, the fishing data of the Gdynia Fishery Monitoring Centre (CMR) from 2018-2021 for fishing quadrants: L5, L6, L7, L8, M7, M8, N7, N8, was used, through which the planned ECI corridor runs. The location of the planned Project against the background of the fishing quadrants is shown in figure 6.1. Average prices of the main commercially exploited fish species were determined (Kuzebski, 2021) for the years 2019, 2020 and 2021 (for the period from January to November). On this basis, the value of catches in individual fishing squares and in relation to the total value of catches of the Polish Baltic fleet was estimated. In addition, based on FMC data, the routes of fishing vessels in the analysed area in 2021 were determined, as well as the amount of fishing effort expressed by the number of hours a given unit was present in individual fishing squares.

The planned Project interferes with the areas of the listed fishing quadrants to varying degrees, as shown in table 6.1.

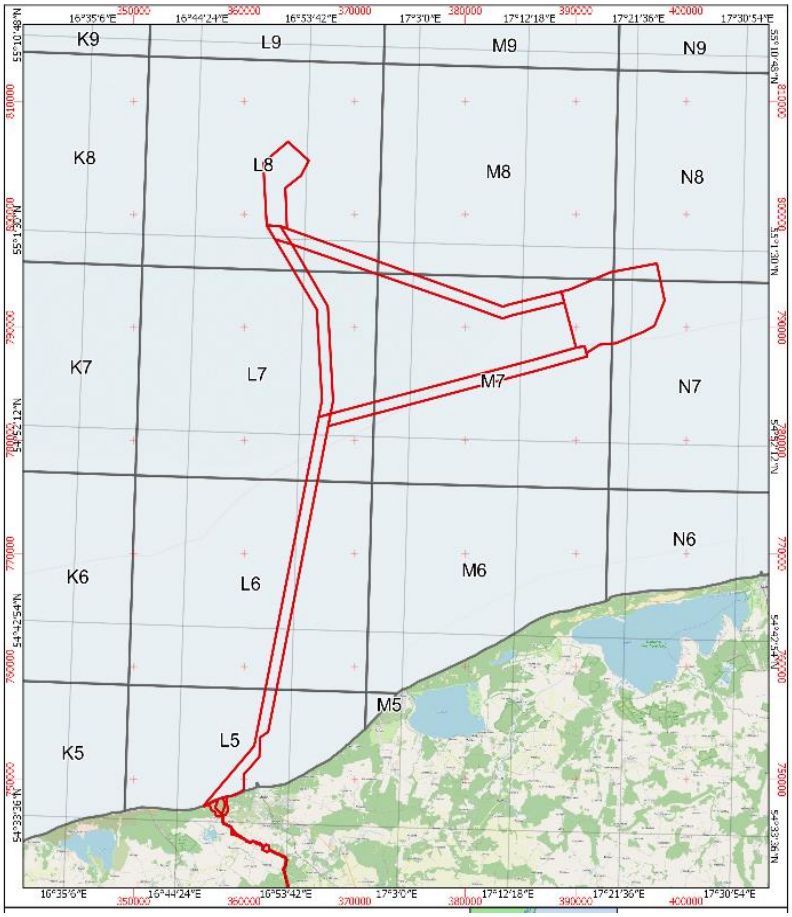


Figure 6.1. *Location of the planned Project against the background of the fishing quadrants*

Source: In-house study

Table 6.1. *The size of the area occupied by the connection infrastructure of the MFW Bałtyk II and MFW Bałtyk III, in relation to fishing squares*

Fishing quadrant	Area of the fishing quadrant [km^2]	Area covered by the Environmental Decision application [km^2]	Width of the corridor [km]	% of occupied area
L5	187.8	13.37	0.39-3.9	7.1
L6	397.9	18.71	1	4.7
L7	396.2	23.64	1	6.0
L8	394.6	32.2	1-3.06	8.2
M7	396.2	58.94	1-6.1	14.9
M8	394.5	2.34	-	0.6
N7	396.1	20.87	-	5.3
N8	394.5	4.56	-	1.2

Source: In-house study

The largest share of the area covered by the application for the environmental decision concerns the fishing quadrant No. M7 (14.9%). This is due to the fact that both the part of the ECI included in the area of MFW Bałtyk III, as well as two sections of the cable power line connecting the MFW Bałtyk III with the shore (approx. 19.7 km) and the connector between the MFW Bałtyk II and Bałtyk III (approx. 15.8 km), are located in this quadrant. A smaller share of the area will be included in the application for the environmental decision for L8 and L5 quadrants (8.2% and 7.1% respectively). In the case of L5, it results from its smaller total area, as it is located in the coastal zone. For the L7 and

N7 quadrants, the proportion of the area covered will be 6.0% and 5.3% respectively, and for the remaining quadrants it will be less than 5%.

Due to the ban on directed eastern stock cord fishing implemented from mid-2019, data was analysed separately for 2018-2019 (table 6.2.) and for 2020-2021 (table 6.3.).

In 2018-2019, anchored gill nets were the most commonly used fishing gear in the fishing quadrants in question, with a total catch of over 484 tonnes of fish (35,9% of catch weight using the aforementioned fishing net). Another frequently used tool was bottom otter trawls, which harvested over 372 tons of fish (27.6%). Midwater otter trawls were used by a much smaller number of vessels, but the catch with this gear was high (over 399 tonnes, 29.6%). The second most frequently used gear was bottom otter trawl, which caught over 189 tonnes of fish (21.6%). Set longlines were also a fairly frequently used gear, but the catch weight was moderate 92 tonnes (6.9%), while drifting longlines catches reported in kilograms were negligible. In salmonid catches reported in units, however, drifting longlines were the most commonly used gear, with 1054 fish caught (28.9%). Anchored gill nets were less frequently used to catch this group of fish, but the number of fish caught with this method was the highest (2,536 fish, 69.6%). In addition, salmonids were incidentally caught in set longlines (56 fish).

In 2020-2021, in the fishing quadrants in question, the most frequently used fishing gear was again, as in 2018-2019, anchored gill nets, in which a total of over 166 tonnes of fish were caught (18.7% of the catch by weight). Midwater otter trawls were used quite infrequently, but the catch with this gear was the highest (over 569 tonnes, 63.9%), and well above the value for 2018-2019. The next most frequently used gear was bottom otter trawls, in which nearly 156 tonnes of fish were taken (17.5%). Drifting longlines catches reported in kilograms were small (0.17 tonnes). There was no set longlines fishing during the period in question, as this gear is mainly used to catch cod, which was not subject to directed fishing at the time. In the salmonid catches reported in numbers of fish, drifting longlines were the most frequently used gear, with 1,232 fish caught (58.2%). The less frequently used gear in the catch of this group of fish was gill nets (anchored). Moreover, the number of fish caught with this method was lower (884 fish, 41.8%).

Fishing effort for all analysed fishing quadrants in years 2018-2021 was in total from 1,444 to 2,120 fishing days (table 6.2). It was the highest in 2018 and after that it was lower in 2019-2020 and higher in 2021 again. In the fishing quadrants L6, L7, L8, M7, M8, N7 and N8 (excluding a costal zone) the percentage in the fishing effort of vessels of over 12 m long, was the highest in 2019 (55%), and the lowest in 2020 (27%). Moreover in the fishing quadrant L5 located in the coastal zone, the percentage of smaller vessels was very high throughout the entire period, ranging from 86% to 99%. Efficiency measured by weight of fish caught in one fishing day was in total from 255 kg/day in 2020 to 377 kg/day in 2019 for all discussed fishing quadrants. On the other hand, the fishing productivity in the analyzed area was the highest in 2018 (249 kg/km^2), in years 2019 – 2020 dropping to 125 km/km^2, and in 2021 grew to 177 kg/km^2. The average value for all considered fishing quadrants in the analysed period was 189 kg/km^2, the highest average fishing productivity was recorded in the M8, L8 (open sea zone) and L5 (including coastal zone) quadrants. The lowest values was obtained in quadrants N8 and N7 (table 6.3.). Fishing productivity in analysed area was relatively low – about 4,6 % of average value for the Polish Sea Areas in 2014 – 2019.

Table 6.2. *Fishery effort (expressed in fisfing days in a given year) and efficiency in considered fishing quadrants in years 2018-2021*

Fishing quadrants	Vessel lenght	Year			
		2018	2019	2020	2021
L5	< 12 m	315	608	611	735
	≥ 12 m	15	5	100	108
	Total	**330**	**613**	**711**	**843**
	Efficiency (kg/day)	**187**	**103**	**47**	**77**
L6	< 12 m	160	130	87	269
	≥ 12 m	230	125	147	216

	Total	**390**	**255**	**234**	**485**
	Efficiency (kg/day)	**351**	**201**	**165**	**100**
L7	< 12 m	125	79	34	95
	≥ 12 m	180	87	106	51
	Total	**305**	**166**	**140**	**146**
	Efficiency (kg/day)	**362**	**391**	**317**	**180**
L8	< 12 m	180	108	6	8
	≥ 12 m	163	43	21	22
	Total	**343**	**151**	**27**	**30**
	Efficiency (kg/day)	**469**	**403**	**2583**	**6833**
M7	< 12 m	144	73	16	41
	≥ 12 m	162	111	74	62
	Total	**306**	**184**	**90**	**103**
	Efficiency (kg/day)	**356**	**309**	**277**	**305**
M8	< 12 m	129	45	10	19
	≥ 12 m	92	50	78	50
	Total	**221**	**95**	**88**	**69**
	Efficiency (kg/day)	**392**	**2668**	**931**	**1934**
N7	< 12 m	113	85	34	14
	≥ 12 m	34	25	38	33
	Total	**147**	**110**	**72**	**47**
	Efficiency (kg/day)	**385**	**398**	**281**	**164**
N8	< 12 m	50	33	13	29
	≥ 12 m	28	16	69	82
	Total	**78**	**49**	**82**	**111**
	Efficiency (kg/day)	**176**	**371**	**673**	**58**
Total		**2120**	**1623**	**1444**	**1834**
Efficiency (kg/day)		**347**	**377**	**255**	**285**

Source: In-house study basing on data from Fishery Monitoring Centre

Table 6.3. *Fishery productivity in considered quadrants in 2018-2021*

Fishing quadrants	Fishery productivity (fishing kg/km²)				
	2018	**2019**	**2020**	**2021**	**Average**
L5	329	336	180	345	**297**
L6	344	129	97	121	**173**
L7	279	164	112	66	**155**
L8	408	154	177	520	**315**
M7	275	143	63	79	**140**
M8	219	642	208	338	**352**
N7	143	111	51	19	**81**
N8	35	46	140	16	**59**
Total	**249**	**207**	**125**	**177**	**189**

Source: In-house study basing on data from Fishery Monitoring Centre

The value of catches in each fishing quadrant potentially impacted by the Project in 2019, 2020 and 2021 was analysed.

In 2019, the total fish catch in all analysed quadrants was 612.3 tonnes. With average annual fish prices, this translated into a value of about 1,155 thousand PLN, which accounted for 0.64% of the

total catch value of the Polish Baltic fleet in 2019. Cod accounted for the largest share in the value of catches in the fishing quadrants in question (47%). The revenue from flounder (22%) and sprat (15%) was also significant.

In 2020, the total fish catch in all analysed quadrants amounted to 368.7 tonnes. With average annual fish prices, this translated into a value of approx. 575 thousand PLN, which constituted 0.41% of the total value of catches of the Polish Baltic Sea fleet in 2020. Flounder had the largest share in the value of catches in the fishing quadrants in question (32%), with a significant share of herring (25%) and cod (22%). The share of cod in catch value has more than doubled compared to 2019, while the share in catch weight has more than doubled. This disparity is due to a significant increase in the average annual price of cod (from 5.17 PLN/kg in 2019 to 6.73 PLN/kg in 2020) and a lower total catch weight in 2020.

In 2021, the total fish catch in all analysed quadrants amounted to 523.4 tonnes. With the average annual fish prices, this translated into a value of approx. 617 thousand PLN, which constituted 0.47% of the total value of catches of the Polish Baltic Sea fleet in 2021. The largest share in the value of catches in the discussed fishing quadrants was taken by sprat (43%), with a significant share of flounder (24%). Herring constituted 16% and cod 11% of the catch value. Other species accounted for 6% of the catch value. The share of cod in the catch value has again decreased by two times compared to 2020, while the share in the catch weight has decreased by more than two times. The average price of cod rose to 8.26 PLN/kg, the prices of sprat and herring increased slightly in subsequent years, while the prices of flounder were lower in 2021 than in previous years.

An almost 2-fold decrease in the volume and value of catches can be observed in 2020 compared to 2019, and a certain increase in these values in 2021 compared to 2020, but not reaching the level of 2019. One of the main factors driving these changes is the introduction of a ban on directed cod fishing from mid-2019, the catches of which decreased in subsequent years from 105 tonnes (2019) through 18 tonnes (2020) to 8 tonnes (2021) in the fishing quadrants in question. In contrast, a significant share of sprat (287 tonnes) was responsible for the renewed increase in total catches in 2021.

Navigational analyses – Fishery

A detailed discussion of navigational data in terms of potential impacts on the fishery is provided in the Navigation Analysis (Volume IV, Attachment 3). The picture of fishing vessel traffic was based on AIS data for the year 2021. Vessel traffic volumes are shown regardless of vessel speed (figure 6.2). In the study cited above, it was assumed that 5 knots is the upper speed limit at which vessel fishing can take place. Figure 6.3 shows the traffic volume of vessels travelling at less than 5 knots (fishing vessels).

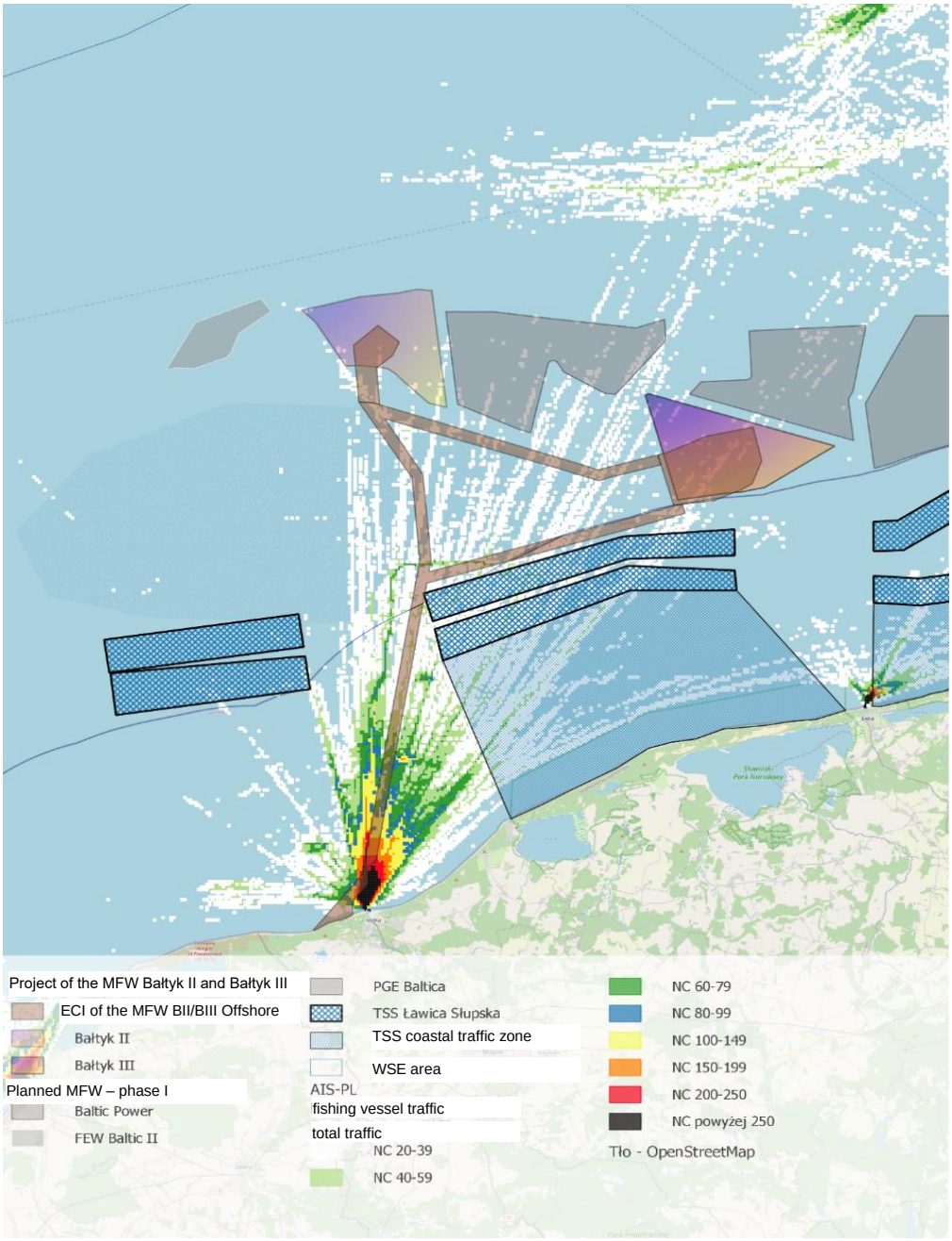


Figure 6.2.*Traffic of all fishing vessels based on AIS-PL data in 2021*

Source: Navigation analysis (Volume IV of this report, Attachment 3)

In general, there is a high intensity of fishing vessel traffic in the area of Ustka, which is connected with the approach of vessels to the port. At a distance of approximately 10.5 km, the ECI crosses an area with a significant number of passing vessels (>100 per year). Further offshore, vessel traffic disperses to the east and west and the frequency of passage in the ECI decreases significantly.

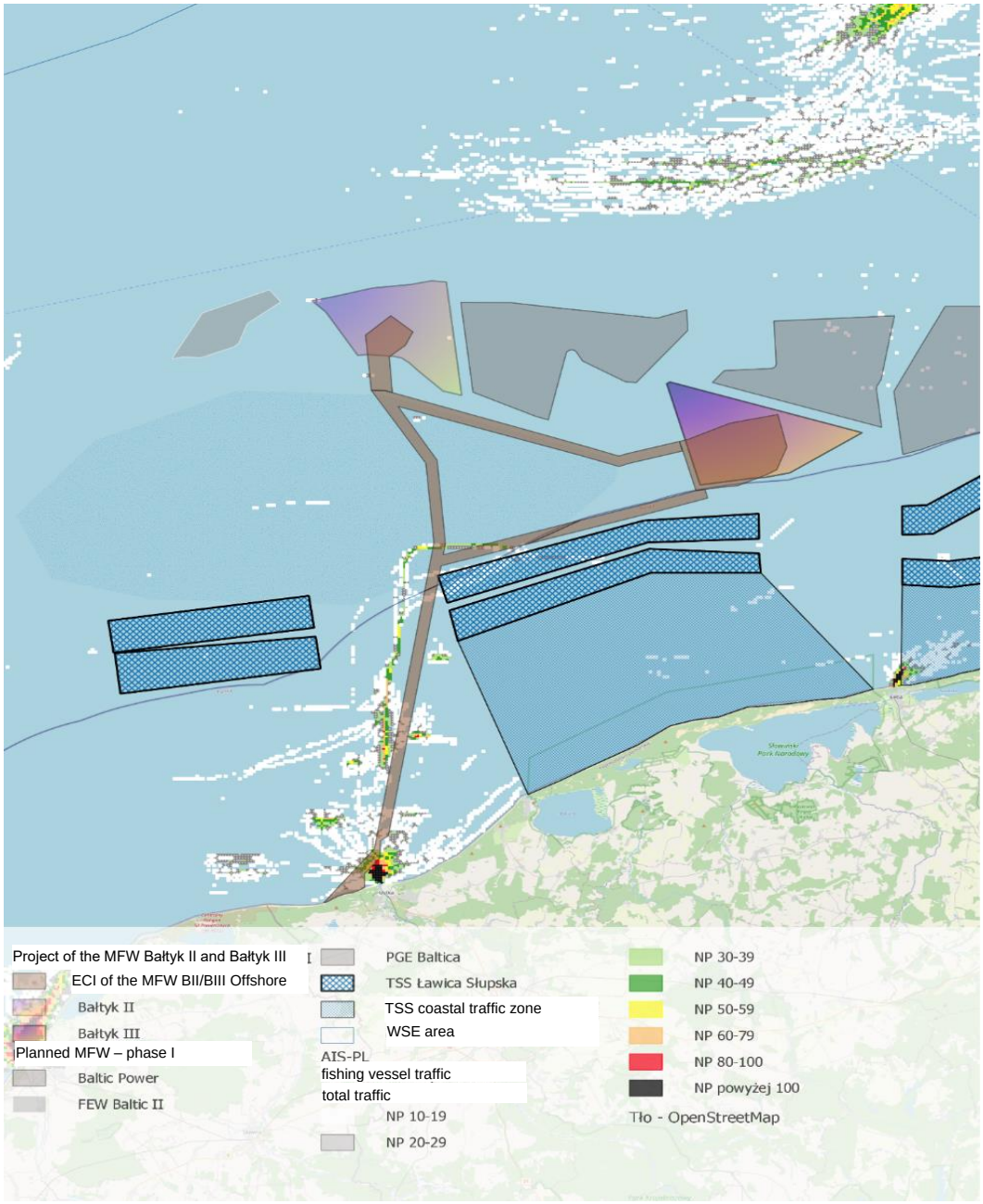


Figure 6.3. *Fishing vessel traffic under 5 knots, based on AIS-PL 2021 data*

Source: Navigation analysis (Volume IV of this report, Attachment 3)

Figure 6.3 shows the routes of fishing vessels travelling at less than 5 knots. Fishing vessels in 2021 were both within and in the immediate vicinity of the ECI corridor. According to the ICES classification, the Project is located in four fishing areas covering 8 fishing quadrants. The estimated fishing intensity in the ECI corridor of the MFW-BII/BIII and in its closest vicinity is presented in table 6.4.

Table 6.4. *Fishing quadrants where fishing vessels travelling at less than 5 knots have been recorded. The ICES division and the fishing quadrants in which the ECI is located are taken into account*

ID-ICES	Fishing quadrant	Number of registrations	Maximum number of crossings	ECI Kilometres
38G6	L5, L6, L7	Very high (>500)	99	15-19; 25-49; 48-53(ECI-BIII)
39G6	L8	Very low (<10)	25	67-69
38G7	M7, N7	Low (10 - 20)	49	54 - 56 (ECI-BIII)
39G7	M8, N8	No registration		

Source: Navigation analysis (Volume IV of this report, Attachment 1.3)

The analysis of the traffic of fishing vessels in the different fishing areas shows that the most sensitive area is the ICES area 38G6, which roughly covers the ECI corridor of the MFW-BII/BIII located in territorial waters, in the section between the TSS Ławica Słupska and the port of Ustka. This area includes fishing quadrants L5, L6 and L7. Probable fishing locations have been identified on both sides of the corridor, with the most intense locations approximately 6 Mm (11 km) offshore. The intensity of fishing vessel traffic is very high in the vicinity of Ustka, but this is also considered to be related to approaching the port and not solely to fishing.

Analysis of the catches in particular fishing quadrants

L5 fishing quadrant

In 2018-2019, a total of more than 125tonnes of fish belonging to 13 fish species and groups were caught (0.1% of the total catch in the POM for that period). Flounder dominated the catch weight (436.49%), with a significant share of cod (28.4%) and smaller shares of sprat (14.2%) and herring (12.2%), other species were caught in smaller numbers. The catches of salmonid species included 368kg and 2353 sea trout (3.74% of the total catches in the POM in pieces in the period), 32 Atlantic salmon and 7 kg and 2 rainbow trout. In the period in question, 29 fishing vessels operated in the L5 quadrant, using anchored gill nets, midwater otter trawls and set longlines.

A total of more than 98.41 tonnes of fish belonging to 11 fish species and groups were caught in 2020-2021 (0.10% of the total catch in the POM for that period). The catch weight was significantly dominated by flounder (68.2%), with a significant share of herring (23.5%) and much smaller shares of plaice (2%), sprat (2.0%) and cod (1.8%), other species were caught in smaller numbers. The catch of salmonid species recorded 12 kg and 13 pieces of Atlantic salmon and 1,022 kg and 731 pieces of sea trout (the most abundant catch in the fishing squares analysed) - a total of 2.2% of the total catch in POM in pieces from this period. Compared to 2018-2019, there was a significant decrease in catches of cod (due to the ban on directed fishing) and sprat, with a significant increase in catches of of flounder and herring. Catches of salmonids remained high in both periods. In the period in question, a total of 35 fishing vessels (the largest number in the analysed fishing quadrants) were operating in the L5 quadrant, using anchored gill nets, midwater otter trawls and bottom otter trawls. The analysis of the traffic intensity of fishing vessels travelling at fishing speed (less than 5 knots) for the year 2021 showed a significant number of locations (>500) in the ECI corridor area in the L5 quadrant, which, however, in the vicinity of Ustka, may also be related to approaching the port rather than fishing.

The value of catches in the L5 quadrant changed from 122.576 thousand PLN in 2019, through 52.81 thousand PLN in 2020 to 82.56 thousand PLN in 2021. This represented between 0.04% and 0.07% of the value of catches of the Polish Baltic fleet.

L6 fishing quadrant

In 2018-2019, a total of more than 187,99 tonnes of fish belonging to 10 fish species and groups was caught (0.674% of the total catch in the POM from that period). The catch weight was codominated by flounder (46.4%), andcod (45,1%) with a smaller share of plaice (7.3%), while other species were caught in smaller numbers. The catches of salmonid species included 33 kg and 166 pieces of Atlantic salmon and 254 pieces of sea trout (altogether 0.64% of the total catches in the POM in pieces in this

period). A total of 43 fishing vessels operated in the L6 quadrant during the period, using, anchored gill nets, otter bottom trawls, set and drifting longlines and pelagic otter trawls.

A total of more than 86.83 tonnes of fish belonging to 9 fish species and groups were caught in 2020-2021 (0.90% of the total catch in POM for that period). The catch weight was by far dominated by flounder (77.5%), with smaller contributions from cod (7.4%) and plaice (5.5%), and small contributions from herring (4.8%) and turbot (3.3%). Other species were caught in smaller numbers. In the salmonid species catch, 8 kg and 31 pieces of Atlantic salmon and 17 kg and 11 pieces of sea trout were recorded (together 0.12% of the total catch in the POM in pieces from this period). Compared to 2018-2019, there was a over 10-fold decrease in cod catches (due to the ban on directed fishing), with a slight decrease catches of flounderand increases in herring and turbot catches. Salmonid catcheshave decreased significantly compared to 2018-2019. A total of 27 fishing vessels operated in L6 during the period in question, using bottom otter trawls, anchored gill nets, midwater otter trawls and drifting longlines. An analysis of fishing vessel traffic volume moving at fishing speed (less than 5 knots) for 2021 showed a significant number of locations (>500) in the ECI corridor area in L6 quadrant, indicating fairly intensive fishing in the area.

The value of catches in the L6 quadrant fell from 140.37 thousand PLN in 2019, through 75.69 thousand PLN in 2020 to 73.62 thousand PLN in 2021. This represented between 0.05% and 0.08% of the value of catches of the Polish Baltic fleet.

L7 fishing quadrant

A total of more than 1754,27 tonnes of fish belonging to 10 fish species and groups were caught in 2018-2019 (0,275% of the total catch in the POM for the period). The catch weight was dominated by flounder (48,4%), with a significant share of cod (32.2%), with a smaller share of sprat (10.4%) and a small share of plaice (4.9%); Other species were caught in smaller numbers. In the salmonid fishery, 74 Atlantic salmon were recorded and 40kg of 95 pieces sea trout (0.26% of the total catches in the FMP in pieces during the period). In the period in question, a total of 21 fishing vessels operated in L7 using bottom otter trawls, anchored gill nets, set longlines and pelagic otter trawls.

A total of more than 70.66 tonnes of fish belonging to 8 fish species and groups were caught in 2020-2021 (0.73% of the total catch in the POM for the period). The catch weight was by far dominated by flounder (72.1%), with a smaller share of cod (12.5%), and small shares of plaice (5.6%), turbot (4.8%) and herring (4.3%). Other species were caught in smaller numbers. The catch of salmonid species recorded 62 kg and 40 pieces of Atlantic salmon and 3 kg and 1 piece of sea trout (a total of 0.12% of the total catch in the POM in pieces from this period). Compared to 2018-2019, there was a decrease in catches of cod (due to the ban on directed fishing) and flounder. The decreasing trend also affected plaice and herring catches; in 2020 - 2021 there was no catches of sprat. Catches of salmonids remained relatively low in both periods, with an apparent downward trend During the period in question, a total of 21 fishing vessels operated in the L7 using bottom otter trawls, anchored gill nets, midwater otter trawls and drifting longlines. Traffic analysis of fishing vessels travelling at fishing speed (less than 5 knots) for 2021 showed a significant number of locations (>500) in the ECI corridor area in L7 quadrant, indicating fairly intensive fishing in this area.

The value of catches in the L7 quadrant fell from 124.9 thousand PLN in 2019, through 98.0 thousand PLN in 2020 to 47.5 thousand PLN in 2021. This represented between 0.04% and 0.07% of the value of catches of the Polish Baltic fleet.

L8 fishing quadrant

In 2018-2019, a total of more than 221,72 tonnes of fish belonging to 8 fish species and groups were caught (0.22% of the total catch in the POM from that period). Cod was by far the dominant species in the catch weight (61,1%), with a significant share of herring (28.0%) and a smaller share of herring (6.4%). Other species were caught in smaller numbers, 16kg and 5 pieces of Atlantic salmon and 54kg 133 pieces of sea trout (A total of 0.21% of total catches in POM in pieces from this period) was recorded in catches of salmonid species. During the period in question, a total of 29 fishing vessels operated in L8 using anchored gill nets, midwater otter trawls, set longlines, pond rims, ropornic bottom trawls and drifting longlines.

A total of more than 274.74 tonnes of fish belonging to 10 fish species and groups were caught in 2020-2021 (0.28% of the total catch in POM from that period). Sprat was by far the dominant species in the catch weight (75%), with a smaller share of herring (20.1%). Other species were caught in lesser numbers. In the catch of salmonid species, 17 Atlantic salmon were recorded. Compared to 2018-2019, there was a increase in catch weight and an increase in the number of species and fish groups caught. Catches of sprat have increased in particular, and there has also been an increase in catches of herring and flounder. There has been a drastic decline in cod catches (due to the ban on directed fishing); there was also a slight decrease in herring and flounder catches. Catches of salmonids have decreased significantly. In the period in question, a total of 11 fishing vessels (one of the lowest results recorded) operated in L8, using mainly midwater otter trawls and anchored gill nets. A traffic analysis of fishing vessels travelling at fishing speeds (less than 5 knots) for 2021 showed a low number of locations (<10) in the ECI corridor area in L8, indicating sporadic fishing in this area.

The value of catches in the L8 quadrant fluctuated from 210.255 thousand PLN in 2019, through 80.88 thousand PLN in 2020 to 198.28 thousand PLN in 2021. This represented between 0.06% and 0.15% of the value of catches of the Polish Baltic fleet.

M7 fishing quadrant

In 2018-2019, a total of over 165.81 tonnes of fish belonging to 9 fish species and groups were caught (0.13% of the total catch in the POM from that period). The catch weight was by far dominated by flounder (53.7%), with a significant share of cod (38.3%), and a small share of plaice (5.0%) and turbot (2.4%). Other species were caught in smaller numbers. In the salmonid catches, 33 Atlantic salmon and 82 sea trout were recorded (altogether 0.18% of the total catches in the FMP in pieces during the period). In the period in question, a total of 36 fishing vessels operated in M7 (which was the highest number in the fishing quadrants analysed) using bottom otter trawls, anchored gill nets, set longlines and midwater otter trawls.

A total of over 56.39 tonnes of fish belonging to 6 fish species and groups were caught in 2020-2021 (0.06% of the total catch in the POM from that period). Flounder (78.8%) was by far the dominant species in the catch weight, with smaller contributions from cod (11.1%), plaice (6.4%) and turbot (3.7%). Other species were caught in lesser amounts. In the salmonid species catch, 35 Atlantic salmon and 9 kg and 3 sea trout were recorded (together 0.11% of the total catch in the POM in pieces from this period). Compared to 2018-2019, there was a nearly 3-fold decrease in catch weight and a decrease in the number of species and fish groups caught. There was an increase in the share of flounder in the catch, a strong decrease in cod catches (due to the ban on directed fishing) and a decrease in plaice and turbot catches. Salmonid catches showed a decreasing trend. A total of 21 fishing vessels were operating in M7 during the period in question, using bottom otter trawls, anchored gill nets and drifting longlines. The analysis of the traffic of fishing vessels travelling at fishing speed (less than 5 knots) for the year 2021 showed a small number of locations (10-20) in the ECI corridor area in M7 quadrant, indicating periodic fishing in this area.

The value of catches in the M7 quadrant changed from 129.505 thousand PLN in 2019, through 53.68 thousand PLN in 2020 to 57.08 thousand PLN in 2021. This represented between 0.04% and 0.07% of the value of catches of the Polish Baltic fleet.

M8 fishing quadrant

In 2018-2019, a total of over 339.98 tonnes of fish belonging to 8 fish species and groups were caught (0.26% of the total catch in the POM from that period - the highest recorded catch weight). The catch was dominated by sprat (58.3%) with a significant share of cod (19.8%) and herring (17.9%) and a smaller share of flounder (3.7%). Other species were caught in smaller numbers. In the catch of salmonid species, 50 Atlantic salmon and 182 sea trout were recorded (altogether 0.37% of the total catches in POM in pieces from that period). A total of 33 fishing vessels operated in the M8 quadrant during the period in question, using midwater otter trawls, anchored gill nets, set longlines and bottom otter trawls.

In 2020-2021, a total of more than 215.42 tonnes of fish belonging to 10 fish species and groups were caught (0.22% of the total catch in the POM for the period, - the highest recorded catch weight).

The catch was dominated by sprat (52.4%) and herring (43.7%) with flounder accounting for 3.0%. Other species were caught in less amounts. The catch of salmonid species recorded 263 Atlantic salmon and 12 kg and 19 sea trout (together 0.83% of the total catch in the POM in pieces from this period). Compared to 2018-2019, there was a significant decrease in the weight of the sprat catch, an increase in the herring catch and almost no cod catch (due to the ban on directed fishing). An increase in the number of species and groups of fish caught was noticeable. The share of Atlantic salmon has increased, while the share of sea trout in catches has decreased; overall, catches of salmonids have increased. In the period in question, a total of 14 fishing vessels operated in the M8 quadrant, using midwater otter trawls, anchored gill nets, bottom otter trawls and drifting longlines. Despite the small number of vessels operating, the catch weight was the highest among the quadrats analysed, which is due to the targeting of bulk pelagic species (sprat and herring). The analysis of the traffic volume of fishing vessels moving at fishing speed (less than 5 knots) for the year 2021 showed a lack of locations in the ECI corridor area in M8 quadrant, indicating that this area is not used for fishing.

The value of catches in the M8 quadrant varied from 271,258 thousand PLN in 2019, through 101,04 thousand PLN in 2020 to 138,31 thousand PLN in 2021. This represented between 0.07% and 0.15% of the value of catches of the Polish Baltic fleet.

N7 fishing quadrant

A total of more than 100.43 tonnes of fish belonging to 10 fish species and groups were caught in 2018-2019 (0.08% of the total catch in the POM from that period). The catch weight was by far dominated by flounder (65.8%), with a significant share of cod (29.7%). Other species were caught in lesser numbers. The catches of salmonid species included 8 kg and 22 pieces of Atlantic salmon and 30 kg and 65 pieces of sea trout (altogether 0.14% of the total catches in POM in pieces from the period). In the period in question, a total of 20 fishing vessels operated in quadrant N7 using anchored gill nets, set longlines and bottom otter trawls.

In 2020-2021, a total of more than 27.91 tonnes of fish belonging to 8 species and fish groups were caught (0.03% of the total catch in POM from that period, the lowest recorded catch weight in the fishing quadrant). Flounder strongly dominated the catch (86.6%), cod had a 7.9% share and other species were less numerous. Only 32 kg and 8 pieces of Atlantic salmon were recorded in the salmonid species catch (0.02% of the total catch in POM in pieces from this period). There has been more than a 3-fold decrease in total catch weight compared to 2018-2019. There was an increase in the share of flounder and a decrease in the share of cod in the catch (due to the ban on directed fishing). A decrease in the number of species and groups of fish caught has been noted. The catch of salmonids has decreased, with trout fishing disappearing. In the period in question, a total of 15 fishing vessels operated in quadrant N7, using anchored gill nets, bottom otter trawls and drifting longlines. Analysis of the traffic volume of fishing vessels travelling at fishing speed (less than 5 knots) for the year 2021 showed a small number of locations (10-20) in the ECI corridor area in quadrant N7, indicating periodic fishing in this area.

The value of catches in the N7 quadrant fell from 95.629 thousand PLN in 2019, through 36.67 thousand PLN in 2020 to 12.49 thousand PLN in 2021. This represented between 0.01% and 0.05% of the value of catches of the Polish Baltic fleet.

N8 fishing quadrant

In 2018-2019, a total of more than 31.88 tonnes of fish belonging to 7 fish species and groups were caught (0.025% of the total catch in the POM from that period - the lowest catch weight in the fishing quadrant). Cod was by far the dominant species in the catch (51.1%), with a significant share of flounder (26.5%) and herring (20.4%). Other species were caught in smaller amounts. In the salmonid catches, 33 Atlantic salmon and 67 sea trout were recorded (altogether 0.16% of the total catches in POM in pieces in this period). A total of 17 fishing vessels (which is the lowest number of vessels) operated in quadrant N8 during the period in question, using anchored gill nets, bottom otter trawls, midwater otter trawls and set longlines.

A total of more than 61.68 tonnes of fish belonging to 8 fish species and groups were caught in 2020-2021 (0.06% of the total catch in POM from that period). The catch weight was dominated by

Lesser sand eel (45.4%) with a significant share of sprat (32.7%). Flounder contributed 11.1% and herring 10.5%. Other species were caught in smaller numbers. The catches of salmonid species recorded 46kg and 937 Atlantic salmon (the most numerous catch in the fishing squares analysed) and 1 sea trout (a total of 2.75% of the total catches in the POM in pieces from this period). Compared to 2018-2019, there was a nearly 2-fold increase in total catch weight. The catches included Lesser sand eel and sprat in large numbers, the share of herring and flounder decreased, while the share of cod decreased drastically (due to the ban on directed fishing). There was a very strong increase in catches of Atlantic salmon, with a simultaneous decrease in the share of sea trout in catches; overall, there was a significant increase in catches of salmonids. In the period in question, a total of 11 fishing vessels operated in N8 quadrant (which was one of the lowest recorded results), using midwater otter trawls, anchored set gillnets and drifting longlines. An analysis of the traffic volume of fishing vessels travelling at fishing speed (less than 5 knots) for 2021 showed a lack of locations in the ECI corridor area in M8 quadrant, indicating that this area is not used for fishing.

The value of catches in the N8 quadrant changed from 60.856 thousand PLN in 2019, through 75.94 thousand PLN in 2020 to 7.07 thousand PLN in 2021. This represented between 0.01% and 0.05% of the value of catches of the Polish Baltic fleet.

Table 6.5. *List of species found in commercial catches in the analysed fishing quadrants in 2018-2019*

Fishing quadrant	Species/group	Live weight catch (kg)	Catch (fish)	% weight	% fish
L5	**13 species**	**125 045**	**2 387**	**100,0**	**100,0**
	Cod	35 553		28,4	
	Plaice	8 923		7,1	
	Bream	35		<0,1	
	Atlantic salmon		32		1,3
	Perch	90		0,1	
	Roach	17		<0,1	
	Rainbow trout	7	2	<0,1	0,1
	Pikeperch	48		<0,1	
	European flounder	46 101		36,9	
	Sprat	17 700		14,2	
	Herring	15 217		12,2	
	Sea trout	368	2 353	0,3	98,6
	Turbot	986		0,8	
L6	**10 species**	**187 991**	**420**	**100,0**	**100,0**
	Garfish	400		0,2	
	Cod	84 810		45,1	
	Plaice	13 740		7,3	
	Atlantic salmon	33	166	<0,1	39,5
	Perch	14		<0,1	
	Pikeperch	22		<0,1	
	European flounder	87 173		46,4	
	Sprat	1 225		0,7	
	Sea trout		254		60,5
	Turbot	574		0,3	
L7	**10 species**	**175 268**	**169**	**100,0**	**100,0**
	Cod	56 361		32,2	
	Plaice	8 653		4,9	
	Atlantic salmon		74		43,8
	Roach	9		<0,1	

Fishing quadrant	Species/group	Live weight catch (kg)	Catch (fish)	% weight	% fish
	Pikeperch	2		<0,1	
	European flounder	84 849		48,4	
	Sprat	18 250		10,4	
	Herring	4 100		2,3	
	Sea trout	40	95	<0,1	56,2
	Turbot	3 004		1,7	
L8	**8 species**	**221 721**	**138**	**100,0**	**100,0**
	Cod	135 556		61,1	
	Plaice	55		<0,1	
	Atlantic salmon	16	5	<0,1	3,6
	European flounder	8 630		3,9	
	Sprat	14 150		6,4	
	Herring	62 000		28,0	
	Sea trout	54	133	<0,1	96,4
	Turbot	1 260		0,6	
M7	**9 species**	**165 817**	**115**	**100,0**	**100,0**
	Cod	63 480		38,3	
	Plaice	8 212		5,0	
	Atlantic salmon		33		28,7
	Perch	33		<0,1	
	Pikeperch	56		<0,1	
	Flounder	88 999		53,7	
	Herring	1 000		0,6	
	Sea trout		82		71,3
	Turbot	4 037		2,4	
M8	**8 species**	**339 987**	**232**	**100,0**	**100,0**
	Cod	67 347		19,8	
	Plaice	505		0,1	
	Atlantic salmon		50		21,6
	Flounder	12 510		3,7	
	Sprat	198 150		58,3	
	Herring	60 995		17,9	
	Sea trout		182		78,4
	Turbot	480		0,1	
N7	**10 species**	**100 436**	**87**	**100,0**	**100,0**
	Cod	29 866		29,7	
	Plaice	1 411		1,4	
	Bream	4		<0,1	
	Atlantic salmon	8	22	<0,1	25,3
	Perch	131		0,1	
	Pikeperch	428		0,4	
	Flounder	66 084		65,8	
	Bream	1		<0,1	
	Sea trout	30	65	<0,1	74,7
	Turbot	2 473		2,5	
N8	**7 species**	**31 887**	**100**	**100,0**	**100,0**

Fishing quadrant	Species/group	Live weight catch (kg)	Catch (fish)	% weight	% fish
	Cod	16 279		51,1	
	Plaice	275		0,9	
	Atlantic salmon		33		33,0
	Flounder	8 460		26,5	
	Bream	6 500		20,4	
	Sea trout		67		67,0
	Turbot	373		1,2	
Total		**1 348 149**	**3 648**		

Source: In-house study

Table 6.6. *List of species found in commercial catches in the analysed fishing quadrants in 2020-2021*

Fishing quadrant	Species/group	Live weight catch (kg)	Catch (fish)	% weight	% fish
L5	**11 species**	**98,417**	**750**	**100.0**	**100.0**
	Cod	1,771		1.8	
	Plaice	1,960		2.0	
	Common bream	21		<0.1	
	Salmon	12	13	<0.1	1.7
	Perch	26		<0.1	
	Pike-perch	42	3	<0.1	0.4
	Flounder	67,121	3	68.2	0.4
	Sprat	1,920		2.0	
	Herring	23,080		23.5	
	Sea trout	1,022	731	1.0	97.5
	Turbot	1,443		1.5	
L6	**9 species**	**86,834**	**42**	**100.0**	**100.0**
	Cod	6,443		7.4	
	Plaice	4,757		5.5	
	Salmon	8	31	<0.1	73.8
	Perch	110		0.1	
	Flounder	67,288		77.5	
	Sprat	1,200		1.4	
	Herring	4,170		4.8	
	Sea trout	17	11	<0.1	26.2
	Turbot	2,841		3.3	
L7	**8 species**	**70,666**	**41**	**100.0**	**100.0**
	Cod	8,855		12.5	
	Plaice	3,965		5.6	
	Salmon	62	40	<0.1	97.6
	Flounder	50,917		72.1	
	Herring	3,005		4.3	
	Lesser sand eel (ABZ)	500		0.7	
	Sea trout	3	1	<0.1	2.4
	Turbot	3,360		4.8	
L8	**10 species**	**274,747**	**17**	**100.0**	**100.0**

Fishing quadrant	Species/group	Live weight catch (kg)	Catch (fish)	% weight	% fish
	Three-spined stickleback	1,000		0.4	
	Sand eel	2,000		0.7	
	Cod	69		<0.1	
	Salmon		17		100.0
	Sea fish not elsewhere specified	2,000		0.7	
	Flounder	7,073		2.6	
	Sprat	206,100		75.0	
	Herring	55,350		20.1	
	Turbot	155		<0.1	
	Whiting	1,000		0.4	
M7	**6 species**	**56,391**	**38**	**100.0**	**100.0**
	Cod	6,243		11.1	
	Plaice	3,588		6.4	
	Salmon		35		92.1
	Flounder	44,455		78.8	
	Sea trout	9	3	<0.1	7.9
	Turbot	2,096		3.7	
M8	**10 species**	**215,424**	**282**	**100.0**	**100.0**
	Sand eel (YEZ)	800		0.4	
	Cod	520		0.2	
	Salmon		263		93.3
	Flounder	6,417		3.0	
	Sprat	112,900		52.4	
	Herring	94,100		43.7	
	Lesser sand eel (ABZ)	600		0.3	
	Sea trout	12	19	<0.1	6.7
	Turbot	25		<0.1	
	Whiting	50		<0.1	
N7	**8 species**	**27,913**	**8**	**100.0**	**100.0**
	Cod	2,203		7.9	
	Plaice	635		2.3	
	Salmon	32	8	0.1	100.0
	Perch	425		1.5	
	Pike-perch	110		0.4	
	Flounder	24,184		86.6	
	Herring	2		<0.1	
	Turbot	322		1.2	
N8	**8 species**	**61,681**	**938**	**100.0**	**100.0**
	Cod	75		0.1	
	Common bream	5		<0.1	
	Salmon	46	937	0.1	99.9
	Flounder	6,855		11.1	
	Sprat	20,200		32.7	

Fishing quadrant	Species/group	Live weight catch (kg)	Catch (fish)	% weight	% fish
	Herring	6,500		10.5	
	Lesser sand eel (ABZ)	28,000		45.4	
	Sea trout		1		0.1
Total		**892,073**	**2 116**		

Source: In-house study

In summary, the total catches in the analysed fishing quadrants were significantly higherbetween 2018-2019 (over 1348tonnes) than 2020-2021 (over 892 tonnes). In the first period, the highest catches were recorded in M8 fishing quadrant and the lowest in N8 quadrant (table 6.7). In contrast, in 2020-2021, the highest catches were recorded in L8 quadrant and the lowest in N7 quadrant. The highest increase in catch weight (by nearly 214 tonnes) was recorded for L8, while the highest decrease (by over 124 tonnes) was found in M8.

In the catch of salmonid species in 2018-2019, a total of 57 kg and 415 pieces of Atlantic salmon and 492 kg and 3231 pieces of sea trout were recorded. The catch of both species together accounted for 5,79% of the total catch in the POM from this period recorded in individuals. In contrast, between 2020 and 2021, a total of 160 kg and 1344 individuals of Atlantic salmon and 1061 kg and 766 individuals of sea trout were recorded. The catch of both species together accounted for 6.25% of the total catch in the POM from that period recorded in individuals. The total catch of both species in 2018-2019 was 549 kg and 3646 individuals, and in 2020-2021 was 1221 kg and 2110 individuals. Thus, there has been a significant increase in Atlantic salmon catches and a decrease in sea trout catches.

Table 6.7. *Size of catches per fishing quadrant in relation to total catches in POM in the period analysed*

Fishing quadrant	Total catch [tonnes] 2018-2019	% of catches in POM 2018-2019	Total catch [tonnes] 2020-2021	% of catches in POM 2020-2021
L5	125,045	0.10	98.417	0.10
L6	187,991	0.15	86.834	0.09
L7	175,268	0.14	70.666	0.07
L8	221,721	0.17	**274.747**	**0.28**
M7	165.817	0.13	56.391	0.06
M8	**339.987**	**0.26**	215.424	0.22
N7	100.436	0.08	27.913	0.03
N8	31.887	0.02	61.681	0.06
Total	**1 348,149**	**1,05**	**892.073**	**0.92**

Source: In-house study

A summary of the catch volumes in the analysed fishing quadrants in years 2018-2019 and 2020-2021 divided by the main commercially exploited species is presented in figure 6.4. The significant decrease in the share of cod catches (from 36% to 3%) is noteworthy, which is related to the introduction of the ban on directed fishing of this species from mid-2019. In addition, there has been an 19% increase in the share of sprat and 10% increase of herring catches, with no significant change in the share of flounder, plaice and turbot. Between 2020 and 2021, the share of Lesser sand eel (3%) was notable in the catch; this species was mainly caught in fishing quadrant N8. The reduction in cod catches has therefore resulted in an increase in catches of other primary commercial species and the exploitation of more fish species and groups from 14 to 17. Fishing effort for all analysed fishing quadrants in years 2018-2021 was in total from 1,444 to 2,120 fishing days. It was the highest in 2018. Efficiency measured by weight of fish caught in one fishing day was in total from 255 kg/day in 2020 to 377 kg/day in 2019. On the other hand, the fishing productivity in the analyzed area was the highest in 2018 (249 kg/km^2),

and the average value for all analyzed fishing quadrants during the period under review was 189 kg/km^2 and was relatively low (4,6% average value for POM in 2014-2019).

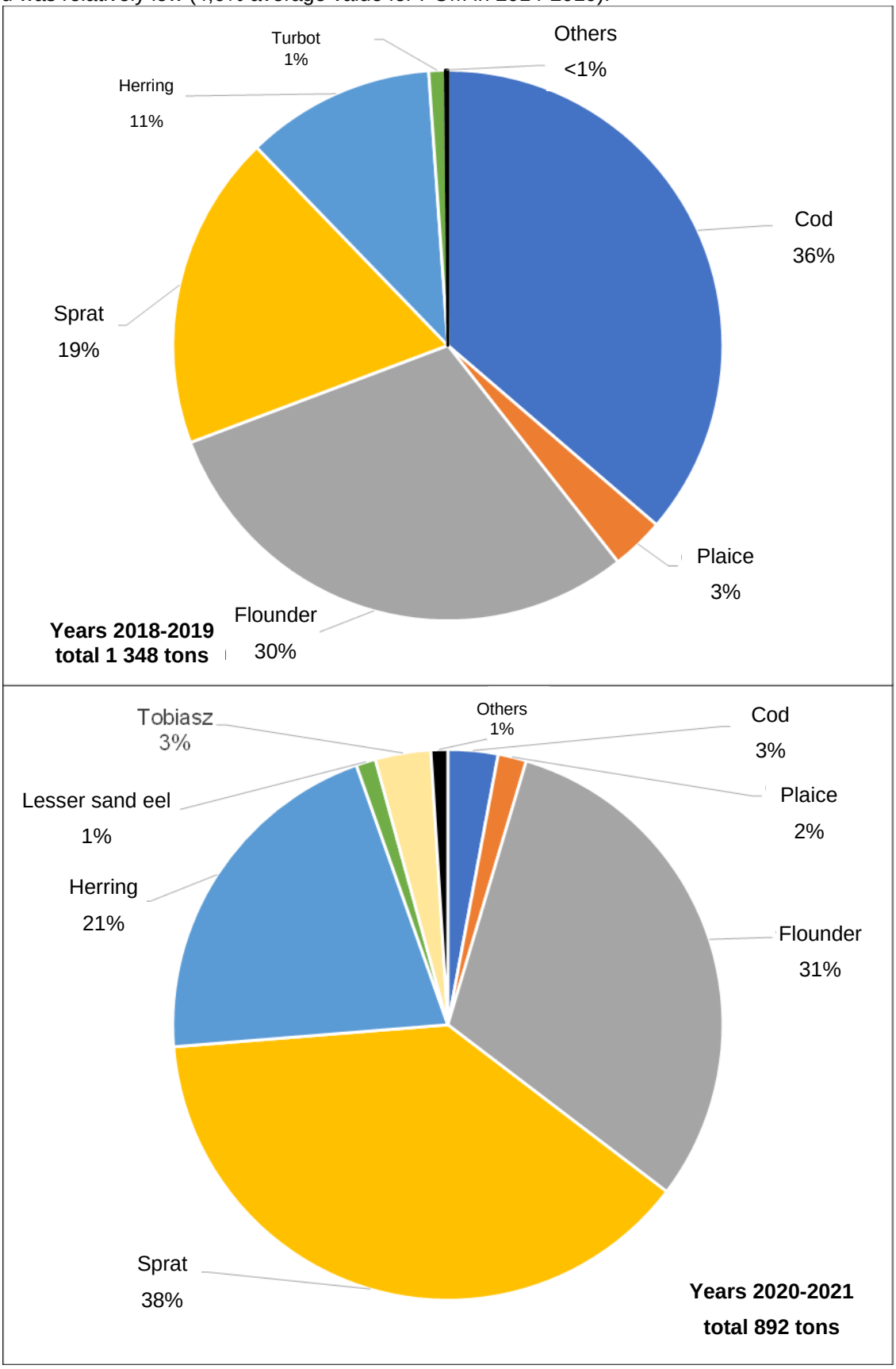


Figure 6.4. *Share of fish species and groups in the commercial catches conducted in the analysed fishing quadrants in 2018-2019 and 2020-2021*

With regard to the value of catches carried out in the fishing quadrants analysed, it is possible to observe an almost 2-fold decrease in the volume and value of catches in 2020 compared to 2019 and a certain increase in these values in 2021 compared to 2020, but not reaching the level of 2019. One of the main factors determining these changes is the introduction of a ban on directed cod fishing from mid-2019, the catches of which in the fishing quadrants in question decreased in subsequent years from 105 tonnes (2019) through 18 tonnes (2020) to 8 tonnes (2021). However, a significant contribution from sprat (287 tonnes) was responsible for the renewed increase in total catches in 2021. The total value of catches accounted for between 0.41 and 0.64% of the total value of catches of the Polish Baltic fleet, while the share of particular fishing quadrants ranged from 0.01 to 0.15%.

Analysis of the 2021 fishing vessel traffic in each quadrant shows that the area covering fishing quadrants L5, L6 and L7 is the most sensitive. Probable fishing locations have been identified on both sides of the corridor. The intensity of fishing vessel traffic is very high in the vicinity of Ustka, but this is also considered to be related to approaching the port and not only to fishing. In contrast, the area of the ECI corridor within the other fishing quadrants was not an important fishing area.

6.1.2. Maritime transport and shipping

The planned Project crosses the most important customary shipping route in the Baltic Sea, TSS Ławica Słupska, going, among others, to sea ports in Gdynia and Gdańsk (figure 6.5). In addition to vessels sailing to and from seaports, fishing vessels catching in the basin or sailing to other fishing grounds, as well as small recreational vessels (e.g. sailing yachts), also occur in the analysed water body. Vessel traffic in the TSS Ławica Słupska area is supervised by the Vessel Traffic Control Service VTS Ławica Słupska.

For the purposes of this Report, a navigational analysis was carried out, which is included in full in Volume IV (Attachment 3). A summary of the most important information is provided below.

On the basis of AIS data recorded by the Polish maritime administration in 2021, an analysis of vessel traffic was made with a classification split into two half-years, which is due to the new rules for regulating vessel traffic on the TSS Ławica Słupska introduced on 1 July 2021. The modified TSS has a different shape of directional tracks and a third part is added, and the eastern part has two lanes of variable width, a traffic separation zone of variable shape and width and a coastal traffic separation zone. Due to the new rules, the analysis was performed for the first and second half of 2021.

Four basins with different locations and expected vessel traffic were identified in the area of the planned Project (table 6.8, figure 6.5).

Table 6.8. *Subdivision into water bodies for vessel traffic analysis*

Name of the body of water	Description	Comments on the basin
A	ECI implemented in the area from the borders of MFW BII/BIII to the border of TSS Ławica Słupska	Nature 2000 Ławica Słupska
B	ECI implemented in the area of the Ławica Słupska TSS and in the ship traffic zone between the western and central parts of the TSS	The basin is part of the most important southern shipping route to the ports of the Gulf of Gdansk
C	ECI implemented in the coastal traffic zone up to a line located 3 Mm from the shore	Large traffic of small vessels not required to navigate the route designated by the TSS
D	ECI in the area of the 3 Mm wide strip delimiting the boundary for category D passenger shipping.	Large ship traffic associated with the operation of the port in Ustka

Source: navigation analysis (Volume IV, Appendix 3)

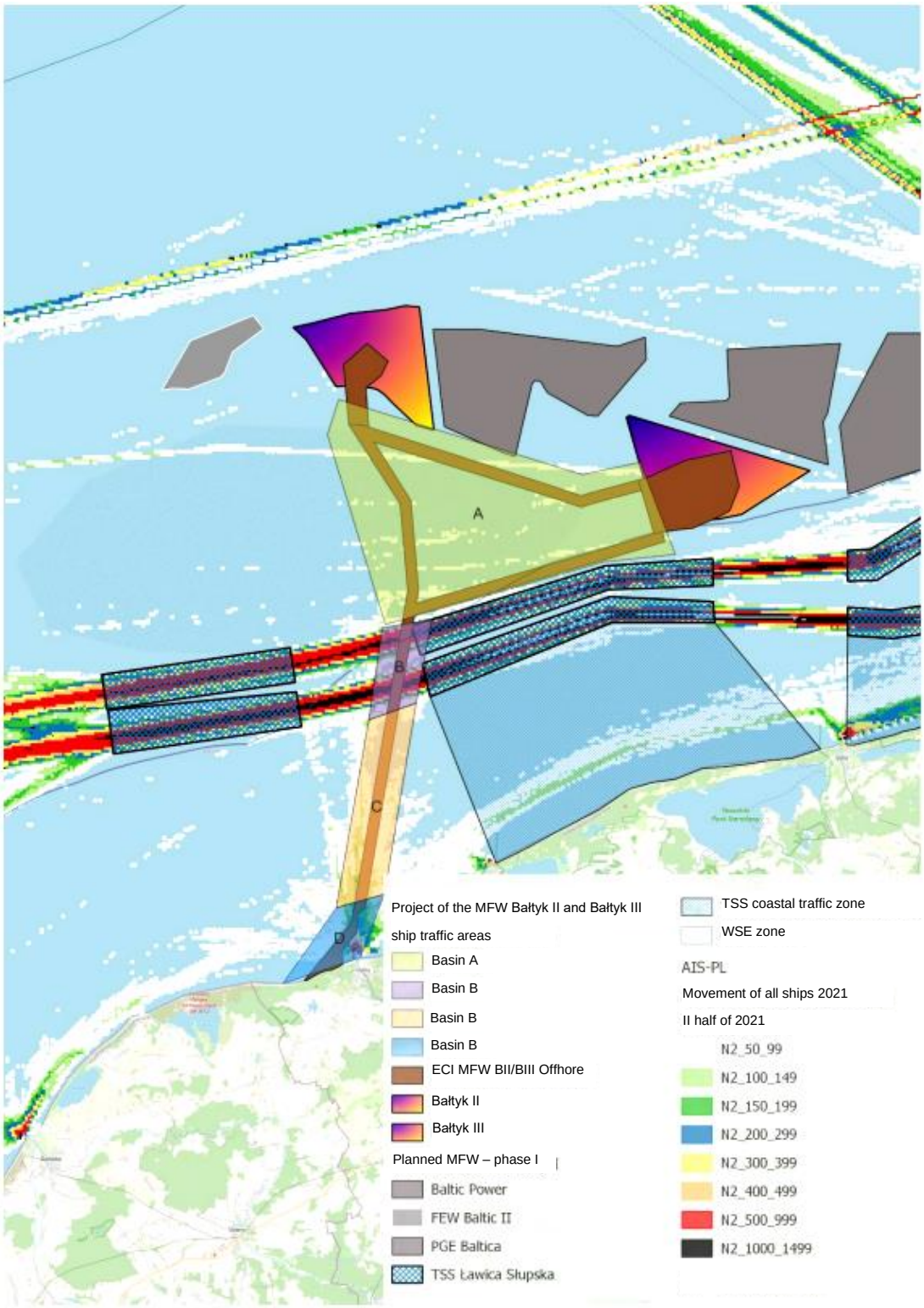


Figure 6.5. *Navigation areas in the planned Project zone*

Source: navigation analysis (Volume IV, Appendix 3)

The analysis of vessel traffic shows that in areas A, C and D, the presence of fishing vessels is dominant, accounting for nearly 60% of the total. In area B, commercial vessel traffic is clearly dominant, accounting for more than 60% of the total (table 6.9). In the A area, 11.5% is represented by the traffic of service vessels, which is related to preparatory works related to offshore wind energy. The presence of vessels in this category is expected to increase due to the large number of projects. In areas C and

D, recreational shipping has a significant share of almost 25%. The number of vessels in this category is expected to increase in the future due to the development of tourism.

Table 6.9. *Percentage of watercraft in each body of water*

Vessel category	Percentage of vessels in each navigation areas [%]			
	A	B	C	D
Fishing vessels	**57.65**	4.96	**60.27**	**54.64**
Recreational vessels	13.39	2.14	23.18	24.48
Merchant vessels	12.94	**63.47**	0.59	0.25
Service vessels	11.53	8.54	3.84	12.90
Tankers	2.08	18.84	2.56	0.00
Unidentified vessels	1.07	0.30	0.41	0.32
Warships	0.73	0.44	6.31	3.02
Other vessels	0.39	0.11	2.74	4.39
Passenger vessels	0.22	0.86	0.09	0.00
RoRo PAX vessels	0.00	0.35	0.00	0.00

Source: In-house study basen on navigation analysis (Volume IV, Appendix 3)

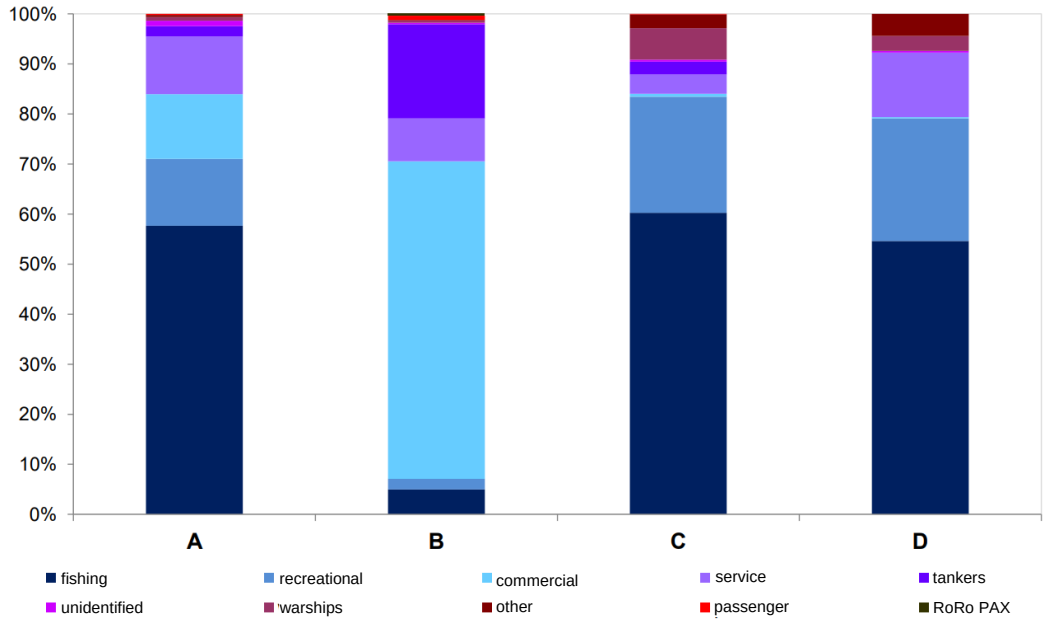


Figure 6.6. *Percentage of vessels in each navigation areas*

Source: In-house study basen on navigation analysis (Volume IV, Appendix 3)

The highest number of vessels - more than 6,500 - was recorded in area B, within the TSS Ławica Słupska. Commercial vessels accounted for just over 4,200 units. Equally high ship traffic in area D, exceeding 4,000 units per year, is connected with functioning of the port in Ustka. In the remaining water bodies, the traffic is lower, with the number of vessels amounting to 1,778 in area A and 2,178 in area C.

A gradual increase in shipping traffic is anticipated due to the growing importance of Ustka as a service port for offshore wind energy projects. With constant or slightly decreasing traffic of fishing vessels, assumed development of recreational shipping and water sports it should be assumed that the harbour in Ustka and the area of the approach to the harbour will require special attention in terms of ensuring safety of navigation.

6.1.3. National Defence

The planned Project is partially located in sub-areas with a leading function B - State defence. These are: 27.915.B and 29.926.B (the location of the POM Plan sub-areas is shown in Figure 3.1 in

Chapter 3.1.). The first one was designated as a protection zone of the closed area in order to enable safe use of the military complex K-4175 Ustka for the surroundings. In the second one there are located Polish Navy waterways (0025, 0026, 0208, 0209). These sub-areas, according to the provisions of the POM Plan, were made available for location of technical infrastructure, including power cables.

The corridor designated for the ECI of MFW Bałtyk II and MFW Bałtyk III in the immediate vicinity of land passes through Zone no. 6 (sub-areas for Zone 6 within the Project corridor boundaries: 29.926.B, 27.505.C, 27.206.I., 27.311.Ip, 27.915.B) (see figure 3.1 in Section 3.1 for the location of the POM Plan sub-areas), which is temporarily closed for navigation and fishing due to activities at the P-20 military training ground (in the vicinity of Ustka and the Ustka - Wicko Morskie training ground) – figure 6.7 below.

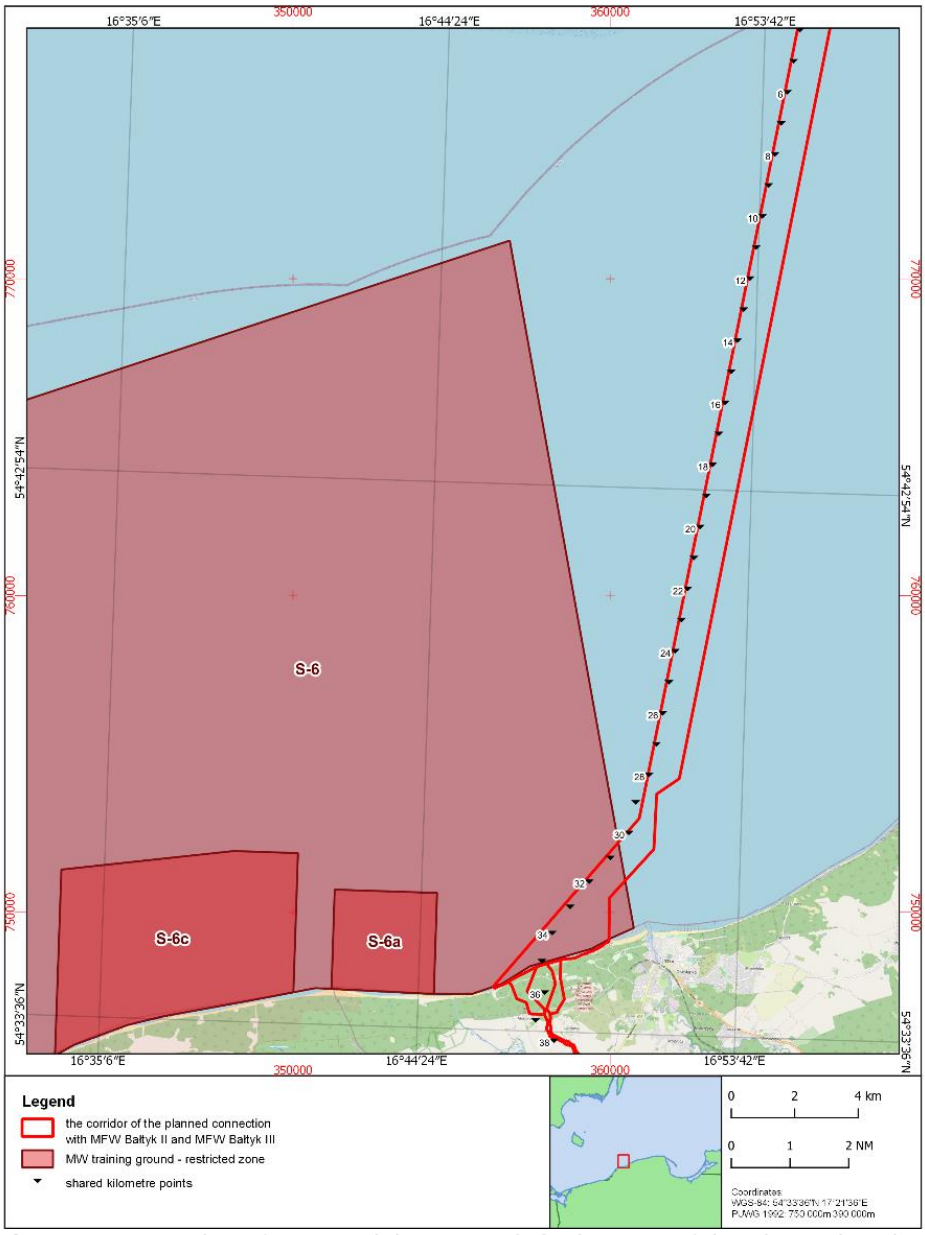


Figure 6.7. *Location of Navy training grounds in the area of the planned Project*

Source: In-house study basen on sipam

6.1.4. Infrastructure

The planned project is located approximately 50 km from the SwePol Link high-voltage direct current cable, uder operation for ovr 20 years. The approximately 2 km of the SwePol Link cable runs within the corridor designated for the planned ECI of the offshore wind farms (figure 12.1. in Subchapter 12). In the immediate vicinity of the planned Project, there will be cable lines from other wind farms

located in the vicinity of the MFW Bałtyk II and MFW Bałtyk III, including the connection to MFW Bałtyk I (Investor: Polenergia/Equinor) and Bałtyk II (RWE Offshore Wind Poland Sp. z o.o.).

6.1.5. Mining concessions

The planned Project is located outside areas licensed for oil, petroleum and gas prospecting and exploration.

6.2. ONSHORE

The planned Project is mainly located in agricultural and forest areas, outside residential zones. In the coastal zone (the area of the Ustka Municipality), these are partly areas under the administration of the Maritime Office in Gdynia, and partly closed areas belonging to the Polish Army and the State Forests. On the territory of the Słupsk Municipality, the route runs mainly through forest areas of the State Forests. The administrative boundaries and other formal and legal aspects related to the course of the planned Project through areas administered by various authorities, together with a map, can be found in Subchapter 1.1. *Introduction*.

Analysis of spatial development in the area of the planned Project, including reference to municipal studies and valid local spatial development plans in the area of the Ustka and Słupsk municipalities is included in Subchapter 2.4. *Planning documents*.

Analyses of the planning documents conducted at the preliminary stage of the Report's development and subsequent field work based on topographic maps, the Map of Hydrographic Division of Poland, soil maps and satellite images, enable to select objects and devices which are located in close vicinity of the planned Project or which are located in the corridor designated for the planned Project. The preliminarily selected potential collision sites were marked on the map (figure 6.8) and a field inspection was carried out in May 2022. Photographic documentation and field verification of facilities and equipment that may be affected by the implementation and operation of the planned Project was carried out. The results of the field visit are the Site Inspection Cards, which include photographs and a brief description. The cards are presented below. They include the entire area covered by the application for the environmental decision, thus both the Investor's variant and the alternative variant for the location of the landfall of the cables (the so-called Western Corridor). The cards have been used to identify a potential impact of the Investor's variant and the alternative variant, discussed later in this Report.

Particular attention was paid to material assets and residential development, as well as watercourses whose nature is changing from the data on the Hydroportal (from permanent to intermittent watercourses), and to protected areas and habitats.

On the route of the planned Project 25 objects were identified for which the Site Inspection Cards were prepared, of which 22 are located in Ustka Municipality and 3 in Słupsk Municipality. The planned Project will cross a total of 8 public roads, 2 railway lines (one of them is a non-existing, historical railway line ‘Szlak zwiniętych torów’), 2 bicycle routes, and 2 watercourses: Struga Lędowska and Pogorzeliczka. All objects are shown on the map (figure 6.8).

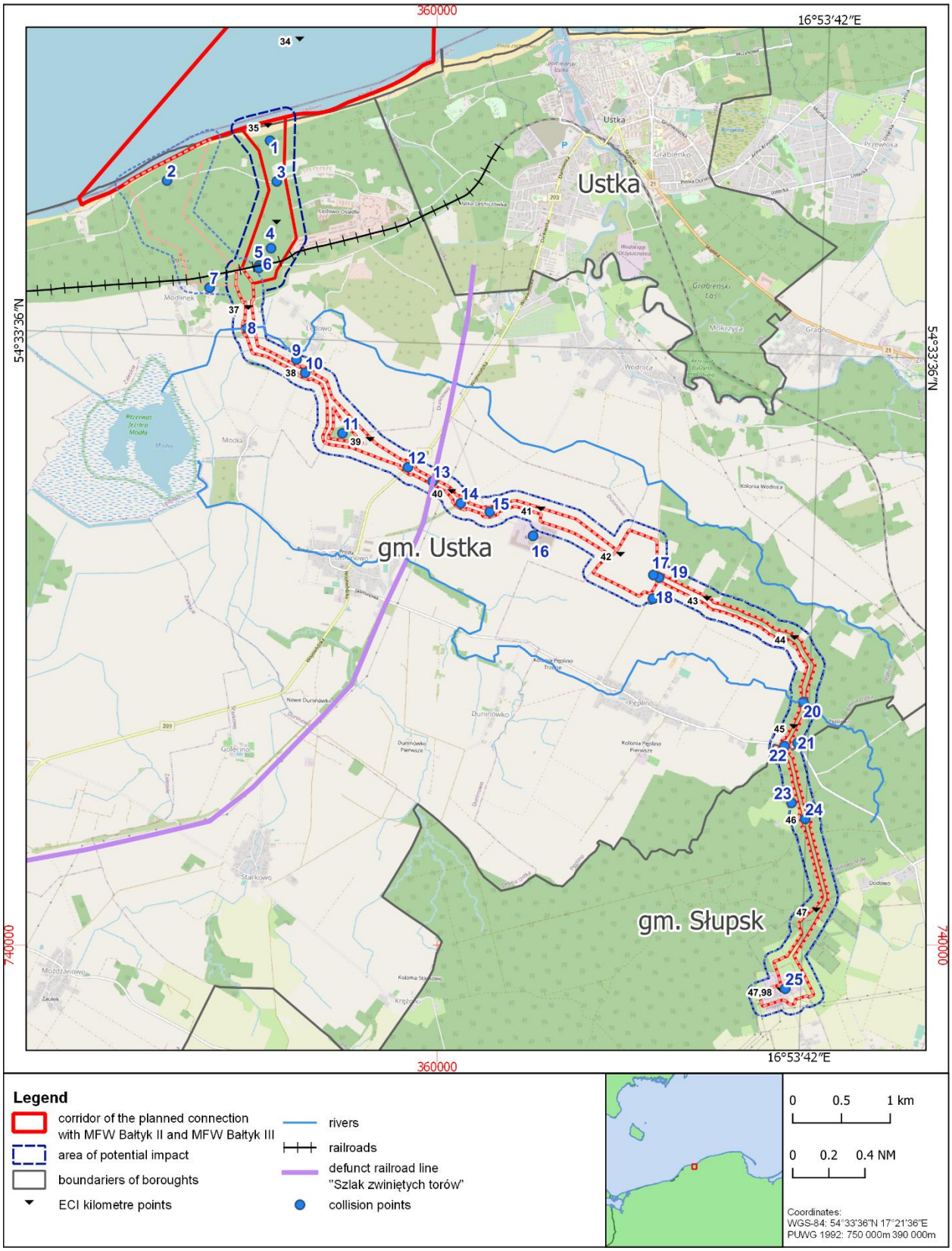


Figure 6.8. *Locations of the field inspection conducted and numbering of the Field Inspection Cards*

Source: In-house study

Number of Site Inspection Card	**1**
Kilometre of the ECI corridor	**35.15**
CHARACTERISTICS:	
The area of the landfall construction site	
Distance from the ECI corridor:	Within the ECI corridor
Municipality:	USTKA, Lędowo - Osiedle area

Description:

In the vicinity of km 35.1, the cable landfall is planned. The location of the construction site is planned in this area. The construction site area will be approximately 8,500 m^2, but the exact location is not definitively determined. The preliminary proposed location of the construction site (HDD launching chambers) includes an area that is partially deforested and paved due to the functioning of the fortification complex of the 9th Permanent Artillery Battery Ustka - Lędowo in this area (photo 1). Access to this area is provided from Bosmańska Street, along an existing forest road (photo 2) approximately 420 m long, which runs next to a disused shooting range and a sports field.

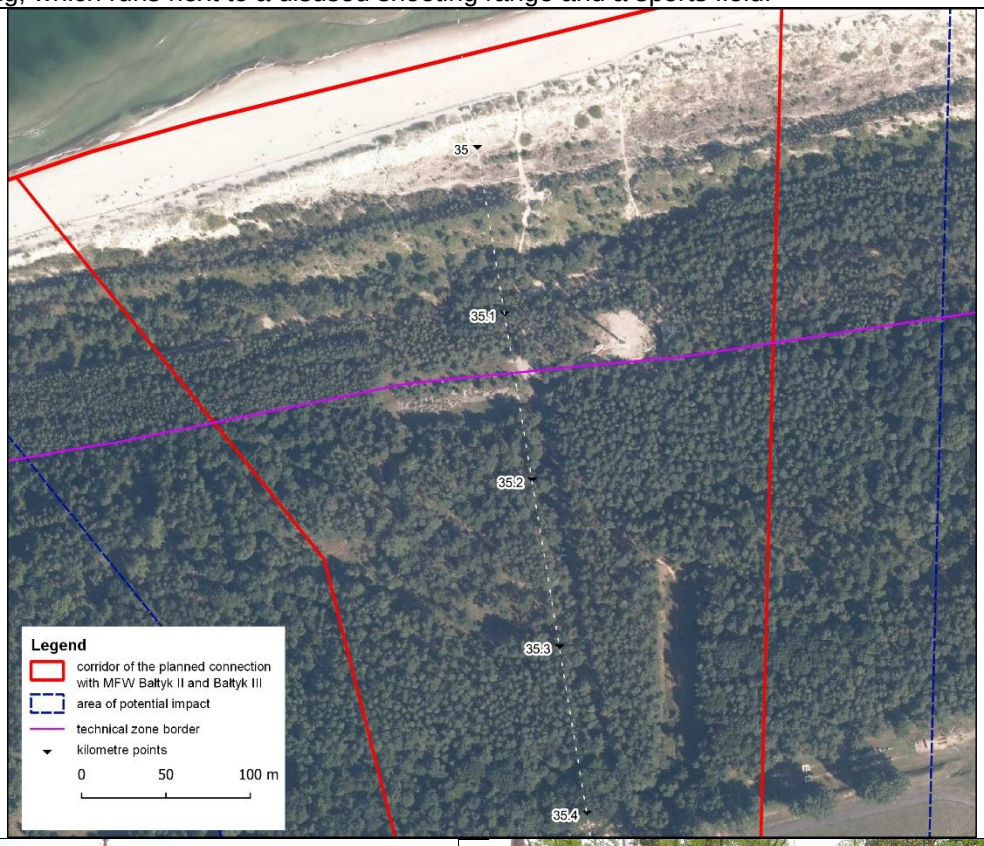


Photo 1. *The cable landfall area - around km 35.1*

Photo 2. *An existing forest road leading to the cable landfall site*

Notes: The site inspection on 20 May 2022.

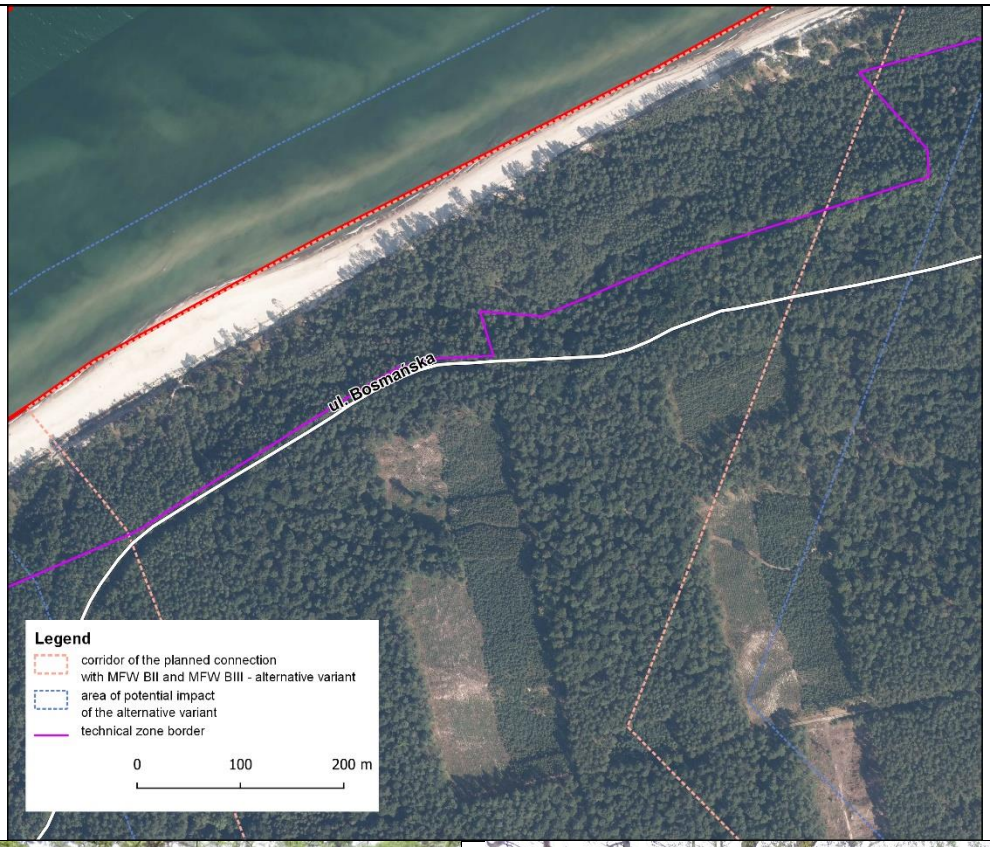
Number of Site Inspection Card	**2**
Kilometre of the ECI corridor	**None - alternative variant**

CHARACTERISTICS:

The cable landfall area in the western variant

Distance from the ECI corridor:	Within the ECI corridor
Municipality:	in the area of Lędowo

Description:
In photo 3 and 4, the cable landfall area of the western variant is shown; the site is characterised by varied topography (high denivelations), it is a forest area without any infrastructure and forest roads. The nearest asphalt road (Bosmańska Street) is located approximately 200-300 m from the preliminary designated construction site.



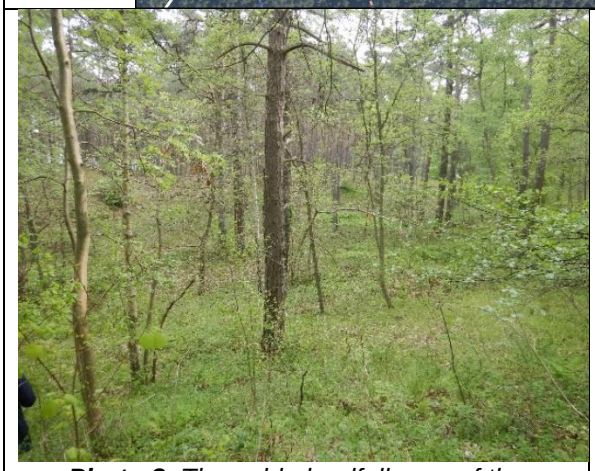


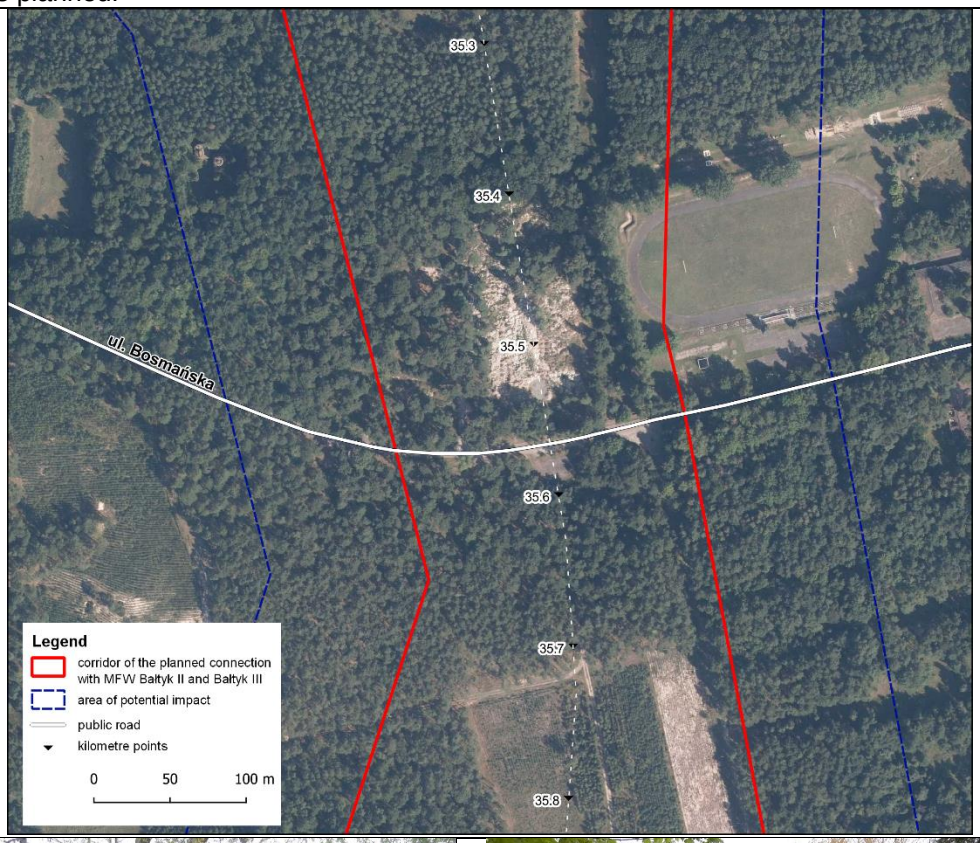
Photo 3. *The cable landfall area of the alternative variant*

Photo 4. *Bosmańska Street and the cable landfall area in the alternative variant*

Notes: The site inspection on 20 May 2022.

Number of Site Inspection Card	**3**
Kilometre of the ECI corridor	**35.6**
CHARACTERISTICS:	
PUBLIC ROAD - BOSMAŃSKA STREET	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Lędowo - Osiedle

Description:
In the area of km 35.56, the planned Project crosses a public road (Bosmańska street) to the Central Air Force training ground in Ustka, together with the associated infrastructure (water supply, sewerage, low-voltage and telecommunications lines). An asphalt road in good technical condition will be the main access road to the cable landfall construction site. The road is surrounded by partially devastated forests (a debris dump, a disused shooting range in poor condition and a sports field). A trenchless crossing of the road is planned.



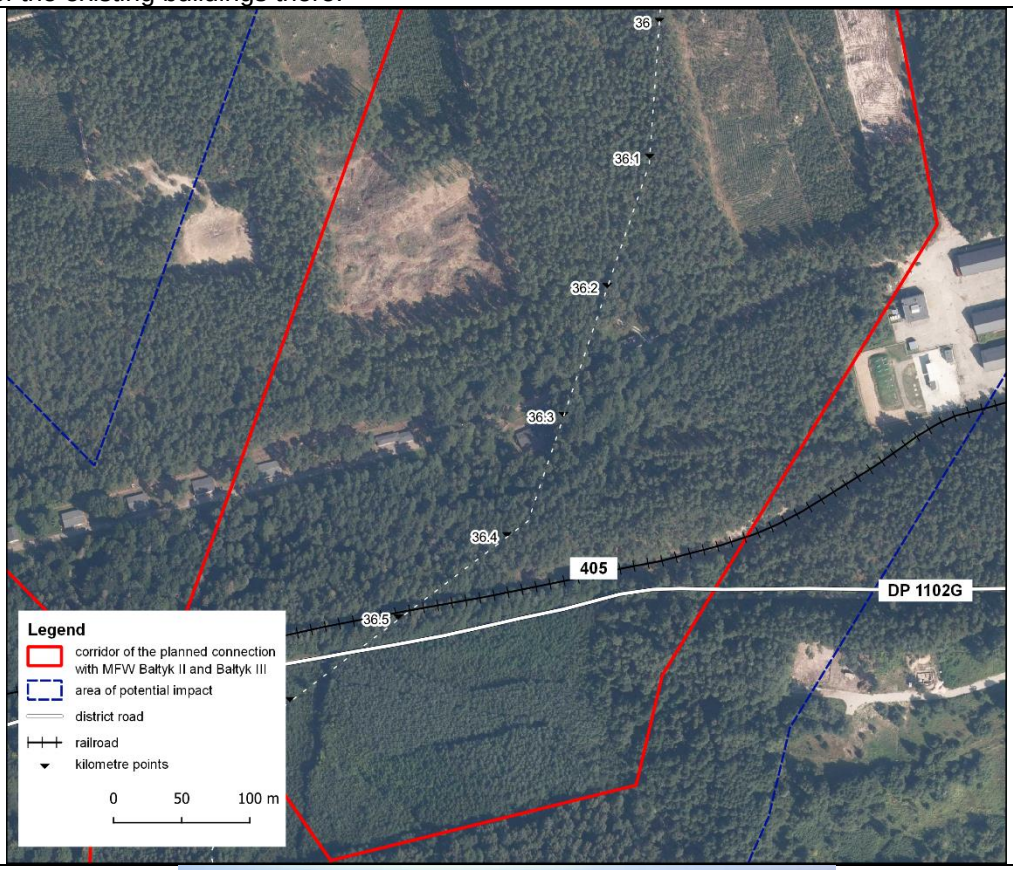
***Fot. 5**. Ulica Bosmańska w rejonie IP*

***Fot. 6.** Nieczynna strzelnica*

Uwagi: data wizji w terenie 20 maja 2022 r.

Number of Site Inspection Card	**4**
Kilometre of the ECI corridor	**36.3**
CHARACTERISTICS:	
Grounds of the USTKA NAVAL CENTRE	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Lędowo - Osiedle

Description:
At km 36.3, the planned Project passes through closed areas belonging to the Naval Centre in Ustka. It is a forested area with few cubic objects (barracks), serving military purposes. It is an area with heavily restricted access, for safety reasons. The planned trenchless crossing of this area concerns plot no. 359 in view of the existing buildings there.



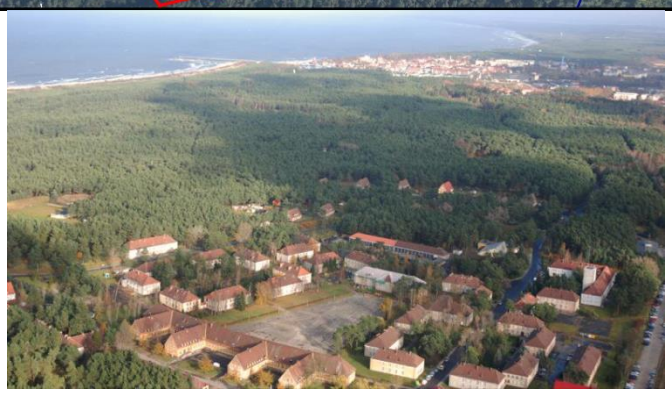
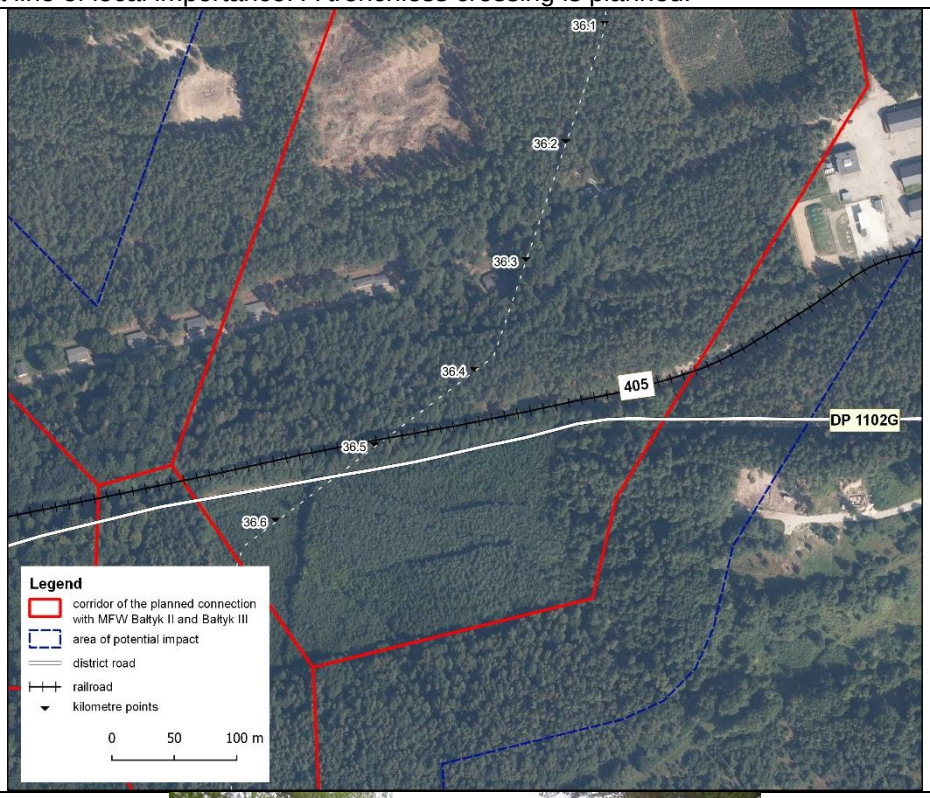


***Photo 7**. The Naval Centre from a bird's-eye view*

Notes: The site inspection on 20 May 2022.

Number of Site Inspection Card	**5**
Kilometre of the ECI corridor	**36.5**
CHARACTERISTICS:	
RAILWAY LINE	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, Lędowo

Description:
At km 36.5, the planned Project will cross the active Ustka - Centrum Marynarki Wojennej railway line. It is a continuation of railway line No. 405 Miastko - Słupsk - Ustka. The line is electrified from Słupsk to Ustka. It is a line of local importance. A trenchless crossing is planned.



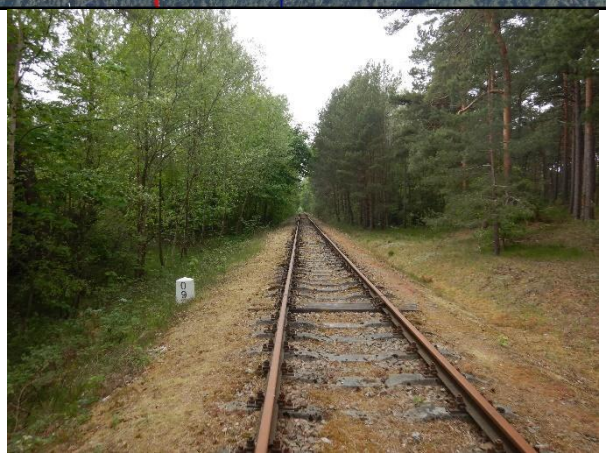


***Photo 8**. The railway line to the Naval Centre in the ECI area*

Notes: The site inspection on 20 May 2022.

Number of Site Inspection Card	**6**
Kilometre of the ECI corridor	**36.54**
CHARACTERISTICS:	
DISTRICT ROAD No. 1102G	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, Lędowo

Description:
In the vicinity of the railway line (at km 36.54), the planned Project crosses the district road DP 1102G between Ustka - Modlinek - Duninowo. It is a paved road with an unpaved side road in good technical condition. It is surrounded by forest areas.

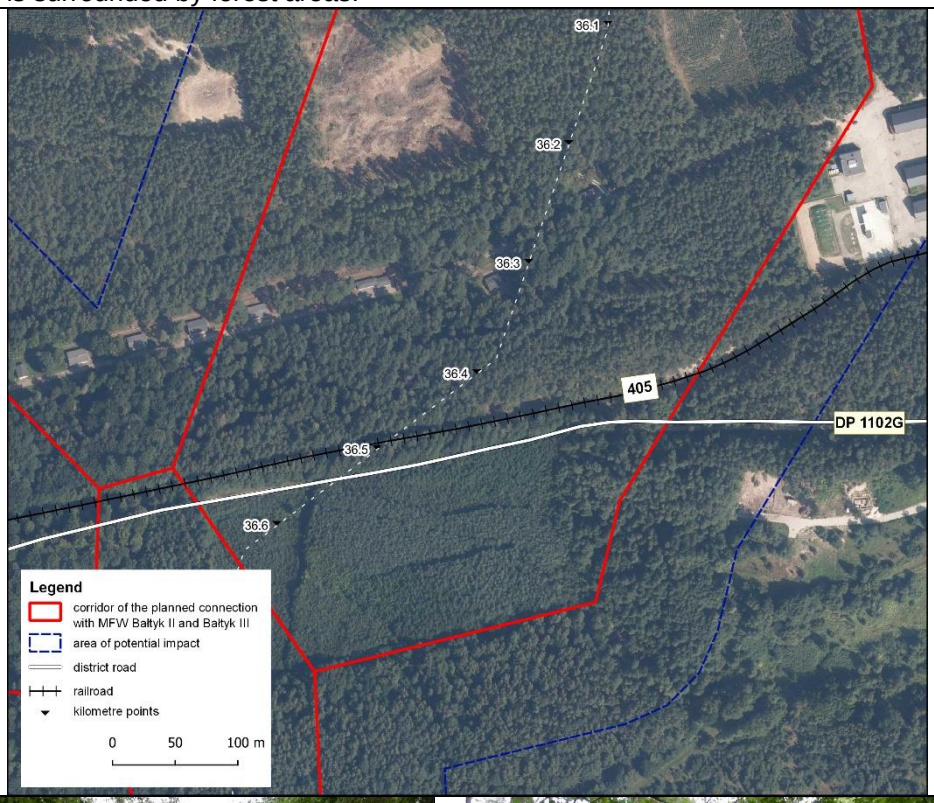


Photo 9 *The district road DP 1102G towards Modlinek in the ECI area*

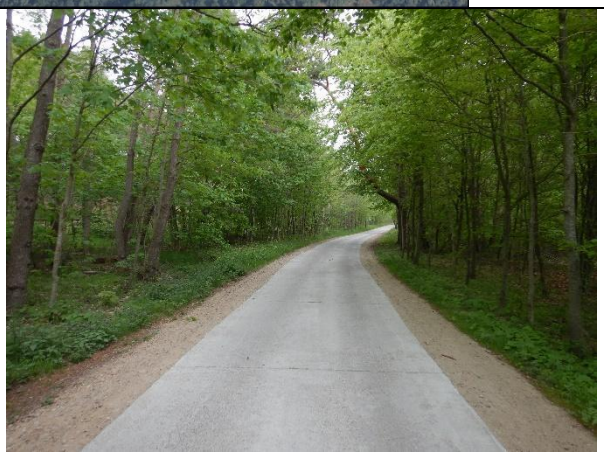


Photo 10. *The district road DP 1102G towards Ustka in the area of the ECI*

Notes: The site inspection on 20 May 2022.

Number of Site Inspection Card	**7**
Kilometre of the ECI corridor	**36.7**
CHARACTERISTICS:	
SINGLE-FAMILY HOUSING in the Modlinek area - alternative option	
Distance from the ECI corridor:	The closest two houses are approximately 29 m and 39 m from the ECI corridor boundary.
Municipality:	USTKA, Modlinek village

Description:

At km 36.7 of the alternative option, the planned Project passes in close proximity to single-family houses and farm buildings. These are located in the area of potential impact, in the village of Modlinek; according to BDOT, there are 7 residential buildings and 4 farm buildings. One of them, located on plot no. 137/3, is entered in the register of monuments of the Ustka municipality.

To the south-west there are two single-family houses located on plots: 132/13 (approx. 57 m from the corridor boundaries) and 121/4 (approx. 29 m from the corridor boundaries). On the eastern side of the road there are 5 single-family houses located along the internal road on plots: No. 141 (approx. 95 m from the corridor borders), No. 142 (approx. 98 m from the corridor borders), No. 143/1 (approx. 83 m from the corridor borders), No. 137/3 (approx. 56 m from the corridor borders), and No. 137/2 (approx. 39 m from the corridor borders).

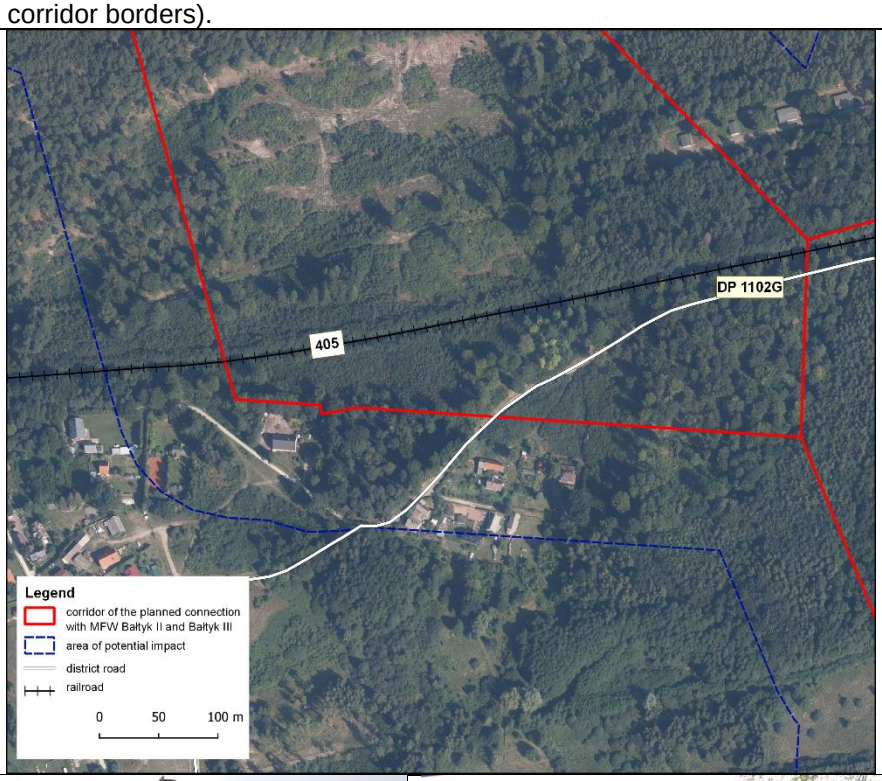


***Photo 11**. Modlinek - single-family housing development*

***Photo 12.** Modlinek - single-family housing development*

***Photo 13**. Modlinek - single-family housing development*

***Photo 14**. A house registered as a monument (plot No. 137/3)*

***Photo 15**. Modlinek - single-family housing development*

***Photo 16**. Modlinek - single-family housing development*

***Photo 17**. Modlinek - single-family housing development*

Notes:
Implementation of the alternative will cause periodic nuisance associated with the construction phase. The site inspection on 20 May 2022.

Number of Site Inspection Card	**8**
Kilometre of the ECI corridor	**37.2**
CHARACTERISTICS:	
STRUGA LĘDOWSKA	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Modła

Description:
At km 37.2, the planned Project crosses the largest permanent watercourse on the ECI route, Struga Lędowska, which is up to 1.5 m wide and flows into Modła Lake, which is protected as a nature reserve and a Natura 2000 site. At the point of the planned crossing, the watercourse is regulated (embanked) with an escarpment approximately 1 m high on both sides - photo 18. The watercourse is surrounded by wetlands.

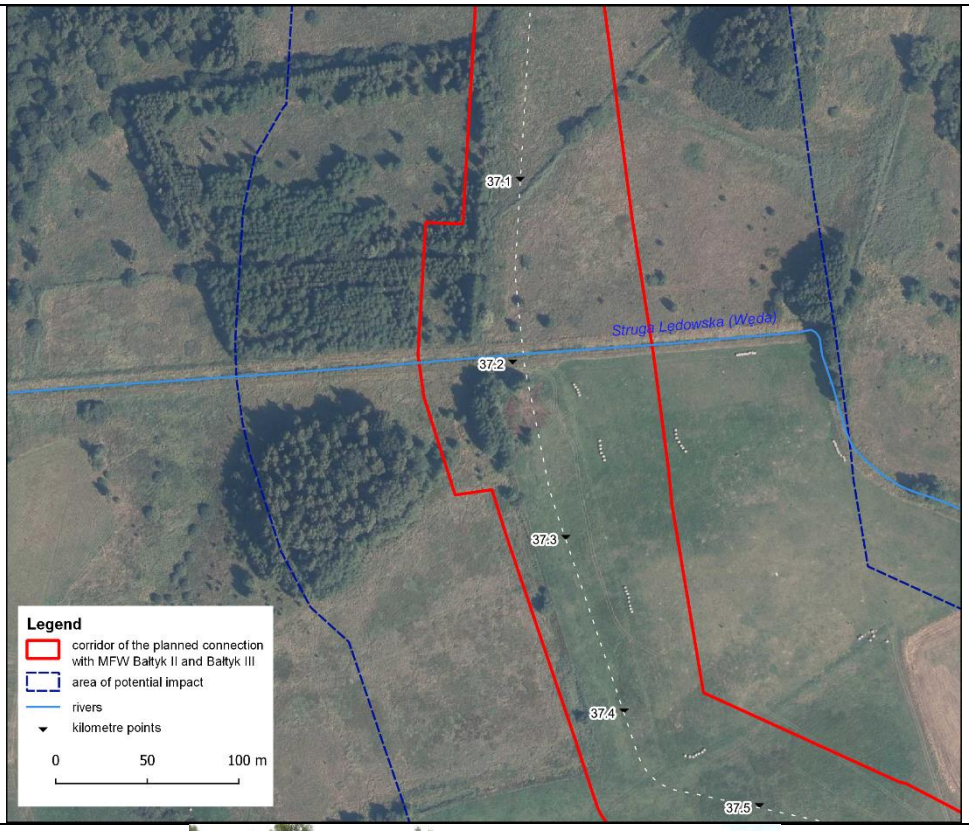


***Photo 18**. Struga Lędowska*

Notes:
The way the watercourse is crossed may affect protected areas. The site inspection on 20 May 2022.

Number of Site Inspection Card	**9**
Kilometre of the ECI corridor	**37.85**
CHARACTERISTICS:	
SINGLE-FAMILY DEVELOPMENT IN LĘDÓW	
Distance from the ECI corridor:	approx. 67 m from the ECI corridor boundary
Municipality:	USTKA, Lędowo village

Description:
At a distance of approx. 67 m from the ECI corridor boundary there is a residential building with one outbuilding (Lędowo village house No. 6).
The building does not conflict with the route of the cable line; however, due to its close proximity, it may be exposed to periodic nuisance associated with the construction phase.

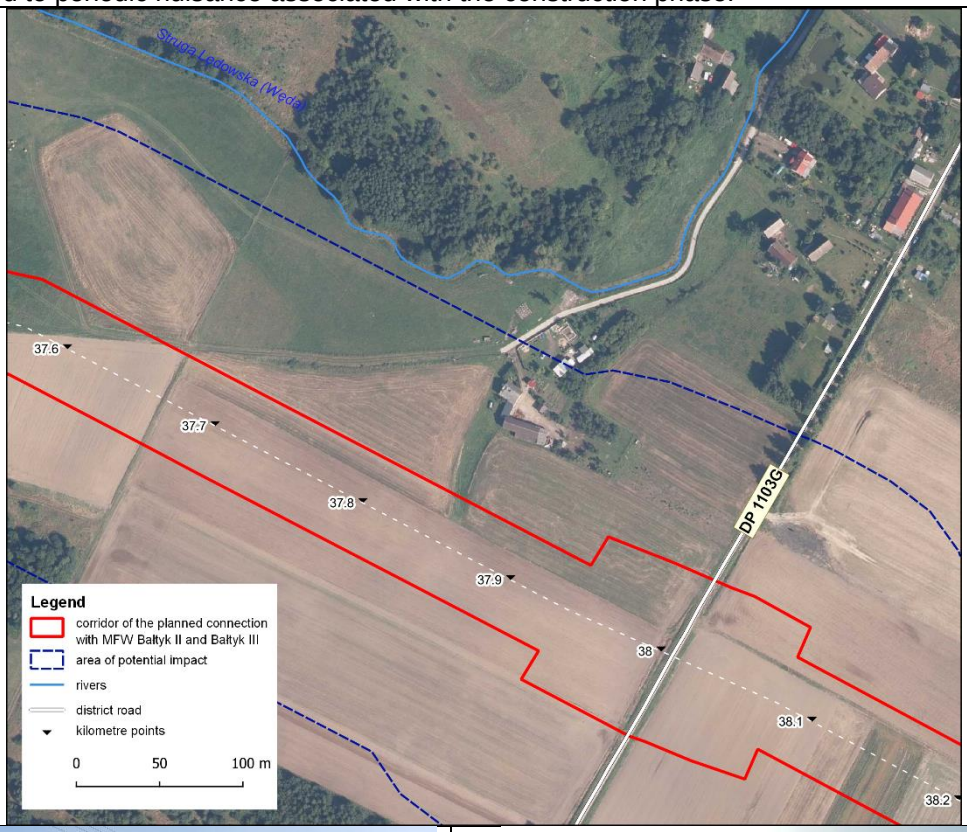


***Photo 19**. Single-family house, Lędowo 6*

***Photo 20.** Surroundings of the house*

Notes: The site inspection on 20 May 2022.

Number of Site Inspection Card	**10**
Kilometre of the ECI corridor	**38**

CHARACTERISTICS:

DISTRICT ROAD No. 1103G

Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Lędowo

Description:

At approximately km 38, the planned Project crosses the district road DP 1103G between Lędowo and Modła. This is a dirt road paved with concrete slabs, surrounded by agricultural fields. There is a residential area approximately 200 m from the axis of the corridor (Card 9). A trenchless crossing of the road is planned.

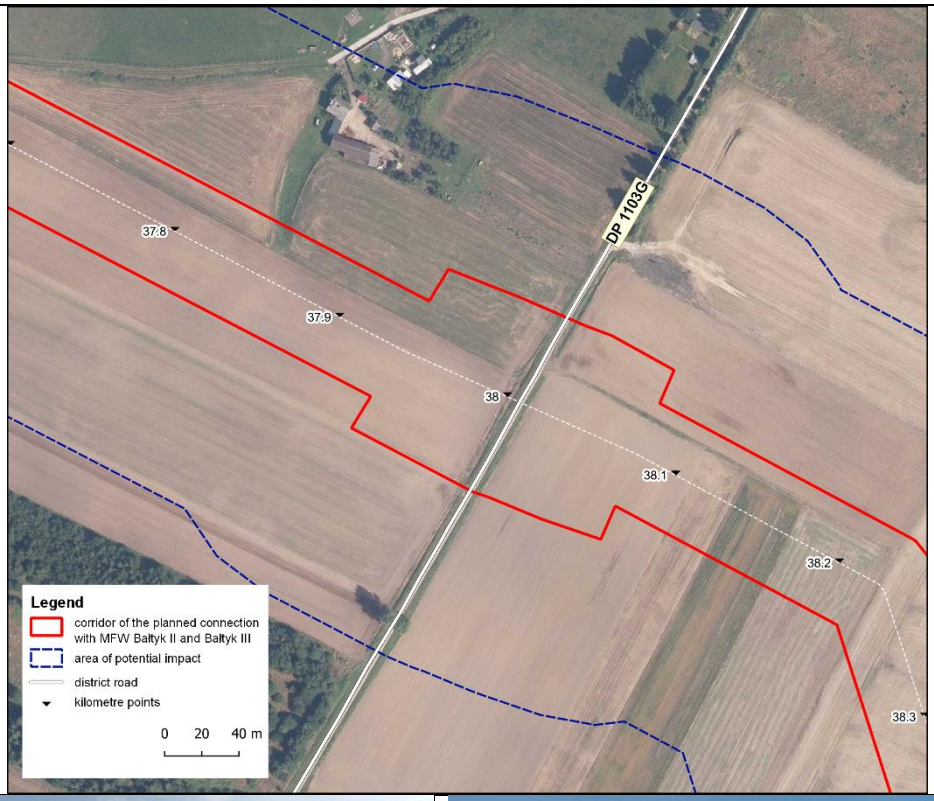


***Photo 21**. The dirt road towards Modla*

***Photo 22.** The dirt road towards Lędowo*

Notes:

Due to the close proximity of residential development (Card 8), there will be possible periodic nuisance associated with the construction phase of the trenchless crossing.
The site inspection on 20 May 2022.

Number of Site Inspection Card	**11**
Kilometre of the ECI corridor	**38.6-39.0**
CHARACTERISTICS:	
HABITAT 91F0	
Distance from the ECI corridor:	Between the ECI corridor of the MFW Bałtyk II and MFW Bałtyk III
Municipality:	USTKA, in the area of Modła

Description:
At a length of approximately 400 m between km 38.6 and 39.0, the route passes in the vicinity of a valuable habitat: Riparian oak-elm-ash forest (Ficario-Ulmetum). It is a periodically wetland habitat, surrounded by agricultural fields. A place of concentration of fauna.

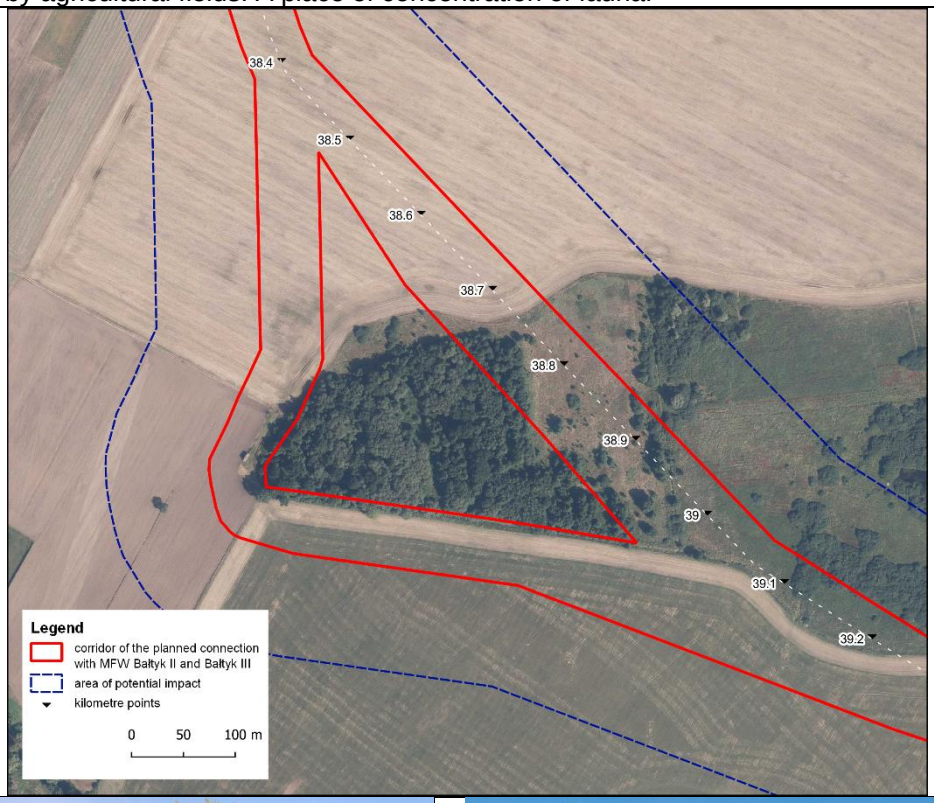


***Photo 23**. The riparian forest - view from the west*

***Photo 24.** The riparian forest - view from the east*

Notes: The site inspection on 20 May 2022.

Number of Site Inspection Card	**12**
Kilometre of the ECI corridor	**39.5**
CHARACTERISTICS:	
PROVINCIAL ROAD No. 203	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Duninowo

Description:
At approximately km 39.5, the planned Project crosses provincial road No. 203 from Darłowo to Ustka. It is a two-lane road with an unpaved side road in good technical condition. Along the road there is a fragment of a coastal tourist route (a cycle lane - photo 26). On both sides of the road there are herpetological fences (to protect amphibians during migration) - photo 28, and under the road there is an amphibian passage - photo 27 (at a distance of approx. 200 m from the border of the ECI corridor).

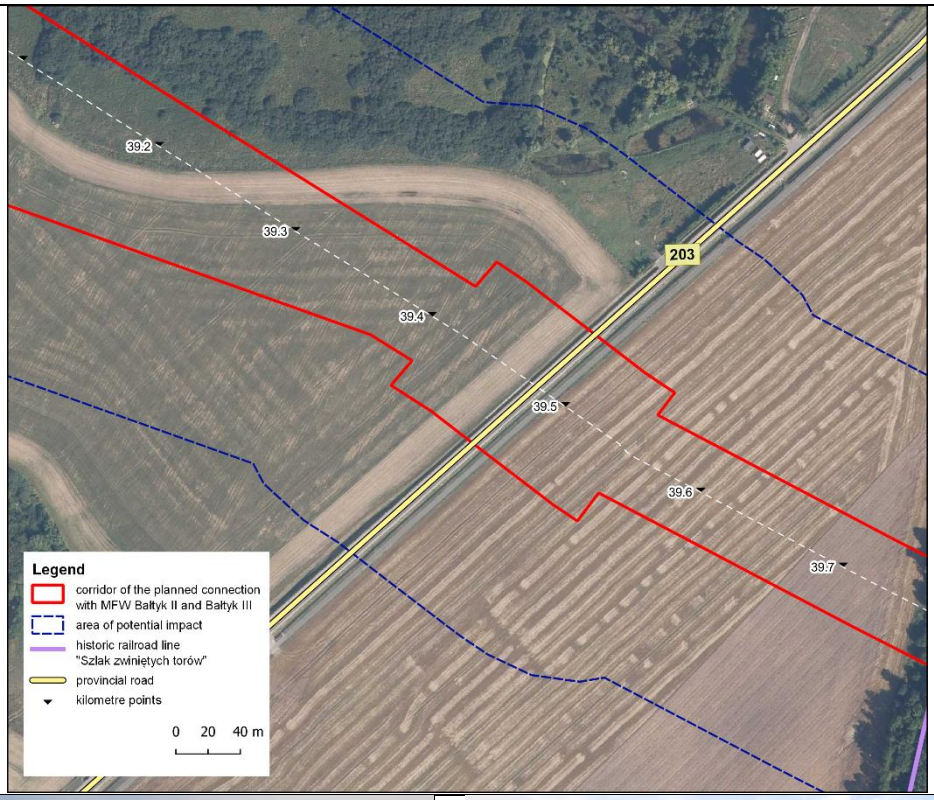


***Photo 25**. Provincial road No. 203 towards Duninowo*

***Photo 26.** The cycle lane along provincial road No 203 towards Ustka*

***Photo 27**. The passage for amphibians under road No. 203*

***Photo 28**. Herpetological fences running towards allotment development and a nearby pond*

Note: the presence of fences and the proximity of the pond indicate a site important for herpetofauna. . The site inspection on 19 May 2022.

Number of Site Inspection Card	**13**
Kilometre of the ECI corridor	**39.78**
CHARACTERISTICS:	

HISTORICAL RAILWAY LINE

Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Duninowo

Description:
In the vicinity of km 39.78, the planned Project crosses the historical railway line 'Szlak zwiniętych torów', which is listed as a cultural asset in the 'Study of conditions and directions of spatial development of the Ustka municipality'. It is a non-functional railway line, from which the tracks have already been removed and only embankments and ravines with periodically occurring wetlands remain. The area now forms an interesting ecosystem, also used as a recreational horse trail. It probably acts as an ecological link and allows fauna to migrate in the monotonous landscape of the surrounding agricultural fields.

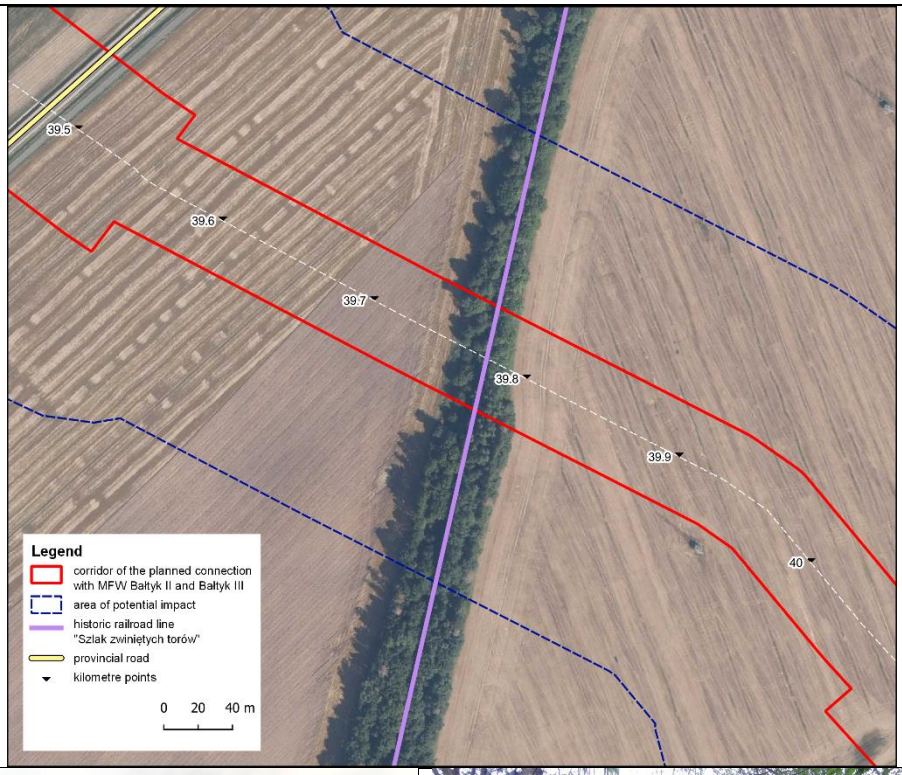


***Photo 29**. Current use of the historic railway line as a horse trail*

***Photo 30.** Water occurring in depressions in the area of the historic railway line*

Notes: socially and naturally valuable area. The site inspection on 19 May 2022.

Number of Site Inspection Card	**14**
Kilometre of the ECI corridor	**40.15**
CHARACTERISTICS:	
Avenue of trees and municipal road nr 101047G-1	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Duninowo

Description:
At approximately km 40.15, the planned Project crosses the municipal road No. 101047G-1 from Duninowo to Wodnica (a dirt road). Along the avenue there are single trees and shrubs. In the section from municipal road No. 101047G-1 (near km 40.15) to the access road to the fish processing plant MOWI S.A (km 40, 4), the ECI corridor runs along an avenue of trees (photo 31).

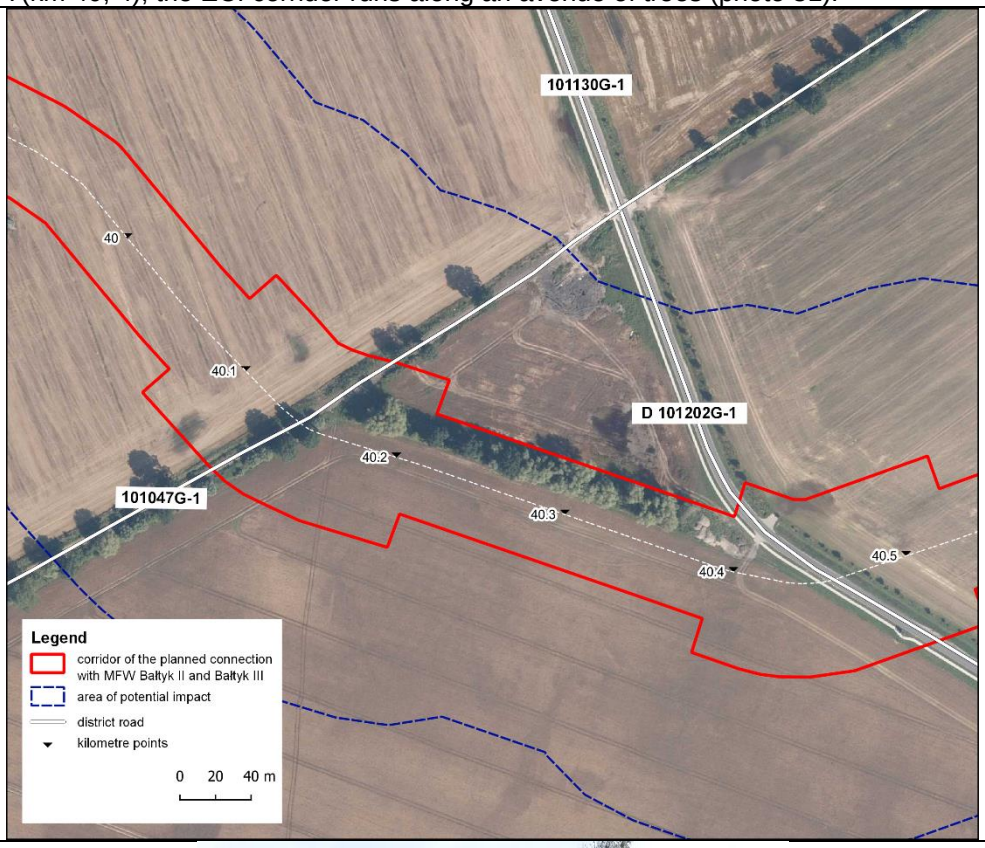


***Photo 31**. The avenue of trees within the ECI corridor boundaries. Municipal road No. 101047G-1 visible in the background.*

Note: The site inspection on 19 May 2022.

Number of Site Inspection Card	**15**
Kilometre of the ECI corridor	**40.4**
CHARACTERISTICS:	
ACCESS ROAD TO MOWI S.A.	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Duninowo

Description:
At approximately km 40.4, the planned Project crosses the access road to the MOWI S.A salmon and seafood processing plant (municipal road D 101202G-1). A two-lane, paved road with an asphalt surface in good condition. The road is surrounded by agricultural land. There are tree plantings along the road. The plant in Duninowo employs about 4,000 workers, therefore during the construction of the planned Project it will be important to organise the works in such a way as not to disturb the operation of the Plant.

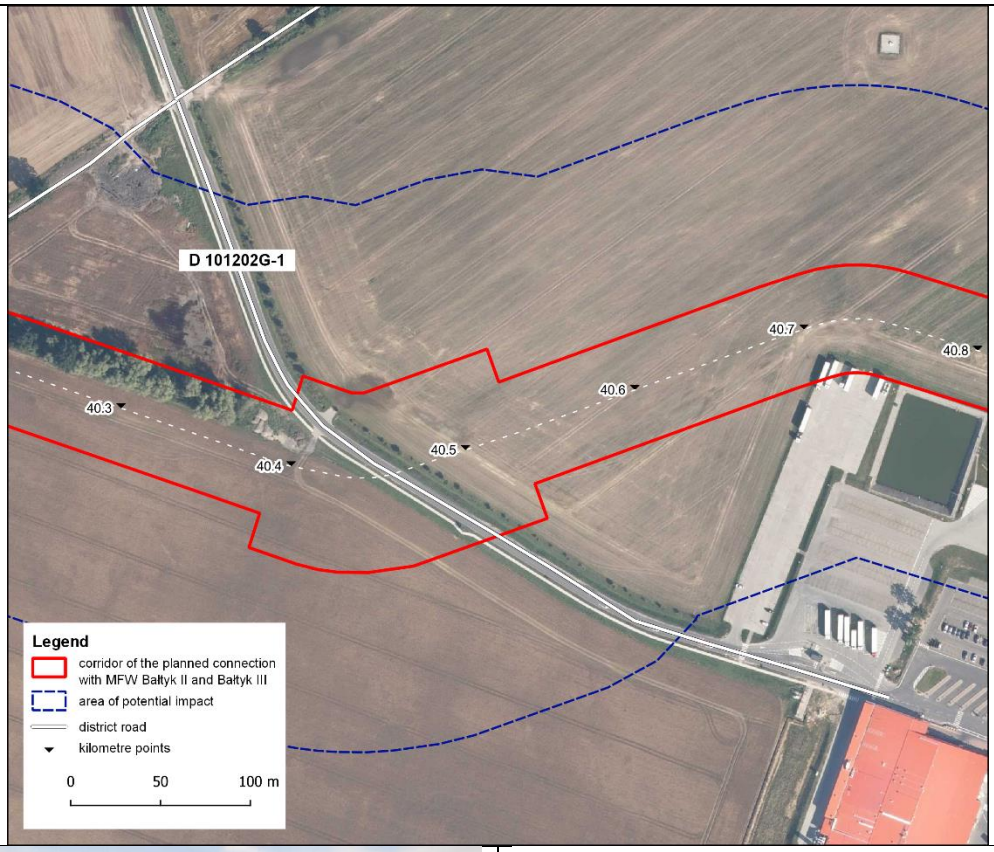


***Photo 32**. The access road to MOWI S.A.*

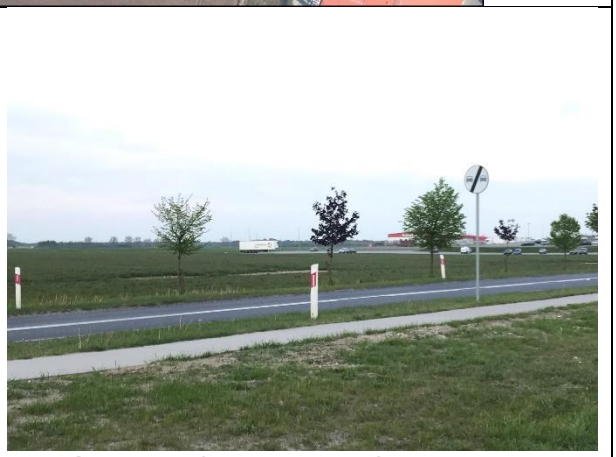
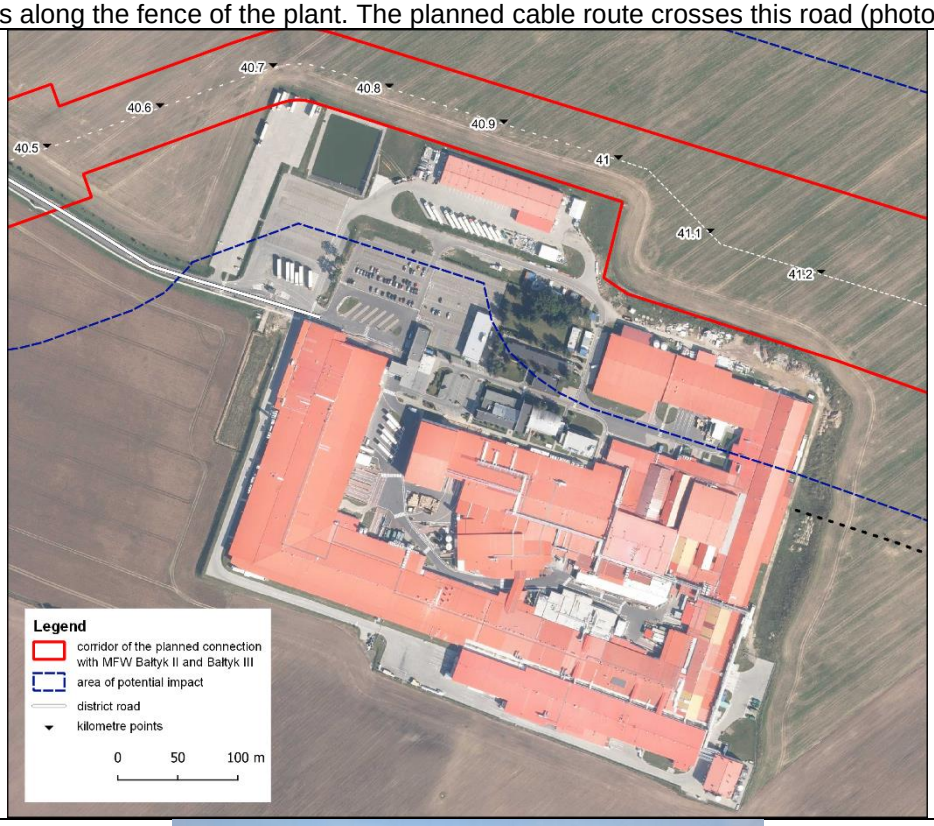


***Photo 33**. The access road to MOWI S.A.*

Notes: maintaining free-flowing access to the Plant, which employs around 4,000 people, during its operating hours. The site inspection on 19 May 2022.

Number of Site Inspection Card	**16**
Kilometre of the ECI corridor	**41**
CHARACTERISTICS:	
MOWI S.A. PLANT	
Distance from the ECI corridor:	directly adjacent to the ECI corridor
Municipality:	USTKA, in the area of Duninowo

Description:
In the vicinity of km 41 there is a large fish processing company, MOWI S.A, which employs around 4,000 people. The entire enterprise occupies an area of approximately 22 ha and borders the ECI corridor on the northern side. The surroundings of MOWI S.A. are agricultural land. A dirt road used by farmers runs along the fence of the plant. The planned cable route crosses this road (photo 34).



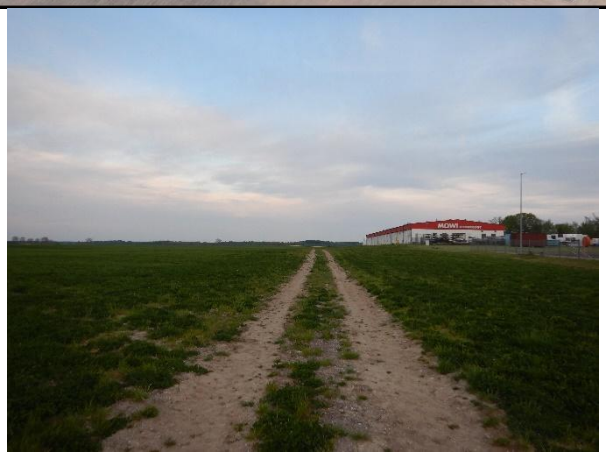


***Photo 34**. Field access road along the MOWI fence in the corridor of the planned Project*

Notes: maintaining the workflow of the plant, which employs around 4,000 people, during its operating hours and changing employees should be taken into account in planning the organisation of works in the area. The site inspection on 19 May 2022.

Number of Site Inspection Card	**17**
Kilometre of the ECI corridor	**41.9-42.4**
CHARACTERISTICS:	
15 kV OVERHEAD LINE	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, in the area of Pęplino

Description:
In the vicinity of km 41.9-42.4, two ONS substations are planned respectively for the MFW Bałtyk II and the MFW Bałtyk III. A 15 kV overhead line No. 106 runs through the area intended for the construction of the substation, at the western border of the corridor, together with a branch line providing power connection to the fish processing plant MOWI S.A., which crosses the entire ONS construction area. The technological zone with a width of 15 m from the existing line was taken into account in the 'Local spatial development plan for a part of the area located within the geodesic area of Pęplino, Ustka municipality (Resolution No. XLV.564.2018)' dated 26 October 2018, which sets out the principles and conditions for the development of the area intended for electricity infrastructure.

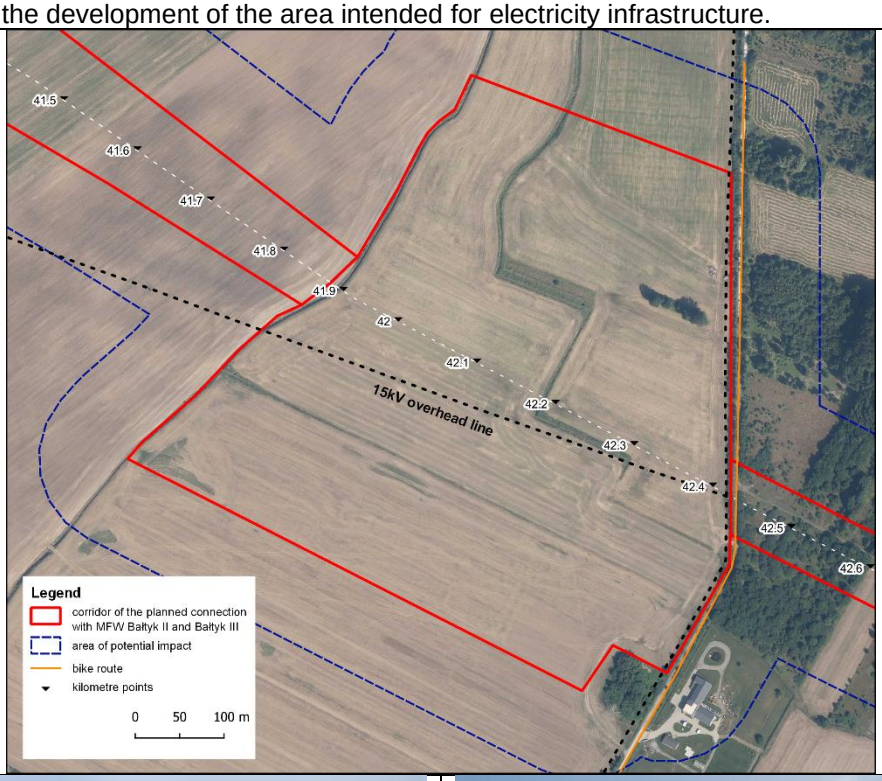


***Photo 35**. 15 kV overhead line running along the road*

***Photo 36.** 15 kV overhead line located within the planned ONS*

Notes: it is likely that the overhead line will be wired and re-routed. The site inspection on 19 May 2022.

Number of Site Inspection Card	**18**
Kilometre of the ECI corridor	**42.5**
CHARACTERISTICS:	
POLIART PRINTING COMPANY	
Distance from the ECI corridor:	approx. 30 m
Municipality:	USTKA, in the area of Pęplin

Description:
In the area of km 42.5 of the ECI corridor, the Poliart printing company is located on a plot of land of approximately 3.5 ha, with an concrete slabroad running next to it (it is also a marked international cycle trail). The road provides access to the company. There are forest and agricultural areas all around.

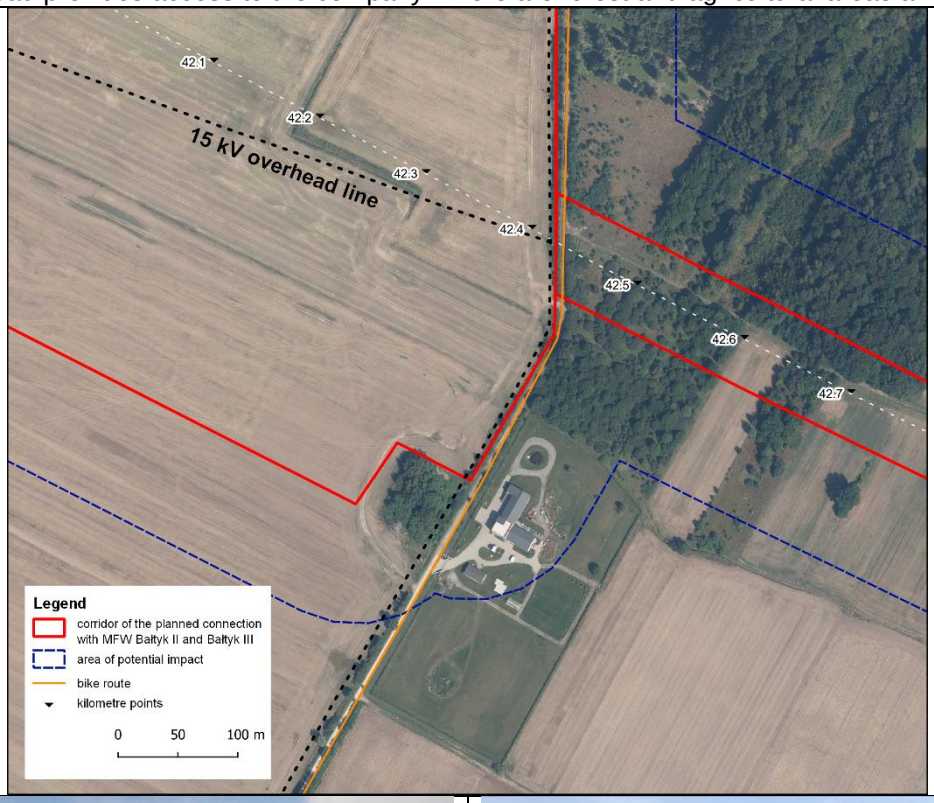


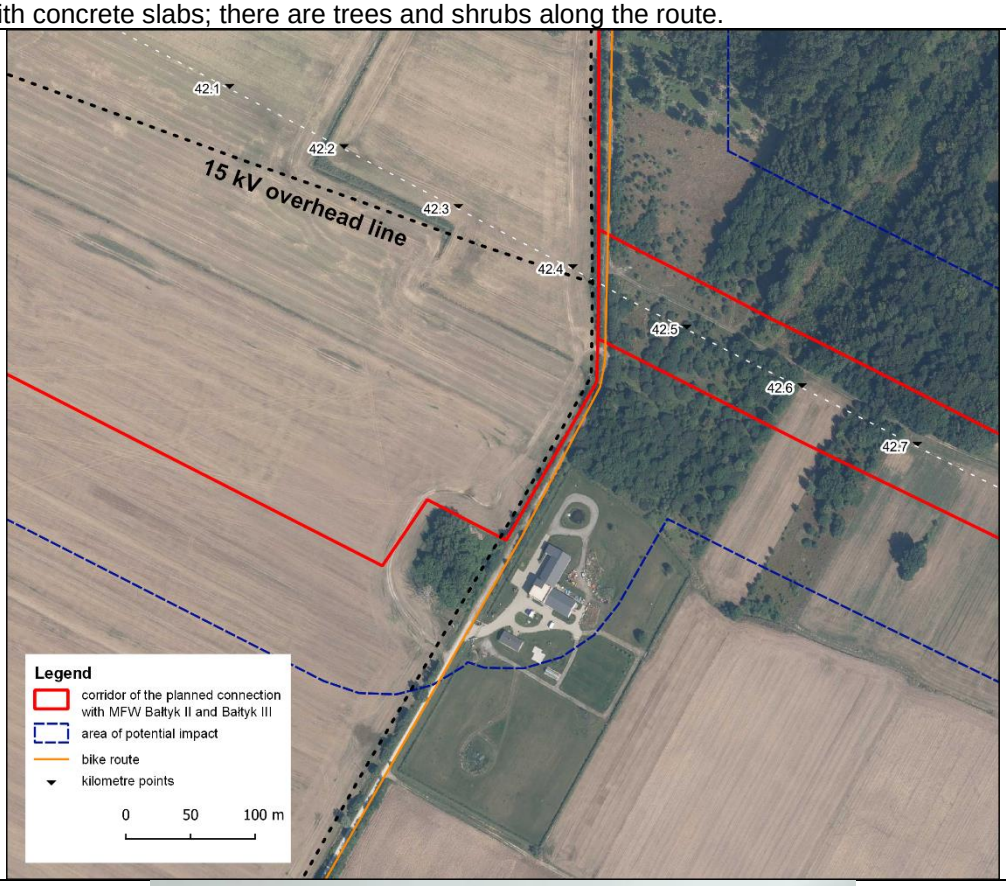
Photo 37 *Poliart Printing Company*

Photo 38*. Poliart Printing Company*

Notes: The route of the ECI corridor does not cross the access road, but could provide convenient access to the ONS substation site. The site inspection on 19 May 2022.

Number of Site Inspection Card	**19**
Kilometre of the ECI corridor	**42.5**
CHARACTERISTICS:	
EUROVELO R10 CYCLING TRAIL	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, the road from Peplin to Wodnica

Description:
At around km 42.5, the planned Project crosses the EuroVelo R10 international cycle trail. It is a road paved with concrete slabs; there are trees and shrubs along the route.



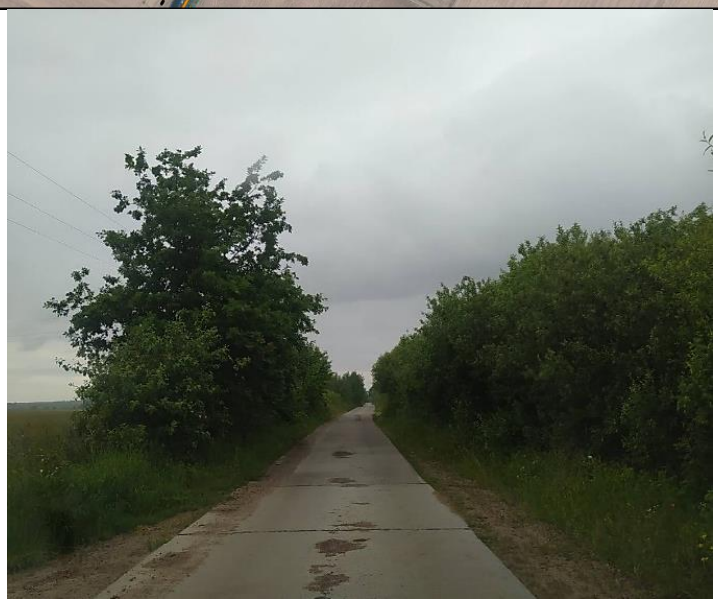


***Photo 39**. EuroVelo R10 cycle trail. View towards the north*

Notes: The site inspection on 19 May 2022.

Number of Site Inspection Card	**20**
Kilometre of the ECI corridor	**44.7**
CHARACTERISTICS:	
POGORZELICZKA watercourse	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	USTKA, the area of the plot No. 170, Pęplino precinct

Description:
At km 44.7, the planned Project crosses the Pogorzeliczka, a watercourse up to 1.5 m wide. This is a watercourse where water occurs intermittently. During the field inspection, the riverbed was dry. At the location of the planned crossing of the Pogorzeliczka, the watercourse is regulated. There are forests and wetlands in the surrounding area. The site visit on 19 May 2022 confirmed that the river does not carry water during rain-free periods.

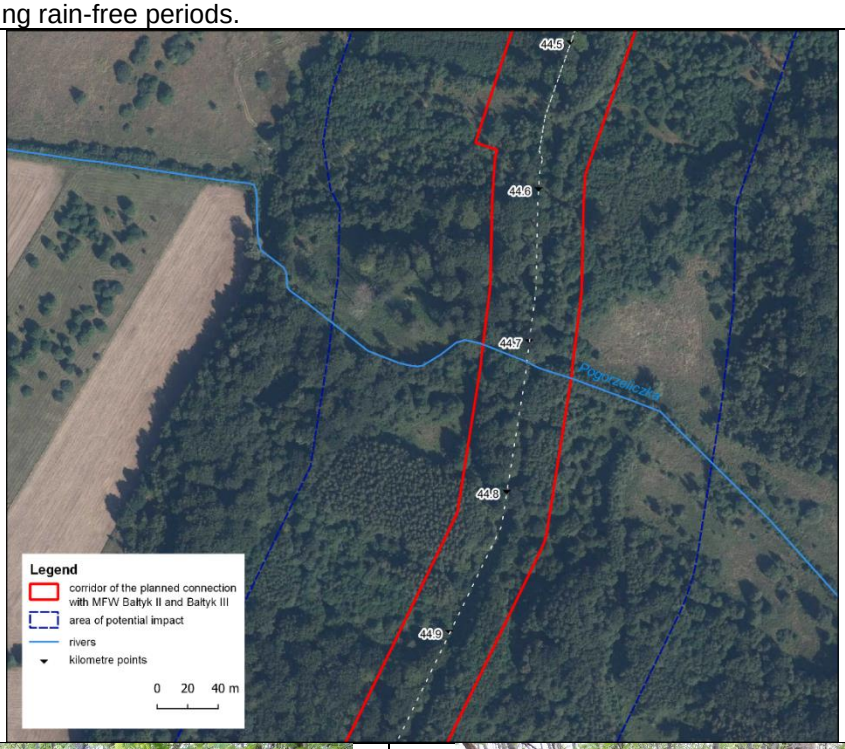


***Photo 40**. The Pogorzeliczka watercourse*

***Photo 41.** The Pogorzeliczka crossing area, photo in the corridor axis*

Notes:
A watercourse of low ecological value. The crossing of the watercourse by open excavation may be considered to reduce interference with the surrounding wetland. The method of crossing the watercourse will be further specified following geotechnical investigations. The site inspection on 19 May 2022.

Notes: The site inspection on 19 May 2022.

Number of Site Inspection Card	**21**
Kilometre of the ECI corridor	**45.1**
CHARACTERISTICS:	
SINGLE-FAMILY HOUSING IN PĘPLINO	
Distance from the ECI corridor:	approx. 50 m
Municipality:	USTKA, the area of Pęplin (Graniczna street 3)

Description:
A single-family house approximately 50 m from the corridor of the planned Project, within the area of potential impact. The house is surrounded by forest.

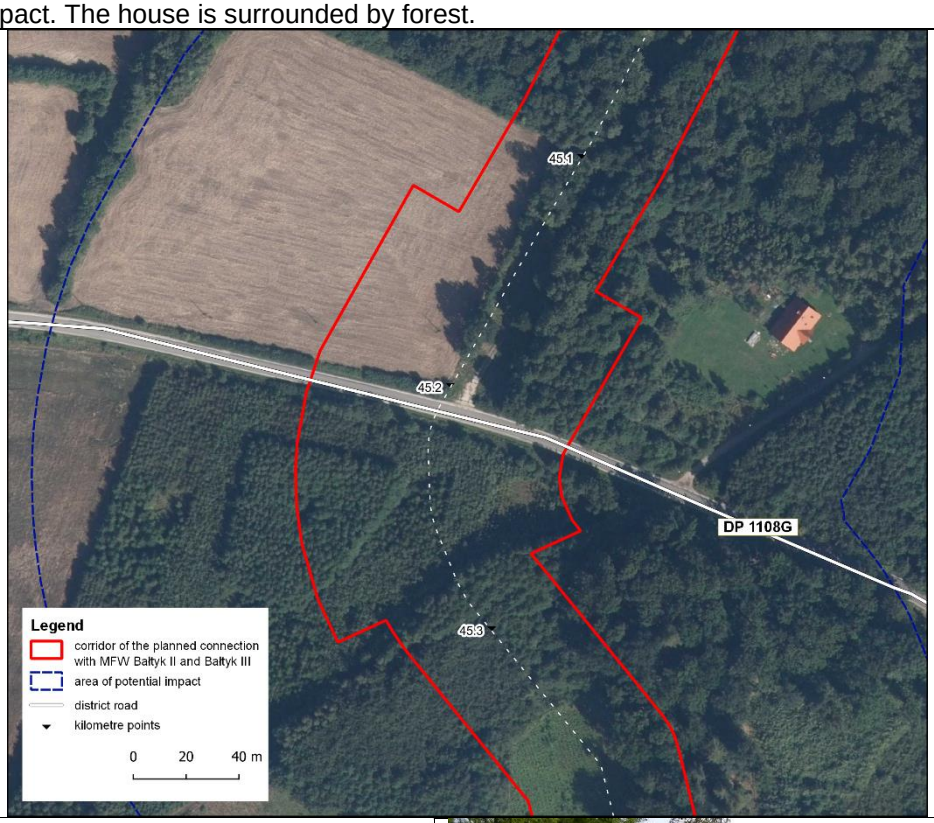


***Photo 42**. Pęplino - housing development*

***Photo 43.** The access road leading to the building*

Notes**:** The site inspection on 19 May 2022.

Number of Site Inspection Card	**22**
Kilometre of the ECI corridor	**45.2**
CHARACTERISTICS:	
DISTRICT ROAD No. 1108G	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality: USTKA	Plot No.: 181, Pęplino precinct

Description:
At km 45.2, the planned Project crosses the district road DP 1108G Duninowo - Bruskowo Wielkie; an asphalt road in good technical condition. The ECI corridor crosses the road, surrounded mainly by forest areas. Nearby there are single-family housing developments (Card No. 21).

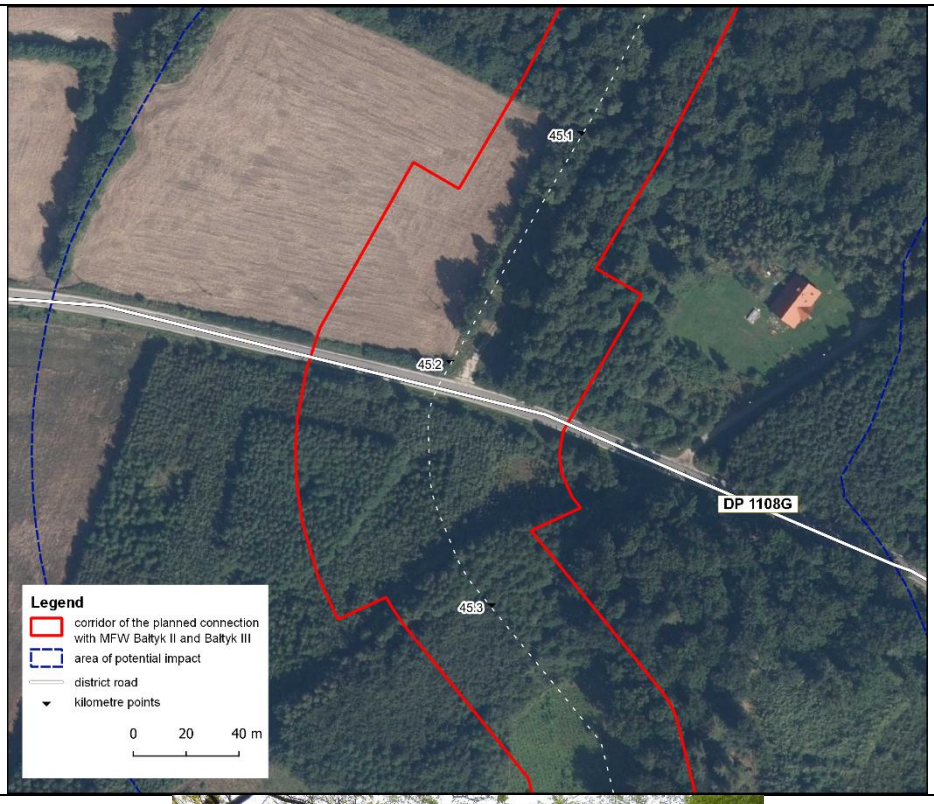


***Photo 44**. A section of the road towards Pęplin*

Notes: A trenchless road crossing is planned. The site inspection on 19 May 2022.

Number of Site Inspection Card	**23**
Kilometre of the ECI corridor	**45.8**
CHARACTERISTICS:	
SINGLE-FAMILY HOUSING IN GAJKI	
Distance from the ECI corridor:	approx. 60 m
Municipality:	SŁUPSK, in the area of Bruskowo Leśnictwo village (a forester's house)

Description:
At km 45.8, the planned Project passes in close vicinity to a single-family house (the forester's house address: Gajki 2 Bruskowo Leśnictwo). The forester's house is located in the area of potential impact, in the village of Gajki. The area is surrounded by forest and there is an access road to the building, which is crossed by the ECI corridor. The building is entered in the register of monuments of Słupsk municipality.

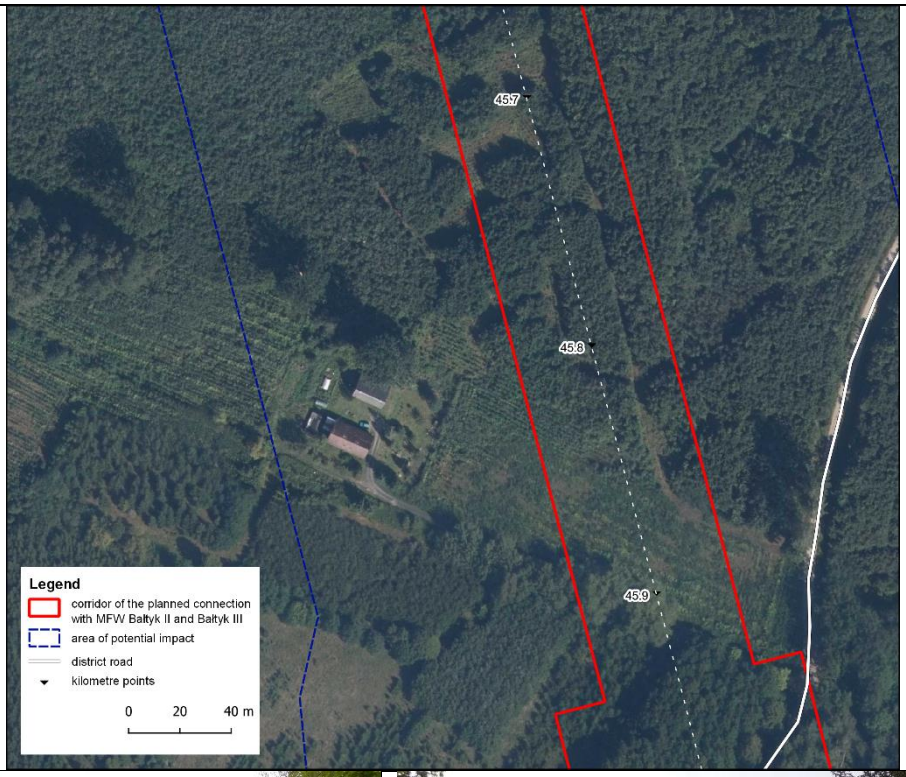


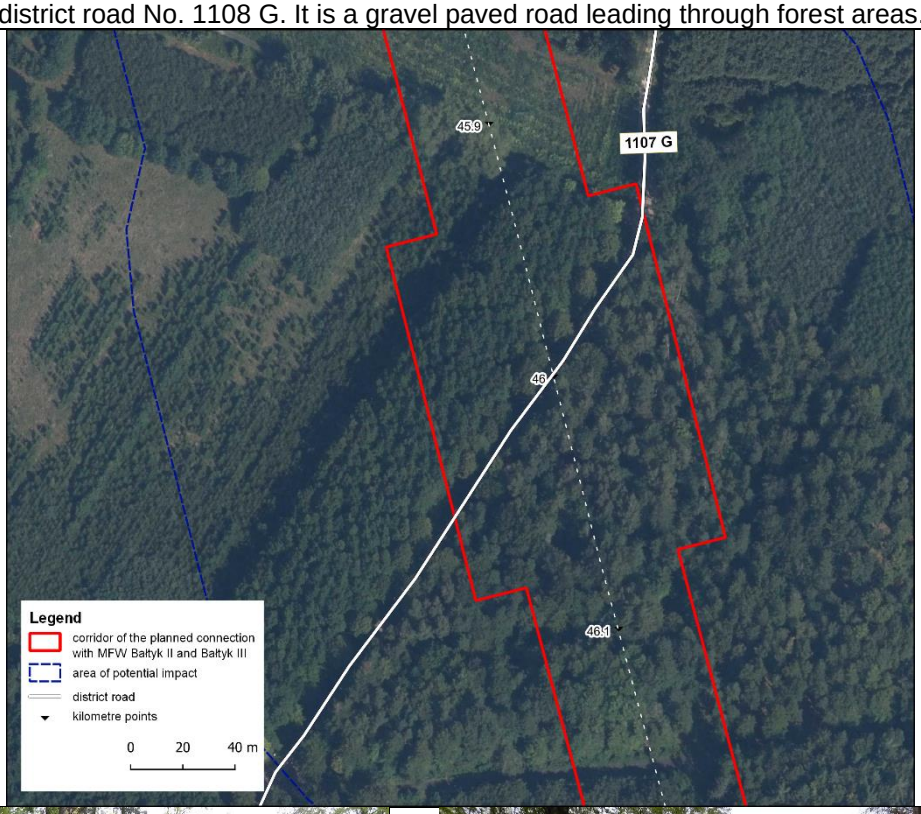
***Photo 45**. Gajki – the access road*

***Photo 46.** Gajki – the single-family house*

Notes:
The access road to the forester's house is planned to be crossed in an open trench, which may periodically make access to the property difficult. The site inspection on 19 May 2022.

Number of Site Inspection Card	**24**
Kilometre of the ECI corridor	**46**
CHARACTERISTICS:	
MUNICIPAL ROAD	
Distance from the ECI corridor:	Crossing the ECI corridor
Municipality:	SŁUPSK, rejon Bruskowo Leśnictwo

Description:
At around km 46, the Project crosses the municipal road No. 1107 G to the village of Krężołki, through Gajki to the district road No. 1108 G. It is a gravel paved road leading through forest areas.



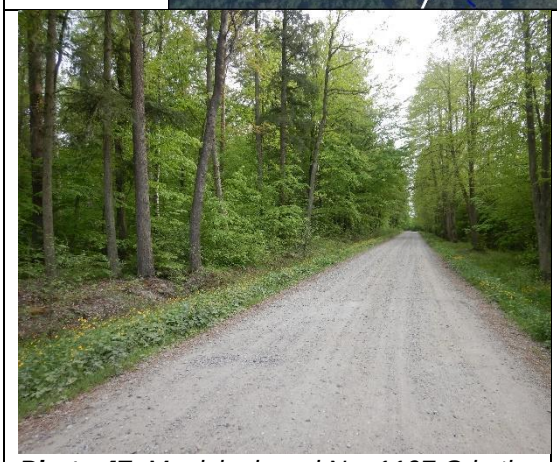


***Photo 47**. Municipal road No. 1107 G in the south direction to Krężołki*

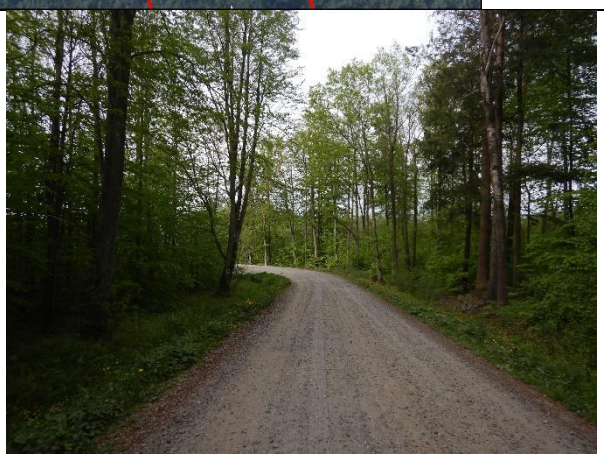


***Photo 48.** Municipal road No. 1107 G in the north direction*

Notes: The site inspection on 19 May 2022.

Number of Site Inspection Card	**25**
Kilometre of the ECI corridor	**47.9**
CHARACTERISTICS:	
WIERZBIĘCINO PSE SUBSTATION	
Distance from the ECI corridor:	Within the ECI corridor
Municipality:	SŁUPSK, in the area of Wierzbięcino

Description:

The planned Project ends at the entrance to the PSE Wierzbięcino substation, at km 47.9 of the Project corridor. An asphalt road leads to the substation from the village of Wierzbięcino, it is a municipal road numbered 119099G. The surroundings of the station are wooded and bushy areas and arable fields. There is no residential development.

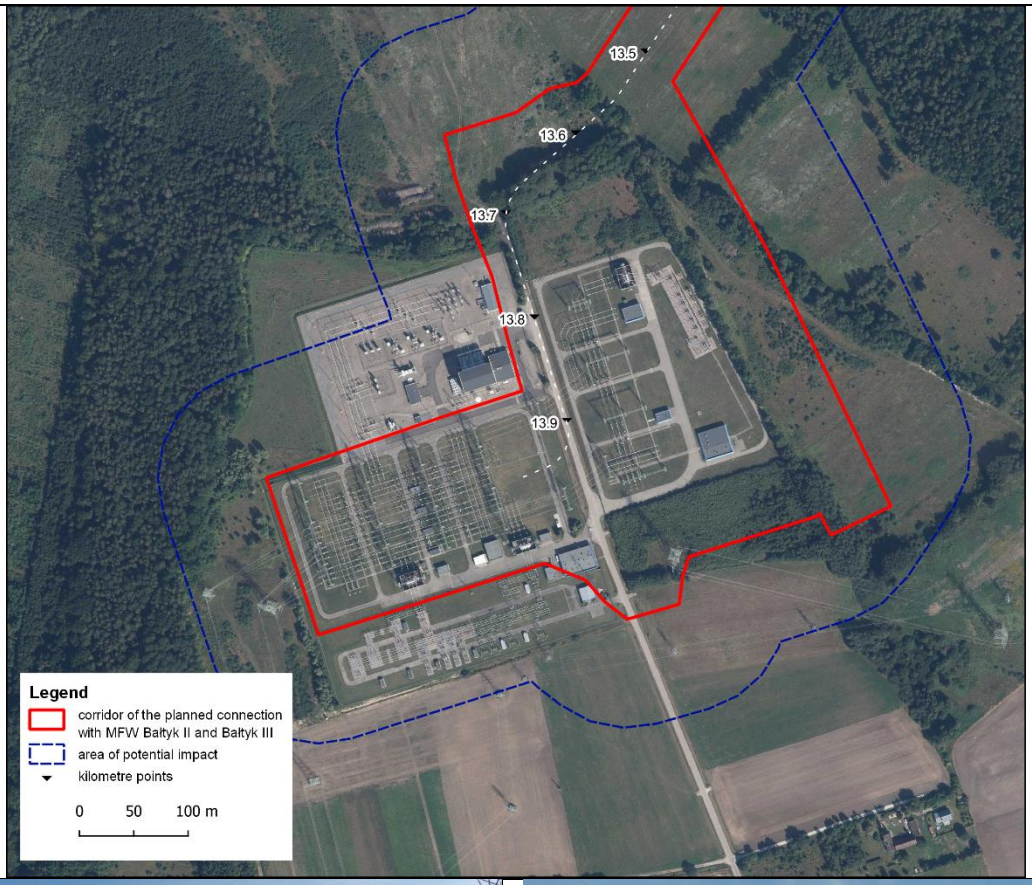


***Photo 49**. Municipal road No. 119099G towards Wierzbięcino.*

***Photo 50.** Wierzbięcino PSE Substation*

Notes: The site inspection on 19 May 2022.

7. MARINE ENVIRONMENT CHARACTERISTICS

7.1. LOCATION AND SHAPE OF THE BOTTOM OF THE BASIN

The characterisation of the bottom shape, geological structure and surface sediments was prepared on the basis of the results of bathymetric, sonar and seismoacoustic surveys conducted in the area of the planned Project in 2013-2014 (the area of the ECI of the MFW Bałtyk II and MFW Bałtyk III) included in Attachments 1.1, 1.2 and 1.3 in Volume III of this Report.

The planned Project is located between the MFW Bałtyk II and MFW Bałtyk III fields, located in the area of the northern and north-eastern inclination of Ławica Słupska, and the land in the area of 235.0 - 238.75 km of the seashore (according to Maritime Office mileage). It covers a fragment of the seabed with a depth to approx. 33m.

The seabed in the area of the planned Project has a varied character, which is related to the last glaciation (presence of the Scandinavian Ice Sheet), the subsequent deglaciation of the area and the activity of modern seabed processes.

Denivelations along the ECI corridor route are approx. 33 m. The shallowest part is located in the southern part reaching the shore in the area of Ustka - figure 7.1. Going northward the depth increases. The deepest area, with a value of 33 m, occurs at a distance of approx. 35 km from the shore (region km 0 and 24 of BIII). Subsequently, both in the northerly and easterly direction, the depths decrease to approx. 16 m within section 16 BII - 0 BII and to approx. 21 m within section 22 BIII - 0 BIII, which is related to the entry of the ECI on Ławica Słupska. In the area of the corridor connecting the MFW Bałtyk II and MFW Bałtyk III fields, located at depths of approx. 20-30 m, the seabed is an extensive plain.

In the area of the Project located within the MFW Bałtyk II field, the denivelations are approximately 25 m. In the southern and south-western parts the depths are between 20 and 25 m. Going north, the depth increases and reaches more than 35 m in the north-western and north-eastern parts of the field. In the north-western part of the field, ridge and hollow forms occur in a strip with depths of 30-35 m. Denivelations within these forms reach up to 3 m, and in some places up to 6.5 m.

Within the MFW Bałtyk III field, depths vary from 23 m to about 33 m, with denivelations of about 19.5 m. The southern and south-western parts are the shallowest. Going north-west and east, the depth increases. The central and eastern part is an extensive plain.

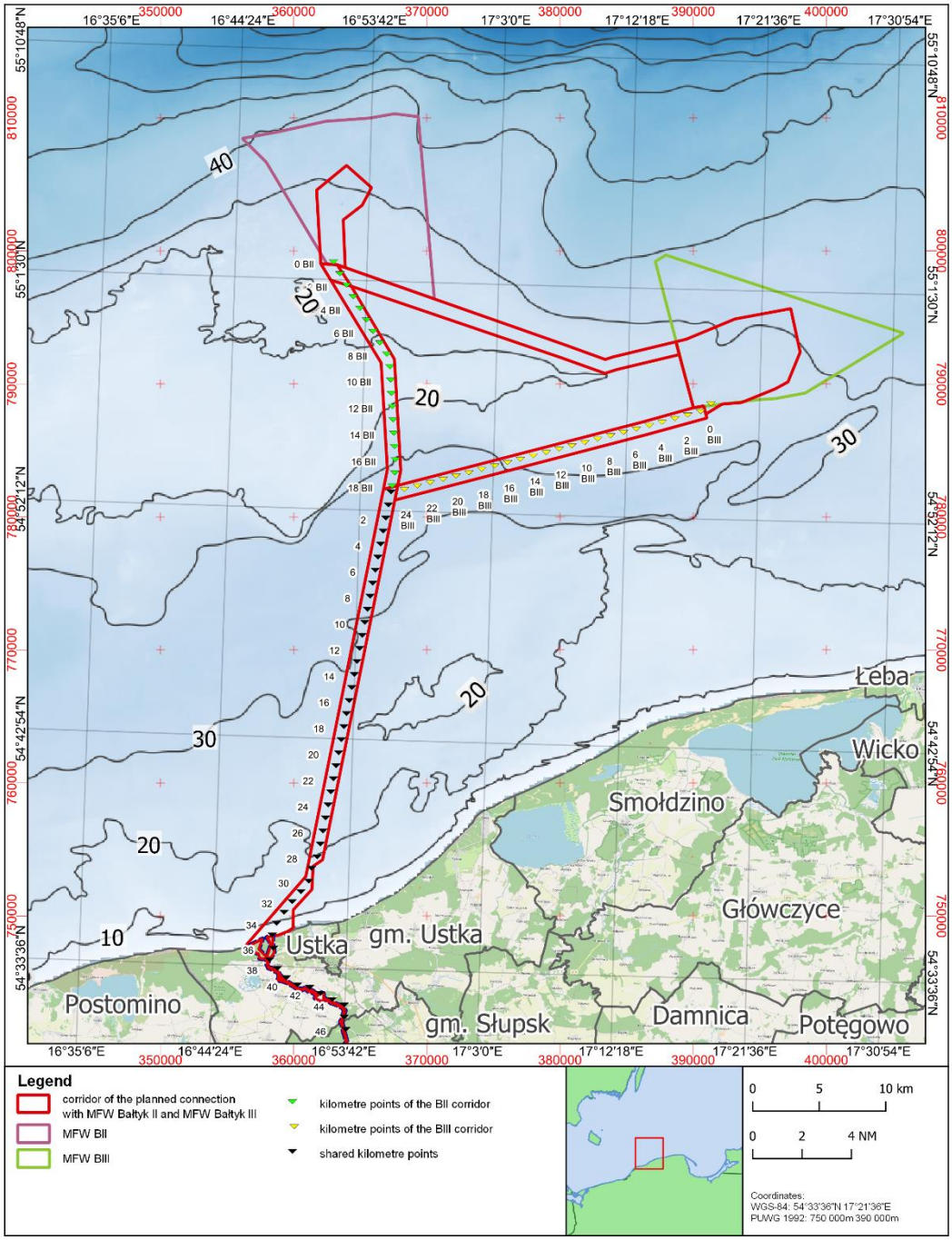


Figure 7.1. *Bathymetry within the planned Project area*

Source: In-house study based on surveys carried out in 2013-2014 in the area of the ECI of the MFW Bałtyk II and MFW Bałtyk (Volume III, Attachment 1.1.)

The bottom surface in the ECI corridor area is varied. In the deeper parts of the route (20-30 m) it has the character of flat plains, while in the northern part of the corridor - convex forms built of boulder clays.

In the area of the MFW Bałtyk II field, most of the seabed is made up of moraine uplands with relict moraine hills, with relative heights of up to 3-4 metres. In the central part, single moraine hills or a series of hills and hills forming sequences occur. In the south-western part, the series of hills takes the form of east-west strips, while in the north-eastern part it runs north-west-southeast. The northernmost is a set of kame terraces. The seabed sculpture here is not very varied and the bottom is gently undulating.

The MFW Bałtyk III field is dominated by sets of kame terraces, i.e. a higher placed one covering most of the field and a lower placed one running along its northern edge. The shallowest parts of the bottom occur here at a depth of approximately 25 m. The bottom within the lower terraces is less diversified. The area of the field is traversed by a valley running south-west to north-east, gently sloping in a north-easterly direction, with numerous step-like formations. The width of the valley reaches up to 2 km in some places and a depth of up to 3 m. A sandy accumulation plain extends across the eastern part of the field.

A number of sedimentary structures are present in the ECI area, i.e. reefs, boulder areas, ripplemarks, and sand waves.

Reefs are found in the shallowest part of the corridor, in the sub-bottom strip, where the average slope of the bottom is 0.01. The reef zone extends to approximately 400-500 m offshore (data from 2005 and 2013) (figure 7.2.). The first reef up to a depth of 5 m, the second one is marked just beyond the 5 m isobath. The 10 m isobath has an irregular course and is between 1000 and 1400 m from the shore.

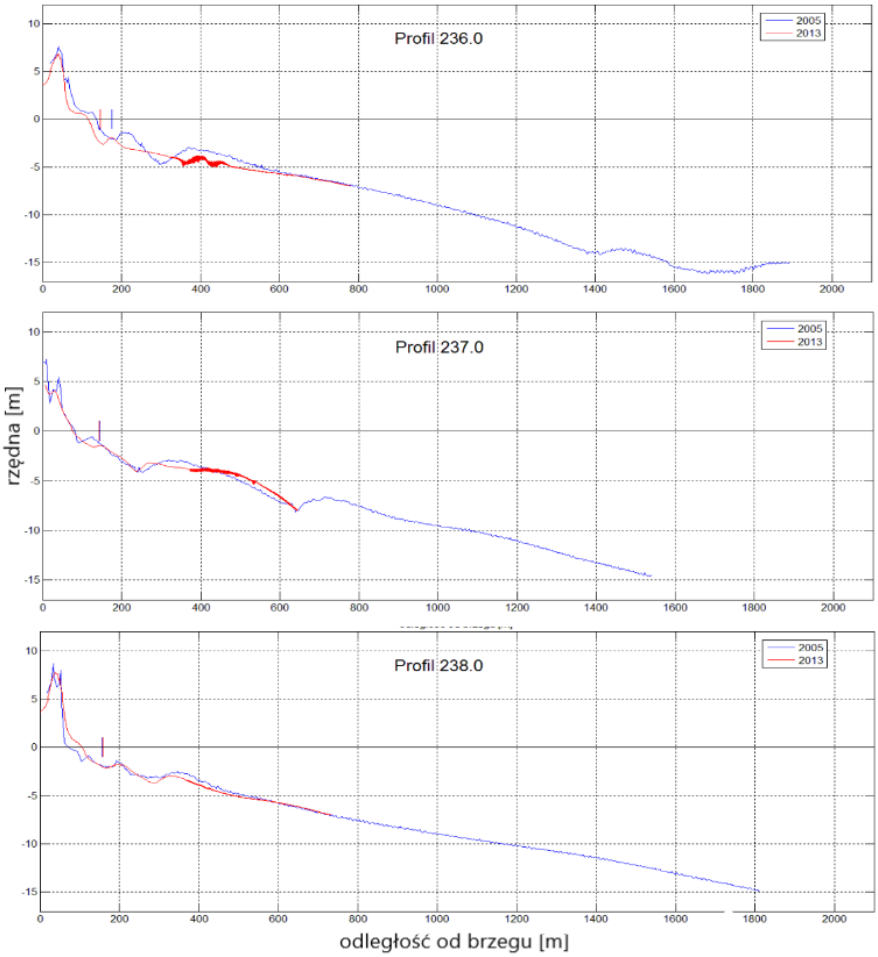


Figure 7.2. *Selected bathymetric and tachymetric profiles of the shore and foreshore in the area of the planned Project (data from 2005 and 2013)*

Source: In-house study based on surveys conducted in 2013-2014 in the ECI area (Volume III, (Attachment 1.3.)

The boulder areas and individual stones within the ECI corridor (greater than 0.5 m in diameter) cover an area of approximately 22.38 km², representing 12.97% of the total area of the corridor designated for the connection infrastructure. Going from the shore, the boulder areas are located in the area of 32 km and 28 km and in sections: 14 - 12.5 km, 8 - 6 km, 10 BII - 0 BII and in the western part of the connector. Individual stones are scattered almost throughout the entire corridor, with the

exception of the central and eastern part of the corridor connecting MFW Bałtyk II with MFW Bałtyk III. Larger accumulations occur in sections 24 BIII - 16 BII, 12 BIII - 9 BIII and 2 BIII - 0 BIII (figure 7.3).

Within the MFW Bałtyk II field, boulder areas are found in almost the entire area, while in the MFW Bałtyk III field they are found in the south-western part and extend towards the north-east.

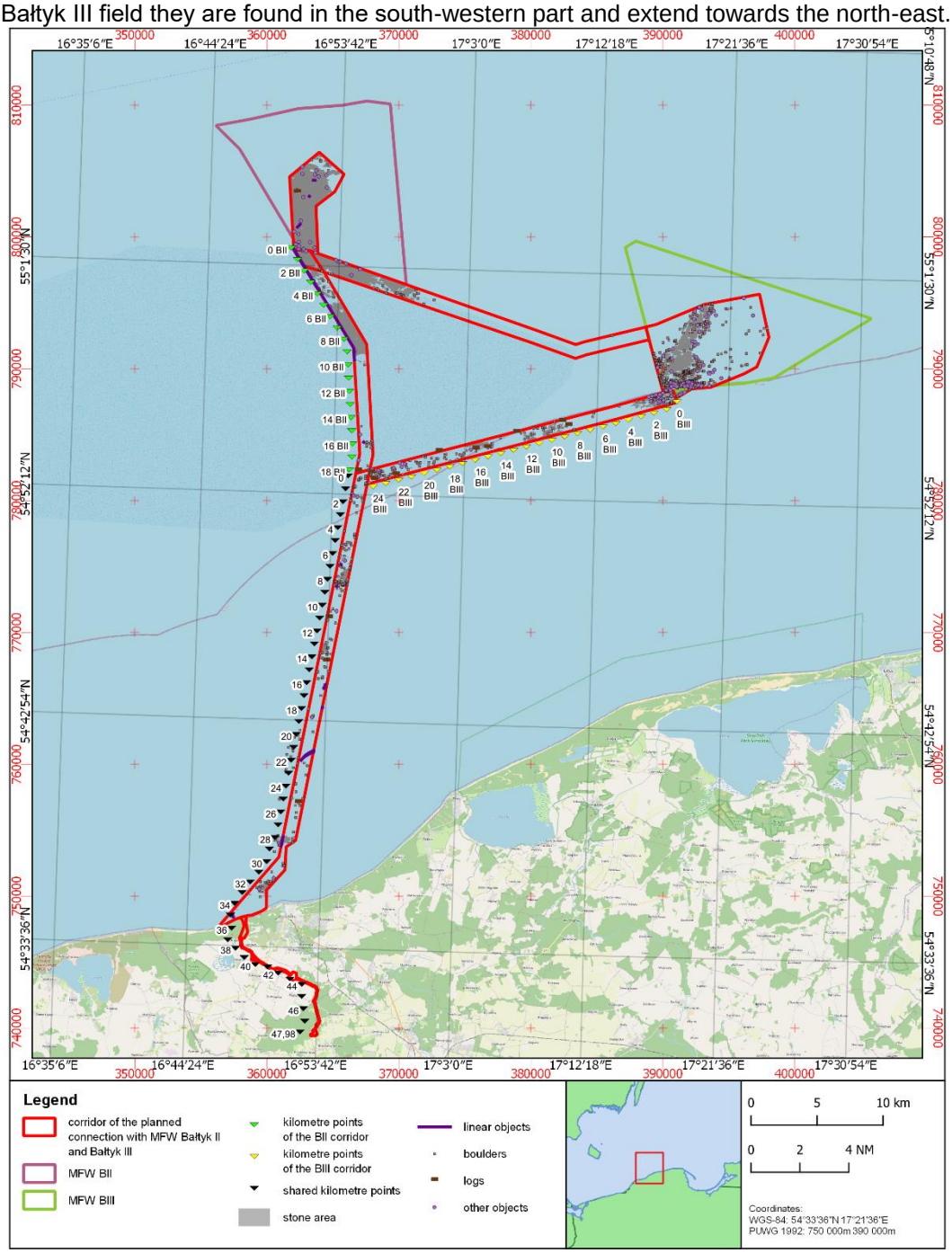


Figure 7.3. *Distribution of the boulder areas and individual stones within the planned Project area*

Source: In-house study based on surveys carried out in 2013-2014 in the area of the ECI of the MFW Bałtyk II and Bałtyk III (Volume III, Attachment 1.2.)

The ripplemarks and sand waves within the ECI corridor cover an area of approximately 27.54 km², representing 15.97% of the offshore part of the ECI corridor. Going from the shore, sedimentary structures are located at: 25 - 18 km, 14 - 4 km and 12 BII - 9.5 BII km, 6.5 BII - 0 BII km, 16 BIII - 7 BIII km, as well as in the western part of the connector, and in some places in the eastern part (figure 7.4). The pattern of formations in the southern (25 - 18 km) and central (14 - 4 km) parts of the ECI route is

more or less linear and indicates the locally dominant directions of sediment movement, i.e. the SW-NE and NNW-SSE directions respectively.

Within the MFW Bałtyk II field, ripplemarks and sand waves occur almost throughout the area, while in the MFW Bałtyk III field they extend eastwards from the boulder areas, concentrating in the central part of the area.

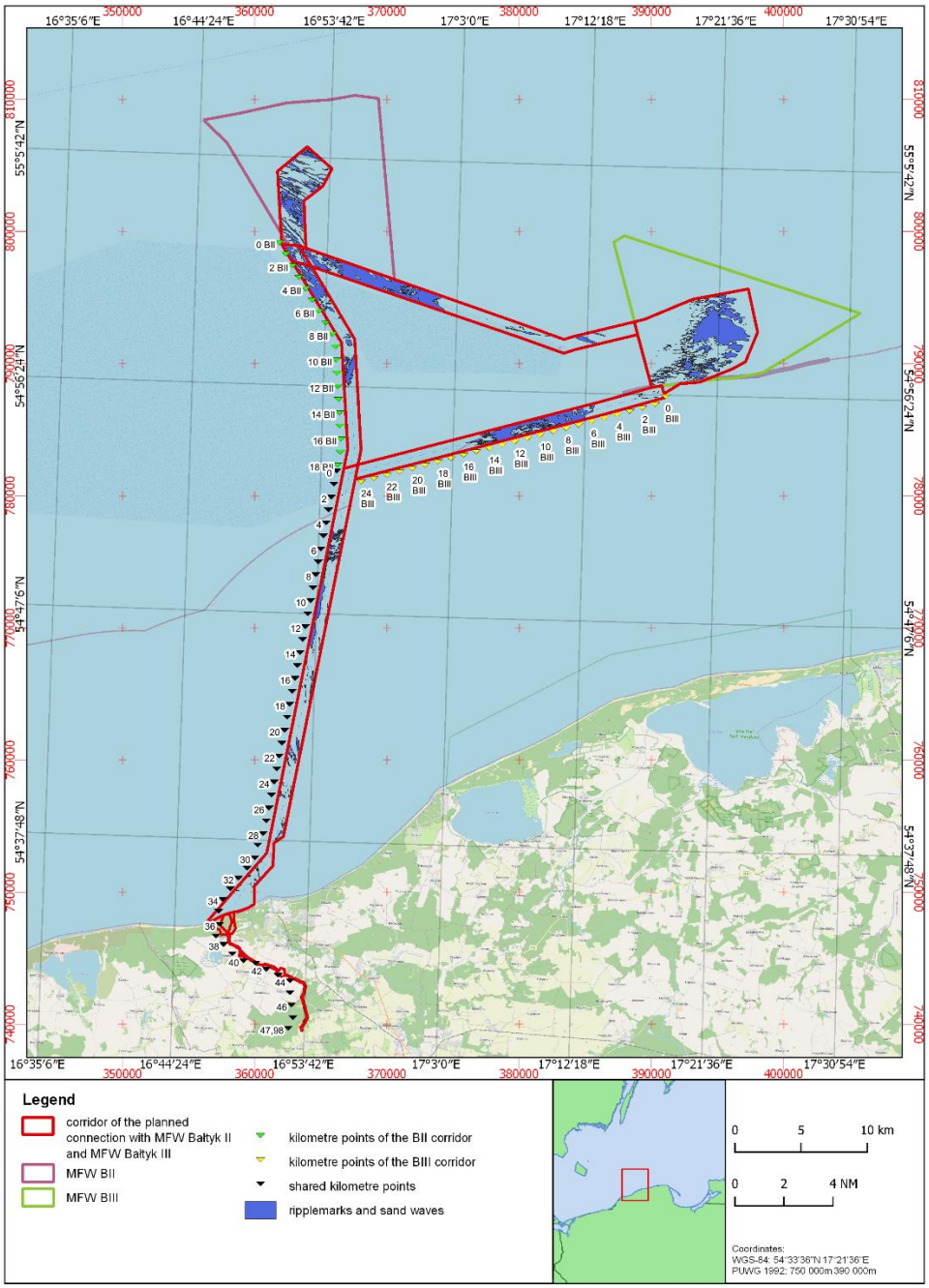


Figure 7.4. *Occurrence of ripplemarks and sand waves within the planned Project area*

Source: In-house study based on surveys carried out in 2013-2014 in the area of the ECI of the MFW Bałtyk II and Bałtyk III (Volume III, Attachment 1.2.)

The thickness of the dynamic layer in the ECI corridor area is variable (figure 7.5). The lack of a dynamic layer or its low thickness (less than 30 cm) is present in Section 0 BII - 12 BII and in the western part of the connector. This is associated with boulder areas and clay outcrops. In areas where clays lie shallowly in the subsoil (section 10 BIII - 12 BIII km, 0 BIII - 4 BIII km), the thickness is 30 cm. In the remaining ECI area, the thickness exceeds 50 cm. The greatest thickness of approximately 3 m occurs within the coastal slope and reef zone (km 33-35), and at several points along the route.

Within the MFW Bałtyk II and MFW Bałtyk III fields, the thickness of the dynamic layer is variable, ranging from 0.2 to 1.7 m on average.

Figure 7.5. *Thickness of the dynamic layer within the planned Project area*

Source: In-house study based on surveys carried out in 2013-2014 in the area of the ECI of the MFW Bałtyk II and Bałtyk III (Volume III, Attachment 1.2.)

7.2. GEOLOGICAL STRUCTURE, BOTTOM SEDIMENTS, RAW MATERIALS AND DEPOSITS

7.2.1. Geological structure

The immediate Quaternary subsoil in the area of the transmission infrastructure route, as well as the region through which the transmission infrastructure will run, is located in the Precambrian platform area. The tectonic picture of the Precambrian platform is dominated by a block structure.[33] In

[33] *Dadlez 1990*

the eastern part of the Polish section of the platform, there is a NNE-SSW system of faults limiting the main tectonic blocks (proceeding from the east): Kurlandia, Łeba, Rozewie and Słupsk. The crystalline substrate occurs here at depths from about 3600 m to about 2600 m. The faults closest to the area in question are the Ustka and Smołdzino faults, rejuvenated at the end of the Carbon and beginning of the Perm.[34]

The sedimentary cover is built up by Cambrian sandstones and mudstone, as well as siltstone sediments, Ordovician siltstones and limestones, Silurian mudstones and siltstones, Zechstein carbonate sediments and rock salts. Mesozoic sediments are represented here only by Cretaceous sediments[35] and lie beneath the transmission infrastructure only up to the bifurcation at kilometre 0 of the ECI. These are Upper Cretaceous sediments - quartz-glauconitic sands and sands with phosphorites. The Cenozoic complex includes sectional fragments of the Palaeogene, Neogene and Pleistocene profile, and sections of the Holocene profile.

The immediate Quaternary substrate, in the area of the transmission infrastructure, as well as in the area of MFW Bałtyk II and MFW Bałtyk III, consists of Upper Eocene/Lower Eocene sediments. These are muddy-silty or silty-sandy quartz-glauconite sediments with phosphate concretions. The thickness of the series gradually increases from north to south from a dozen to several tens of metres.[36]

The Quaternary is mainly made up of Pleistocene glacial and water-glacial sediments, as well as Holocene marine sediments, locally lake and marsh.[37] The Quaternary formations form a continuous cover, the thickness of which, in the course of the transmission infrastructure, ranges from 20 to about 40 m, in the area of MFW Bałtyk II from 20 to 30 m, and in the area of MFW Bałtyk III up to 45 m.

7.2.2. Depth structure

The subsurface structure in the ECI area, as identified by a detailed analysis of the results of the seismic surveys (subbottom profiler (SBP) and Boomer) conducted by the Investor, contains glacial, fluvioglacial, stagnation deposits, differentiated sediments and fine- and medium-grained sands up to approximately 40 m (Volume III, Attachment 1.2).

The former are represented by a glacial till, which is present in the deep structure along the whole section of the ECI (figure 7.6). The bottom surface of these sediments is generally uneven, and relatively even only in the area of the transmission infrastructure connecting the Bałtyk II and Bałtyk III wind farms. Clay appears on the bottom surface from km 12 BII to km 0 and in the western part of the ECI connector. Variegated sediments, mainly gravels and sands with gravels, of fluvioglacial origin (Pleistocene) form accumulations with a thickness ranging from approximately 0.5 m to 5.0 m, usually on the surface of clays in the central and eastern parts of the ECI connecting the Bałtyk II and Bałtyk III wind farms. These areas are covered by a layer of modern marine sands with a thickness of no more than 2 m.

According to the archival materials, the ECI (central part of the connector between MFW Bałtyk II and MFW Bałtyk III and the eastern part of the field of MFW Bałtyk II) runs through a form of the sandur (an outwash plain) made of glacial sands and gravels.

[34] *Dadlez 1995*
[35] *Dadlez 1995*
[36] *Kramarska et al. 1999*
[37] *Kramarska et al. 1995*

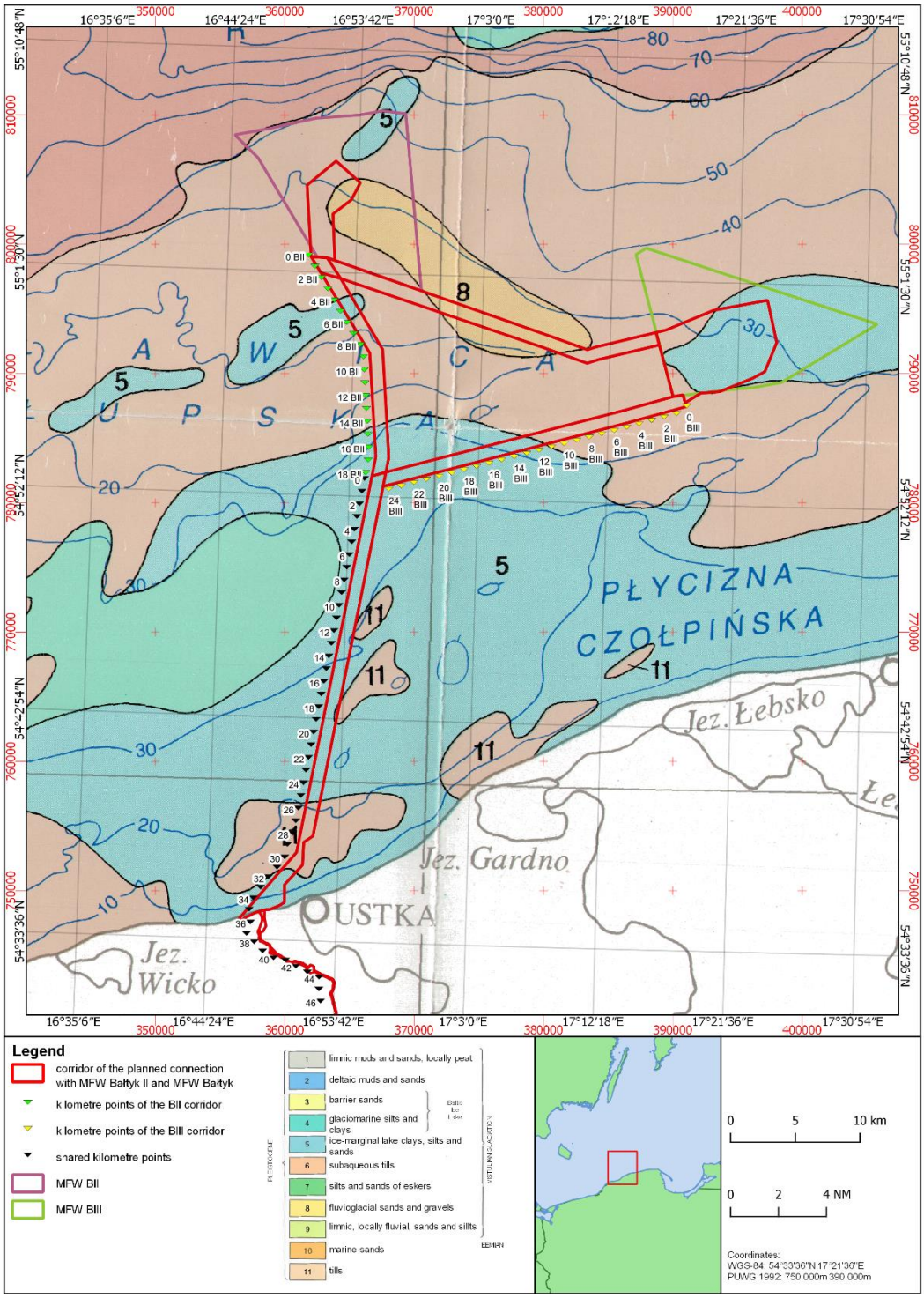


Figure 7.6. *Fragment of a map of Pleistocene sediments showing the course of the ECI through the sandur form*

Source: In-house study based on Uścinowicz Sz.1995a

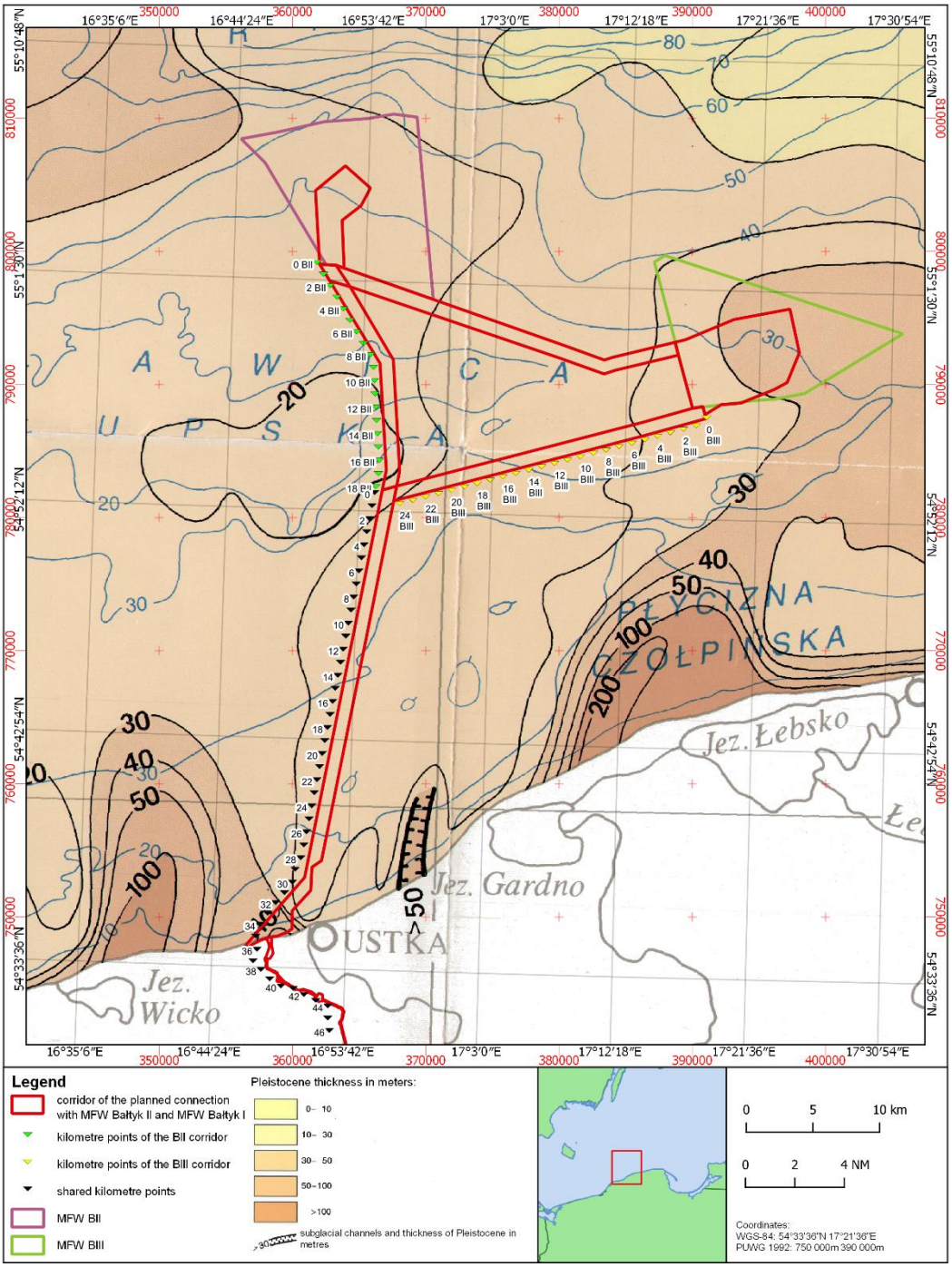


Figure 7.7. *Extract from the Pleistocene thickness map*

Source: In-house study based on Uścinowicz Sz.1995b

The latter are mainly clays, silts and fine sands of Pleistocene and Holocene age of different thickness (figure 7.7, figure 7.8). They have been identified in depressions and indentations in the top of glacial till presumably from km 3 to 16 BII and reach a thickness of up to about 40 m here, and from km 24 B III to km 16 BIII, where muddy-silty deposits are about 15 m thick. At the surface, sandy sediments of variable thickness are present (Volume III, Attachment 1.2).

Fine- to medium-grained sands and modern fine- to medium-grained marine sands (Holocene) form a discontinuous layer of surficial sediments. The greatest thickness of approximately 3 m was found within the coastal slope and reef zone and at several points along the route. Organic sediments were also found along the ECI route. The latter can also be expected in the area of the coastal slope.

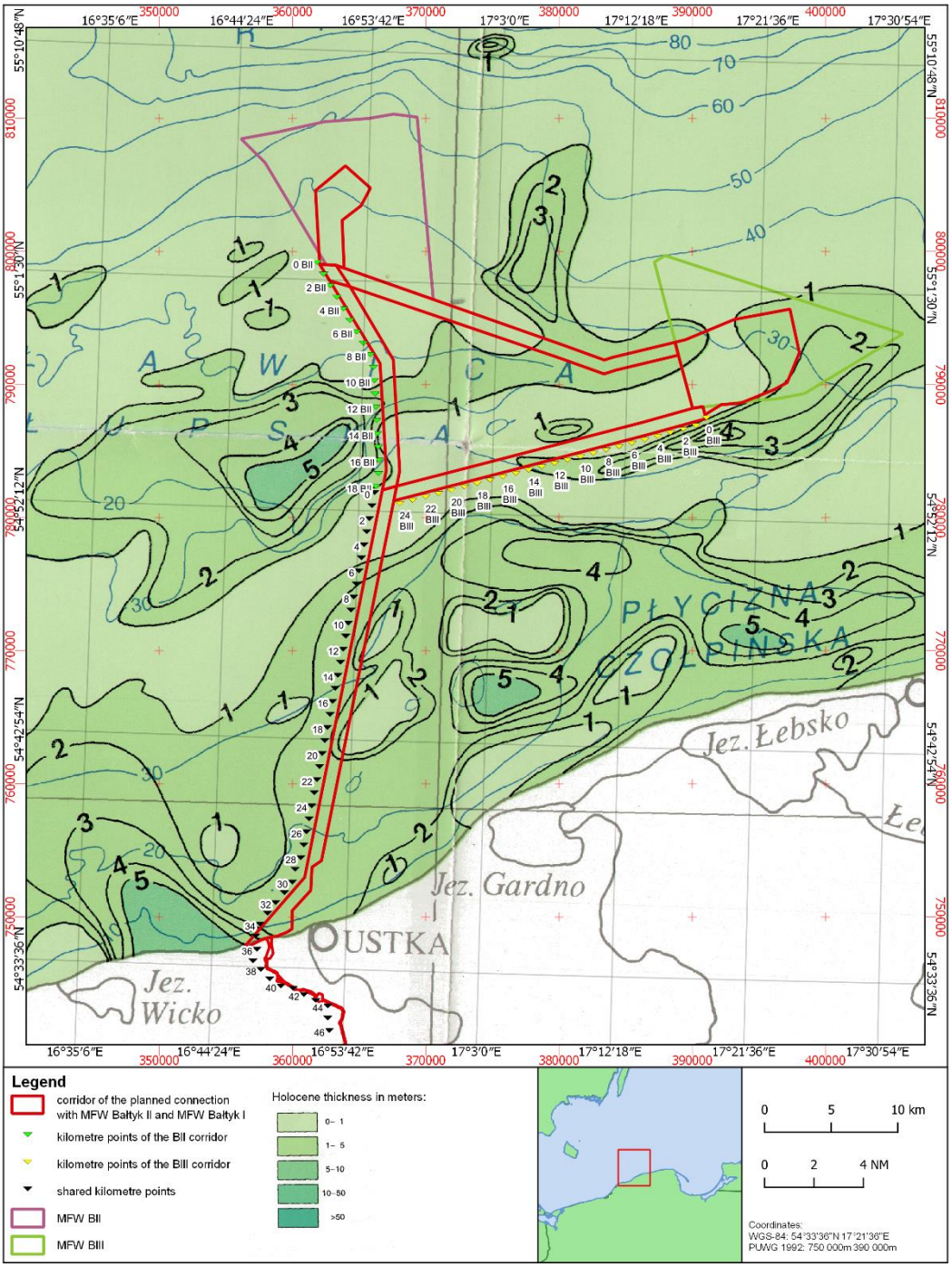


Figure 7.8. *Fragment of Holocene thickness map*

Source: In-house study based on Uścinowicz Sz.1995c

The subsurface structure of the MFW Bałtyk II field is mainly characterised by glacial till and sandy sediments of varying granulation.

The boulder clays form a continuous layer up to about 30 metres thick with an uneven top surface. They occur over almost the entire field. In the western part, within the moraine upland and its slope, the clays occur on the bottom surface. They are overlain by numerous boulders (accumulations and isolated) and gravels, covered by a thin layer of sands in some places.

Variegated sediments, mainly gravels and sands with gravels, fluvioglacial (Pleistocene), are generally found in the eastern part of the field, within parts of the moraine upland, kame terraces and

accumulation plain, where they cover the glacial till with a discontinuous layer up to 5 m thick. These sediments are often covered by marine sands up to 3 m thick.

Fine- to medium-grained sands and modern fine- to medium-grained marine sands (Holocene) form a discontinuous layer of surficial sediments. They constitute a so-called dynamic layer of variable thickness (from 0.2 to 1.7 m).

The subsurface structure of the MFW Bałtyk III field consists of glacial till, stagnant sediments and sandy sediments of various granulations.

The boulder clays, as in the area of the MFW Bałtyk II, occur over almost the entire field. They form a continuous layer with a thickness of 20 to approximately 30 metres and an uneven top surface. In the northern and north-western part of the area, the clays occur on the bottom surface, forming extensive outcrops covered in places by a thin layer of sands and gravels. They are overlain by pebbles and numerous boulders.

Stagnant sediments, mainly represented by clays, silts and sands of the Pleistocene, have been identified in the subglacial tunnel valley of the SW-NE route and in the eastern part of the area. The top of these sediments occurs at depths ranging from 0.5 m to almost 4 m. They are covered by sandy sediments.

The differentiated sediments are mainly fluvioglacial sands and gravels. They occur in a small area, in the southern part of the higher level of the kame terraces.

The fine- to medium-grained sands, modern fine- to medium-grained marine sands (Holocene), form a discontinuous layer of surficial sediments. They constitute a so-called dynamic layer of variable thickness (from 0.2 to 1.7 m).

Archival materials, as well as studies conducted by the Investor for the purposes of the investment, indicate that glacial deposits are mainly glacial till, water-glacial sands, as well as clays, silts and stagnation sands, and their thickness may exceed 40 metres. Holocene sediments are generally sands of varying granulation and occasional biogenic sediments. Their thickness may exceed only in the coastal slope zone and in the reef zone may exceed 3 m.

7.2.3. Bottom sediments

On the basis of the analyses of bathymetric, sonar and seismo-acoustic data (Volume III, Attachment 1.2.) boulder clay, boulder clay with sand cover, mixed-grained sediments, sands on clay/silt (stagnant sediments) and fine-grained sands were identified on the surface of the bottom of the planned Project .

The ECI area is mainly covered by sandy sediments. Going from the shore (km 35), sands overlie the bottom surface, with outcrops of glacial till on the bottom surface in the area of km 32, 28 and 25, and sands overlying clays have been identified from km 22 to 19 and from km 12 to 5.5. From km 3 to km 0 and from km 18 BII to km 16 BII there are sands lying on clays. At km 2 a ribbon of sands occurs. Above km 16 BII and km 10.5 BII there are again sandy sediments. Above to km 0 BII and in the western part of the course of the ECI connecting the MFW Bałtyk II and MFW Bałtyk III, glacial till occurs on the bottom surface, covered in places by a thin layer of sands, while the central and eastern part is covered by a continuous layer of sands and at the end, by a layer of sands overlying clay. From km 0 BIII to km 2 BIII, and almost to km 4 BIII there are sands over clay. From km 4 BIII to km 16 BIII, the bottom surface is overlain by variably grained sediments with small patches of fine sands on the surface. From km 16 BIII to the junction of BIII with BII, sands on clay occur (figure 7.9).

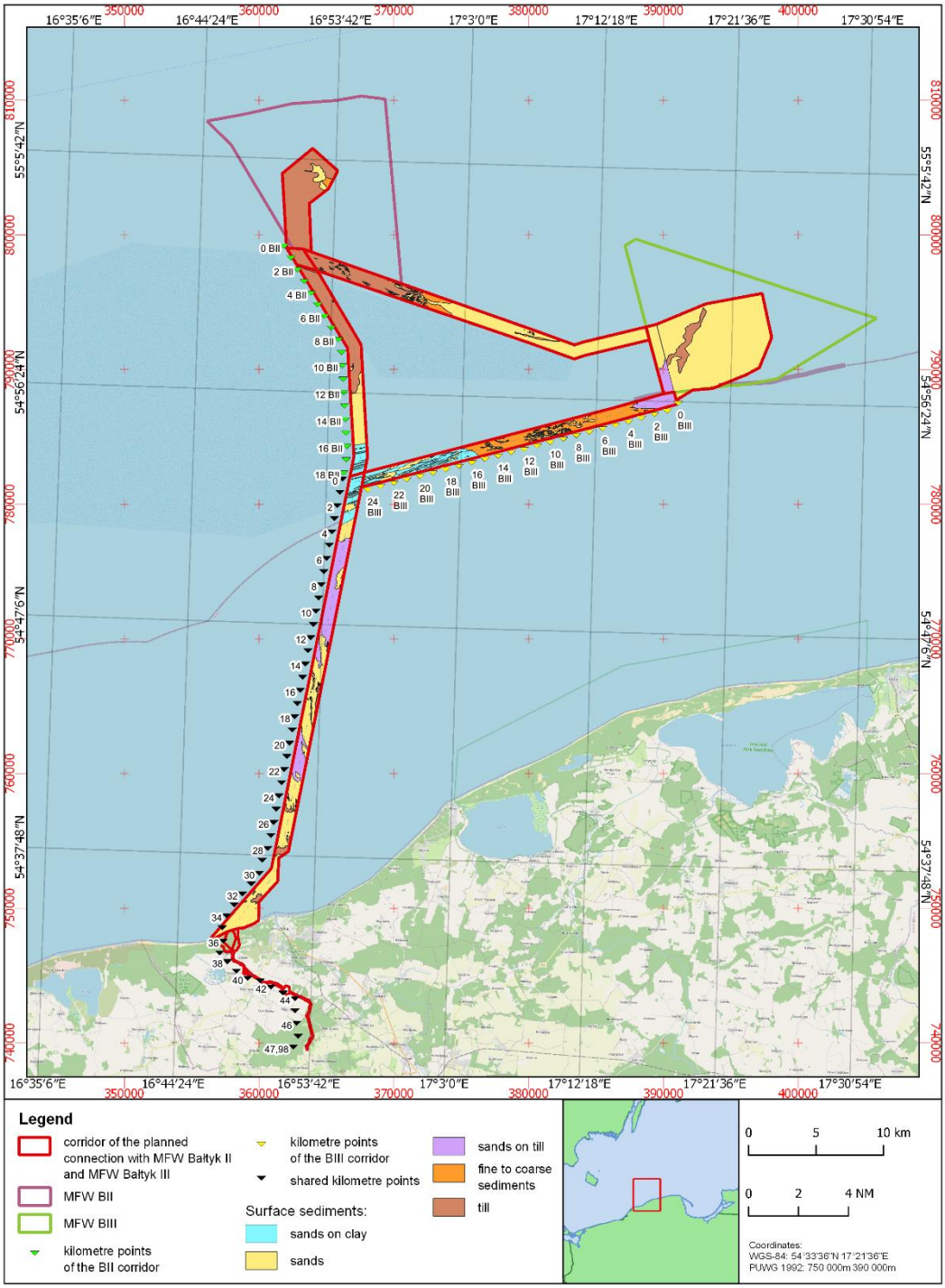


Figure 7.9.*Surface sediments within the area of the planned Project*

Source: In-house study based on surveys carried out in 2013-2014 in the area of the ECI of the MFW Bałtyk II and Bałtyk III (Volume III, Attachment 1.3.)

Both in the area of MFW Bałtyk II and MFW Bałtyk III, the seabed surface is predominantly covered by clay till with a thin, variable fine- to medium-grained sandy layer (marine sands), the thickness of which is variable and ranges from 0.2 to 1.7 m on average.

7.2.4. Geological and engineering valorisation and zoning

According to the geological and engineering valorisation and zoning[38], the planned Project runs through three depth zones (figure 7.10):

[38] *Kramarska (red.) 2019*

- I - from 0 to 10 m above sea level.
- II - from 10 to 20 m above sea level.
- III - from 20 to 30 m above sea level.

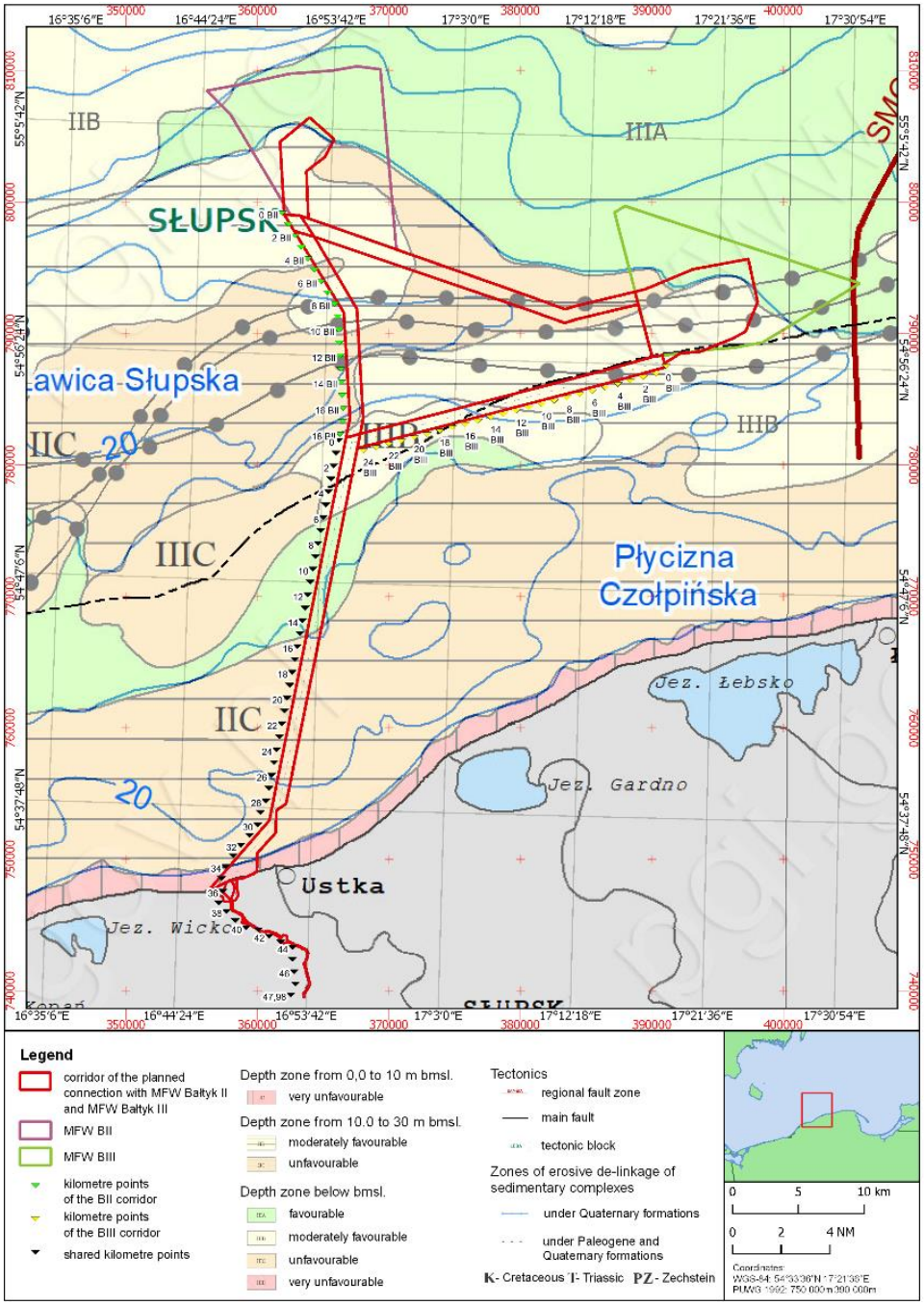


Figure 7.10. *Geological-engineering valorisation and zoning of the seabed in the area of the planned Project*

Source: In-house study based on Kramarska (ed.) 2019

Zone I extends into the coastal strip of the bottom and includes the coastal slope and the reef zone. This area is subject to systematic wave action and continuous bottom transformation through erosion, shoreline debris redeposition and accumulation.[39] In the Project area, this zone extends in the section of 33-34.5 km. Changes in the bottom ordinate due to shifting reefs may reach 1-2 m per year in the surf zone. The seabed surface is mainly sandy (table 7.1).

[39] *Kramarska (ed.) 2019*

Zone II is located within the zone where cut storm waves influence the bottom. Under the influence of wave action, the transport of sand and gravel, sandy and silty sediments takes place. The transport process produces small wave-current wrinkles (ripplemarks) and larger sand waves. This zone is divided into two regions, i.e. IIB - with medium favourable conditions and IIC - with unfavourable conditions.[40] In the area of the Project, Zone II covers the largest part of the corridor and the MFW Bałtyk II and Bałtyk III fields. There are clays, clays covered by sands and sands of different granulation on the bottom. Both the MFW Bałtyk II and Bałtyk III fields are areas of sandy sediment redeposition, where water flow and sediment transport is mainly in E and NE directions. The seabed is eroded (at least periodically) almost throughout the fields, with the exception of the accumulation areas located in the north in the case of MFW Bałtyk II.

Zone III is outside the range of storm wave impact on the seabed. Sandy sediments, clays and silty and clay fractions are present. The zone is divided into 4 regions, two of which occur in the area of the planned Project.[41] In the area of the Project, Zone III covers approx.. 27km long section of the ECI corridor, which is underlain by sandy sediments overlying clays and loams.

Table 7.1.*Summary and characteristics of geological and engineering regions in the area of the planned Project.*

Bottom area	Geological and engineering region		Lithology	The ECI lithology	Kilometrage/ the ECI area
I 0-10 m asl.	**ID**	very unfavourable	sands, gravels, clays	sands	33-34.5
II 10-30 m asl.	**IIB**	moderately favourable	till (hard-plastic and plastic)	clay, multigrained sands, sands on clays	0-12 BIII 0-4.5 BII 6.0-10 BII the connector - western part MFW Bałtyk II MFW Bałtyk III
	IIC	unfavourable	sands (low and medium density), locally enriched in gravels, forming covers on abrasion-accumulation plains	sands, sands on clays, clay	15.0-33.0 4.5-6.0 BII 10 BII-18 BII the connector - central and eastern part
III > 30 m asl.	**IIIA**	favourable	sands and gravels (medium and high density), glacial clays (hard-plastic and plastic)	sands on clays	6-15
	IIIB	moderately favourable	subaqueous clays (plastic), clays, silt and sand (plastic)	sands on loam sands	0-6,0 12-24 BIII

Source: In-house study based on:Kramarska (ed.) 2019 and the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

7.2.5. Physico-chemical conditions of the seabed sediments

The physico-chemical characterisation of the surface sediments was prepared on the basis of the results of the investigations carried out in 2013-2014 in the ECI area and within the MFW Bałtyk II and Bałtyk III (Volume III, Attachment 1.2.).

[40] *Kramarska (ed.) 2019*
[41] *Kramarska (ed.) 2019*

Moisture and organic matter content (LOI)

Seabed sediments from the area of the planned Project belong to inorganic sediments with organic matter content expressed by loss on ignition (LOI) < 10% (table 7.2, table 7.3). The average moisture content of the sediments oscillates between 15.5 and 18.2%.

Table 7.2. *Organic matter content and moisture content of the seabed sediments from the Project area within the ECI corridor boundaries*

Parameter	Values	The Project area		
		0-34; 0-18 BII	0 BIII - 24 BIII	connector
LOI [%]	Medium	0.44	0.40	0.70
Moisture content [%]	Medium	18.0	16.7	16.4

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Table 7.3.*Organic matter content and moisture content in seabed sediments from the Project area within MFW Bałtyk II and MFW Bałtyk III*

Parameter	Values	The Project area			
		MFW Bałtyk II		MFW Bałtyk III	
		months			
		12/1	4/5	6/7	11
LOI [%]	Medium	0.54	0.83	0.33	0.31
Moisture content [%]	Medium	15.5	17.3	17.7	18.2

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Phosphorus

Phosphorus in seabed sediments is conventionally divided into labile (mobile) and refractory phosphorus. Refractories are compounds of phosphorus with calcium, clay, clay minerals and organic forms of this element. Labile phosphorus is phosphorus contained in fresh organic matter, phosphates in interstitial waters, phosphorus-iron compounds and phosphates loosely bound to various sediment elements by adsorption. The refractory form is deposited in the sediment, while the labile form readily returns to the water due to, among other things, mineralisation of organic matter and dissolution of phosphorus-iron compounds.[42]

The phosphorus content of the surface layer of the Baltic sediments depends on their lithology. Fine-dispersed sediments, in areas of continuous accumulation, have much higher phosphorus concentrations than sediments in areas of transport and erosion. Typically, phosphorus concentrations in Baltic sediments do not exceed 200 μmol-g^{-1} d.m. (6180 mg-kg^{-1} d.m.).[43]

The content of total phosphorus found in the surface sediments of the Project area did not exceed values typical for the Baltic Sea sediments, i.e. 6180 mg-kg^{-1} d.m. (table 7.4, table 7.5).

Table 7.4. *Phosphorus and nitrogen content in seabed sediments from the Project area within the ECI corridor*

Component	Concentrations	The Project area		
	[mg-kg^{-1} d.m.].	0-34; 0-18 BII	0 BIII - 24 BIII	connector
P	scope	53.5 - 746	69 - 899	194 - 709

[42] *Uścinowicz (ed.) 2011*
[43] *Uścinowicz (ed.) 2011*

Component	Concentrations [mg-kg⁻¹ d.m.].	The Project area		
		0-34; 0-18 BII	0 BIII - 24 BIII	connector
	Medium	185	281	343
N	scope	93.7-1520	174-1370	117-1466
	Medium	603	652	478

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Table 7.5. *Phosphorus and nitrogen content in seabed sediments from the area of the Project within the MFW Bałtyk II and MFW Bałtyk III*

Component	Concentrations [mg-kg⁻¹ s.m.].	The Project area			
		MFW Bałtyk II		MFW Bałtyk III	
		Months			
		12/1	4/5	6/7	11
P	scope	139 - 942	171 - 884	145 - 784	177 - 591
	Medium	345	355	265	264
N	scope	104-967	126-2777	103-2926	84-1874
	Medium	385	966	792	616

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Nitrogen

The main source of nitrogen in sediments is organic matter. Nitrogen in organic compounds is the predominant form. The circulation of nitrogen in the aquatic environment takes place with the participation of microorganisms, and aerobic conditions play an important role in the transformation of the nitrogen compound. [44]

In the Baltic sediments, nitrogen occurs mainly in organic form and its regional variability is analogous to that of carbon.[45] In the Southern Baltic, the nitrogen content of sandy sediments ranges from 7-186 µmol-g⁻¹ d.m. (98-2604 mg-kg⁻¹ d.m.), in sandy silty and silty sandy sediments 79-221 µmol-g⁻¹ d.m. (1106-3094 mg-kg⁻¹ d.m.), in silty sediments 136-679 µmol-g⁻¹ d.m. (1904-9506 mg-kg⁻¹ d.m.), and in clays 121-329 µmol-g⁻¹ d.m. (1694-4606 mg-kg⁻¹ d.m.).[46]

The nitrogen content of the surface layer of the Baltic sediments is subject to seasonal changes. An increase occurs after spring and autumn phytoplankton blooms, when a load of fresh organic matter reaches the sediments from the water.[47]

The content of total nitrogen in the surface sediment of the Project area is comparable to the concentrations determined for the Baltic Sea sediments for the individual sediment fractions.

Metals

Heavy metals in sediments come from both natural sources and anthropogenic pollution. Their content depends primarily on the grain size of the sediment. Fine-grained sediments, silts and clays contain considerably more metals than sands, as metals are bound mainly by clay minerals and organic matter, as well as iron and manganese hydroxides. An increase in the sandy fraction in the sediment reduces the metal content.[48]

[44] *Uścinowicz (ed.) 2011*
[45] *Carman 2003*
[46] *Pęcherzewski 1972*
[47] *Aigars and Carman 2001*
[48] *Uścinowicz (ed.) 2011*

Metals are present in the sediment in different chemical forms, more or less mobile and therefore more or less easily involved in biogeochemical reactions. [49]

One of the main factors influencing the concentration of metals in sediments is changes in redox conditions. In addition, sedimentation rates, the extent of sediment mixing due to bioturbation and the influence of bottom currents, and the rate and extent of pore water diffusion.[50]

The metal content in seabed sediments from the area of the planned Project occurred at low levels (table 7.6, table 7.7). Concentrations of analysed metals: Pb, Cu, Zn, Ni, Cd, Cr, As, Hg, did not exceed typical values for sandy sediments of the southern Baltic Sea.[51] [52] [53] Arsenic, cadmium and mercury were present at trace levels, generally below the lower limit of quantification.

Table 7.6. *Metal content in seabed sediments from the Project area within the ECI corridor*

Metal	Concentrations [mg-kg^{-1} d.m.].	The Project area		
		0-34; 0-18 BII	0 BIII - 24 BIII	connector
Hg	scope	< 0.01 – 0.01	< 0.01 – 0.01	< 0.01 – 0.01
	Medium	< 0.01	< 0.01	< 0.01
Pb	scope	1.08-5.24	1.36-3.51	1.01-6.15
	Medium	2.59	2.18	2.79
Cu	scope	0.25 to 5.74	0.35-2.32	0.46-6.73
	Medium	1.23	0.76	1.83
Zn	scope	< 25	2.05-49.7	3.63-121
	Medium	8.25	9.51	15.80
Ni	scope	0.25-9.38	0.53-4.15	0.82-13.34
	Medium	1.33	1.27	2.88
Cd	Scope	< 0.05	< 0.05	< 0.05
	Medium	< 0.05	< 0.05	< 0.05
Cr	scope	0,94-15,2	1,51-4,40	1,74-16,7
	Medium	2.61	2.28	4.31
Ace	scope	<1.25 – 2.51	< 1.25 – 3.30	< 1.25 – 3.40
	Medium	-	-	-

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Table 7.7. *Metal content in seabed sediments from the Project area within MFW Bałtyk II and MFW Bałtyk III*

Metal	Concentrations [mg-kg^{1} d.m.].	The Project area	
		MFW Bałtyk II	MFW Bałtyk III
Hg	scope	<0,01	<0,01
	Medium	-	-
Pb	scope	1,63-7,29	0,96-7,40

[49] *Uścinowicz (ed.) 2011*
[50] *Uścinowicz (ed.) 2011*
[51] *Uścinowicz (ed.) 2011*
[52] *Szczepańska and Uścinowicz 1994*
[53] *Szefer 2002*

Metal	Concentrations	The Project area	
	[mg-kg¹ d.m.].	MFW Bałtyk II	MFW Bałtyk III
	Medium	2,92	2,51
Cu	scope	<0,25-9,63	0,25-45,0
	Medium	1,18	0,98
Zn	scope	<40	<60,0
	Medium	8,05	8,71
Ni	scope	0,59-16,45	0,38-11,82
	Medium	1,93	1,48
Cd	scope	<0,05	<0,05
	Medium	-	-
Cr	scope	1,89-24,805	1,24-19,5
	Medium	3,57	2,69
Ace	scope	<1,25-2,18	<1,25-5,05
	Medium	-	-

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Slightly elevated metal concentrations were observed in the area of MFW Bałtyk II in the NW and W part and the area of MFW Bałtyk III in the NW and SW part, which was related to the occurrence of clayey sediments and sands on clays.

Labile form of metals

The properties of a given element as well as its ability to pass into the water, depend on the physical and chemical form in which it occurs.[54] [55]

In terms of persistence and physical-chemical compounds, metals are associated with the sediment in two ways. One part is permanently embedded in the crystal structure of the minerals (mainly with aluminosilicates) and will not pass into water. The other is mobile (labile), adsorbed on the surface, bound to carbonates, hydrated iron and manganese oxides and organic matter, which, under favourable conditions, can pass into water, thus posing a real threat to the ecosystem.[56]

Concentrations of the labile form of metals in the surface sediments of the planned Project occur at very low levels (table 7.8, table 7.9).

Table 7.8. *Labile metal form content in seabed sediments from the Project area within the ECI corridor*

Labile form metal	Concentrations [mg-kg^{-1} d.m.].	The Project area		
		0-34; 0-18 BII	0 BIII - 24 BIII	connector
Hg	scope	< 0.01	<0.01	<0.01
	Medium	< 0.01	<0.01	<0.01
Pb	scope	0.72-3.88	1.07-2.08	0.35-4.08
	Medium	2.00	1.63	1.77
Cu	scope	<0.25-3.93	0.29-2.32	<0.25-3.62
	Medium	0.71	0.55	1.60

[54] *Siepak 1998*
[55] *Savvides et al. 1995*
[56] *Tessier et al. 1979*

Labile form metal	Concentrations [mg-kg^{-1} d.m.].	The Project area		
		0-34; 0-18 BII	0 BIII - 24 BIII	connector
Zn	scope	0.35-11.34	2.07-9.36	2.21-16.65
	Medium	2.80	4.19	5.02
Ni	scope	<0.25-4.10	<0.25-0.76	<0.25-3.23
	Medium	0.97	0.50	0.97
Cd	scope	<0.05-0.1	<0.05	<0.05-0.08
	Medium	<0.05	<0.05	<0.05
Cr	scope	0.27-3.73	0.40-1.13	0.25-3.46
	Medium	0.65	0.59	0.78
Ace	scope	<1.25-1.94	<1.25	<1.25
	Medium	<1.25	<1.25	<1.25

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Table 7.9. *Content of labile form of metals in seabed sediments from the area of the Project within the MFW Bałtyk II and MFW Bałtyk III*

Labile form metal	Concentrations [mg-kg^{-1} s.m.].	The Project area	
		MFW Bałtyk II	MFW Bałtyk III
Hg	scope	<0.01	<0.01
	Medium	-	-
Pb	scope	0.88-6.04	0.65-5.50
	Medium	2.15	1.90
Cu	scope	0.25-5.54	0.25-5.60
	Medium	0.73	0.53
Zn	scope	0.47-11.70	0.76-12.09
	Medium	3.17	2.67
Ni	scope	<0.25-4.37	0.25-5.38
	Medium	0.83	0.53
Cd	scope	<0.05	<0.05
	Medium	-	-
Cr	scope	<0.25-2.44	<0.25-4.23
	Medium	0.73	0.79
Ace	scope	<1.25	<1.25
	Medium	-	-

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

Analysis of the labile form of metals showed that under unfavourable conditions in the ECI sections (0-34 km; 0-18 BII km, 0 BIII - 24 BIII km, the connector), 58-87% of Cu and 64-77% of Pb can pass from the sediment to water. The remaining metals, i.e. Ni, Zn and Cr, are mostly bound to the sediment in a persistent manner and their released form does not exceed 44% for Ni, 44% for Zn and 39% for Cr (figure 7.11).

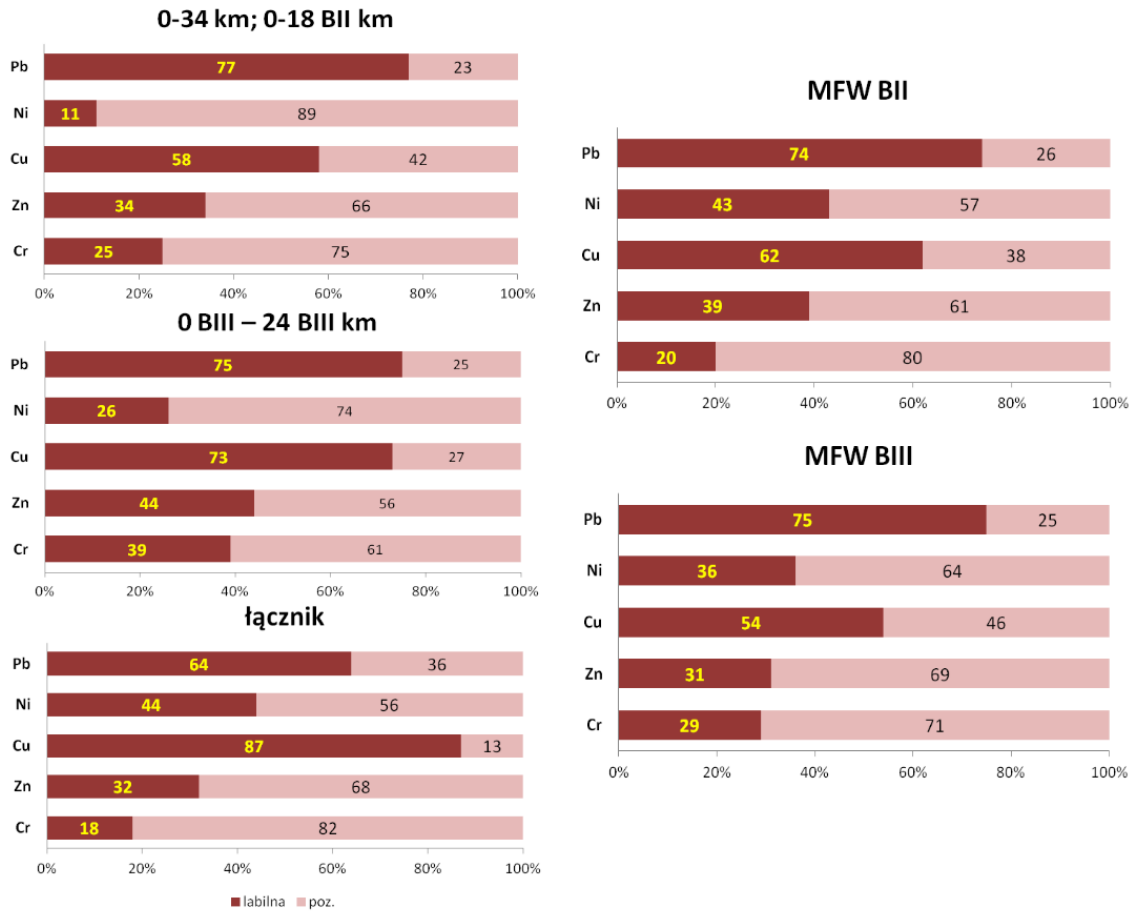


Figure 7.11. *Labile metal form content in seabed sediments from the Project area*

Source: In-house study based on the results of the surveys conducted in 2013-2014 in the ECI area and the surveys for the project of the construction of the MFW Bałtyk II and the MFW Bałtyk III (Volume III, Attachment 1.2.)

In the MFW Bałtyk II and MFW Bałtyk III area, the content of metals in labile form is at a similar level. More than 70% of Pb and 54% of copper may migrate from the sediment to water under favourable conditions. The remaining metals are mostly bound to the sediment in a permanent manner.

Polycyclic aromatic hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) are a group of organic compounds widely distributed in the environment.

PAHs are released into the environment mainly during the processing of hard coal in coking plants, domestic coal combustion, fuel combustion by means of transport, crude oil processing in refineries, the combustion of liquid fuels in car and aircraft engines, the extraction, transport and storage of liquid fuels, as well as the combustion of municipal waste. The main source of PAHs in modern surface water sediments is the deposition of dust from the combustion of fossil fuels and biomass, with which PAHs are associated.[57]

PAHs can enter bottom sediments with atmospheric pollutants, sewage and runoff, sediment and sewage water from storm sewers, ballast water, oil pollutants from normal ship operations and substances introduced during oil spills.

The accumulation of PAHs in sediments is favoured by, among other things: a high proportion of the sediment's silty and clay fraction, with a large specific surface area and a high capacity to retain

[57] *Uścinowicz (ed.) 2011*

hydrophobic pollutants (which repel water molecules) on its surface; and a high content of humic substances and organic phosphorus, sulphur and nitrogen compounds.[58]

The bottom sediments from the area of the planned Project are characterised by low concentrations of the PAHs tested (a sum of 16 analytes). Directly in the corridor area (0-34 km; 0-18 BII km, 0 BIII - 24 BIII km, the connector) they range from 0.001 to 0.085 mg-kg⁻¹ d.m.. In the MFW area, concentrations are similar, except for the NW part of the MFW Bałtyk II, where the value reached 0.207 mg-kg⁻¹ d.m..

The determined PAH values are typical for sandy sediments of the southern Baltic.[59] [60] Low concentrations of the sum of 16 PAHs in sandy sediments with low organic matter content are preserved.

Polychlorinated biphenyls (PCB)

PCBs are highly persistent, non-flammable, lipophilic compounds, poorly soluble in water, emitted only from anthropogenic sources. They typically occur as a mixture of 209 compounds differing from each other only in the number and position of the chlorine atoms in the molecule.[61]

Concentrations of PCB compounds (sum of 7 congeners) (IUPAC No. 28, 52, 101, 118, 138, 153, 180) in the Project corridor area (0-34 km; 0-18 BII km, 0 BIII - 24 BIII km, the connector) are low (ranging from below the quantification limit of 0.0001 mg-kg⁻¹ d.m. to 0.001 mg-kg⁻¹ d.m.

For the MFW Bałtyk II, PCB concentrations ranged from less than 0.0001 to 0.0303 mg-kg⁻¹ d.m. Slightly higher concentrations covered the SW part. For MFW Bałtyk III, concentrations ranged from less than 0.0001 to 0.0038 mg-kg⁻¹ d.m.

The most frequent congeners in the analysed sediment samples were PCB 138, 180 and PCB 153, which is justified by the hydrophobic properties and the tendency of these compounds to sorb on particulate matter.

The results obtained do not differ from the literature data on PCB content in seabed sediments of the southern Baltic Sea and, being in their lower range, indicate a decrease in the concentration of these compounds over time. [62] [63]

Mineral oil

Oil pollution comes from anthropogenic and natural sources. Among the anthropogenic ones, the largest contribution is river run-off from the land. Process water from industrial plants, washing water from motor vehicles and flushing of fuels and oils from car operations enter the marine environment. The second major source of oil is the normal (trouble-free) operation of ships. In third place (globally) are tanker disasters. Oil pollutants are also introduced through the atmosphere, with emissions associated with incomplete combustion of liquid fuels in engines and boiler or thermal power plants. In last place is the extraction of oil from beneath the seabed, i.e. the activities of exploration and production platforms. [64] [65] [66]

The natural source, in the case of bottom sediments and bottom waters of the Baltic Sea, is the migration of deep hydrocarbons along dislocation zones (faults) and through zones of wedging of sedimentary complexes.[67]

The accumulation process of petroleum substances in bottom sediments is due to the high sorption capacity of the sediment components.[68] The length of time petroleum substances remain in the sediment depends, among others, on the type of sediment, temperature, type of oil, nutrient content,

[58] *Bolałek (ed.) 2010*
[59] *Głód 1995*
[60] *Guz et al. 2000*
[61] *Zakrzewski 1995*
[62] *Sapota 2006*
[63] *Bogdaniuk et al. 2012*
[64] *Gierak 1995*
[65] *Korzeniowski 1998*
[66] *Fabisiak 2008*
[67] *Jaworowski et al. 2010*
[68] *Belkina 2006*

and rate of biological decomposition.[69] The sorption strength of hydrocarbons in sediment varies depending on the type of hydrocarbon and the organic matter content of the sediment.

The oil concentration results for most of the samples from the ECI area (0-34 km; 0-18 BII km, 0 BIII - 24 BIII km, the connector) are below the method's quantification limit i.e. 1 mg-kg^{-1}. Elevated values were recorded at three locations, i.e. at two samples at 0-34 km and 0-18 BII km, where mineral oil concentrations were 11.4 and 4.8 mg-kg^{-1} and from one sample at the connector section, where concentrations reached 6.6 mg-kg^{-1}.

For the MFW Bałtyk II and Bałtyk III area, mineral oil concentrations for most samples were below the method's quantification limit of 1.0 mg-kg^{-1}. The highest concentrations in the sediments of MFW Bałtyk II, reached 22.8 mg-kg^{-1} d.m., while in MFW Bałtyk III they reached 17 mg-kg^{-1} d.m..

The determined concentrations for the whole ECI area are very low and do not exceed the first limit value set in all Baltic countries. They are adequate for the type of sediments studied (sands and gravels), which have a low sorption capacity and correlate with the low content of organic matter in them.

Summary of sediment physical and chemical conditions in the area of the planned Project

As a part of the implementation of the Project, it is anticipated that the bottom sediments will be scoured for ECI placement. During the aforementioned works, there will be movement of sediments in water, the Project site and the area of its impact. In accordance with the provisions of the Regulation of the Minister of Climate of 2 January 2020 on the catalogue of waste (Journal of Laws of 2020, item 10) and the Regulation of the Minister of Environment of 11 May 2015 on the recovery of waste outside installations and equipment (Journal of Laws of 2015, item 796 consolidated text), the aforementioned sediments do not qualify as waste.

An analysis of sediment samples taken from the ECI and MFW Bałtyk II and MFW Bałtyk III area (Volume III, Attachment 1.2) in order to determine the concentrations of accumulated metals and organic compounds in the sediment was performed to determine the potential for release of metals and organic compounds into water, in concentrations that could potentially affect water status.

The limit concentrations given in the Regulation of the Minister of the Environment of 11 May 2015 on the recovery of waste outside installations and equipment (Journal of Laws of 2015, item 796 consolidated text) for waste code 17 05 06 Dredging spoil other than those listed in 17 05 05* were used as the standard for the above analyses. According to the provisions of the aforementioned regulation, the metal concentration limits for this waste code are respectively: Hg (<1.0 mg-kg^{-1} d.m.), Pb (<200 mg-kg^{-1} d.m.), Cu (<150 mg-kg^{-1} d.m.), Zn (<1000 mg-kg^{-1} d.m.), Ni (<75 mg-kg^{-1} d.m.), Cd (<7.5 mg-kg^{-1} d.m.), Cr (<200 mg-kg^{-1} d.m.), As (<30 mg-kg^{-1} d.m.), and for organic matter (PAHs), respectively: benzo(a)anthracene (<1.5 mg-kg^{-1} d.m.), benzo(b)fluoranthene (<1.5 mg-kg^{-1} d.m.), benzo(k)fluoranthene (<1.5 mg-kg^{-1} d.m.), benzo(ghi)perylene (<1.0 mg-kg^{-1} d.m.), benzo(a)pyrene (<1.0 mg-kg^{-1} d.m.), dibenzo(a,h)anthracene (<1.0 mg-kg^{-1} d.m.), indeno(1,2,3-c,d)pyrene (<1.0 mg-kg^{-1} d.m.), polychlorinated biphenyls [sum of PCB carcinogens 28, 52, 101, 118, 138, 153 and 180] (<0.3 mg-kg^{-1} d.m.). None of the sediment samples tested in 2013-2014 exceeded the above-mentioned concentration limits for metals and organic compounds. On the basis of the analysis carried out, it can be concluded that the movement of bottom sediments within the water bodies, the Project site and the area of the Project's impact will not result in the release of metals and organic compounds from the sediments in concentrations that could potentially affect water status.

7.2.6. Thermal conductivity of sediments

The operation of power cables involves the emission of heat into the environment. This effect, in addition to its technical parameters, depends on the type of sediment in which it is buried and, in particular, on the value of resistivity or its inverse - thermal conductivity. The resistivity/conductivity has a close relationship to the type of sediment (sands, gravels, clays, loams, rocks) and the content of organic matter.

[69] *Nikanorov and Stradomskaya 2003*

For the purpose of the planned Project, a measurement of the thermal conductivity of the bottom sediments deposited in the area of the ECI corridor was carried out (Volume III, Attachment 1.2).

The average thermal conductivity value of the sediments is λ = 2.09127 W/m-°K (thermal resistivity 1/λ = 0.47817 m-°K/W). The maximum conductivity values occur in the km 0 area, the minimum in the km 4 BII area and are λ = 3.36643 W/m-°K (thermal resistivity 1/λ = 0.29705 m-°K/W) and λ = 0.83730 W/m-°K (thermal resistivity 1/λ = 1.19431 m-°K/W) respectively.

Considering the individual sections of the cable corridor, the section between km 24 BIII and 0 BIII is the most thermally stable, with the least variation in conductivity values. The section between km 18 BII and 0 BII, as well as the western part of the corridor connecting MFW Bałtyk II and MFW Bałtyk III, is the most varied. This may indicate the varying parameters of the conductivity and resistivity properties of the clays found in the mentioned areas.

The measured values for conductivity and resistivity do not exceed the critical values specified for cables and therefore allow the Project to be carried out economically and technologically safely.

7.2.7. Raw materials and deposits

Mineral raw materials occurring in the South Baltic area include bottom-surface sands, sands and gravels, sands with heavy minerals, glass and moulding sands, iron-manganese concretions and amber, as well as oil and gas and shale gas beneath the seabed.

There are no documented mineral deposits or mineral extraction (mine) sites in or near the area through which the offshore transmission infrastructure will pass.

The Planned Project passes through prospective areas of crumbstone material No. II and IV (figure 7.12).

The prospective area *II Przybrzeżna strefa dna Bałtyku* constitutes one large field with an area of 3547.4 km^2 and extends from Kołobrzeg to Chałupy on the Hel Peninsula. It is dominated by medium-grained sands with admixture of fine-grained sands and locally coarse-grained sands, gravelly sands and sandy gravels.[70] The ECI crosses the area for approximately 17 km, i.e. between 30 and 13 km of the corridor route.

The prospective area *IV – Rejon Ławicy Słupskiej* of 1006.6 km^2 covers western, southern and eastern edges of Ławica Słupska. It comprises sands of varied granulation, from fine-grained sands to coarse-grained sands with a small admixture of gravels.[71] The ECI crosses the area between 10 BII-17 BII km, 17 BIII-0 BIII km, and in the central and eastern part of the connector. The MFW Bałtyk III field is located entirely within area *IV*.

[70] *Kramarska (ed.) 2019*
[71] *Kramarska (ed.) 2019*

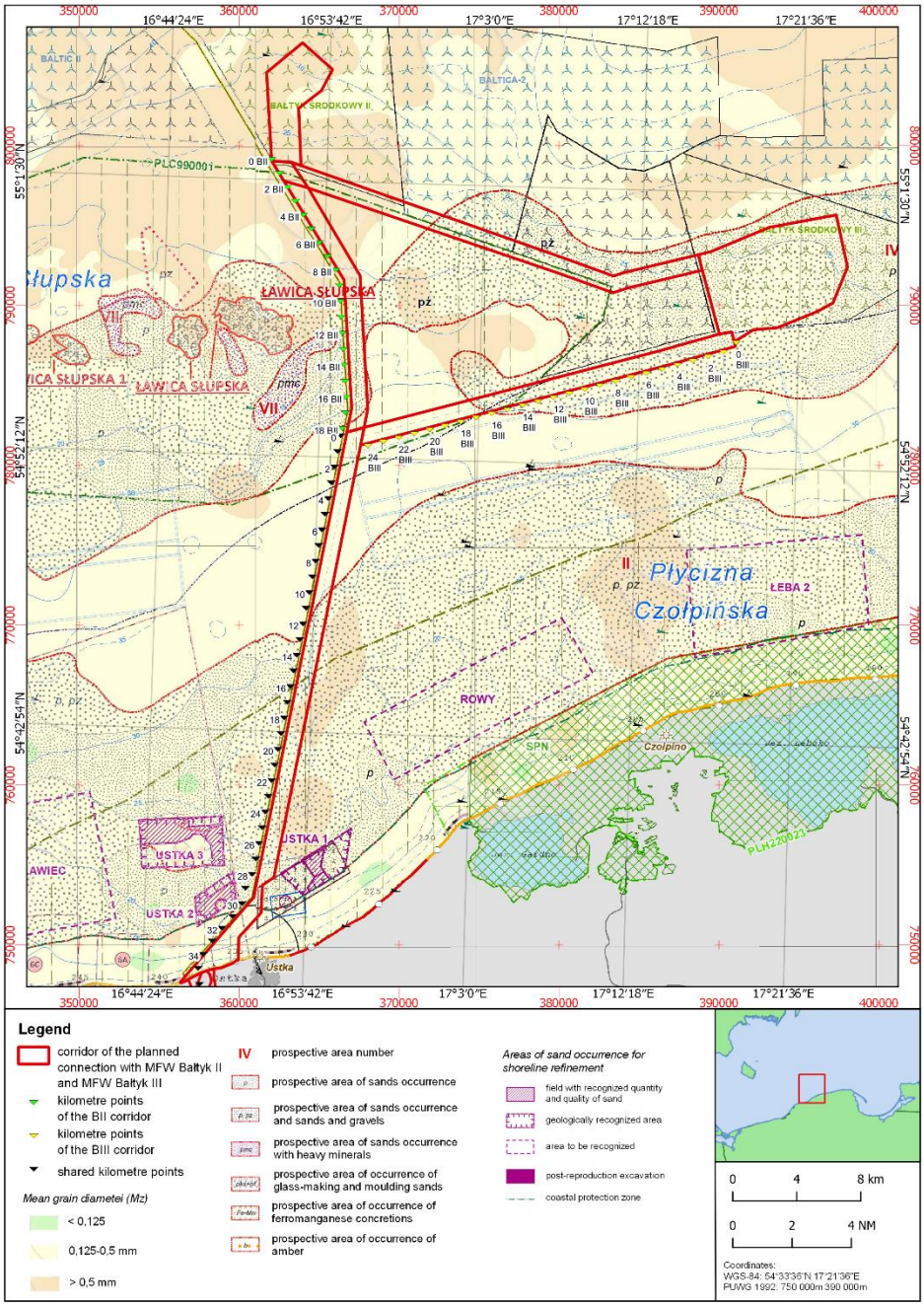


Figure 7.12. *Range of prospective sand areas in the area of the planned Project*

Source: In-house study based on data from the National Geological Survey https://www.pgi.gov.pl/

On both the eastern and western sides of the ECI, geological areas of sand for coastal recharge have been identified. These areas are: Ustka 1, Ustka 2 and Ustka 3 (table 7.10)

Table 7.10. *Prospective areas of sand for shoreline recharge and the status of their identification and estimated resources of sand for shoreline recharge as at 31.12.2019*

Area	Study area [km²]	Area of sand fields [km²]	Estimated sand resources [million m³]
Ustka 1	8.1	2.13	1.73
Ustka 2	4.5	2.83	3.65
Ustka 3	15.5	7.16	7.18

Source: Kramarska (ed.) 2019 - changed

No mineral resources are identified in the area through which the ECI runs and no oil and gas has been documented.[72] The area envisaged for the construction of the transmission infrastructure is located in an area with low prospects for hydrocarbon exploration (figure 7.13), and no exploration work is expected to be carried out in this area at present (any licences issued).

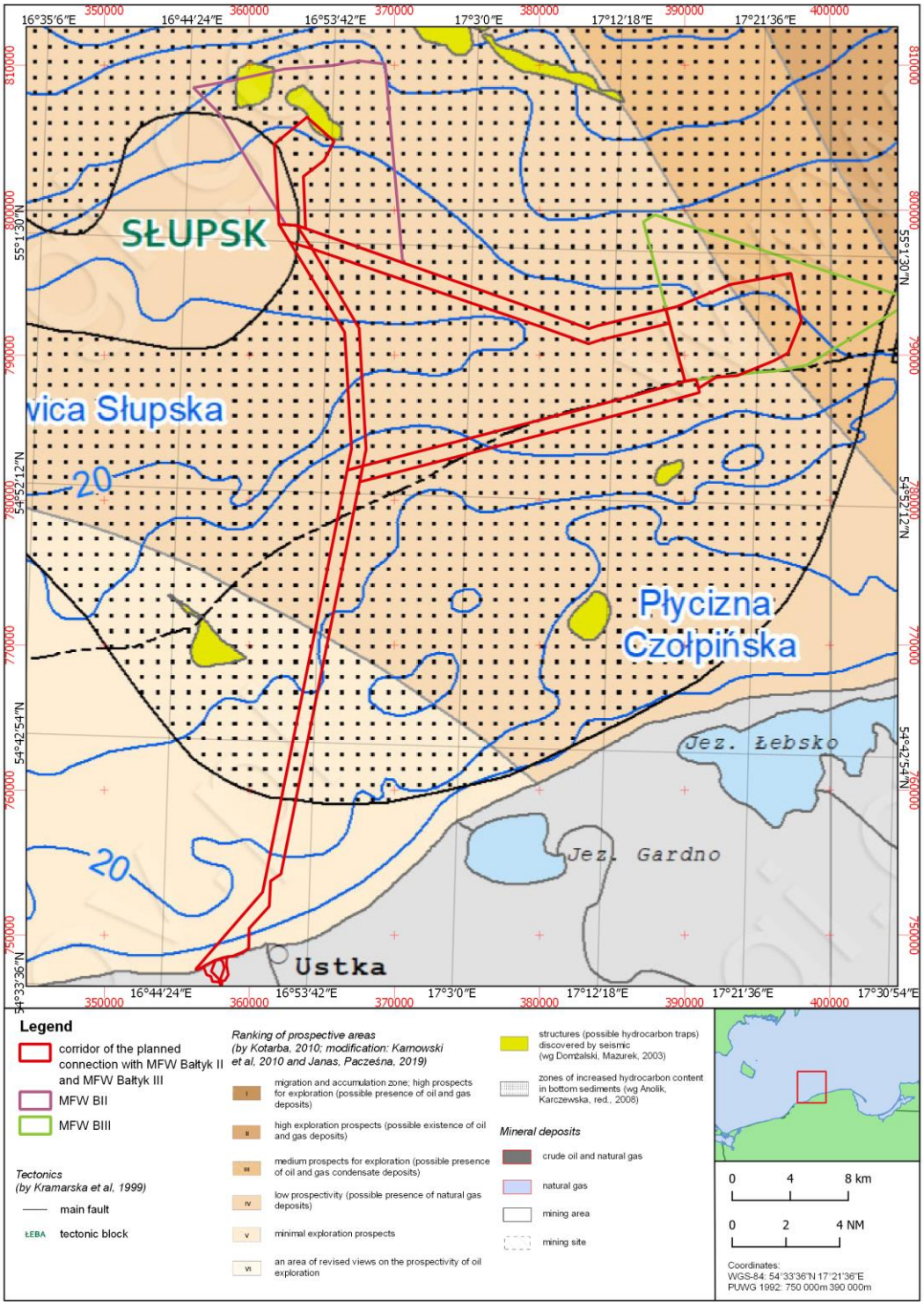


Figure 7.13. *Range of oil and gas prospective areas in the area of the planned Project*

Source: In-house study based on Kramarska (ed.) 2019

[72] *Kramarska (ed.) 2019*

7.3. MARINE WATER CHARACTERISTICS

The following is a characterisation of selected hydrological components (temperature and salinity)[73], hydrochemical conditions and an assessment of water status in the area of the planned Project. The characterisation is based primarily on data from the PMŚ for the Bornholm Basin contained in the publication of the Inspectorate of Environmental Protection: 'Assessment of the state of the environment of Polish marine areas of the Baltic Sea on the basis of monitoring data from 2020 against the background of the decade 2010-2019' (2021). In addition, the results of hydrological and hydrochemical measurements carried out by the Investor within the MFW Bałtyk II and MFW Bałtyk III were used (a report on the research carried out in 2013 - 2014, including the location of the research profiles is presented in Volume III of this Report in Attachment 1.4). Water sampling took place at a grid of density of - 1 sample per 5 km^2 in standard vertical profiles and referred to:

- reaction, alkalinity, suspension;
- biogenic substances: ammoniacal nitrogen, nitrite nitrogen, nitrate nitrogen, total nitrogen, mineral N, phosphates, total phosphorus;
- aerobic conditions: dissolved oxygen, five-day oxygen demand (BOD5), total organic carbon (TOC);
- metals: nickel (Ni), lead (Pb), cadmium (Cd), chromium (Cr-og), chromium (VI), arsenic (As), mercury (Hg),
- particularly harmful substances: phenols, free and bound cyanides,
- Caesium 137 (137 Cs),
- Strontium 90 (90 Sr),
- mineral oil index,
- Polycyclic aromatic hydrocarbons (PAHs),
- polychlorinated biphenyls (PCB).

In addition, conductivity, temperature and depth measurements were taken using the Citadel CTD-NV oceanographic probe.

Outside the area of the offshore wind farms, the Investor conducted surveys of bottom water temperature at two points along the route of the ECI corridor at a distance of approximately 1.5 - 2 km from the shore (profiles IPZ1_10 and IPZ1_15 marked on figure 1 page 2 in Volume III, Attachment 1.4).

7.3.1. Temperature and salinity

Temperature

Water temperature in the Baltic shows variability in the vertical profile and seasonal variability. Based on the PMŚ data from 2020, the average water temperature surveyed for the Bornholm Basin in the surface layer (0-10 m depth) varied between 5.2-18°C (figure 7.14). A slightly higher variability was recorded in 2019, i.e. 3-20°C.

In 2020, the lowest surface layer water temperature was recorded in January, at 4.3°C. This was higher than the average surface layer water temperature of the 2010-2019 multi-year period in that month by approximately 2.5°C. The maximum recorded surface layer water temperature was recorded in August and was approximately 19°C. This temperature was lower than the average surface layer water temperature recorded for this month in the 2010-2019 multi-year period by approximately 1°C.

[73] *Other hydrographic conditions such as currents and wave action are discussed in Subsection 7.7. Hydro-meteorological conditions and air quality*

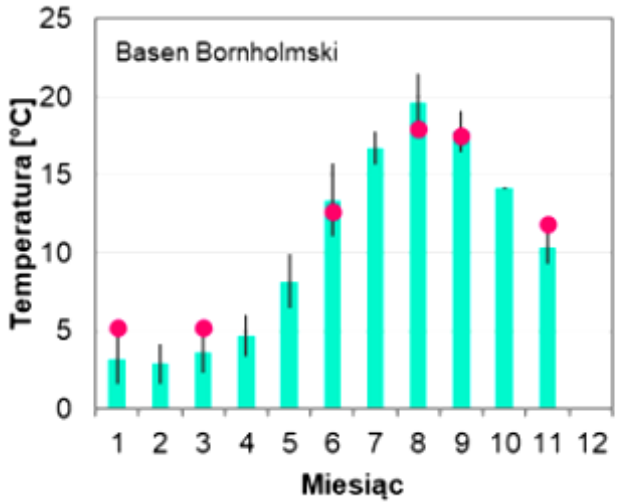


Figure 7.14. *Water temperature in the sea surface layer in 2020 in designated areas of Polish maritime areas: Bornholm Basin in comparison with multiyear period 2010-2019*

Explanatory notes: (graph shows data for months for which statistics could be calculated); bar – average value for 2010-2019; whiskers – average value ± standard deviation for 2010-2019; points – average value for 2020

Source: Zalewska and Kraśniewski (ed.) 2021

Surveys carried out by the Investor in 2013-2014 within the ECI corridor approximately 1.5-2 km offshore were conducted at a depth of approximately 0.7 m above the seabed, at IPZ 10 p point from 12 May 2013 to 14 January 2014, at IPZ 15 point from 12 May 2013 to 3 October 2013. (Volume III, Attachment 1.4)

The results obtained confirm the seasonal variability of water temperature. The highest bottom water temperatures (around 20°C) were recorded in July and August 2013, while the lowest temperatures were recorded in May 2013, December and January 2014. (approx. 4°C) - figure 7.15 and figure 7.16.

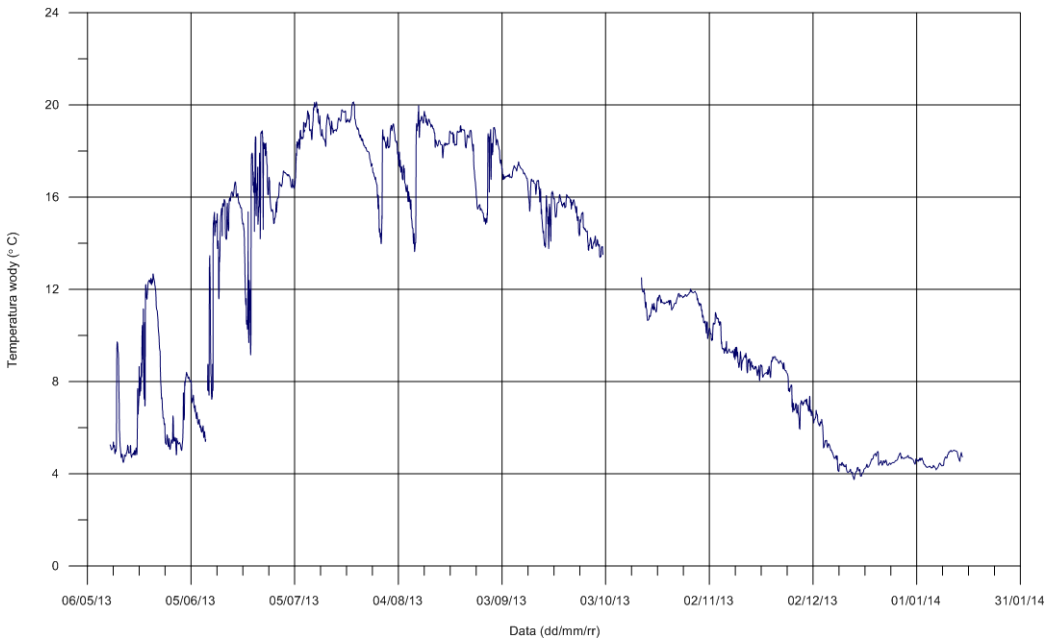


Figure 7.15. *Bottom water temperature at IPZ 10 point*

Source: study of hydrological conditions in the area of the Maritime Transmission Infrastructure (MIP) (Volume III, Attachment 1.4)

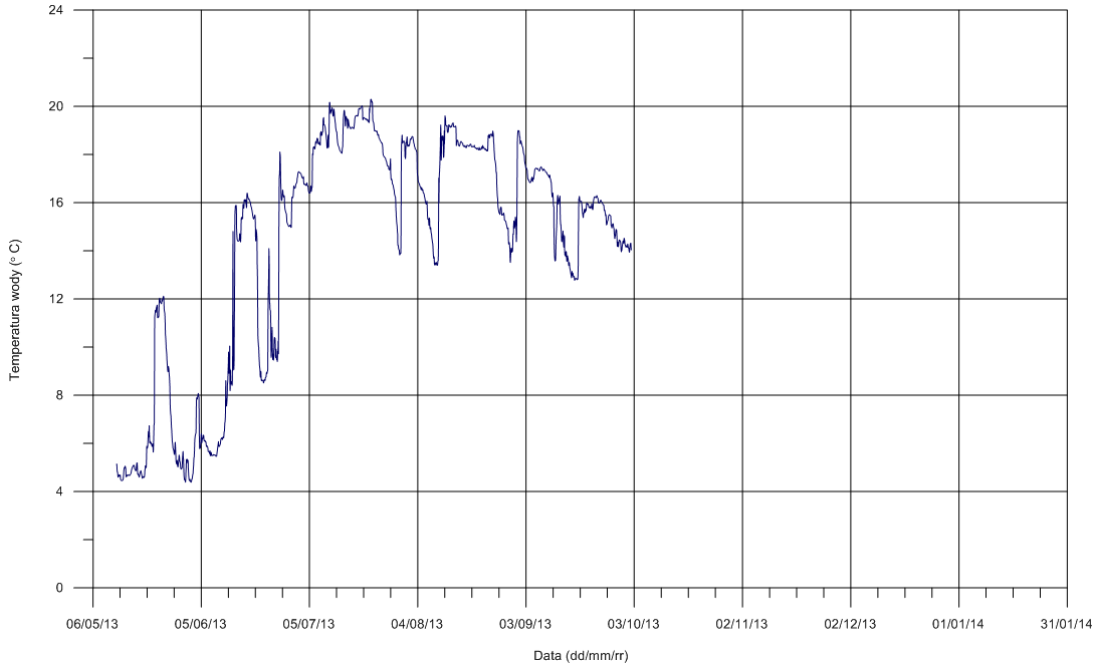


Figure 7.16. *Bottom water temperature at IPZ 15 point*

Source: study of hydrological conditions in the area of the Maritime Transmission Infrastructure (MIP) (Volume III, Attachment1.4)

At both measurement points, almost identical patterns of bottom temperature variation were observed throughout the study period. The results of the bottom temperature measurements carried out by the Investor in 2013 - 2014 do not deviate from typical bottom temperature values for the South Baltic waters.

Salinity

In Polish maritime areas, the average salinity of bottom waters is between 5.5 and 12 PSU. Higher values are found in the Bornholm Basin and the Rynna Słupska. In the shallow water area, the salinity variation is low, mostly not exceeding 2 PSU.

The characterisation of salinity of marine waters in the area of the planned Project is based on the data of the Chief Inspectorate for Environmental Protection (GIOŚ) used for the assessment of the state of the environment of Polish marine areas. The aforementioned data are from the multi-year period 2009-2018.

Based on the aforementioned data, the average salinity of the surface layer waters in 2019 in the area of the planned Project ranged from 7.43 to 7.95. The highest average salinity value was recorded in March, the lowest in June. The largest difference in average salinity value between 2019 and the 2009-2018 multi-year period was recorded in March (0.55). In the other months, the differences were small: in February the difference was 0.07, in June and November the difference did not exceed 0.2, while in August and September the value of average water salinity in 2019 was 0.3 higher than in the 2009-2018 multi-year period.

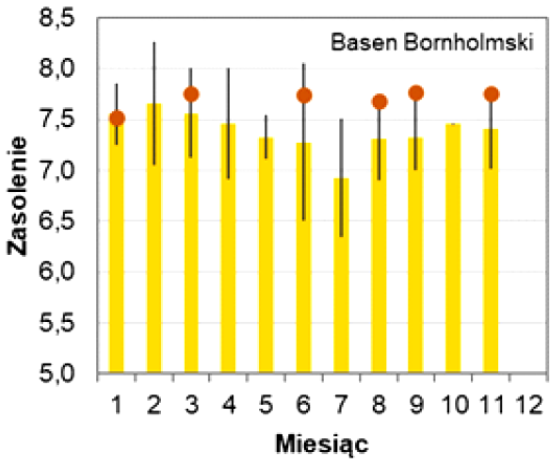


Figure 7.17. *Water salinity in the sea surface layer in 2020 in the Bornholm Basin compared with the 2010-2019 multiannual period*

(The graph shows data for months for which statistics could be calculated); bar – average value for 2010-2019; whiskers – average value ± standard deviation for 2010-2019; points – average value for 2020

Source: Zalewska and Kraśniewski (ed.) 2021

7.3.2. Hydrochemical conditions

pH

The characterisation of pH of the sea water in the area of the planned Project is based on the PMŚ data used to assess the state of the environment of Polish marine areas.

Seawater pH surveys conducted for the PMŚ were carried out during monitoring cruises in the Polish exclusive economic zone. Cruises took place with a frequency of six times a year. Surveys were conducted in the years 2009-2019.

Based on the aforementioned data, the seawater was found to have a slightly alkaline reaction. In 2019, pH values ranged from 6.88-8.97. The average pH value of the Baltic Sea water was 7.96. This value was 0.13 lower than the multi-year average value for 2009-2019.

In 2019, against the background of the last decade, the water column showed a change in the reaction trend from increasing to decreasing (figure 7.18).

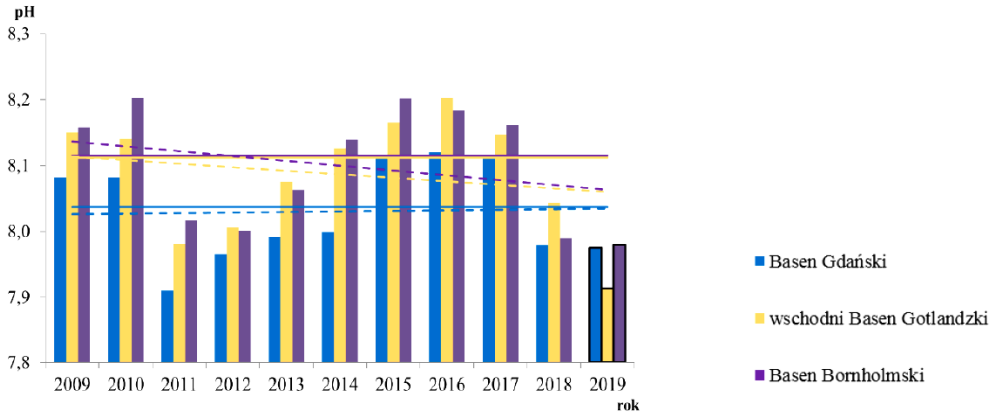


Figure 7.18. *Average annual pH values in the entire water column in the years 2009-2019 in separated areas of Polish marine areas; continuous line – average value for 2009-2018, dashed line - trend of changes*

Source: Zalewska and Kraśniewski (ed.) 2021

Hydrochemistry

The description of the hydrochemical background of the marine waters in the area of the planned Project is based on the results of the research conducted by the Investor in 2013-2014 within the MFW Bałtyk II and MFW Bałtyk III. The research report is included in Volume III in Attachment 1.4).

The results of the investigations carried out indicate that the hydrochemical parameters of the water in the area of the planned Project do not deviate significantly from the typical values recorded in the waters of the southern Baltic Sea.

The results of the BOD_5 and TOC tests indicate good water quality. Throughout the measurement period, the BOD_5 values did not exceed the limits set for the first water quality class (I).

The results of suspended solids levels in water also did not show concentrations that deviated from typical values for the Baltic Sea waters. The highest values of suspended solids concentrations were recorded in May and July 2013. (max. suspended solids concentration near the bottom: 9.18 ± 2.70 mg/dm^{-3}). During the rest of the period, they did not exceed the value of 3 mg/dm-^{3}.

The results of biogenic substances content: total nitrogen, mineral nitrogen, nitrates, nitrites, ammonia, phosphates and total phosphorus showed seasonal variability. The lowest concentrations were recorded in May and July, while the highest (elevated) concentrations were recorded in the winter months: December and February. The upward trend in the winter months is attributed to the seasonal trend of nutrient recovery.

Low values of particularly harmful substances were recorded in the water samples of the study area. Polychlorinated biphenyls, free and bound cyanides, the metals Pb, Cd, Cr, Cr(VI), As, Ni, Hg and phenols were present in trace amounts, as were^{137} Cs and^{90} Sr, and mineral oil.

The recorded concentrations of PAHs are only slightly above literature concentrations. This is probably due to the difference in sample preparation (PAHs were determined in waters without separation of suspended matter). Nevertheless, no exceedances of the water quality indicator limits for average PAH values were recorded in the water samples. The situation is similar for the indicators for cadmium, nickel, lead and mercury.

According to the MSFD and the established pressure indicators related to eutrophication and pollutants, the results of the studies carried out indicate a water status below good (sub-GES).

7.3.3. Environmental assessment marine waters

The environmental assessment of marine water quality was based on criteria recommended by the RDSM on the basis of the basic indicators determined for each characteristic based on the results of research conducted, obtained within the framework of the State Environmental Monitoring (PMŚ).

According to the division of Polish maritime areas into sub-areas, applicable in the National Plan for the Protection of Marine Waters, adopted by the Regulation of the Council of Ministers of 11 December 2017 on the adoption of the National Programme for the Protection of Marine Waters (Journal of Laws 2017.2469), the planned Project is located within the boundaries of the two sub-areas:

- 36 Open waters of the Bornholm Basin,
- 38 Polish coastal waters of the Bornholm Basin.

The location of the aforementioned sub-areas is shown in figure 2.1 in Chapter 2 of this Report.

Assessment of the state of the marine environment is carried out in accordance with the RDSM in relation to eleven characteristics from D1 to D11, which are divided into characteristics that assess the state of the environment and those that describe pressures. Member countries are developing a set of environmental objectives and related indicators to guide efforts to achieve Good Environmental Status (GES) of the marine environment. Baseline indicators and parameters to assess whether environmental objectives have been achieved are established under the Marine Water Monitoring Program. The current set of environmental objectives for marine waters was adopted by the Regulation of the Minister of Infrastructure of 25 February 2021 on the adoption of an update to the set of environmental objectives for marine waters (Journal of Laws 2021.569). The current set of environmental objectives and the deadline for their achievement are presented in table 7.11.

Table 7.11. *Environmental objectives set currently in force for individual characteristics of marine waters*

No.	Characteristics	Environmental objective established for the features RDSM
I.	***Characteristics of the state***	
1.	D1 - Biodiversity is maintained. The quality and occurrence of habitats and the distribution and diversity of species correspond to the prevailing physiographic, geographic and climatic conditions of the Baltic Sea region.	Reducing or maintaining anthropogenic pressure at a level that ensures the maintenance of natural habitats where the natural biodiversity of the biotic elements present is conserved, including fisheries, and habitat protection within Natura 2000 protected sites is ensured. Basic evaluation criteria: D1C1 (bycatch mortality), D1C2 (population and species abundance), D1C4 (species range), D1C5 (species habitat), D1C6 (habitat type status), D6C4 (extent of habitat loss due to anthropogenic impacts), D6C5 (extent of negative effects of anthropogenic impacts on habitat)
2.	D4 – The occurrence of components of the marine food chain in numbers and diversity at levels that ensure species diversity and maintain full reproductive capacity.	Reducing the impact of human activities to a level which allows the ecosystem to reach a state where all components of the marine trophic chain are naturally and stably abundant and diverse and where the productivity of biotic components guarantees the correct functioning of the trophic network. Basic evaluation criteria: D4C1 (diversity of species within a trophic group), D4C2 (balance of total abundance between trophic groups).
II.	***Characteristics of the pressure***	
3.	D2 – Maintaining alien species introduced to marine ecosystems as a result of human activities at levels that do not adversely alter those ecosystems.	Limiting the dispersal of alien species introduced into the environment as a result of human activities, in order to ensure that alien species occur at levels which do not disturb the structure and functioning of the ecosystem, especially for particular groups of species, areas particularly vulnerable to introduction, and general habitat types, by taking appropriate actions. Primary evaluation criterion: D2C1 (number of alien species newly introduced within 6 years of the reference year)
4.	D3 – Maintaining populations of all commercially exploited fish and shellfish within safe biological limits and maintaining a distribution of these fish and shellfish populations by age and abundance indicative of good status.	The objective is to maintain populations of commercially exploited fish and shellfish within safe biological limits corresponding to natural conditions by ensuring that the exploitation of all commercially exploited fish stocks is at or below maximum sustainable catch levels that ensure that all commercially exploited fish are within safe biological limits, and by limiting or maintaining the exploitation of fish stocks at levels that maintain their full reproductive capacity and a full range of ages and sizes. Basic assessment criterion: D3C1 (fishing mortality rate), D3C2 (spawning stock biomass), D3C3 (age and number cross-section of individuals)
5.	D5 – Minimising human-induced eutrophication, in particular its adverse effects such as biodiversity loss, ecosystem degradation, harmful algal blooms and oxygen deficiency in lower waters.	Keeping the inflow of annual nitrogen and phosphorus loads by rivers and by atmospheric deposition to the Baltic Sea below the maximum inflow values (MAI) established within the framework of regional agreements (HELCOM), which will allow to decrease the concentration of nutrients in the sea to the level not exceeding permissible threshold values, which are in accordance with the recommendations of existing national and European Union legislation and which guarantee that good environmental status is achieved or maintained and do not cause adverse

No.	Characteristics		Environmental objective established for the features RDSM
			effects in the form of excessive algal growth, elevated concentrations of chlorophyll a in the water column, decreased transparency of seawater and decreased oxygenation of the bottom waters, which consequently promote the proper development of pelagic and benthic habitats. Basic assessment criterion: D5C1 (nutrient concentrations), D5C2 (chlorophyll "a" concentration), D5C5 (dissolved oxygen concentration).
6.	D6 – Maintaining the integrity of the seabed at a level which ensures that the structure and functions of benthic ecosystems are safeguarded and that these ecosystems in particular are not adversely affected.		Reducing the cumulative pressure on the seabed to a level that enables near-natural functioning of benthic habitats. Basic assessment criterion: D6C1 (permanent alteration of natural bottom), D6C2 (spatial extent and distribution of pressure of physical bottom disturbance), D6C3 (spatial extent of habitat influenced by changes in biotic and abiotic structure), D6C4 (maximum possible extent of habitat loss), D6C5 (maximum possible impact on habitat)
7.	D7 – Permanent change in hydrographic characteristics not adversely affecting marine ecosystems.		Reducing pressures associated with permanent changes in hydrographic conditions and reducing cumulative pressures on habitats. Only the secondary criterion for evaluation was established: D7C1 (spatial extent and distribution of permanent changes in hydrographic conditions related in particular to the physical loss of the natural seabed), D7C2 (extent of benthic habitat under pressure due to permanent changes in hydrographic conditions)
8.	D8 – Maintaining concentrations of pollutants at levels that do not cause marine pollution.	Criterion D8C1 (primary): Within coastal and territorial waters and outside territorial waters, concentrations of pollutants do not exceed the specified threshold values.	Reducing or maintaining the current level of pollutant input from marine sources, including the application of measures to minimise the release of pollutants as a result of emergency events and terrestrial discharges into the marine environment, in order to achieve or maintain concentrations of pollutants in components biotic and abiotic marine ecosystems at levels below the acceptable threshold values, below which the probability of adverse effects of hazardous substances on marine organisms is minimal, and which are consistent with the recommendations of applicable national and international legal acts and guarantee the achievement or maintenance of a good environmental status.
9.		Criterion D8C2 (secondary): Species health and habitat conditions (such as species composition of these habitats and relative abundance in long-term contaminated locations) have not been adversely affected by pollutants, including cumulative and synergistic effects.	Areas selected for long-term exposure to pollutants: the impact of the pollutants on the marine biota at different levels: molecular, cellular, tissue, organ, organism, individual, population including cumulative and synergistic effects, is at a level that ensures the correct functioning of the organisms including the maintenance of normal physiological functions and therefore ensures the maintenance of the correct species structure and habitat range.
10.		Criterion D8C3 (primary): the spatial extent and duration of significant acute pollution with polluting substances	Polish sea areas defined by national borders: The occurrence of pollution emergencies involving pollutants as defined in Article 2(2) of Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005 on ship-source

No.	Characteristics		Environmental objective established for the features RDSM
			pollution and on the introduction of penalties for infringements, including oil and similar constituents, is reduced to a minimum through the implementation of appropriate operational level measurements and security systems.
		Criterion D8C4 (secondary): Adverse effects of significant pollution of an acute nature on species health and habitat condition (such as their species composition and relative abundance) shall be minimised and, where possible, eliminated.	The impact of pollutants from releases resulting from sudden events on the structure of species (listed in Table 1 in Part II of the Annex to Commission Decision 2017/848) and the extent of habitats (listed in Table 2 in Part II of the Annex to Commission Decision 2017/848) is reduced to a minimum by implementing measures and safeguards to eliminate the occurrence of sudden events.
11.	D9 - Maintaining levels of contaminants in fish, crustaceans and molluscs intended for human consumption not exceeding those set out in the standards or regulations concerning the levels of these substances.	Reducing or maintaining at current levels the input of pollutants from various marine and terrestrial sources into the marine environment in order to achieve or maintain concentrations of pollutants in fish and seafood for human consumption at levels not exceeding limit values which comply with the standards and recommendations of existing national and European Union legislation and which guarantee food safety and the achievement or maintenance of good environmental status. The primary criterion for evaluation was established: D9C1 (level of contaminants in tissues of fish and seafood eaten)	
12.	Characteristic 10 - Maintaining waste characteristics and quantities at levels that do not cause damage to the marine, transitional and coastal water environment.	Reducing newly emerging and deposited solid wastes in the marine environment from various terrestrial and marine sources to levels which ensure the proper functioning of the ecosystem, taking into account its natural resilience, or to the complete elimination of newly emerging wastes. The primary criterion for evaluation was established: D10C1 (composition, quantity and spatial distribution of waste on the shore, in the surface layer of the water column and on the seabed).	
13.	Characteristic 11 - Maintaining energy input to marine waters, including undersea noise, at levels that do not adversely affect the marine environment.	Criterion D11C1 (primary): The spatial distribution, temporal extent and levels of impulse sound in water associated with human activities do not reach levels causing an adverse effect on marine animal populations.	Reducing pressures associated with the temporal and spatial occurrence of human-related impulsive sounds in the sea above levels that adversely affect marine animal populations.
14.		Criterion D11C2 (primary): The spatial distribution, time-scale and levels of continuous low-frequency sounds in water associated with human activities do not reach levels that cause adverse effects on marine animal populations.	Reducing pressures due to temporal and spatial occurrence of continuous low frequency sounds in the sea related to human activities above levels that adversely affect marine animal populations.

Source: In-house study based on the Regulation of the Minister of Infrastructure of 25 February 2021 on the adoption of an updated set of environmental objectives for marine waters (Journal of Laws 2021, item 569)

For each of the above-mentioned criteria for assessing the achievement of environmental objectives, more specific environmental objectives were assigned and, where necessary/possible, assessment parameters were established.

The assessment of the state of the marine water environment for the two basins through which the planned Project passes was carried out on the basis of the criteria recommended by the RDSM on the basis of the basic indicators set for each characteristic. The data obtained from the Marine Water Monitoring Program enabled the assessment to be performed in 2020 for two state features: D1 - biodiversity and D6 - seabed integrity, and six pressure features: D2 - alien species, D3 - commercially exploited fish and invertebrate populations, D5 - eutrophication, D8 - pollutants with pollution-related effects, D9 - pollutants in fish and other seafood, and D10 - waste in the marine environment.

The assessment of the state of the marine environment in the above mentioned sub-areas is presented in table 7.12, which has been developed on the basis of the results presented in the 'Ocena stanu środowiska polskich obszarów morskich Bałtyku na podstawie danych monitoringowych z roku 2020 na tle dziesięciolecia 2010-2019' ('Assessment of the environmental status of the Polish marine areas of the Baltic Sea on the basis of monitoring data from the year 2020 against the background of the decade 2010-2019').

The assessment of the status of coastal water bodies is presented in Chapter 8.4.

Table 7.12. *Assessment of the state of the marine environment in 2020. GES - good environmental status, subGES - good environmental status not achieved, - no assessment*

No.	Sub-area	Name of a sub-area	D1/D4				D3	D6	D5	D8				D9		D10
			Fish	Zooplankton	Macrozoobenthos	Chlorophyll a				Radionuclides	Heavy metals	POPs	Micronucleus test	Heavy metals	POPs	
1.	36	Open waters of the Bornholm Basin	sub-GES	GES	sub-GES	sub-GES	sub-GES	GES	sub-GES	sub-GES	sub-GES	sub-GES	sub-GES	GES	sub-GES	-
2.	38	Polish coastal waters of the Bornholm Basin	-	-	sub-GES	-	-	sub-GES	sub-GES	GES	sub-GES	-	-	GES	sub-GES	sub-GES

D1- Biodiversity, D3- Commercially species of fish and invertebrates, D4- Food chains, D5- Eutrophication, D6- Seabed integrity, D8- Contaminants and pollution effects, D9- Harmful substances in fish and seafood, D10- Litter in the marine environment

Source: Zalewska and Kraśniewski (ed.) 2021

The assessment of the marine environmental status of sub-areas 36 and 38 shows that in the waters of sub-area 36 good status was achieved in the features: D1 biodiversity - zooplankton, D6 seabed integrity and D9 harmful substances in fish and seafood - heavy metals, while in the waters of sub-area 38 in the features: D8 pollutants and pollution effects - radionuclides and D9 harmful substances in fish and seafood - heavy metals. In the remaining features, good environmental status has not been achieved or has not been assessed. So far, for marine waters, no overall assessment of water status has been prepared.

7.4. WILDLIFE

7.4.1. Phytobenthos

Phytobenthos is a complex of plant organisms associated with the bottom of aquatic environments. It plays an important role in aquatic ecosystems, including as a habitat for other organisms. In addition, macrophytes take up CO_2 and produce organic compounds and oxygen through photosynthesis.

Phytobenthos characterisation was performed on the basis of inventory surveys conducted in 2013-2014 in the area of the planned Project. The location of the sampling sites is shown in figure 7.19. The survey methodology and a discussion of the results are included in Volume III of this EIA Report in Attachment 1.5. In addition, the results of monitoring surveys performed in subsequent years as a part of the PMŚ were used, as well as the results of marine environment surveys conducted by other investors in the vicinity - primarily the results of surveys conducted for the connection with FEW Baltic III (Investor RWE Offshore Wind Poland Sp. z o.o.).

The surveys conducted by the Investor were carried out separately for the connection infrastructure and separately for the MFW Bałtyk II and MFW Bałtyk III. Since the planned Project covers with its borders the area of all three inventories, and the way of presenting the data differs between them, the phytobenthos characteristics are presented below, divided into: ECI (external connecting infrastructure from the offshore wind farm boundaries to the shore), offshore wind farm MFW Bałtyk II and MFW Bałtyk III. Then, in the summary, the most valuable sections in terms of phytobenthos within the boundaries covered by the application for an environmental decision were indicated on the resulting map.

Macroalgae from the brown algae and red algae families were identified in the study area. They occurred mostly in residual form or as single, small specimens very sparsely distributed on the bottom (bottom macroalgal coverage is < 1, i.e. one to a few specimens along a ROV run of min. 150 m). Such a poor quantitative structure of the phytobenthos is typical for open water areas of the Baltic Sea with depths of approximately 20 m[74].

[74] *Feistel et al. 2008, Kruk-Dowgiałło et al. 2011*

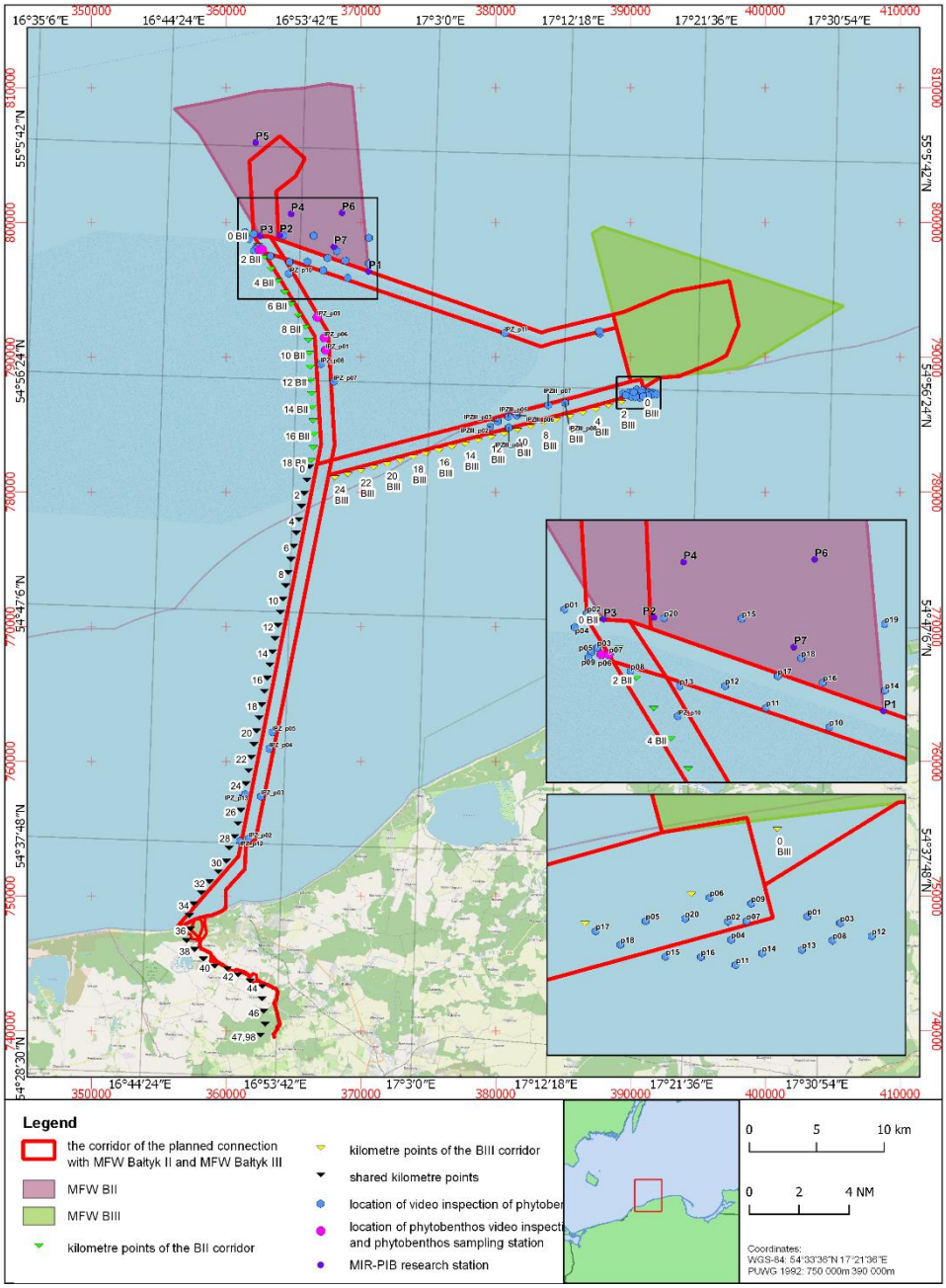


Figure 7.19. *Distribution of phytobenthos video inspection locations in the ECI corridor (IPZ_sample number) and within the MFW Bałtyk II and Bałtyk III*

Source: In-house study based on benthos surveys in the area of ECI and MFW Bałtyk II and Bałtyk III (Volume III. Attachment 1.5).

Phytobenthos in the ECI section from the wind farm boundary to the shoreline

In the analyzed section, 34 video inspections using an ROV and three qualitative tests (one each at three locations) were performed. In the area of the planned Project, there are mainly sandy and gravelly sediments, and local clusters of pebbles and boulders. In the depth zone of 15-25 m, phytobenthos, i.e. macroalgae from the group of brown algae (3 species), was found: *Pylaiella littoralis, Ectocarpus siliculosus, Sphacelaria cirrosa* and red algae (5 species): *Polysiphonia fucoides, Coccotylus truncatus, Rhodomela confervoides, Furcellaria lumbricalis* and *Ceramium diaphanum* (Volume III, Attachment 1.5.). These were usually single thalli, attached to boulders and pebbles sparsely distributed on the sandy bottom. Bottom cover was <1% (i.e. one to a few specimens along a minimum 150 m ROV route). *F. lumbricalis* thalli were present at two video inspection locations and one sampling station (a total of 3 specimens were found), while *C. diaphanum* thallus remains were recorded

at two of the three stations where samples were collected. Only in a small area (representing about 1% of the ECI area), located at a depth of 15-21 m, macroalgae formed communities with greater bottom cover of 40-90%, i.e. sites IPZ_p01 (80-90%), IPZ_p06 (80-90%), IPZ_p09 (70-80%) and IPZ_p10 (40-50%). The areas with the highest conservation value, due to the presence of rare and protected species or a high degree of bottom cover by macroalgae, are located pointwise in the section 7 BII to 12 BII (i.e. from IPZ_p09 to IPZ_p07) and in the area of 3,5 BII km of the Project - IPZ_p10 (figure 7.11).

The lack of vascular vegetation in the coastal zone of this part of the Baltic, characterised by highly dynamic waters, is typical and has been confirmed in previous studies.[75] The poor species composition and low degree of macroalgal bottom cover are also characteristic for the open water areas of the southern part of the Baltic, with depths of approximately 20 m.[76] This is due, among other things, to the considerable depth and the limited availability of hard substrate. A unique site is the boulder field of Ławica Słupska, characterised by high species richness and the presence of protected and rare algal species.[77] [78]

Phytobenthos surveys carried out in the neighbourhood (for the EIA Report for the FEW Baltic II connection) in 2017 and 2020[79] indicate that phytobenthos occurred in very low amounts, with filamentous brown algae of the genera Pylaiella or Ectocarpus and only occasionally kelp. Macroalgae occurred mainly on single pebbles. The degree of bottom cover by macroalgae is <1%, which is not sufficient to create valuable habitats for invertebrates and fish. No rare, protected or endangered species were found in the FEW Baltic II ECI study area, either in terms of phyto- or zoobenthos.

Phytobenthos in the area of the MFW Bałtyk II including the buffer zone

The research was conducted in the area of the offshore wind farm of the Baltic II offshore wind farm along with a one-mile buffer zone using 20 video inspections with an ROV and a total of 9 phytobenthos quality samples were taken. Surveys conducted in the area of the MFW Bałtyk II, including the one-mile buffer zone, revealed the presence of macroalgae from the group of brown algae (3 species) and red algae (5 species) (Volume III, Attachment 1.5.). They occurred mainly as single specimens very sparsely distributed on the bottom (macroalgal bottom cover was < 1%). Macroalgae forming communities (bottom cover from 10 to 70%) were found only in a small area (approx. 0.02% of the MFW area and the buffer zone) located in the shallowest part of the buffer zone, i.e. from 18-22 m located in the south-western part of the area: p03 station (10%), p06station p06 (40-50% and p07 station (60-70%). The protected red algae species *F. lumbricalis* was recorded at two survey stations (P6 - MIR-PIB station and p15), while the other protected species *C. diaphanum* was recorded at only one station located in the buffer zone (p06).

Phytobenthos in the area of the MFW Bałtyk III including the buffer zone

In the area of the MFW Bałtyk III with its one mile buffer zone, using 20 video inspections with an ROV. The presence of phytobenthos was found only in a small area (<1%) located in the south-western part of the buffer zone of the area (Volume III, Attachment 1.5.). Four species of algae were present, but the degree of bottom cover was <1%. Plants overgrew pebbles and boulders at only two locations (p05 and p20). In contrast, at the other nine locations, they were attached to small groupings of mussels, moving along the bottom with the currents. This was the case for the protected red algae species *F. lumbricalis*, which, based on film documentation, was found in five locations. Based on the results of the surveys obtained for the areas: MFW Bałtyk III together with the one-mile buffer zone (depth from 20 to 40 m), it can be concluded that the area is characterised by negligible phytobenthos conservation values.

[75] *Pliński and Jóźwiak 2004*

[76] *Kruk-Dowgiałło et al. 2011*

[77] *Andrulewicz et al. 2004*

[78] *Kruk-Dowgiałło et al. 2011*

[79] *Environmental Impact Report for the FEW Baltic II transmission infrastructure project, EKOZAPAS, August 2022 (Volume IIA Natural Inventory Results - benthos).*

Summary and valorization

The most important results of the phytobenthos inventories conducted by the Investor are summarized in the table below.

Table 7.13. *Summary of results of phytobenthos inventories conducted by the Investor*

Inventories made by Investor / Criteria for valorization	ECI	MFW Bałtyk II including a buffer zone	MFW Bałtyk III including a buffer zone
Number of species	8	8	4
Phytobenthos turnout	65% surveyed locations	70% surveyed locations and station	10% surveyed locations
Coverage of the bottom by phytobenthos	<1% (with the exception of a region representing about 1% of the ECI area, where bottom coverage was 40-90%)	<1% (with the exception of the region representing about 0.02% of the area of the MFW Bałtyk II and the buffer zone, where the bottom coverage amounted to 10-70%)	< 1%
Presence of protected species	*Furcellaria lumbricalis i Ceramium diaphanous*	*Furcellaria lumbricalis i Ceramium diaphanum*	None
Presence of eutrophication indicator species	*Pylaiella littoralis, Ectocarpus siliculosus*	*Pylaiella littoralis, Ectocarpus siliculosus*	None

Source: In-house study based on benthos surveys in the area of ECI and MFW Bałtyk II and Bałtyk III

The conducted surveys indicate the presence of phytobenthos only within the corridor intended for the construction of the connection with MFW Bałtyk II. Within the boundaries of the ECI the MFW Bałtyk III with the land, no valuable sites were found in terms of phytobenthos (table 7.13 and figure 7.20).

In the phytobenthos inventory surveys conducted in 2013-2014 by the Investor, a total of 8 macroalgae species were recorded. Twice the number of species was found in surveys covering a large area of the boulder field on Ławica Słupska in 1999[80], while in later years at the PMŚ monitoring station in the Ławica Słupska area, results comparable to those of the Investor were obtained. [81]

In the ECI of the MFW Bałtyk II along with the buffer zone, two species in Poland under strict species protection were recorded: the fork-wort *Furcellaria lumbricalis* and the rosebay *Ceramium diaphanum*, as well as two other species rare in Polish Marine Areas: *Coccotylus truncatus* and *Rhodomela confervoides*. [82] Both strictly protected species and *Coccotylus truncatus* are also found in the Puck Bay and in the area of Boulder Ditch. [83] Optimal living conditions for crayfish are found in the rocky areas of the shallows of the central coast.[84]

The inventoried macrophytes within the boundaries of the corridor intended for the laying of a cable from the offshore wind farm of the MFW Bałtyk II cover less than 1% of the bottom. These areas may represent zones providing shelter, breeding and/or feeding areas for invertebrates and fish. It is noteworthy that the presence of engineered species, i.e. macrophytes such *as Furcellaria lumbricalis*, as well as the mussel *Mytilus trossulus*, has a positive effect on biodiversity, contributing, among other things, to an increase in zoobenthic species diversity.

Also present during the survey were common species of filamentous brown algae (*Pylaiella littoralis* and/or *Ectocarpus siliculosus*), which are particularly abundant in zeutrophic waters. Due to

[80] *Andrulewicz et al. 2004*
[81] *Zalewska and Kraśniewski (ed.) 2021*
[82] *Kraśniewski et al. 2018*
[83] *Zalewska and Kraśniewski (ed.) 2021*
[84] *Gic-Grusza et al. 2009*

their negative impact, including on the species diversity of zoobenthos[85], they are considered an element of the environment that reduces its natural value.

On the basis of the research conducted by the Investor, it can be concluded that the areas with the highest natural value, due to the presence of rare and protected plants and a high degree of bottom coverage by macroalgae, are located only in the ECI corridor from the offshore wind farm MFW Bałtyk II in the section from km 7 BII to 12 BII and in the rocky area from km 3,5 BII to the shallowest part of the buffer zone of the MFW Bałtyk II area (squares 21 and 22).

Within the boundaries of the corridor connecting the MFW Bałtyk III with the land, no valuable places were found in terms of phytobenthos.

Figure 7.20. *The most valuable parts of the area covered by the application for an environmental decision in terms of phytobenthos*

Source: In-house study based on benthos surveys in the area of ECI and MFW Bałtyk II and Bałtyk III

[85] *Norkko and Bonsdorff 1995*

Macrophytes are one of the elements for assessing the ecological status of marine waters. On the basis of surveys carried out within the framework of the PMŚ in the area Ławica Słupska, an index of macrophyte status (SM1) is determined, which is calculated on the basis of samples collected during the period of peak development of rooted plants and macroalgae (June) and during the period of decline of macrophytobenos physiological activities (September). The condition of macrophytes within the Ławica Słupska in the 2011- 2020 decade was assessed as good (GES) - figure 7.21.

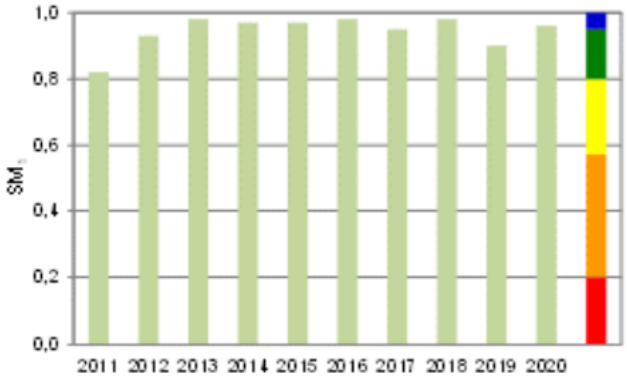


Figure 7.21. *Assessment of the status of macroalgae and angiosperms based on the SM1 index in the Ławica Slupska basin in the decade 2011 - 2020*

Source: Zalewska and Kraśniewski (ed.) 2021

7.4.2. Macrozoobenthos

Zoobenthos is the assemblage of animal organisms associated with the bottom of aquatic environments. The fraction of organisms that remains on a 1 mm mesh sieve after sieving a sample is called macrozoobenthos. Sediment-dwelling animals, through their activity, oxygenate the sediment and influence biogeochemical processes.[86] [87] Macrozoobenthos is an important component of the diet of fish and birds, including rare and protected species.[88] [89] The factors that have the greatest influence on the species composition of the benthos and its abundance and biomass are: sediment type, salinity, oxygen concentration in the water layer above the bottom.

The characterisation of the zoobenthos was carried out on the basis of inventory surveys conducted in 2013-2014 in the area of the planned Project. The location of the sampling sites is shown in figure 7.22. The survey methodology and a discussion of the results are included in Volume III of this EIA Report in Attachment 1.5. In addition, the results of monitoring surveys performed in subsequent years as a part of the PMŚ were used, as well as the results of marine environment surveys conducted by other investors in the vicinity - primarily the results of surveys conducted for the connection with FEW Baltic II (Investor: RWE Offshore Wind Poland Sp. z o.o.).

The research conducted by the Investor was carried out separately for the connection infrastructure (from the border of the wind farms to the shoreline) and separately for the wind farms MFW Bałtyk II and MFW Bałtyk III. Since the planned project covers with its borders the area of all three inventories, the zoobenthos characteristics are presented below, divided into: ECI (connecting infrastructure from the offshore wind farm boundaries to the shore), offshore wind farm MFW Bałtyk II and offshore wind farm MFW Bałtyk III. Then, in summary, the most valuable sections in terms of zoobenthos within the boundaries covered by the application for an environmental decision were indicated on the resulting map.

Macrozoobenthos in the ECI section from the wind farm boundary to the shoreline

In the analyzed area, 92 macrozoobenthos samples were collected with a van Veen-type bucket. In the ECI area, 26 macrozoobenthos taxa were found on sandy and gravelly bottoms (22 were designated to species) (VOLUME III, Attachment 1.5.). Between 4 and 18 taxa were recorded at

[86] *Aller 1982*
[87] *Renz and Forster 2014*
[88] *Bonsdorff et al. 1990*
[89] *Bonsdorff and Blomqvist 1993*

individual survey stations. The most abundantly represented were Crustacea (13 taxa), Polychaeta and Bivalvia (4 taxa each), Gastropoda (2 taxa), Hydrozoa, Oligochaeta and Bryozoa (1 taxon each). Polychaetes were the most constant component of the benthic communities (3 taxa*, Pygospio elegans, Marenzelleria* spp. and *Hediste diversicolor,* occurred at more than 90% of the surveyed stations) and dominated in density (53% of the total macrozoobenthos density). By far the dominant species was *Pygospio elegans*, accounting for 41% in the total macrozoobenthos density. Macrozoobenthos density at the study stations located in the ECI area ranged widely from 400 to 10,830 individuals per m^2 (average 2,144 individuals per m^2), while biomass ranged from 1.5 to 1,034.7 g-m^{-2} (average 115.8 g-m^{-2}). The biomass was by far dominated by bivalves (93% of the total macrozoobenthos biomass). Two of the four bivalve species found in the ECI area, *Mya arenaria* and *Macoma balthica*, accounted for 39 and 34% of the biomass of the total macrozoobenthos, respectively. The contribution of the other two bivalve species was considerably lower: *Mytilus trossulus* (14%) and *Cerastoderma glaucum* (6%). Boulders and pebbles found in the studied ECI area, often overgrown by macroalgae, provided habitat for the mussel *M. trossulus* and the barnacle *Amphibalanus* improvises, which was found during video inspections conducted for the phytobenthos survey.

Macrozoobenthos surveys carried out in the neighbourhood (for the EIA Report for the FEW Baltic II connection) in 2017 and 2020[90] indicate that the macrozoobenthos taxonomic composition (28 taxa) was very similar to that in the ECI to MFW Bałtyk II and MFW Bałtyk III, where 26 macrozoobenthos taxa were found. The ranges of total abundance (30 to 13,910 individuals/m2) and total macrozoobenthos biomass (from 0.3 to 1,248 g/m^2) were also similar to the values found for the ECI to MFW Bałtyk II and MFW Bałtyk III. The mean mussel biomass at the ECI of FEW Baltic II was higher at around 62g/m2, while it was only 16.26 g/m^2 at the ECI to MFW Bałtyk II and MFW Bałtyk III. For both projects, the average total biomasses of the other 3 mussel species (i.e. *Cerastoderma glaucum*, *Macoma balthica* and *Mya arenaria*) were similar (approximately 90-100 g/m^2), but the shares of each species differed.

In the MFW Bałtyk II and MFW Bałtyk III IPs, absolutely constant species (with an incidence of over 75%) were 3 polychaete taxa (*Pygospio elegans, Marenzelleria spp. and Hediste diversicolor*), the bivalves *Macoma balthica, Mya arenaria* and the gastropod *Hydrobiidae*. In the FEW Baltic II IP, the polychaetes *Pygospio elegans*, as well as representatives of the Oligochaeta and the mussel *Mytilus trossulus* were also absolutely constant taxa.

In the ECI areas of MFW Bałtyk II and MFW Bałtyk III, by far dominant species was *Pygospio elegans*, accounting for 41% in the total macrozoobenthos density and very similarly in the ECI FEW Baltic II 42%. In both areas, the biomass was strongly dominated by bivalves in the ECI area (93% of the total macrozoobenthos biomass), with bivalves accounting for approximately 86% in the FEW Baltic II IP.

In summary, surveys carried out by the Investor adjacent to the planned Project in later years (i.e. 2017 and 2020) indicate similar results in terms of macrozoobenthos species composition and biomass and no protected species found.

[90] *Environmental Impact Report for the FEW Baltic II transmission infrastructure project, EKOZAPAS, August 2022 (Volume IIA Natural Inventory Results - benthos).*

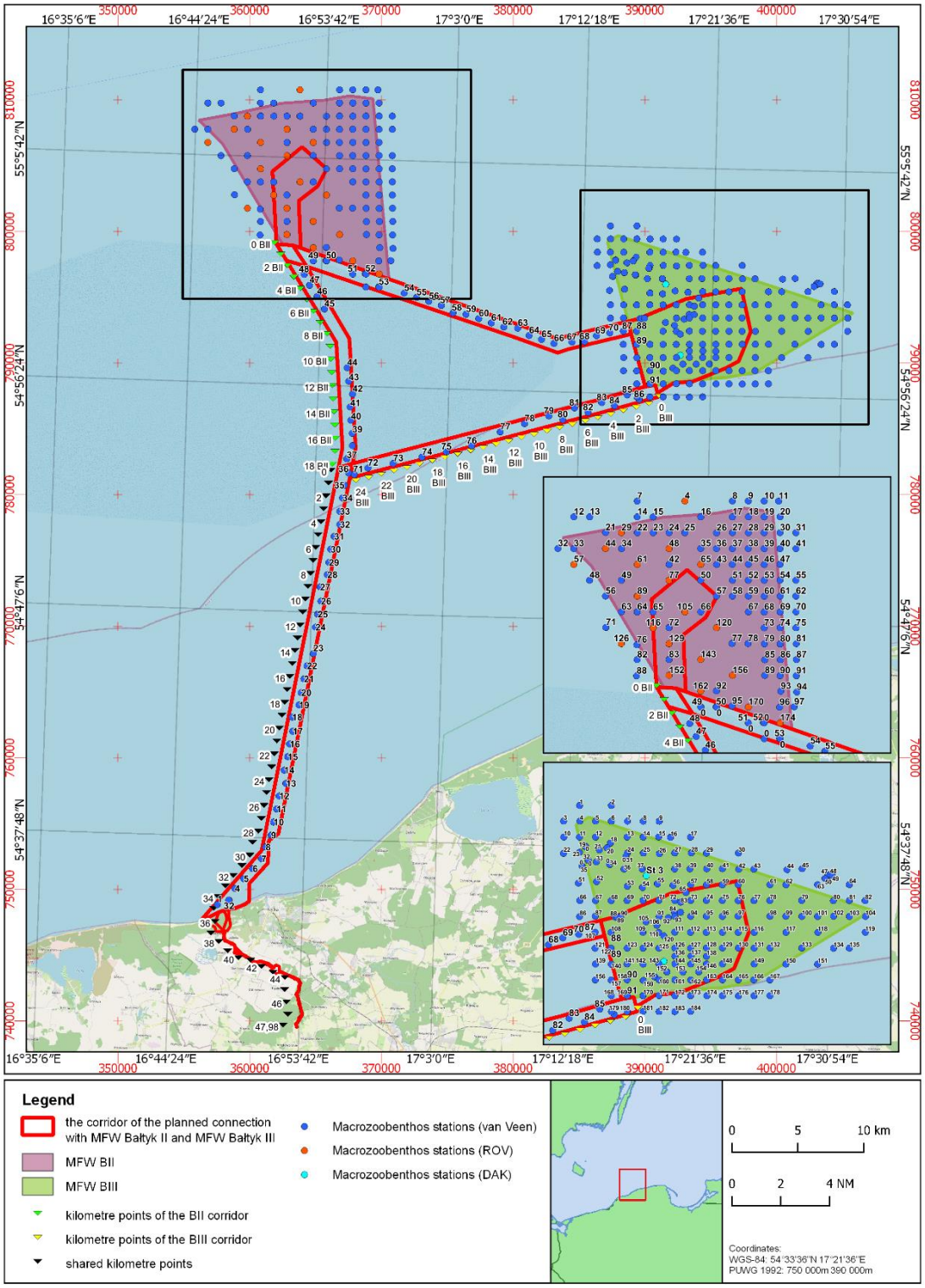


Figure 7.22. *Location distribution of macrozoobenthos stations in the ECI corridor and within the MFW Bałtyk II and Bałtyk III*

Source: In-house study based on benthos surveys in the area of the ECI and MFW Bałtyk II and Bałtyk III (Volume III. Attachment 1.5).

Macrozoobenthos in the area of the MFW Bałtyk II with the buffer zone

A total of 117 macrozoobenthos samples were taken in the area of the offshore wind farm MFW Bałtyk II including the one-mile buffer zone, 48 of them within the planned Project. In the area of the MFW Bałtyk II together with a one-mile buffer zone, 32 taxa of benthic fauna were found (Volume III, Attachment 1.5.). Two macrozoobenthos assemblages were distinguished in the study area. The first

community, inhabiting coarse-grained sediments located in the western shallower part of the study area (average depth 33 ± 7 m), was dominated by the mussel *M. trossulus in* terms of both density and biomass. The large central part of the MFW Bałtyk II area is covered by a dense layer of pebbles and boulders. On the surface, mussel assemblages were found, which in terms of abundance and biomass repeatedly exceeded the values found in the first assemblage. The second separate assemblage occurred in the eastern part of the MFW Bałtyk II area, on a sandy bottom (average depth 34± 5 m). The dominant species in terms of density was the polychaete *P. elegans*, while the biomass was dominated by the bivalve *M. balthica*.

Macrozoobenthos in the area of the MFW Bałtyk III with the buffer zone

A total of 176 macrozoobenthos samples were taken in the area of the planned offshore wind farm Bałtyk III (MFW Bałtyk III) including the one-mile buffer zone. In the area of the planned MFW Bałtyk III together with a one-mile buffer zone, 27 taxa belonging to the macrozoobenthos were found (Volume III, Attachment 1.5.). Crustaceans were the most abundantly represented, with 12 taxa. Two macrozoobenthos communities were identified in the study area. The first complex occurs on coarse-grained sands located mainly in the north-western, deepest part of the studied area (in the area with an average depth of 40 ± 3 m). The area it occupies is 20.3 km^2 (approx. 11% of the area of MFW Bałtyk III). This assemblage is dominated in density by the mussel *M. trossulus*, which attaches to hard surfaces. This assemblage was characterised by a higher taxonomic diversity (24 taxa) compared to the assemblage inhabiting the sandy bottom (20 taxa). To the south, the area described above is adjacent to a small area (16.6 km^2 , approx. 9% of the area of MFW Bałtyk III), which is dominated by a stony bottom also very abundantly populated by the mussel *M. trossulus.* The second community inhabits sandy sediments in the shallower part of the MFW Bałtyk III area (average depth 30± 3 m). The area occupied by this assemblage is approximately 148.3 km^2 (which is approximately 80% of the area of MFW Bałtyk III). The dominant species in terms of abundance was the polychaete *P. elegans*. In terms of biomass, the dominant species were typical sandy bottom bivalves - *M. balthica* (with 40.5%) and *M. arenaria* (22.5%). The average macrozoobenthos biomass of this assemblage was 34.85 g-m^{-2} (min. 4.03-max. 175.18 g-m^{-2}) and was four times lower than in the *M. trossulus* assemblage.

Summary: No protected macrozoobenthos species were found in the area of the planned ECI Project at depths between 6.6 and 33 m. The crustacean species *Eurydice pulchra,* found in the ECI area, is listed on the Red List of Threatened Species in the Baltic Sea as a Data Deficient (DD) species.[91]

Areas characterised by a high macrozoobenthos biomass are areas of high conservation value as potential feeding grounds for fish and/or birds, as well as sites that play an important role in biogeochemical transformations occurring in sediments and overlying water.

Macrofaunal biomass in the ECI area ranged widely from 1.5 to 1,034.7 g-m^{-2} (average 115.8 g-m^{-2}) (figure 7.23). The biomass was by far dominated by bivalves (93% of the total macrozoobenthos biomass).

[91] *HELCOM, 2013 HELCOM Red List of Baltic Sea species in danger of becoming extinct*

Figure 7.23. *Macrozoobenthos biomass on sandy and gravelly bottoms*

Source: In-house study based on benthos surveys in the area of the ECI and MFW Bałtyk II and Bałtyk III (Volume III. Attachment 1.5).

In the area of MFW Bałtyk II, the biomass on sandy and gravelly bottoms was dominated by the mussel, *M. balthica,* while on rocky bottoms it was *M. trossulus*. Mussels, an important component of the diet of benthic-feeding birds, colonised a significant area of the bottom in this area (119.71 km^2, which is about 64%), and the biomass reached 648.63 g-m^{-2} (on sandy and gravelly bottoms with dense mussel aggregations). However, the highest values of biomass (1,990.93 g-m^{-2}) were found in the boulder covered part of the MFW Bałtyk II area (figure 7.24). In the area of MFW Bałtyk III, the biomass of macrozoobenthos on the sandy bottom did not exceed 175.18 g-m^{-2}, and in the mussel aggregation it averaged 125.26 g-m^{-2} (maximum 757.34 g-m^{-2}).

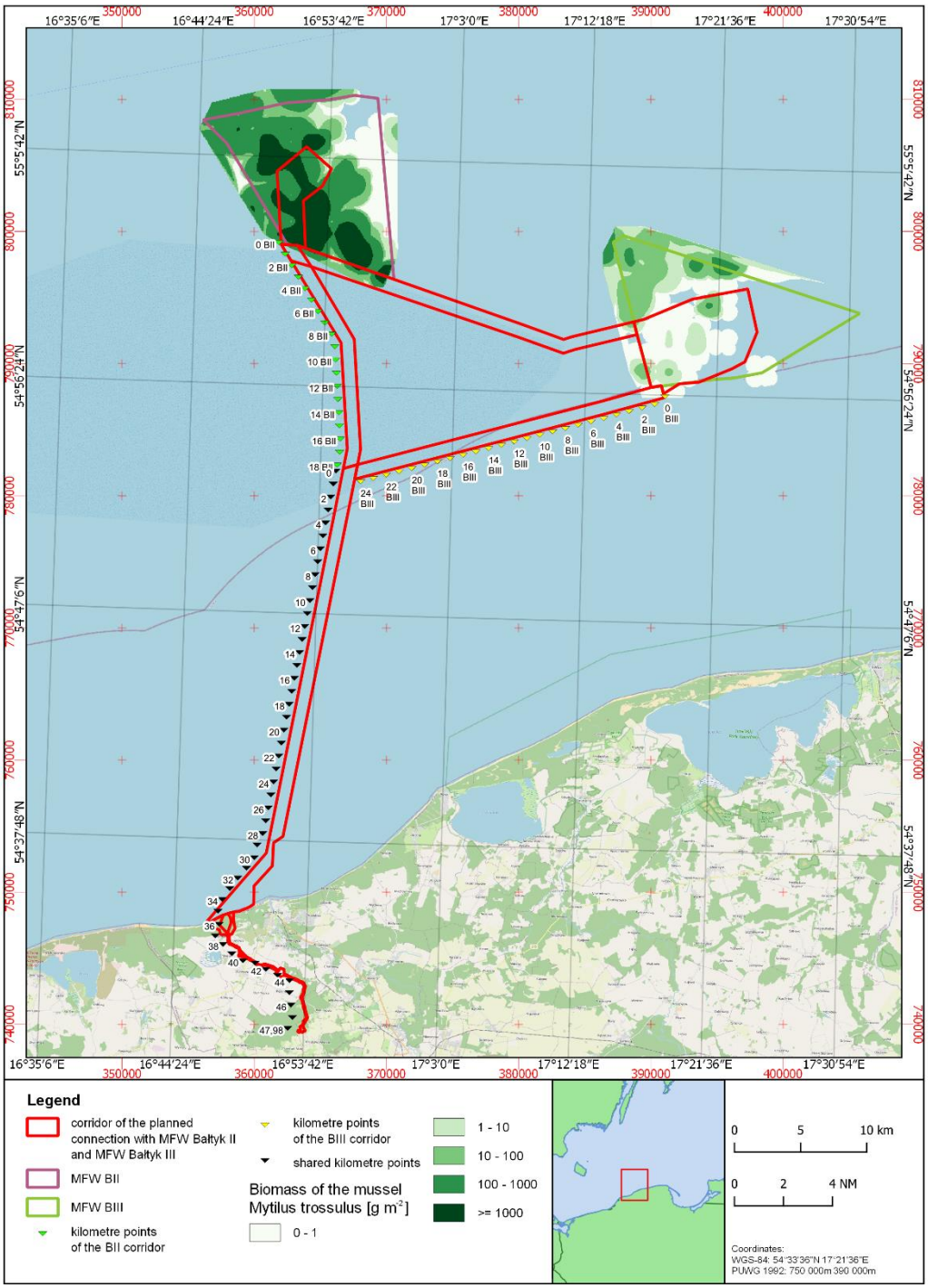


Figure 7.24. *Biomass of the mussel M. trossulus*

Source: In-house study based on benthos surveys in the area of the ECI and the MFW Bałtyk II and Bałtyk III (Volume III. Attachment 1.5).

The taxonomic composition, density and biomass of macrozoobenthos in the area of the ECI, MFW Bałtyk II and MFW Bałtyk III were typical of the open zone of the southern Baltic.[92] [93]

Summary and valorization

The most important results of the macrozoobenthos inventories conducted by the Investor are summarized in the table below (table 7.14)

[92] *Gic-Grusza et al. 2009*
[93] *Gogina et al. 2016*

Table 7.14.*Summary of results of macrozoobenthos inventories conducted by the Investor*

Inventories made by Investor / Criteria for valorization	ECI	MFW Bałtyk II including a buffer zone	MFW Bałtyk III including a buffer zone
Number of taxa (species) Number of taxa at the station	26 (22) 4-18	32 (25) 3-12	27 (22) 4-16
Presence of protected and rare species	None protected species Rare species: *Eurydice pulchra*, listed on the Red List of Threatened Species in the Baltic Sea (Category Data Deficient, DD) (HELCOM 2013)	None protected species Rare species: *Eurydice pulchra*, listed on the Red List of Threatened Species in the Baltic Sea (Category Data Deficient, DD) (HELCOM 2013)	None
Potential feeding sites for fish and/or birds	Bouldering areas with a complex of *Mytilus trossulus*mussel complex	Regions with a high biomass of macrozoobenthos The mussel complex *Mytilus trossulus* (area 119.71 km2, 64% of the area)	Regions with high macrozoobenthos biomass *Mytilus trossulus*mussel complex
Number of alien species	3	3	2

Source: In-house study based on benthos surveys in the area of ECI and MFW Bałtyk II and Bałtyk III

Surveys conducted by the Investor in the analyzed body of water covered by the application for an environmental decision indicate the occurrence of a total of 34 macrozoobenthos taxa (28 were designated to species). Between 3 and 18 taxa were recorded at individual stations on the soft bottom. These values are typical for the southern part of the Baltic Sea. Between 9 and 11 macrozoobenthos taxa were determined in individual samples from the rocky bottom from the MFW Bałtyk III area. A larger number of taxa (18) was found on the sand and stone bottom of Ławica Słupska[94], and 28 macrozoobenthos taxa were found in a large area of the Ławica Słupska boulder bed [95]. The taxonomic composition, abundance and biomass of macrozoobenthos in the area of the planned project are typical of the shallow and medium-depth bottom zone of the open part of the southern Baltic Sea. [96] [97] [98]

No protected species were found in the macrozoobenthos in the study area. The rare crustacean species *Eurydice pulchra*, which is listed on the Red List of Threatened Species in the Baltic Sea as a Data Deficient, but at the same time suspected to be endangered (category: Data Deficient, DD), was present in the area of the ECI with the MFW Bałtyk II. The presence of this rare species in the Gulf of Gdansk was found only in the vicinity of the Orlovsky Cliff. [99]

Particularly noteworthy are areas of high zoobenthic biomass as potential sites for intensive biogeochemical transformations occurring in sediments and over-bottom water, as well as foraging areas for fish and/or benthic-feeding birds, such as long-tailed dabbler and uhla. The main food of these birds is bivalves. The list of bivalves that played the most significant role in the biomass structure included four species: three sediment burrowing species: *Mya arenaria, Macoma balthica*, *Cerastoderma glaucum*, and the hard-bottom mussel *Mytilus trossulus.*

In the surveyed areas of the planned ECI Project, two species of mussels dominated on the soft bottom in terms of biomass: *Mya arenaria* and *Macoma balthica*, while on the rocky bottom there were clusters of the mussel *Mytilus trossulus*. The biomass of the macrofauna in the ECI area ranged widely from 1.5 to 1,034.7 g-m-2 (average 115.8 g-m-2). The biomass was definitely dominated by

[94] *Warzocha 1995*
[95] *Andrulewicz et al. 2004*
[96] *Warzocha 1995*
[97] *Gic-Grusza et al. 2009*
[98] *Gogina et al. 2016*
[99] *Miernik et al. 2021*

bivalves (93% of the total macrozoobenthos biomass). The most valuable, due to the highest macrozoobenthos biomass wasthe section from 15 BII to 1 shared kilometre points,

In addition, mussel assemblages were observed in areas of stonework and boulders occurring within the ECI corridor along the section:

- from km 11 BII to the end of the connection within the MFW Bałtyk II field,
- km 0 BIII to 4 BIII and 8 BIII to 12 BIII,
- common section from km 26 to 28.

Information on mussel assemblages came from video inspections performed within the MIP for the phytobenthos survey; however, no hard-bottom samples were taken and the mussel biomass in the MIP corridor was therefore not determined. The biomass was estimated for the MFW Bałtyk II and MFW Bałtyk III fields (Volume III, Appendix 1.5).

Figure 7.25 presents a summary of the available results of the macrozoobenthos reconnaissance by voxel pointing to valuable sites along the ECI corridor, taking into account both soft-bottom macrozoobenthos biomass data as well as mussel biomass data (within the MFW Bałtyk II and MFW Bałtyk III field boundaries) and recorded mussel assemblages from video inspections.

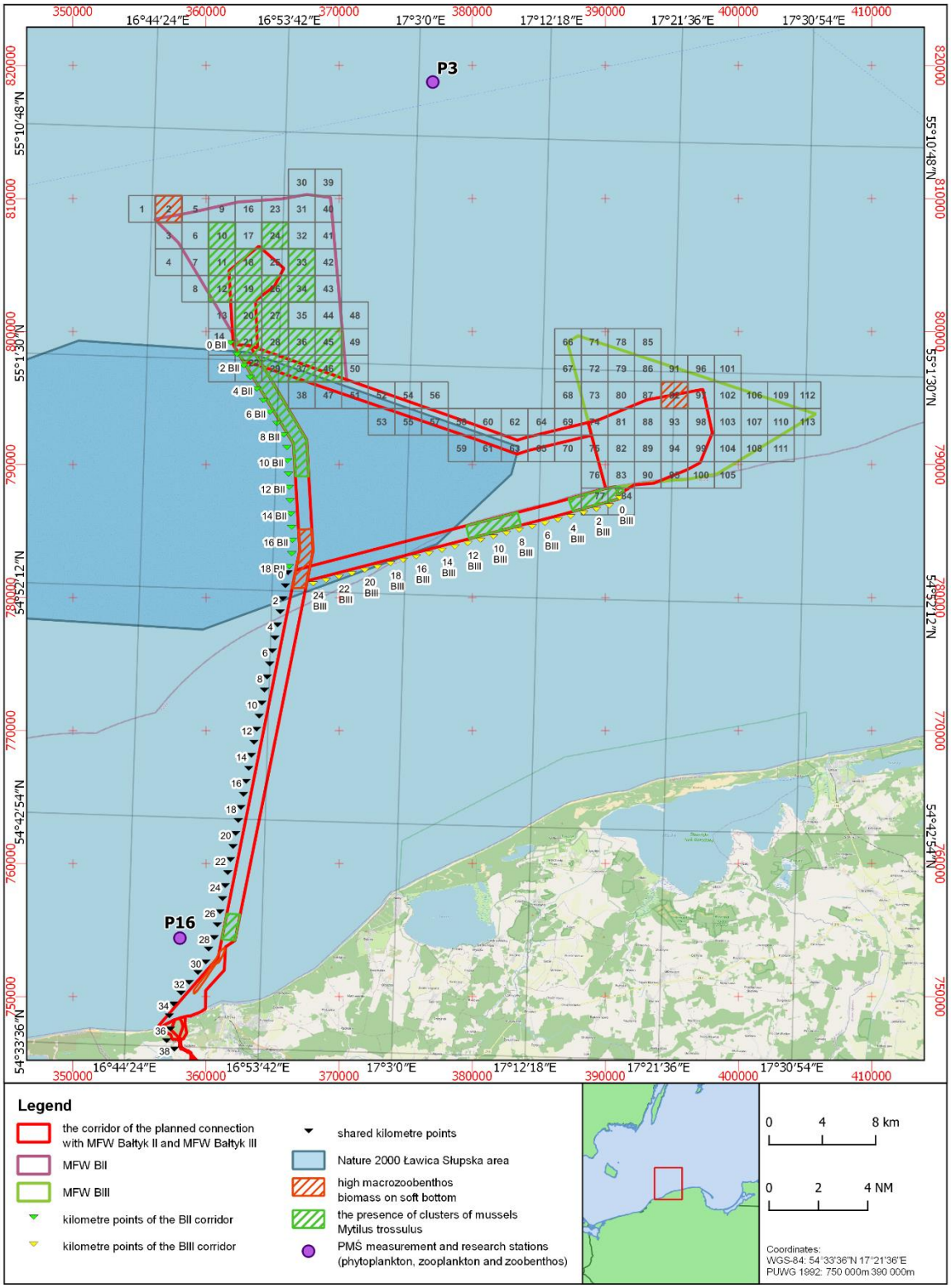


Figure 7.25. *Areas of highest natural value in the context of macrozoobenthos*

Source: In-house study based on benthos surveys in the area of ECI and MFW Bałtyk II and Bałtyk III

In the MFW Bałtyk II offshore area, the biomass on the sand and gravel bottom was dominated by the mussel, *Macoma balthica*. The mussel, which is an important component of the diet of benthivorous birds, colonized a significant area of the bottom of the area (119.71 km2, which is about 64%), and the biomass reached 648.63 g-m^{-2} (on sandy and gravelly bottoms with dense mussel aggregations). The highest macrozoobenthos biomass (> 500 g-m^{-2}) was found in three squares: 2 and

33 and 34, i.e. outside the area covered by the application for an environmental decision for the connection from the MFW Bałtyk II. The highest values of mussel biomass (>1000 g-m^{-2}) were estimated in the part of the MFW Bałtyk II area covered with rocks and boulders (squares: 10-12,18-21, 24, 26-29, and 36-37 and 45-46), of which the planned project involving the construction of a connection from the MFW Bałtyk II is mainly affected by squares 18-21.

In the area of MFW Bałtyk III, macrozoobenthos biomass on the sandy bottom did not exceed 175.18 g-m^{-2}, and in the mussel assemblage it averaged 125.26 g-m^{-2} (maximum 757.34 g-m^{2}) (among others, square 92) – (figure 7.25). Mussel biomass within the analysed section of the connection was below 500 g-m^{-2} (Volume III, Appendix 1.5).

In addition, three alien species belonging to the macrozoobenthos were found in the area of the planned Project. These were two species of crustaceans: barnacles *Amphibalanus improvisus* that overgrow hard substrates, and the gudgeon *Gammarus tigrinus*, an incidental species in the area, preferring a coastal zone overgrown with vegetation. Polychaetes of the genus *Marenzelleria* were an absolutely constant and abundant taxon throughout the area, as well as throughout the POM.

In the assessment of the condition of Polish marine areas developed for the implementation of the Marine Strategy Framework Directive (RDSM), the indicator used to assess the condition of macrozoobenthos is the multimetric Macrozoobenthos Condition Index (B). This is an indicator developed for the purposes of the Water Framework Directive (RDW), which takes into account the taxonomic composition, density and proportion of sensitive/resistant species to eutrophication stress in accordance with the publication by Osowiecki and colleagues (2012)[100] and the Decree of the Minister of Infrastructure of 2021 (Journal of Laws 2021, 1475). For the purpose of assessing the condition as borderline for GES, the indicator value between moderate and good ecological status of the WFD classification was taken as the limit of good ecological status, which is the same as the limit of good ecological status (GES/subGES) according to the RDSM (table 7.15).[101]

Based on the results of the macrozoobenthos surveys, an assessment of the ecological status of the area was performed based on the multimetric indicator (B), which takes into account the taxonomic composition, density and proportion of species sensitive/resistant to eutrophication stress (Volume III, Appendix 1.5).[102] The area distribution of natural valuation as determined by this indicator is mosaic in nature. Moderate condition (subGES according to the RDSM) prevails throughout the analyzed area. Areas characterized by very good and good ecological status of indicator B (adequate state - GES) are:

- 2 connection sections from the MFW Bałtyk III with a total length of about 18 km (section 0BIII - 13BIII and 17BIII - 22BIII);
- The northeastern portions of the MFW Bałtyk II field (including squares 19 and 20 within the boundaries of the planned project);
- The southwestern portions of the MFW Bałtyk III field (including portions of squares 74, 75, 76, 82, 83, 88, 88, 89 and 94 within the boundaries of the planned project).

The ecological status of the area of the planned Project can be considered, according to the classification proposed in the "Assessment of the state of the environment of POM on the basis of monitoring data from 2020 against the background of the decade 2010-2019", as below good (subGES) in almost the entire area of the planned project covered by the applicationfor an environmental decision, with the exception of the sites indicated above (with good and very good status), according to the rule below (table 7.15).

[100] *Osowiecki et al. 2012*
[101] *Zalewska and Kraśniewski (ed.) 2021*
[102] *Osowiecki et al. 2012*

Table 7.15. *B-index limits in the classification according to the Water Framework Directive (RDW) and the Marine Strategy Framework Directive*

B-index value range	Class	Ecological status according to RDW	according to RDMS
≥3,72	I	very good	GES
≥3,18	II	good	
≥2,70	III	moderate	subGES
≥1,91	VI	weak	
<1,91	V	bad	

Source: Zalewska and Kraśniewski (ed.) 2021

With regard to PMŚ monitoring studies, the closest station to the planned Project is located in the Ustka area in the coastal zone (station P16 at a distance of about 3 km) and in the western part of the Rynna Słupska (point P3, about 18 km away) - station location figure 7.25..

Surveys conducted at station P16 in the Ustka area indicate a below good (sub-GES) condition in most of the observed years, with the exception of 2018 and 2019, when the condition was assessed as good (figure 7.26).

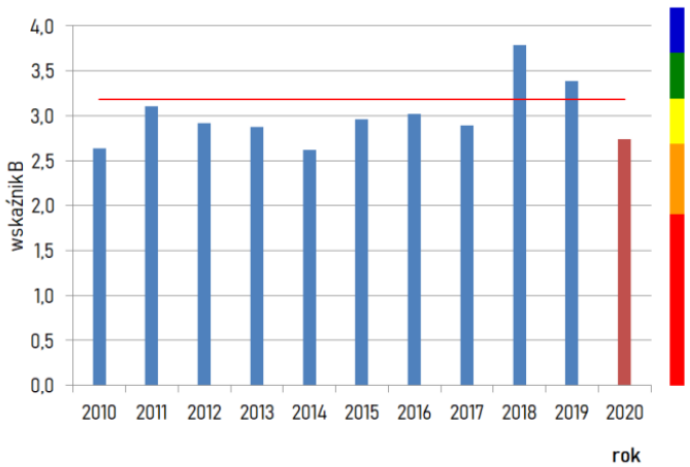


Figure 7.26. *Station P16 - value of the index of macrozoobenthos condition (B) in 2020. (brown bar) against the background of the decade 2010-2019 (blue bars) in the area of Ustka; the coloured bar on the right shows the ranges of the different ecological status classes, as in the table above*

Source: Zalewska and Kraśniewski (ed.) 2021

Studies conducted over the 2014 - 2020 multi-year period at the P3 station indicate the persistence of a moderate B-index condition (yellow marking on the bar to the right in the graph below) and periods above moderate, which influences the variability of the assessment from GES in 2016-2019 to sub-GES in 2014-2015 and 2020 (figure 7.27).

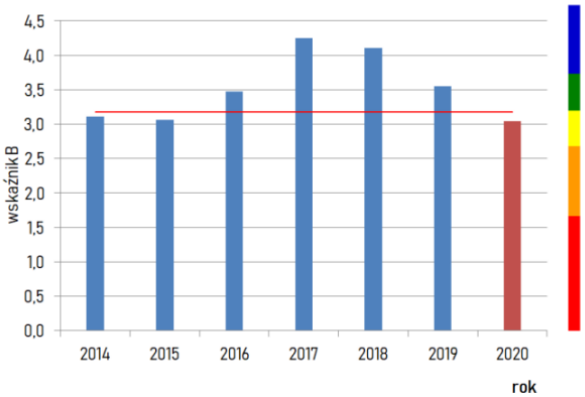


Figure 7.27. *Station P3 - the value of the index of macrozoobenthos condition (B) in 2020. (brown bar) against the multi-year 2014-2019 (blue bars) in the western part of the Rynna Słupska*

Source: Zalewska and Kraśniewski (ed.) 2021

7.4.3. Ichthyofauna

The characteristics of marine ichthyofauna in the area of the planned Project were prepared based on the results of an ichthyofauna inventory performed in 2013 - 2014 for the purpose of this EIA Report, as well as based on the results of inventories performed for MFW Bałtyk II and MFW Bałtyk III. The inventory of ichthyofauna in the area of the ECI, as well as in the area of MFW Bałtyk II and MFW Bałtyk III, was aimed at determining the taxonomic composition, fish abundance and distribution, size structure and biological parameters of selected species of economic importance, as well as ichthyoplankton species composition and abundance. A detailed description of the methodology and results of the inventory, as well as the biological characteristics of the recorded species, are presented in Volume III of the EIA Report, Attachment 1.6.

The results of the inventory were referred to the results of research conducted in 2012-2013 within the framework of the ichthyofauna inventory for MFW Bałtyk II and MFW Bałtyk III (also referred to in Volume III of this EIA Report in Attachment 1.3). This research covered, among others, fragments of the area of MFW Bałtyk II and MFW Bałtyk III, where elements of the planned Project will be located. Therefore, the use of this research allowed for a comprehensive analysis of the entire Project area.

Data collected from the inventory performed for the neighbouring wind farms was also used: Baltica 2 located between Bałtyk II and Bałtyk III (data from 2016-2017)[103], and FEW Baltic II located to the west of MFW Bałtyk II (data from 2017-2018)[104]. This study included the catching of pelagic and demersal species in the deep water zone where the offshore wind farms are located, as well as the catching and analysis of the ichthyoplankton of this zone.

In addition, this study uses data collected as a part of an inventory for the cable power connection of FEW Baltic II, immediately adjacent to the Project, conducted in 2017-2018. These surveys included pelagic and demersal species catches, as well as ichthyoplankton catches and analysis, and hydroacoustic surveys.[105]

Sources of ichthyofauna data are shown schematically in figure 7.28, figure 7.29, figure 7.30. In figures 7.29 and 7.30 presented the location of coastal and deep-water research stations.

[103] *EIA Report MFW Baltica, November 2017 appendix 1. Report on the inventory of abiotic and biotic resources of the MFW area*

[104] *EIA Report MFW FEW Baltic II, September 2019, Vol. II. Appendix 3: Results of monitoring of ichthyofauna and ichthyoplankton*

[105] *EIA Report for the project titled: FEW Baltic II connection infrastructure, september 2022*

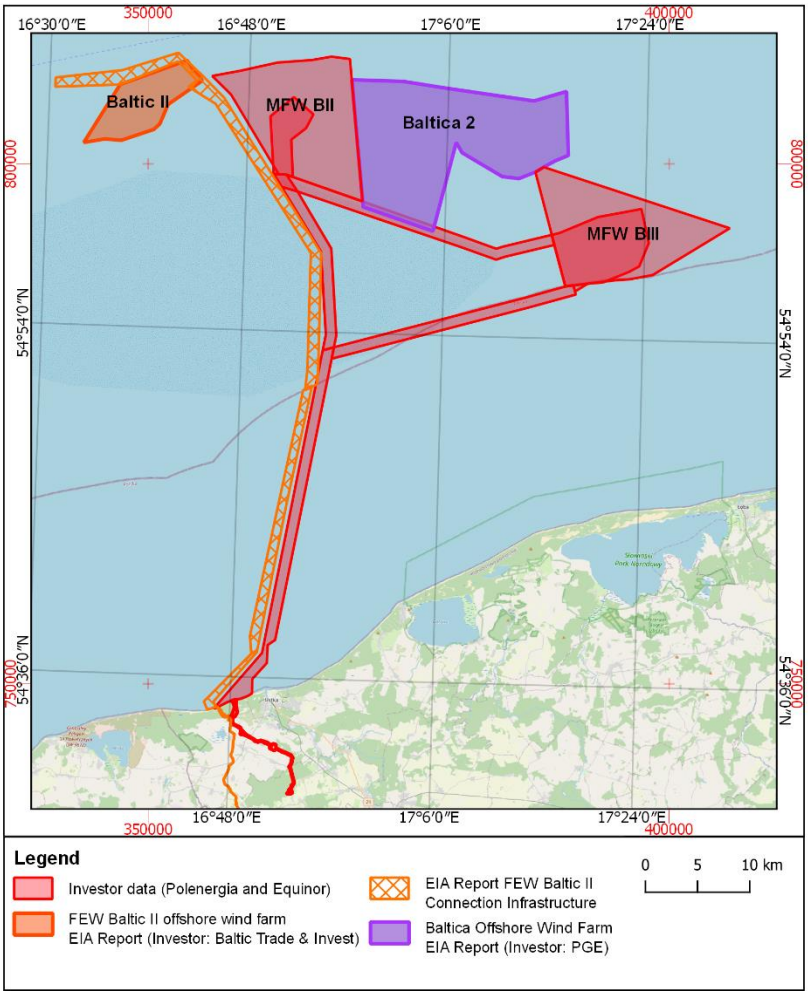


Figure 7.28. *Location of projects for which ichthyofauna surveys were conducted used for the ichthyofauna characteristics*

Data of the Chief Inspectorate for Environmental Protection (GIOŚ) obtained within the framework of the State Environmental Monitoring (PMŚ), financed from the National Fund for Environmental Protection and Water Management, was also taken into account. This includes the results of research catches using multi-panel gillnets on the open sea area (Ławica Słupska) in 2020 and in the coastal water bodies Polskie wody przybrzeżne Basenu Gotlandzkiego CW20001WB2 and coastal water bodies Polskie wody przybrzeżne Basenu Bornholmskiego CW60001WB3 in 2019. Results on the number and weight of species caught are given in terms of standard fishing time, and a range of fish lengths is included.

Methodology

Ichthyofauna surveys for this EIA Report were conducted in summer (July/August), autumn (October) 2013 and spring (April) 2014. The number of survey sessions completed is sufficient to observe seasonal phenological changes for the majority of ichthyofauna species characteristic of the study area. The study also included bi-environmental species breeding in freshwater. Both coastal (depth to 15 m) and deep-water zones were sampled, which required the use of different ichthyofaunal survey methods.

In the coastal zone, 4 types of gear were used: sets of gillnets with different eye sizes, bottom trawls, beach saine nets and semi driftnets to catch demersal fish in water.

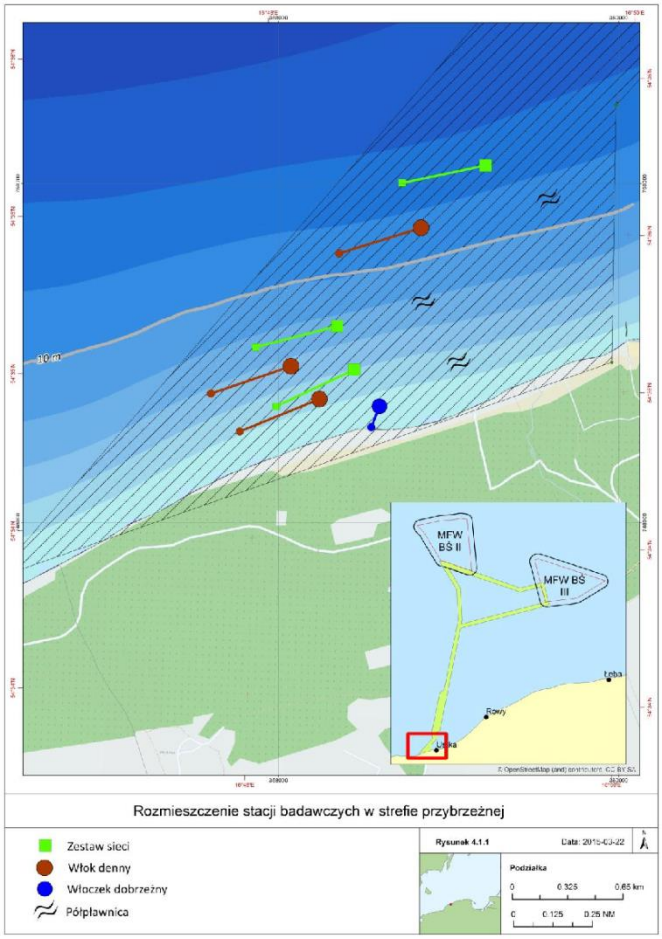


Figure 7.29.*Study area in the corridor of the technical transmission cable in the coastal zone (according to Raport MIR–PIB 2015)*

In the deep-water zone, surveys were conducted using bottom-set gillnets as the anticipated main impact during construction phase (seabed works) and operation phase (electromagnetic field, thermal radiation in the area of cables) will be concentrated in the near-bottom zone and will affect fish species living there.

The distribution of staking locations was planned so as to obtain representative data for the area of the construction corridor of the transmission cable. The principle of relatively uniform distribution of testing sites along the entire length of the cable was adopted, without taking into account the depth distribution, as they are slightly different in the deep-water zone (15-33 m). Sets of test nets were placed at six locations.

Fishing was conducted using bottom set survey nets constructed to allow for the non-selective capture of demersal fish present in the study area and the need to assess the biological characteristics of the dominant fish species of considerable economic importance.

Data analysis followed the same methodology for both coastal and deep water surveys. Fish from each net type were selected for separate, labelled containers. Fish were sorted into species, the catch weight of each species was determined (in the case of bottom-set survey netting from each net type separately), the total length of each fish species was measured and ichthyological analyses of the dominant species of economic importance in the catch were conducted. Ichthyological analysis included: measurement of individual length and weight; determination of sex and stage of sexual maturity (gonad development); assessment of stomach filling (information on food availability in the study area). Collection of otoliths for age determination was also performed. Five fish in each of the length classes present in the catches were examined.

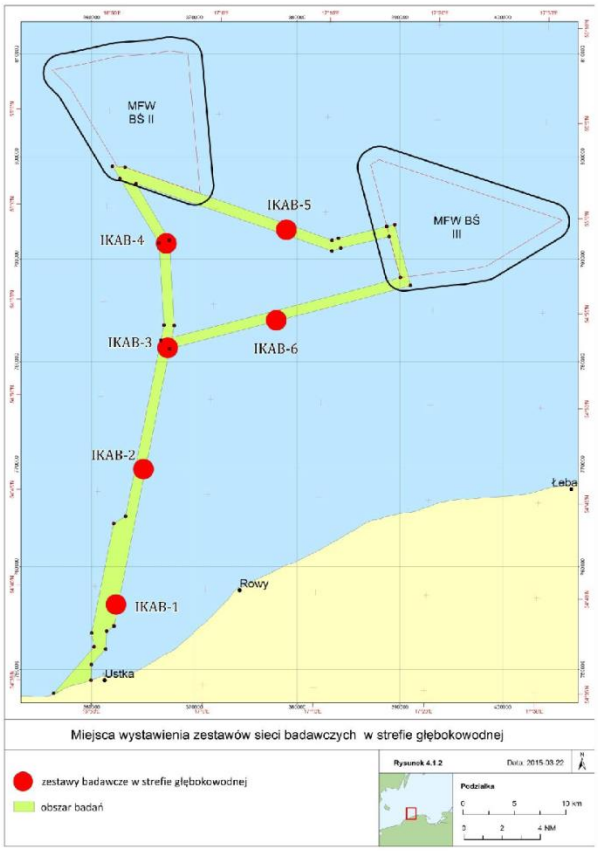


Figure 7.30. *Location of testing network sets in the construction corridor of the transmission cable in the deep water area (according to Raport MIR–PIB 2015)*

Composition of fish communities in the area of the planned Project and results of ichthyological analyses

During the inventory conducted in 2013-2014 for this EIA Report, 27 fish species were recorded in the coastal zone, with variable abundance and distribution between survey seasons (table 7.16). Pelagic fish included 7 species, of which 4 are classified as marine ichthyofauna and 3 (the European smelt, the common whitefish and the sea trout) are diadromous. Demersal fish, on the other hand, were represented by 20 species, including 14 marine species, one diadromous species (the zarte) and 5 freshwater species. The occurrence of 2 demersal fish species under partial species protection in Poland (Journal of Laws 2016, item 2183) was recorded: the sand goby (*Pomatoschistus minutus*) and the straightnose pipefish (*Nerophis ophidion*). One pelagic species, the herring, and 5 demersal species (the tobias, the sandeel, the armed bullhead, the lumpfish and the turbot) spawn in the ECI area, while 4 species (the round goby, the sand goby, the European eelpout and the shorthorn sculpin) may also potentially use the area as spawning grounds, but there is no data to confirm this as survey fishing was conducted outside the spawning season for these species.

Among the pelagic species found in the ECI area, the herring, the sprat, the mackerel and the sea trout are commercially caught. Of the demersal species, the cod, the flounder, the plaice and the turbot are commercially caught in the ECI area, as well as the perch, the pike-perch and the bream in the coastal zone.

Table 7.16. *List of species found in the 2013-2014 research catches with regard to habitat and spawning area*

Species	Latin name	Habitat			Spawning in the research area
		Marine	Bi-environmental	Fresh water	
Garfish**	*Belone belone*	X			
Mackarel*	*Scomber scombrus*	X			
Sprat*	*Sprattus sprattus*	X			
Herring*	*Clupea harengus*	X			
European smelt	*Osmerus eperlanus*		X		
Common whitefish **	*Coregonus lavaretus*		X		
Sea trout *	*Salmo trutta trutta*		X		
Tobias**	*Ammodytes tobianus*	X			
Sand eel **	*Hyperoplus lanceolatus*	X			
Straightnose pipefish	***Nerophis ophidion***	X			
Round goby	*Neogobius melanostomus*	X			
Sand goby	***Pomatoschistus minutus***	X			
European eelpout	*Zoarces viviparus*	X			
Shorthorn sculpin	*Myoxocephalus scorpius*	X			
Armed bullhead	*Agonus cataphractus*	X			
Lumpfish	*Cyclopterus lumpus*	X			
Cod*	*Gadus morhua*	X			
Whiting	*Merlangius merlangus*	X			
Flounder*	*Platichthys flesus*	X			
Plaice*	*Pleuronectes platessa*	X			
Turbot*	*Scophthalmus maximus*	X			
Perch*	*Perca fluviatilis*			X	
Pike-perch *	*Sander lucioperca*			X	
Zerta**	*Vimba vimba*		X		
Common bream *	*Abramis brama*			X	
Common roach **	*Rutilus rutilus*			X	
White bream **	*Blicca bjoerkna*			X	

pelagic species
demersal species
spawning partly in the research area
spawning partly in the research area/no data
species under partial protection
** species which are subject to commercial fishing in the ECI zone*
*** species which are subject to commercial fishing outside the ECI zone*

Source: In-house study on the basis of Ichthyofauna inventory included in Volume III of this Report in Attachment 1.6.

The results of the catches made in 2013-2014 (MIR-PIB Report 2015) in the coastal and deep-water zone, taking into account the season of the study and the habitat of the species are presented in table 7.17. Significant variation in abundance was noted between the study periods. The highest

number of fish was caught during the summer period (July 2013) - 79.4 thousand fish, with a clear dominance of the tobias (95%). Seasonal and spatial variation in abundance is discussed below separately for each species recorded. The presence of the given species in the catches made for MFW Bałtyk II and MFW Bałtyk III inventories as well as in the inventory made for FEW Baltic II connection was also taken into account.

Pelagic species – marine species

The garfish (*Belone belone*) occurred in the coastal area only in summer (30 individuals). The species was also recorded in the inventory catches for the purposes of the MFW Bałtyk III, so its occurrence was confirmed in the area of the planned Project also in the deep-water zone. In the PMŚ research, garfish was recorded in following locations:

- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) – 1 individual of 0.125 kg;

The species was therefore extremely rare, the individual caught was 45 cm long.

The mackerel (*Scomber scombrus*) was caught sporadically - a total of 2 individuals were caught: in summer in the deep-water zone (1 individual) and in spring in the coastal zone (1 individual). The species was also recorded in the inventory catches for the MFW Bałtyk III (in the deep-water zone) and the ECI of FEW Baltic II (in the deep-water and coastal zones). The occurrence of mackerel has therefore been confirmed in the area of the planned Project in different locations and in different years, in the deep water zone and in the coastal zone. Mackerel were found in the following locations during the PMŚ surveys:

- Open sea area – Ławica Słupska (2020) – 17 individuals of 6.736 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) – 10 individuals of 2.281 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) – 1 individual of 0.456 kg.

Thus, the species occurred in all analysed locations in the vicinity of the planned Project and was caught relatively rarely, but more often than in the inventory catches. The caught individuals reached lengths in the range of 25-40 cm.

The sprat (*Sprattus sprattus*) was recorded only in the coastal zone: very numerously in summer (3 062 individuals), in autumn only 2 individuals were caught, and in spring 417 individuals were caught. The juveniles caught in summer were this year's juveniles in the coastal feeding grounds. Fish caught in the spring were age 1+. Areas in the Project area are valuable feeding grounds for this species due to their location near the mouth of the Słupia river. The feeding area aggregation at the point of mixing fresh and salt water is a well-known phenomenon in the context of this species. The occurrence of sprat in the coastal zone was associated with feeding (60% of individuals with partially filled stomachs).

Sprat were also recorded in the inventory catches for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone and in ichthyoplankton) and the ECI for FEW Baltic II (in the deep-water and coastal zone and in ichthyoplankton). The occurrence of sprat was thus confirmed in the area of the planned Project at different locations and in different years, in the deep water and in the coastal zone. Sprat were found in the following locations during the PMŚ surveys:

- Open sea area – Ławica Słupska (2020 r.) – 3 individuals of 0.040 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019 r.) – 37 individuals of 0.301 kg.

Therefore, the species was present in two analysed locations in the vicinity of the planned Project, but was relatively rare. The individuals caught reached lengths of 9-13 cm.

The herring *(Clupea harengus)* was caught both in the coastal and deep water zones in all survey periods. The species was most abundant in the coastal zone in autumn (181 individuals) and in spring in the same zone (143 individuals). The higher abundance of herring in the coastal zone in autumn was due to feeding, while in spring it was due to spawning migration. In the deep-water zone,

on the other hand, herring abundance in spring was 40 individuals; two herring were caught in autumn. In summer, 21 individuals were caught in the coastal zone and 9 individuals in the deep-water zone. The deep-water zone was occupied by individuals aged 3 years and over, while younger year classes were also observed in the coastal zone. In spring, 62% of the fish in the deep water zone had stomachs partially filled with food, indicating intensive feeding of the species.

Herring were also recorded in inventory catches for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone and in ichthyoplankton) and the ECI for FEW Baltic II (in the deep-water and coastal zone and in ichthyoplankton). The occurrence of herring was therefore confirmed in the area of the planned Project in different locations and in different years in the deep water zone and in the coastal zone.

Herring were reported in the following locations in PMŚ surveys:

- Open sea area – Ławica Słupska (2020) – 198 individuals of 13.854 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) – 441 individuals of 26.660 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) – 31 individuals of 1.789 kg.

Therefore, the species was present in all analysed locations in the vicinity of the planned Project, and in two locations it was caught in large numbers. The individuals caught reached the length of 13-27 cm.

Pelagic species - bi-environmental species

The European smelt (*Osmerus eperlanus*) was caught only in the coastal zone, most abundantly in summer (214 individuals) and in very few numbers in autumn (13 individuals) and spring (17 individuals). In autumn, 90% of the fish had partially filled stomachs, while in spring the proportion of individuals with partially filled stomachs was 65%. The species was also recorded in inventory catches for the ECI of FEW Baltic II (coastal and deep water). The occurrence of smelt has therefore been confirmed in the area of the planned Project at different locations.

In the PMS surveys, smelt were found at the following locations:

- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) – 1 individual of 0.029 kg.

The species was therefore extremely rare, the individual caught was 9 cm long.

The common whitefish (*Coregonus lavaretus*) was observed only in autumn in the coastal zone (3 individuals, with filled stomachs). This species was not found in other inventory surveys in the area of the planned Project.

The species was not found in the PMŚ surveys.

The sea trout (*Salmo trutta trutta*) was recorded in summer (1 individual) and autumn (15 individuals), in both periods in the coastal zone. Additionally, the results of catches were analysed, with 16 sea trout caught in the summer period. For catching sea trout, fishing nets (so-called semi driftnets) used by commercial fishermen were used. Both, in summer and autumn, spawning migration was observed, all the fish caught were spawners and had gonad maturity of 5 level. Stomachs of sea trout were empty, because these fish usually do not feed during spawning migration.

Sea trout were also recorded in inventory catches for the ECI for FEW Baltic II (in the coastal zone). The occurrence of sea trout was therefore confirmed in the area of the planned Project in various locations in the coastal zone.

The species was not found in the PMŚ surveys.

The findings indicate that the ECI area is used as a migration corridor for sea trout migrating to spawn (probably to the Slupia River). Increased migration was observed in the autumn, despite the unfavourable pattern of wind directions and sea currents.

The Atlantic salmon (*Salmo salar*) was not recorded in the inventory for this Project. However, the species was recorded in the inventories for MFW Bałtyk II (in the deep-water zone) as well as the ECI for FEW Baltic II (in the coastal zone). The occurrence of salmon was therefore confirmed in the

area of the planned Project in different locations in both the deep water and the coastal zone. The Atlantic salmon is protected under the Natura 2000 network (Annex II and V of the Habitat Directive).

The species was not found in the PMŚ surveys

The rainbow trout (*Oncorhynchus mykiss*) was not recorded in the inventory for the Project, however the species was recorded in the ECI for FEW Baltic II (in the coastal zone). The occurrence of rainbow trout was therefore confirmed in the area of the planned Project in the coastal zone. It is an alien species in the Polish ichthyofauna (native to North America), in the natural environment it forms both migratory forms - bi-environmental, as well as sedentary forms in fresh waters.

The species was not found in the PMŚ surveys.

Demersal species – marine species

The round goby (*Neogobius melanostomus*) was most abundant in the coastal zone in spring (176 individuals). In the deep-water zone of the same study period, it was much less numerous (3 individuals). In summer, in the coastal zone it decreased to 35 individuals, and in the deep water zone only 14 individuals occurred. During autumn, round goby were least abundant in the coastal zone (12 individuals in the coastal zone and 1 individual in the deep water zone). Stomach filling analysis showed that in summer and autumn, most (75%) stomachs were empty or poorly filled, whereas in spring feeding was more intensive with the majority of stomachs containing food (79%).

Round gob were also recorded in the catch inventory for the ECI of FEW Baltic II (in the coastal zone). The occurrence of the round goby has therefore been confirmed in the area of the planned Project at different locations, mostly in the coastal zone.

In the PMŚ surveys, the round goby was found at the following locations:

- Open sea area – Ławica Słupska (2020) – 10 individuals of 0.274 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) – 51 individuals of 1.991 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) – 5 individuals of 0.420 kg.

The species was therefore present in all analysed locations in the vicinity of the planned Project, but was relatively rare. The individuals that were caught reached the length in the range of 7-22 cm.

The round goby is an alien species to the Baltic Sea and its numbers and rate of expansion are steadily increasing, to the detriment of native fish species. It is a very adaptable and opportunistic species, easily adapting to conditions in new habitats, actively caring for its offspring, which increases its reproductive success. Therefore, it is a strong competition for native species.

Sand goby (*Pomatoschistus minutus*) was found in small numbers (3 individuals) in autumn in the coastal zone and in spring in the coastal zone (1 individual). The species was also recorded in the inventory catches for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone in ichthyoplankton) and the ECI of FEW Baltic II (in the coastal zone and in ichthyoplankton). The occurrence of the small goby was therefore confirmed in the area of the planned Project at different locations, in the deep water zone and in the coastal zone. The species was abundant, both as adults and in ichthyoplankton surveys. The sand goby is under partial protection (Journal of Laws 2016, item 2183).

The species was not found in the PMŚ surveys.

The sand eel (*Hyperoplus lanceolatus*) occurred in summer in the coastal zone in great numbers (167 individuals). In autumn, far fewer individuals (19 individuals) were recorded in the coastal zone. There were 5 sand eels in the deep-water zone in summer, and no individuals were caught in the deep-water zone in autumn. In spring, on the other hand, the number of sand eel in the coastal zone increased to 40 individuals, while only 2 sand eels were caught in the deep-water zone. Unlike tobias, in the research fishery, single specimens of sand eel were recorded in beach saine nets in each research season. The greatest differences were recorded in summer, when only 21 sand eels were found in a single haul out of over 37 000 of tobias. The difference in abundance of both species was

much smaller in autumn. In bottom trawl hauls the highest density was observed in the 3-5 m zone, but sand eels were never the dominant species in the catch. Analysis of sand eel stomach filling showed that in summer and autumn most stomachs were significantly full, and tobias and sprat were the primary food. In spring, sand eel feeding was less intensive, and almost 66% of the analysed individuals had empty stomachs.

The sand eel was also recorded in the inventories for MFW Bałtyk II (in the deep water zone and in ichthyoplankton) and MFW Bałtyk III (in the deep water zone), as well as for the ECI of FEW Baltic II (in the coastal zone). The occurrence of sand eel was therefore confirmed in the area of the planned Project at different locations, in the deep water zone and in the coastal zone.

The sand eel was reported in the following locations in the PMŚ surveys:

- Open sea area – Ławica Słupska (2020) - 63 individuals of 2.311 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 17 individuals of 0.574 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 13 individuals of 0.418 kg.

Thus, the species was present in all analysed locations in the vicinity of the planned Project, but was relatively rare. The specimens caught reached lengths of 16-52 cm.

The cod (*Gadus morhua*) was abundant in the deep-water area in summer (512 individuals), autumn (463 individuals) and spring (797 individuals). In the coastal zone, on the other hand, it was recorded in high numbers in autumn (283 individuals) and spring (140 individuals). During the research period, cod were common in the area of the planned Project. In the deep-water zone, cod were co-dominant with flounder in terms of abundance. High abundance of cod in the coastal zone was observed only in autumn and spring. The ECI area (mainly the deep-water zone) is therefore a permanent habitat for cod, especially smaller cod and younger age groups. The results of the cod diet analysis indicate that the study area is a favourable habitat mainly for juveniles. In the survey catch, juvenile cod (below the minimum size of 38 cm) predominated significantly (even 90% in some surveys), mostly representing age 1 and 2 groups. Due to their size range and associated food preferences, these fish inhabit mainly the shallower areas of the Baltic Sea, where they find their preferred food (mostly crustaceans). Cod of younger age classes avoid food competition with larger cod and cannibalism by occupying other habitats, mainly shallow water areas. Stomach filling analysis showed that in summer and autumn, most of the stomachs of cod were empty or poorly filled, while in spring feeding was more intensive, especially in the shallow water zone, where individuals with stomachs partially or completely filled with food predominated.

Cod were also recorded in the inventory catches for MFW Bałtyk II (in the deep water zone and in ichthyoplankton) and for MFW Bałtyk III (in the deep water zone, where it was a co-dominant species with flounder), as well as for the ECI of FEW Baltic II (in the deep water and coastal zone). The occurrence of cod was therefore confirmed in the area of the planned Project at different locations in the deep water and in the coastal zone.
In the PM surveys, cod were reported in the following locations:

- Open sea area – Ławica Słupska (2020) - 306 individuals of 126,475 kg;

The species was therefore present in the open sea area and was abundant. The individuals caught ranged in length from 14 to 54 cm.

The plaice (*Pleuronectes platessa*) were caught in the deep-water zone in summer (22 individuals), while in autumn and spring they occurred in both the coastal (25 individuals and 19 individuals) and deep-water zones (6 individuals and 19 individuals), respectively. The occurrence of plaice in the survey catch along the entire length of the ECI corridor confirms the prevalence of this species in the southern Baltic Sea. The surveys therefore showed that the ECI (mainly the deep-water zone) is a permanent habitat for plaice with a diverse range of lengths and ages. However, in the autumn, the coastal zone is periodically inhabited mainly by juveniles. Stomach filling analysis of plaice showed that in summer, 85% of stomachs were empty, while in autumn most (more than 50%) were filled or partially filled. In spring, plaice foraging was more intensive in the shallow water zone, where

individuals with partially or completely filled stomachs predominated, while in the deep water zone, 64% of fish had slightly filled stomachs and the others were empty.

Plaice were also recorded in the inventory catches for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone and in ichthyoplankton), as well as for the ECI of FEW Baltic II (in the deep-water zone and in the coastal zone). The occurrence of plaice was therefore confirmed in the area of the planned Project in different locations, in the deep water and in the coastal zone.

In the PMŚ surveys, plaice were reported in the following locations:

- Open sea area - Ławica Słupska (2020) - 27 individuals of 5.757 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 2 individuals of 0.507 kg.

Thus, the species was present in two analysed locations in the vicinity of the planned Project, but was relatively rare. The specimens caught reached lengths of 20-32 cm.

The shorthorn sculpin (*Myoxocephalus scorpius*) was caught in small numbers both in summer (17 individuals - deep water zone) and autumn (7 individuals and 4 individuals - coastal and deep water zone, respectively). In summer and spring, the shorthorn sculpin did not occur in the coastal zone, which is related to the preference of this species for cooler waters. Thirteen of this species were caught in the deep-water zone in spring. The species was also recorded in the inventory catches for MFW Bałtyk II and MFW Bałtyk III (in the deep water zone and in ichthyoplankton) and for the ECI of FEW Baltic II (in the deep water and coastal zone and in ichthyoplankton). The occurrence of shorthorn sculpin is therefore confirmed in the area of the planned Project at different locations in the deep water zone and in the coastal zone.

In the PMŚ surveys, the shorthorn sculpin was recorded in the following locations:

- Open sea area - Ławica Słupska (2020) - 28 individuals of 2.657 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 2 individuals of 0.023 kg.

The species was therefore present in two analysed locations in the vicinity of the planned Project, but was relatively rare. The specimens caught reached lengths of 8-27 cm.

The armed bullhead (*Agonus cataphractus*) was caught only in spring, in the deep-water zone (1 individual - female at a spawning stage, stomach empty). The species was also recorded in the inventory catches for MFW Bałtyk II (in the deep-water zone) and for the ECI of FEW Baltic II (in the deep-water and coastal zones and in ichthyoplankton). The occurrence of the armed bullhead in the area of the planned Project is therefore sporadic.

The species was not recorded in the State Environmental Monitoring (PMŚ) surveys.

The turbot (*Scophthalmus maximus*) was caught in low numbers in all survey periods. In summer, 7 and 11 specimens were recorded in the coastal and deep-water zones, respectively, while in autumn 14 specimens were recorded in the coastal zone and two specimens were caught in the deep-water zone. In spring, 30 specimens were recorded in the coastal zone and 9 fish of this species were caught in the deep-water zone. In the ECI area, the species was caught mainly in its northern and southern parts.

The turbot was also recorded in the inventory catch for MFW Bałtyk II and MFW Bałtyk III (in the deep water zone), as well as for the ECI of FEW Baltic II (in the deep water and coastal zone). The occurrence of turbot was therefore confirmed in the area of the planned Project in different locations, in the deep-water zone and in the coastal zone.

In the PMS surveys, the turbot was reported from the following locations:

- Open sea area - Słupska Ławica (2020) - 9 individuals of 3.252 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 3 individuals of 0.237 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 8 individuals of 0.492 kg.

Thus, the species was present in all analysed locations in the vicinity of the planned Project, but was not abundant. The individuals caught ranged in length from 14 to 32 cm.

Taking into account literature data, the species is common, but not numerous in the southern Baltic Sea. The turbot is characterised by a strong attachment of individuals to the place of occurrence and breeding.

The flounder (*Platichthys flesus*) was most abundant in spring (1,334 individuals - deep-water zone) and summer (622 individuals - deep-water zone). It was also abundant in the coastal zone in autumn (474 individuals), and 27 individuals were caught in the coastal zone in summer. During the study period, the flounder was common in the area of the planned Project. In the deep-water zone, the flounder was the dominant species in terms of abundance along with cod. In the coastal zone, in autumn and spring, the flounder was also the dominant species in terms of abundance. The ECI therefore is a stable habitat for flounder with a diverse range of lengths and ages, occurring predominantly in the deep water zone in summer and in the coastal zone in autumn and spring. Analysis of the stomach filling of flounder showed that in summer they were mostly poorly filled, while in autumn and spring feeding was more intensive - more than half of the analysed individuals had stomachs filled with food.

Flounder were also recorded in inventory catches for MFW Bałtyk II (in the deep water zone and in ichthyoplankton) and for MFW Bałtyk III (in the deep water zone, where they co-dominated with cod and in ichthyoplankton), as well as for the ECI of FEW Baltic II (in the deep water and coastal zone and in ichthyoplankton). The occurrence of flounder is therefore confirmed in the area of the planned Project at different locations in the deep water and coastal zone.

In the PMŚ surveys, flounder were recorded in the following locations:

- Open sea area - Ławica Słupska (2020) - 857 individuals of 224,130 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 166 individuals of 35,733 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 354 individuals of 93,445 kg.

Thus, the species was present in all analysed locations in the vicinity of the planned Project, was abundant, and in 2 locations it dominated the catch. The individuals caught ranged in length from 6 to 39 cm. Larger individuals were caught in the open sea zone, while smaller fish were also found in the coastal zone.

The lumpfish (*Cyclopterus lumpus*) was caught only in spring in the deep-water zone (14 individuals, mostly females in the spawning stage or after spawning, stomachs empty). The species was also recorded in inventory catches for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone) as well as for the ECI of FEW Baltic II (in the deep-water zone). The occurrence of lumpfish was therefore confirmed in the area of the planned Project in different locations in the deep water zone.

The species was not recorded in the PMŚ surveys.

The tobias (*Ammodytes tobianus*) in the coastal zone was particularly abundant in summer (75723 individuals), and was also numerous in spring (6081 individuals). During these periods, the species dominated the catches in the coastal zone. In autumn, much lower numbers (146 individuals) were observed in the coastal zone. Tobias dominated both in terms of weight and number of fish caught in the coastal zone in bottom trawl and beach seine nets. Both in spring, summer and autumn, tobias were most abundant up to the 5 m isobath. In fisheries conducted below this depth, their abundance decreased rapidly. In the deep-water area, on the other hand, no tobias were caught. The results of exploratory fishing, against the background of available literature data, have demonstrated that the area of the planned Project is a favourable habitat for the tobias, and the values of fishing efficiency periodically significantly exceed those recorded so far in other areas of the Polish coast. Stomach filling analysis showed that in summer and autumn most of the stomachs were considerably full, whereas in spring feeding was less intensive - 65% of the analysed individuals had empty stomachs.

The tobias has also been recorded in inventory catches for MFW Bałtyk III (in the deep-water zone), as well as ECI for FEW Baltic II (in the coastal zone). The occurrence of tobias has therefore

been confirmed in the area of the planned Project in different locations in the coastal zone (numerous) and in the deep water zone (sporadic).

In the State Environmental Monitoring surveys the tobias was recorded at the following locations:

- Open sea area – Ławica Słupska (2020) - 65 individuals of 1.200 kg;
- the coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 29 individuals of 0.486 kg.

The species was therefore present in two analysed locations located in the vicinity of the planned Project, but was relatively few in number. The caught specimens reached the length within 10-24 cm.

The European eelpout (*Zoarces viviparus*) was caught in the summer and spring in the deep-water zone, 2 individuals and 11 individuals respectively. This species was also recorded in the inventory catches for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone), as well as for the ECI of FEW Baltic II (in the deep-water zone). The occurrence of European eelpout was therefore confirmed in the area of the planned Project at various locations in the deep water zone.

In the PMŚ surveys, the European eelpout was found in the following locations:

- Open sea area - Ławica Słupska (2020) - 25 individuals of 1.382 kg;
- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 8 individuals of 0.288 kg.

Thus, the species was present in two analysed locations located in the vicinity of the planned Project, but was relatively few in number. The specimens caught ranged in length from 15 to 34 cm.

The straightnose pipefish (*Nerophis ophidion*) occurred only in the coastal zone in autumn (1 individual). The species was also recorded in the inventory catch for the ECI of FEW Baltic II (in the coastal zone). The occurrence of the straightnose pipefish was therefore confirmed in the area of the planned Project at different locations in the coastal zone, but the species is rare. The straightnose pipefish is under partial protection (Journal of Laws 2016, item 2183).

The species was not reported in the PMŚ surveys.

The whiting *(Merlangius merlangus*) was only caught in the coastal zone in spring (1 individual). The species was also recorded in the inventory catch for the ECI of FEW Baltic II (deep water zone). The occurrence of whiting was therefore confirmed in the area of the planned Project at different locations in the coastal and deep water zones, but the species is rare.

In the PMŚ surveys, the whiting was reported in the following locations:

- Open sea area – Ławica Słupska (2020) - 1 individual of 0.186 kg.

The species was therefore extremely scarce. The specimen caught was 22 cm long.

The haddock *(Melanogrammus aeglefinus)* was not recorded in the Project inventory. However, this species was recorded in the inventory catch for the ECI of FEW Baltic II (deep water). Occurrence of haddock was therefore confirmed in the area of the planned Project in the deep-water zone.

The species was not recorded in the PMŚ survey.

The fourbeard rockling *(Enchelyopus cimbrius*) was not recorded in the inventory for this Project. However, this species was recorded in the inventories for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone in ichthyoplankton) and for the ECI of FEW Baltic II (in ichthyoplankton). The occurrence of fourbeard rockling was therefore confirmed in the area of the planned Project in the ichthyoplankton community.

The species was not recorded in the PMS survey.

The common seasnail *(Liparis liparis)* was not recorded in the inventory for this Project. However, this species was recorded in the inventory for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone in ichthyoplankton) and for the ECI of FEW Baltic II (in ichthyoplankton). The occurrence of the common seasnail is therefore confirmed in the area of the planned Project in the ichthyoplankton community. The common seasnail is under partial protection (Journal of Laws 2016, item 2183).

The species was not demonstrated in the PMŚ surveys.

The rock gunnel *(Pholis gunnellus)* was not recorded in the inventory for this Project. However, this species was recorded in the inventories for MFW Bałtyk II and MFW Bałtyk III (in the deep-water zone in ichthyoplankton) and for the ECI of FEW Baltic II (in small numbers, in ichthyoplankton). The occurrence of rock gunnel was therefore confirmed in the area of the planned Project in the ichthyoplankton community.

The species was not recorded in the State Environmental Monitoring surveys.

The dab *(Limanda limanda*) was not recorded in the inventory for this Project. However, the species was recorded in the inventory captures for the purposes of the MFW Bałtyk II (in the deep-water zone). The occurrence of dab was therefore confirmed in the area of the planned Project in the deep-water zone.

The species was not recorded in the PMŚ surveys.

The saithe *(Pollachius virens)* was not recorded in the inventory for the purposes of this Project. However, this species was recorded in the inventory catches for the MFW Bałtyk III (in the deep-water zone). The occurrence of saithe was therefore confirmed in the area of the planned Project in the deep-water zone.

The species was not indicated in the PMŚ surveys.

The sole (Solea solea) was not recorded in the inventory for this Project. However, the species was recorded in the inventory catches for the ECI of FEW Baltic II (in the coastal zone). The occurrence of sole was therefore confirmed in the area of the planned Project in the coastal zone.

The species was not recorded in the PMS survey.

The common goby *(Pomatoschistus microps*) was not recorded in the inventory for this Project. However, the species was recorded in the inventory catches for the ECI of FEW Baltic II (in the coastal zone). The occurrence of common goby was therefore confirmed in the area of the planned Project in the coastal zone. The common goby is under partial protection (Journal of Laws 2016, item 2183).

The species was not demonstrated in the PMŚ surveys.

Demersal species - bi-environmental species

The zerta *(Vimba vimba*) occurred only in the coastal zone during summer (1 individual). The species was also recorded in the inventory catches for the ECI of FEW Baltic II (in the coastal zone). The occurrence of zerta was therefore confirmed in the area of the planned Project at different locations in the coastal zone.

In the PMŚ surveys, the zerta was found at the following locations:

- the coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 1 individual of 0.362 kg;

The species was therefore extremely scarce, in the WB covering the estuary of the Słupia and Łupawa rivers, the caught individual was 36 cm long.

The eel *(Anguilla anguilla)* was not recorded in the inventory for the Project. However, this species was recorded in the inventory catch for the ECI of FEW Baltic II (one juvenile was caught in the coastal waters). The occurrence of eel is therefore confirmed in the area of the planned Project in coastal waters. The species is subject to planned restocking in rivers flowing into the Baltic Sea and in coastal lakes (including Gardno and Łebsko) and lagoons (Wiślany and Szczeciński lagoons).

The species was not recorded in the PMŚ surveys.

Demersal species - freshwater species

The white bream *(Blicca bjoerkna*) was recorded sporadically in the catch - in summer in the coastal zone (1 individual). The species was not recorded in the other inventory surveys in the Project area.

The species was not recorded in the PMŚ surveys.

The common bream *(Abramis brama)* was observed in small numbers only in the coastal zone. Five specimens were caught in summer and one in autumn and spring. No bream were found in the deep water zone. The species was also recorded in the inventory catches for the ECI of FEW Baltic II (in the coastal zone). The occurrence of bream has therefore been confirmed in the area of the planned Project at different locations in the coastal zone.

The common bream was found in the following locations during the PMŚ surveys:

- The coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 13 individuals of 2,291 kg weight.

Thus, the species occurred only in one location located in the coastal zone in the vicinity of the planned Project and was also relatively scarce. The specimens caught ranged in length from 18 to 36 cm.

The perch (*Perca fluviatilis*) was found in summer, autumn and spring in the coastal zone (111 individuals, 22 individuals and 11 individuals respectively) and one individual was also caught in autumn in the deep water zone. Therefore, the range of occurrence of perch in the sea is mainly in coastal waters and the occurrence of this species is periodic, which is related to its feeding migrations. Perch feed on both crustaceans and fish (including the sand goby). The results of the biological surveys indicated the occurrence of perch in the fishery with a diverse range of length and age, including both juveniles and adults. This means that marine coastal waters are periodically a convenient habitat for all age groups of this species. Stomach filling analysis of perch showed that in summer, 60% of the fish had partially filled stomachs, while in autumn, the stomachs were mostly empty. In spring, however, feeding was more intensive, with the majority of individuals having partially filled stomachs.

Perch were also recorded in the inventory catches for the ECI of FEW Baltic II (coastal and deep-water zone). The occurrence of perch has therefore been confirmed in the area of the planned Project at various locations, in the coastal zone and sporadically in the deep water zone.

In the PMS surveys, perch were reported in the following locations:

- the coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 449 individuals of 34.893 kg;
- the coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 183 individuals of 15.938 kg.

The species was therefore abundant in the two analysed locations in the coastal zone in the vicinity of the planned Project. The caught individuals reached lengths in the range of 8-35 cm.

The roach (*Rutilus rutilus*) was found in summer and autumn, but only in the coastal zone (19 and 2 individuals respectively). During summer, 85% of the fish examined had empty stomachs. The species was also recorded in the inventory catch for the ECI of FEW Baltic II (in the coastal zone). The occurrence of the roach was therefore confirmed in the area of the planned Project at different locations in the coastal zone.

The roach was found in the following locations during the PMŚ surveys:

- the coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 307 individuals of 52,535 kg weight;
- the coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 4 individuals of 1,015 kg.

Thus, the species occurred in two analysed locations in the coastal zone in the vicinity of the planned Project, with one of them being abundant. The specimens caught ranged in length from 16 to 32 cm.

The pike-perch *(Sander lucioperca*) occurred in the catch both in summer (19 individuals, stomachs partially filled) and in autumn (1 individual). In both survey periods, pike-perch were found only in the coastal zone. The species was not recorded in the other inventory surveys in the Project area.

In the State Environmental Monitoring surveys pike-perch were recorded at the following locations:

- the coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 4 specimens of 0.861 kg;

- the coastal WB Polskie wody przybrzeżne Basenu Bornholmskiego (2019) - 5 individuals of 1.011 kg.

Thus, the species occurred in two analysed locations in the coastal zone in the vicinity of the planned Project and was rare. The caught individuals reached lengths in the range of 26-32 cm.

The three-spined stickleback *(Gasterosteus aculeatus)* was not recorded in the inventory for this Project. However, this species was recorded in the inventory captures for the purposes of MFW Bałtyk II and Bałtyk III (in the deep-water zone). The occurrence of stickleback was therefore confirmed in the area of the planned Project in the deep-water zone.

In the State Environmental Monitoring surveys the species was not indicated.

The ninespine stickleback *(Pungitius pungitius)* was not recorded in the inventory for the purposes of this Project. However, this species was recorded in the inventory captures for the MFW Bałtyk II (in the deep-water zone). The occurrence of the ninespine stickleback was therefore confirmed in the area of the planned Project in the deep-water zone.

In the State Environmental Monitoring surveys the species was not indicated

The Eurasian ruffe *(Gymnocephalus cernuus)* was not recorded in the inventory for the Project. However, this species has been recorded in PMS surveys, where it was reported in the following locations:

- Coastal WB Polskie wody przybrzeżne Basenu Gotlandzkiego (2019) - 6 individuals of 0.055 kg mass.

The species was therefore extremely rare, the individuals caught were in the 8-10 cm length range.

Table 7.17.*List of species found in the 2013-2014 research catches, by zone and fishing season with the number of individuals*

Species (habitat)	Catching area								Total
	Coastal zone				Deep water zone				
	Summer	Autumn	Spring	Total	Summer	Autumn	Spring	Total	
Garfish (M)	30			**30**					**30**
Macrel (M)			1	**1**	1			**1**	**2**
Sprat (M)	3062	2	417	**3481**					**3481**
Herring (M)	21	181	143	**345**	9	2	40	**51**	**396**
European smelt (B)	214	13	17	**244**					**244**
Common whitefish (B)		3		**3**					**3**
Sea trout (B)	1*	15		**16**					**16**
Tobias (M)	75723	146	6081	**81950**					**81950**
Sand eel (M)	167	19	40	**226**	5		2	**7**	**233**
Straightnose pipefish (M)		1		**1**					
Round goby (M)	35	12	176	**223**	14	1	3	**18**	**241**
Sand goby (M)		3	1	**4**					**4**
European eelpout (M)					2		11	**13**	**13**
Shorthorn sculpin (M)		7		**7**	17	4	13	**34**	**41**
Armed bullhead (M)							1	**1**	
Lumpfish (M)							14	**14**	

Cod (M)		283	140	**423**	512	463	797	**1772**	**2195**
Whiting (M)			1	**1**					**1**
Flounder (M)	27	474	1334	**1835**	622	173	528	**1323**	**3158**
Plaice (M)		25	19	**44**	22	6	19	**47**	**91**
Turbot (M)	7	14	30	**51**	11	2	9	**22**	**73**
Perch (F)	111	22	11	**144**		1		**1**	**145**
Pike-perch (F)	19	1		**20**					**20**
Zerta (B)	1			**1**					**1**
Common bream (F)	5	1	1	**7**					**7**
Common roach (F)	19	2		**21**					**21**
White bream (F)	1			**1**					**1**
Total	79443	1224	8412	**89079**	1215	652	1437	**3304**	**92367**

pelagic species
demersal species
Habitat; M – Marine, B – Bi-environmental, F – Fresh water
** in addition, the results of fishing catches were analysed, in which 16 sea trout were caught during the summer period*

Source: In-house study based on the Ichthyofauna Inventory presented in Volume III of this Report in Attachment 1.6.

***Table 7.18.** List of species found in the PMŚ survey catches in the open sea area (Ławica Słupska) in 2020 and in the coastal water bodies Polskie wody przybrzeżne Basenu Gotlandzkiego and coastal water bodies Polskie wody przybrzeżne Basenu Bornholmskiego in 2019.*

Ławica Słupska (2020)			
Species	**Number of species - standard fishing time**	**Weight of species - standard fishing time [kg]**	**Length range [cm]**
Round goby	10	0.274	8-20
Sand eel	63	2.311	16-34
Cod	306	126.475	14-54
Plaice	27	5.757	20-30
Shorthorn sculpin	28	2.657	8-27
Mackarel	17	6.736	25-40
Turbot	9	3.252	20-32
Flounder	857	224.130	19-39
Sprat	3	0.040	11-13
Herring	198	13.854	13-27
Tobias	65	1.200	14-24
European eelpout	25	1.382	16-34
Whiting	1	0.186	22
In total 13 species	**1609**	**388.253**	
Coastal water bodies Polskie wody przybrzeżne Basenu Gotlandzkiego (2019)			
Round goby	51	1.991	7-22
Garfish	1	0.125	45
Zerta	1	0.362	36
Sand eel	17	0.574	20-52
Eurasian ruffe	6	0.055	8-10
Shorthorn sculpin	2	0.023	9

Ławica Słupska (2020)			
Species	**Number of species - standard fishing time**	**Weight of species - standard fishing time [kg]**	**Length range [cm]**
Common bream	13	2.291	18-36
Mackarel	10	2.281	25-39
Perch	449	34.893	9-35
Common roach	307	52.535	16-32
Pike-perch	4	0.861	27-32
Turbot	3	0.237	15-17
Flounder	166	35.733	10-35
European smelt	1	0.029	9
Herring	441	26.660	16-26
European eelpout	8	0.288	15-24
In total 16 species	**1480**	**158.938**	
Coastal water bodies Polskie wody przybrzeżne Basenu Bornholmskiego (2019)			
Round goby	5	0.420	13-22
Sand eel	13	0.418	17-28
Plaice	2	0.507	22-32
Mackarel	1	0.456	36
Perch	183	15.938	8-33
Common roach	4	1.015	22-30
Pike-perch	5	1.011	26-32
Turbot	8	0.492	14-16
Flounder	354	93.445	6-37
Sprat	37	0.301	9-13
Herring	31	1.789	16-23
Tobias	29	0.486	10-18
In total 12 species	**672**	**116.278**	

Source: In-house study based on the Ichthyofauna Inventory presented in Volume III of this Report in Attachment 1.6.

Spawning and breeding

The water area where the Project will be carried out is used by a number of fish species as feeding and breeding grounds. Analysis of data available on the HELCOM website indicates that habitat conditions (depth, salinity, oxygen conditions) corresponding to potential spawning grounds are present in the area. Data from HELCOM research surveys (Baltic International Trawl Survey - BITS) on abundance of selected fish species (cod, herring and sprat) were also analysed.

In the case of cod *Gadus morhua,* the planned Project is located outside the area of potential spawning grounds. The nearest area with a moderate probability of spawning is located more than 9 km north of the nearest ECI location within the MFW Bałtyk II. According to BITS data, the Project area is located in an area of high cod abundance covering the central part of the Baltic Sea. The ECI area around MFW Bałtyk II and Bałtyk III, due to the nature of the seabed and a favourable food base, is a habitat and feeding area for juvenile cod, however adults avoid the area during their spawning migration to the spawning grounds in the Bornholm Deep.

With regard to flounder *Platichthys flesus,* the planned Project is located outside the potential spawning area. The nearest area with a high probability of spawning is located more than 9 km north of the nearest ECI location within the MFW Bałtyk II. The area of MFW Bałtyk II and Bałtyk III, as well as the connecting ECI, is located on the route of winter migration of flounder from feeding grounds in

shallow coastal waters to spawning grounds in the Rynna Słupska. However, it is not the target spawning ground for the dominant deepwater flounder in this area, which is mainly due to insufficient salinity.

In the case of herring *Clupea harengus*, the water area in the vicinity of the planned Project includes areas with moderate probability of spawning. They are located in the north-western part of ECI (total length of about 10 km), include the southern part of ECI located within the MFW Bałtyk II and a small (about 3 km) section of ECI in the coastal zone:

- IP from the offshore wind farm MFW Bałtyk II - over a total length of approx. 10.5 km (km 0.0BII-7.5BII and in the coastal zone at km 32.0-35.0) and within the offshore wind farm MFW Bałtyk II in squares 20 and 21; total area of potential herring spawning ground within the project limits of the connection from MFW Bałtyk II is 13.61 km^2,
- IP from offshore wind farm Bałtyk III - no potential spawning grounds for herring in the area of Ławica Słupska; potential spawning grounds are located only in the coastal zone (km 32.0-35.0); total area of potential herring spawning ground within the boundaries of the project concerning the connection from MFW Bałtyk III is 2.86 km^2,
- connector - in the area of squares 37, 46, 47; the total area of the potential herring spawning ground within the corridor designated for the connector between MFW Bałtyk II and MFW Bałtyk III is 1.26 km^2.
- In total, the corridor designated for the construction of the ECI of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III together with the connector covers an area of 14.87 km2 of potential herring spawning grounds (moderate probability).

According to BITS data, the Project area is located in the zone of extremely low herring abundance. With regard to sprat *Sprattus sprattus*, the area with moderate probability of spawning includes only the northern ends of the ECI located within the limits of MFW Bałtyk II and Bałtyk III, while the whole remaining course of the ECI is outside the spawning area of this species. Analyses of ichthyoplankton in the area of MFW Bałtyk II and Bałtyk III showed that the most abundant components of ichthyoplankton were sprat eggs and larvae, which confirms quite intensive summer spawning of this species in this area. According to BITS catch data, the Project area is located in an area of low or extremely low abundance of sprat.

Summary

A total of 41 fish species were recorded in the inventories carried out on behalf of the Investor in 2012- 2013 and 2013-2014, as well as the inventory for the ECI of FEW Baltic II and the PMŚ surveys. Of the marine pelagic fish, 4 species were recorded, and 5 pelagic bi-environmental species reproducing in freshwater were also found. Demersal fish were represented by 22 marine species, 2 bi-environmental species and 8 freshwater species. The occurrence of 4 demersal fish species under partial protection in Poland (Journal of Laws 2016, item 2183) was recorded: the sand goby (*Pomatoschistus minutus*), the common goby (*Pomatoschistus microps*), the common seasnail *(Liparis liparis)* and the straightnose pipefish (*Nerophis ophidion).* Among alien species, the round goby and the rainbow trout were recorded.

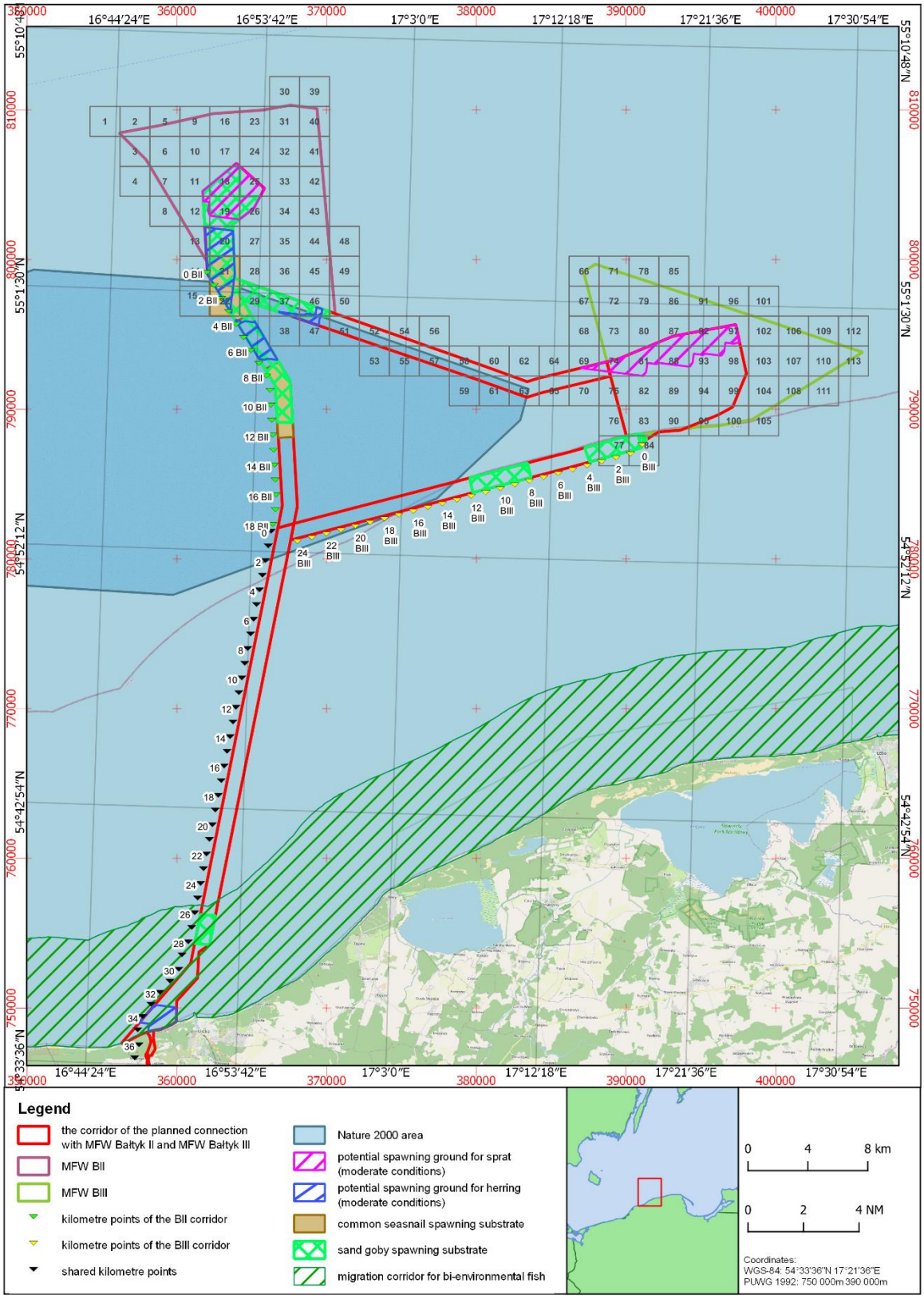


Figure 7.31. *Areas of highest natural value in the context of ichthyofauna*

Source: In-house study based on the Ichthyofauna Inventory presented in Volume III of this Report in Attachment 1.6.

It should be noted that the analysed ECI runs through the area of Słupsk Shoal, where there is an appropriate depth and proper substrate for spawning of the seabass (macroalgae) and the small goby (stones and empty shells of molluscs). A section of the connection from MFW Bałtyk II at km

0.68BII-18.5BII, the connection from MFW Bałtyk III at km 14BIII-24.9BIII and a short section of the common connection at km 0-1.5 run through the Ławica Słupska Natura 2000 area. In total, there is 19.4 km for the connection from MFW Bałtyk II and 12.4 km for the connection from MFW Bałtyk III. In addition, the considered connector between MFW Bałtyk II and MFW Bałtyk III interferes with the Slupsk Bank for a length of approximately 21.2 km. The total length of the ECI within the Słupsk Bank is therefore 51.5 km (figure 7.31). These are sections running through an area of high natural value, of greater importance for the listed protected species. In addition, within the area of the planned Project there are areas that are potential spawning grounds for herring and sprat (area of moderate probability of spawning) - figure 7.31, these areas should also be considered to be located in an area particularly sensitive to impacts.

The findings indicate that the ECI area is used as a migration corridor for ascending spawning (probably to the Slupia River) sea trout and salmon. Increased migration was observed in the autumn, despite the unfavourable pattern of wind directions and sea currents.

7.4.4. Marine mammals

The following marine mammal species may occur in the area of polish sea areas:

- grey seal,
- harbour seal,
- ringed seal,
- harbour porpoise.

All species of marine mammals occurring naturally in the Republic of Poland are covered by strict species protection under the Act of 16 April 2004 on Nature Conservation and the relevant Regulation of the Minister of Environment on the protection of animal species. They are also protected by international law.

Grey seals are the most common of the seals observed on the Polish coast (figure 7.32). Ringed and harbour seals have so far been recorded sporadically. Such data were obtained from WWF Poland and the Marine Station of the Prof. Krzysztof Skóra Institute of Oceanography at the University of Gdańsk in Hel, as a part of the projects 'Supporting the restitution and conservation of Baltic mammals in Poland', 'Protection of marine mammal and bird habitats' (2012-2015) and 'Protection of marine mammals and birds and their habitats' (2016-2020). Until 2019, several hundred records of live seals per year had been entered into the established database[106]. There is also a significant number of sightings of dead seals, mainly grey seals, stranded on the shore (annually from about 50 to about 230 individuals between 2010 and 2019)[107] .

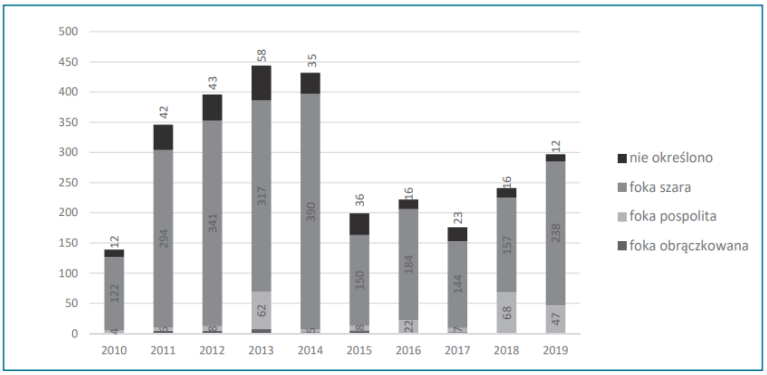


Figure 7.32. *Number of reports on sightings of live seals of different species off the Polish coast in 2010-2019*

Source: WWF 2020, Conservation of marine mammals and birds and their habitats project report 2016-2020

[106] *https://link.wwf.pl/baza_ssaki/public/*
[107] *WWF 2020, Conservation of marine mammals and birds and their habitats project report 2016-2020*

In the case of Baltic harbour porpoises, due to their considerable mobility, exclusively marine lifestyle, cryptic nature, secretive (and underwater) lifestyle, and relatively small population size within the Baltic, estimating abundance is particularly difficult[108] . The most extensive study of the abundance and density of Baltic harbour porpoises, including in Polish waters, has been carried out within the SAMBAH project using passive acoustic monitoring. The research, covering the Polish coastal zone, is currently underway at the Marine Station of the Institute of Oceanography at the University of Gdansk. Compared to other parts of the Baltic Sea, Polish waters have a low detection rate of harbour porpoises.

For the purpose of the planned Project, the Investor conducted research on the occurrence of marine mammals in the area of MFW Bałtyk II and MFW Bałtyk III. Description of the methodology of conducted observations is included in the Reports from aerial observations included in Attachment 1.7. in Volume III of this EIA Report. The research area included both the area designated for offshore wind farms and the area lying to the north and south of them (a sample transect of the aerial research is presented in figure 7.33.

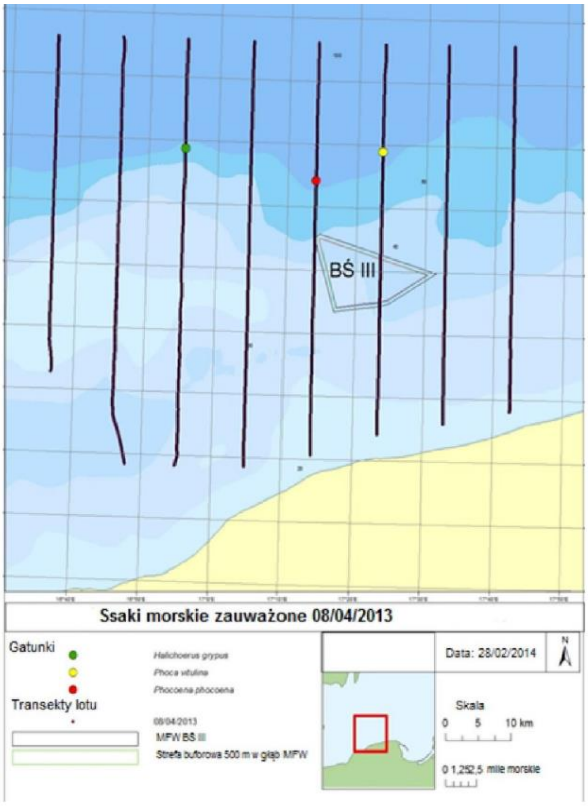


Figure 7.33. *Example of an aerial survey transect of marine mammals in the area of MFW Bałtyk III - flight of 8 April 2013*

Source: Marine Mammal Survey (Vol. III Attachment 1.7)

The acoustic and visual monitoring carried out at MFW Bałtyk III in 2012-2013 and MFW Bałtyk II in 2013-2014 indicated the presence of three marine mammal species in the area of the planned wind farms and adjacent waters: harbour porpoise, grey seal and harbour seal. The number of detections of all the above animal species was low (figure 7.34).

[108] *Amundin et al. 2022*

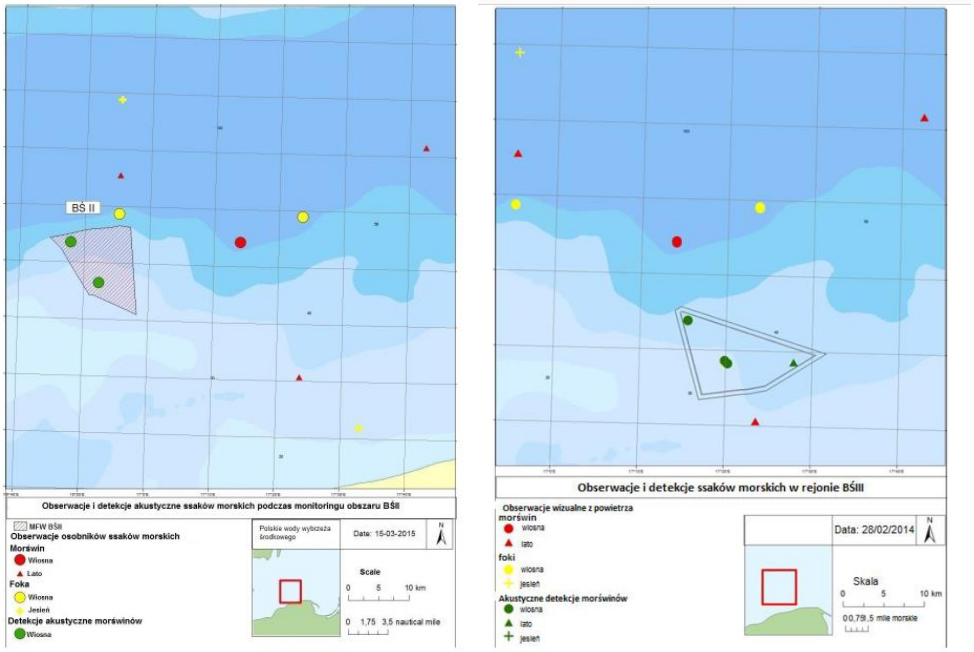


Figure 7.34. *Distribution of marine mammal sightings/detection (DPD) in the area of planned farm BII and BIII on a seasonal basis - acoustic and visual data*

Source: Marine Mammal Survey (Volume III. Attachment 1.7)

In 2012-2014, a total of nine adult marine mammal individuals were observed during aerial visual monitoring, in the areas of MFW BŚ II and MFW BŚ III, of which five were harbour porpoises and four were seals. One of the seals belonged to grey seals, two belonged to common seals and for one individual it was not possible to determine the species[109]. Passive acoustic monitoring showed five days of harbour porpoise presence per year. It was concluded that the MFW Bałtyk III area may be a food region for harbour porpoises and grey seals, as well as a part of their migration routes.

The presence of harbour porpoises in Polish Baltic waters was also recorded in subsequent years, between March 2016 and April 2017, in the area covering MFW Bałtyk, adjacent to the area of the planned MFW Bałtyk II from the east. Surveys using acoustic equipment, and with the help of aerial observations, provided data proof of relatively low porpoise activity. C-POD recorders were deployed within or in the immediate vicinity of the MFW Bałtyk area, while aerial observations (no harbour porpoises were observed) covered a larger body of water, including the MFW Bałtyk II area[110]. During the flights it was possible to observe closer unidentified seals: in May 2016 (1 individual), in June 2016 (2 individuals) and in April 2017 (1 individual).

Further marine mammal surveys were conducted in the area designated for the construction of FEW Baltic II, adjacent to the MFW Bałtyk II from the west. These provided similar results, i.e. low detection of marine mammals, including harbour porpoise and unidentified seals[111] . On the other hand, passive acoustic monitoring and observations along the shore were conducted in the area of the ECI of the MFW Bałtyk Power (the area to the east and south of MFW Bałtyk III) between April 2020 and March 2021. There were 8 days of positive detections of harbour porpoises and one observation of a harbour seal[112] .

In 2016-2018, surveys on the occurrence of harbour porpoises in Zatoka Pomorska and Ławica Stilo areas were carried out as a part of the project 'Pilot implementation of marine species and habitat

[109] *Kancelaria Radców Prawnych Otawski Dziura Jędrzejewski i Troszyński Sp.p. 2021.*

[110] *EIA Report Offshore Wind Farm Baltica, November 2017*

[111] *Environmental impact report for the FEW Baltic II offshore wind farm 2019*

[112] *Report on the environmental impact of the offshore connection infrastructure of the Baltic Power offshore wind farm 2021*

monitoring 2015-2018'. Analysis of the collected data showed significant differences in terms of harbour porpoise occurrence between these areas and showed ten times fewer days of positive detections for Ławica Stilo than for Zatoka Pomorska. From March 2016 to August 2017, between 3 and 5 days of positive detections of harbour porpoise occured at each of the five CPOD stations located on Ławica Stilo (CPOD06-CPOD10). The surveys showed the seasonal nature of the presence of harbour porpoises (in Zatoka Pomorska most detections were recorded during the summer months, in the Ławica Stilo area - during the spring)[113] .

In conclusion, the research on the presence of marine mammals in the area of MFW B II and MFW B III, as well as in the neighbouring areas of the MFW and the ECI, indicate low activity of animals in the area of the Project. Taking into account the above results (low number of observations, no indications of breeding in the area of the Project) and the lifestyle of the animals (food opportunism and related migrations; specific habitat preferences) it should be assumed that the area of the planned Project is not very important for Baltic marine mammals.

The following habitats can be considered, as most important for Baltic marine mammals:

- shallow coastal waters (seals, porpoises),
- sparsely used and poorly developed beaches; estuaries (estuaries), shoals, ice floes (seals), providing feeding, breeding, resting and moulting areas.

The following is a brief description of the species and available data on the occurrence of marine mammals at Polish coasts (observations) and in open waters (acoustic studies on harbour porpoises; data for the entire Baltic Sea). Due to the aquatic nature of the environment and the associated free movement of animals, as well as the need to treat (sub)populations as a whole, they may also provide a reference point for the specific location of the planned ECI.

Grey seal Halichoerus grypus

The grey seal is included in Annex II of the Habitats Directive and Annex II of the Bonn Convention. The species is also protected by the HELCOM Agreement under the Helsinki Convention; in the HELCOM Red List, the grey seal has LC status. The Polish population of grey seals is protected in the sites: PLH220032 Zatoka Pucka i Półwysep Helski, PLH220023 Ostoja Słowińska, PLH280007 Zalew Wiślany i Mierzeja Wiślana, PLH220072 Kaszubskie Klify and PLH320019 Wolin i Uznam. The closest site, at a distance of approx. 16 km to the east, is PLH220023 Ostoja Słowińska. The other Natura 2000 sites are located at a considerable distance from the planned project - respectively approx.: 80 km, 140 km, 100 km and 200 km.

On the coast in the area of the planned Project, grey seals occur sporadically. In the immediate vicinity of Ustka (in the area of the shore near the planned ECI and in Ustka), grey seals were observed 11 times in 2017-2019 - the highest number of observations took place at the mouth of the Słupia river (figure 7.35). In 2020-2022, 11 reports of grey seal sightings in the above-mentioned area were entered into the database of WWF and the Marine Station in Hel.

[113] *Malinga et al. 2019*

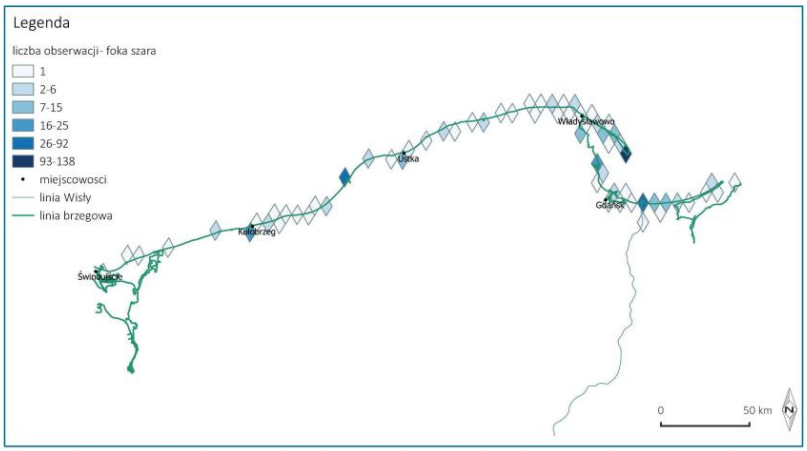


Figure 7.35. *Number of sightings of live grey seals on sections of the Polish coast in 2017-2019*

Source: WWF 2020

In spring, i.e. around March and most often in April, grey seal pups are observed in Poland (figure 7.36). The first months of juvenile independence are critical for their survival, as grey seals begin a period of independent exploration shortly after moulting.

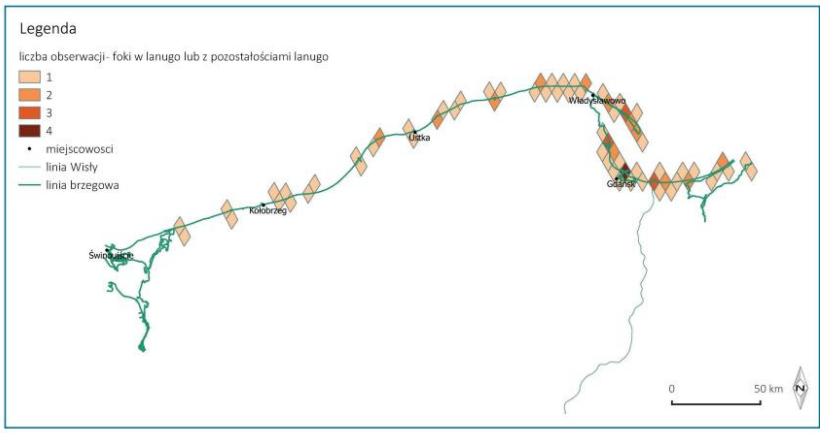


Figure 7.36. *Number of sightings of live grey seal pups on sections of the Polish coast in 2017-2019*

Source: WWF 2020

The area of the planned Project and its surroundings is, according to HELCOM, an area of regular grey seal occurrence with no regular breeding[114]. The grey seal feeds on a variety of fish species, depending on location, season and food availability[115] [116], being classed as a food opportunist.

After a long period of reduced population numbers, mainly due to intensive hunting, disease and the effects of pollution during the 20th century, the grey seal population is gradually recovering and has now reached over 30,000 individuals[117]. However, in the southern Baltic, the grey seal abundance is approximately 7% of this number. This indicator is calculated on the basis of data from several sites in the southern Baltic Sea used as haul-outs, including only one located in Poland (the Wisła river estuary area). Temporary grouping into colonies occurs at such sites, characteristic of the species (figure 7.37).

[114] *HELCOM 2018*
[115] *Lundström et al. 2007*
[116] *Scharff-Olsen et al. 2018*
[117] *HELCOM 2018*

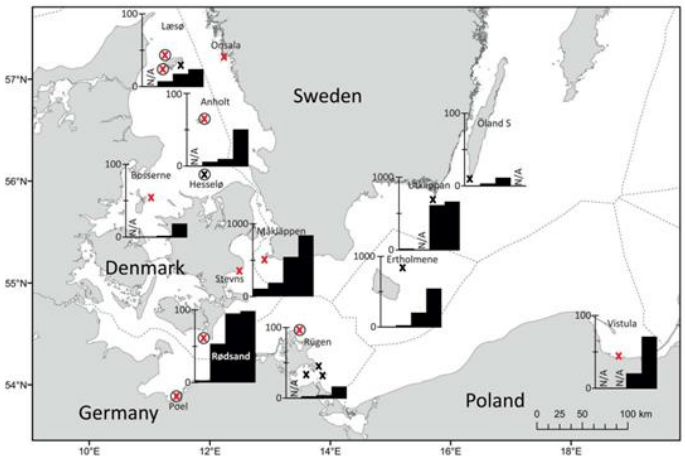


Figure 7.37. *Locations used by Baltic grey seals as haul-out zones - south-western Baltic Sea*
The graphs show seal abundance at sites where more than 10 individuals were recorded; the first column indicates average abundance from 2001-2005, the second column from 2006-2010, the third column from 2011-2015 and the fourth column from 2016-2019. 'N/A' indicates no data from the period in question. Red crosses indicate haul-out *zones with breeding activity after 1990, crosses in circles indicate breeding recorded at an earlier time.*
Source: Galatius et al. 2020

The only permanent site of grey seals in Poland is in the area of the mouth of the Wisła river, covered by reserve protection (Mewia Łacha reserve). Seals have been regularly observed in the reserve for years and it is now assumed that the first Polish grey seal colony in many years is located there. In recent years, the number of seals observed in the area has been increasing and has reached several hundred[118]. Since 2007, it has also been a colony frequently selected by individuals released within the framework of the project for the restitution and conservation of grey seals in Poland carried out by the Marine Station of the IO UG in Hel, and later within the framework of projects carried out jointly by WWF Polska and the Marine Station in Hel[119]. On the western parts of the coast, the presence of grey seals does not show similar regularity as in the Wisła river estuary, but the animals are encountered practically throughout the year; they are easier to observe, for example, at river mouths, in harbours (feeding grounds) and on quiet beaches.

Telemetry data collected through transmitters placed on the backs of pups released into the Baltic Sea by the Marine Station of the Institute of Oceanography at the University of Gdansk showed that these seals move throughout the Polish part of the Baltic Sea (figure 7.38)[120] .

[118] *HELCOM 2018, Thematic assessment of biodiversity 2011-2016*
[119] *WWF 2020*
[120] *WWF 2013*

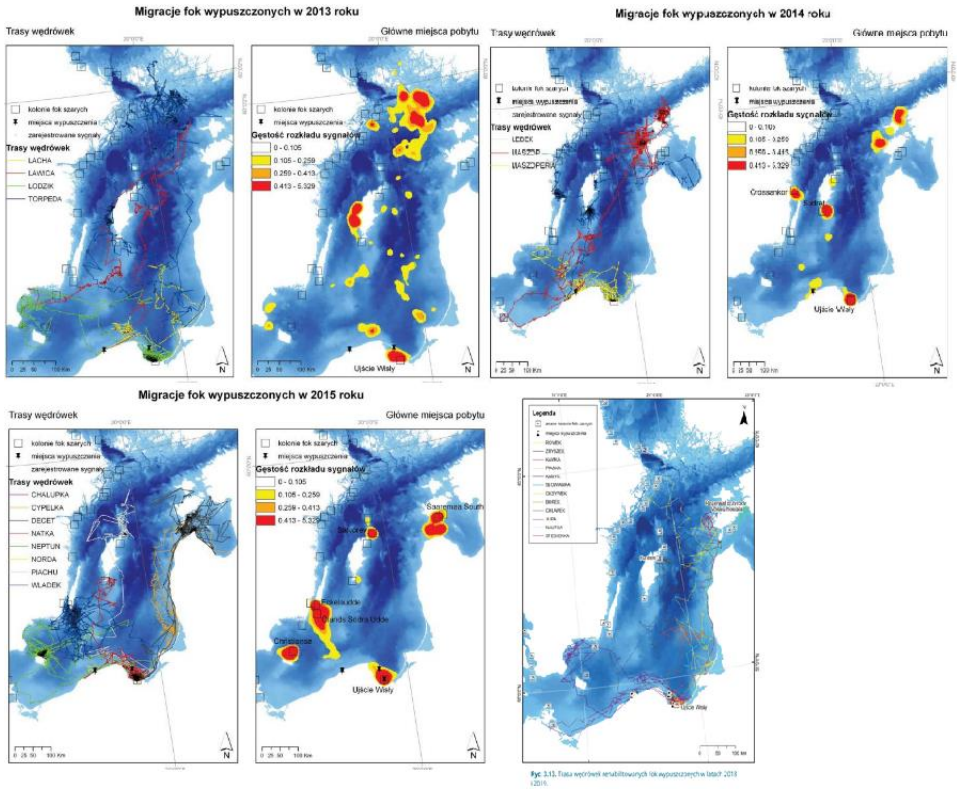


Figure 7.38. *Migrations of juvenile seals released within the grey seal restitution and conservation project in Poland carried out by the Marine Station in Hel and WWF Polska*

Source : WWF 2015, WWF 2020

Harbour seal Phoca vitulina [vitulina]

The harbour seal is listed in Annexes II and IV of the Habitats Directive, Appendix III of the Bern Convention and Appendix II of the Bonn Convention. The Polish Natura 2000 sites where the common seal is protected are Ostoja w ujściu Wisły (PLH220044), Zalew Wiślany i Mierzeja Wiślana (PLH280007), Kaszubskie klify (PLH220072), Zatoka Pucka i Półwysep Helski (PLH220032) and Ostoja Słowińska (PLH2200023).

While harbour seals are relatively common in the area of the Danish Straits, the species occurs sporadically in the southern and eastern Baltic waters, including Poland (the easternmost breeding colony is considered to be the one in the Kalmar Strait[121]).

Harbour seals feed on a wide range of fish species, feeding at relatively shallow depths, in coastal waters, but individuals are seen even over 100 km offshore, and the generalist and opportunistic nature of their diet does not preclude them from feeding on relatively deep-dwelling fish such as the Atlantic wolffish in some regions of the Baltic Sea[122] .

During 2017-2019[123], the area of the planned Project was the site of sporadic sightings of harbour seals (figure 7.39). In the immediate vicinity of Ustka and on the shore in the area of the planned ECI, harbour seals were observed twice in 2017-2019[124]. No reports of harbour seal sightings in the aforementioned area were entered into the WWF database and the Prof. K. Skóra UG Marine Station in Hel in the years 2020-2022 . [125]

[121] *This population is genetically distinct from the South Baltic population and those in the Skagerrak and Kattegat (HELCOM 2013. Species information sheet - harbour seal. HELCOM Red List Marine Mammal Expert Group 2013 www.helcom.fi > Baltic Sea trends > Biodiversity > Red List of species [accessed 10 May 2022])*
[122] *Scharff-Olsen et al. 2018*
[123] *WWF 2020*
[124] *WWF and SMIOUG data, available at baza@wwf.home.pl.*
[125] *WWF and SMIOUG data as at 6 May 2022 available at baza@wwf.home.pl*

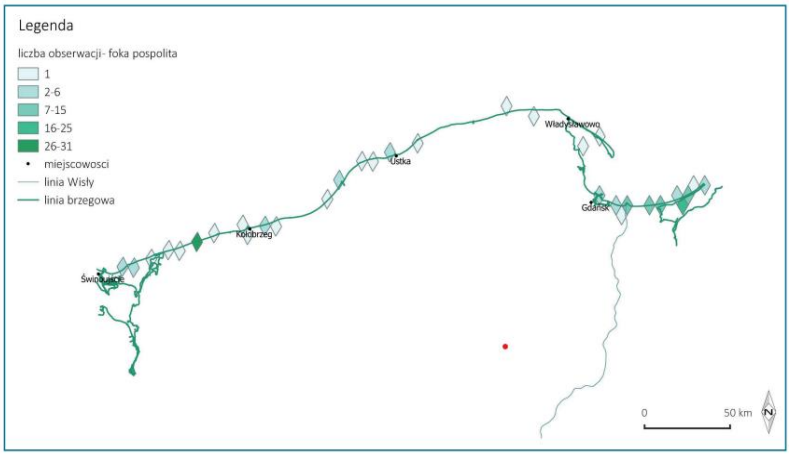


Figure 7.39. *Number of sightings of live harbour seals on sections of the Polish coast - 2017 - 2019*
Source: WWF 2020

According to HELCOM[126], the area around the Project is an area of rare occurrence of the harbour seal, with a lack of regular breeding.

Ringed seal - Phoca hispida [botnica].

The ringed seal is listed in Annex II and V of the Habitats Directive and Appendix III of the Bern Convention. The status of the species (HELCOM) in the Baltic is described as Vulnerable (VU) and the population status as unsatisfactory.

The population in the Baltic Sea is estimated at about 10,000 individuals, but the vast majority of the animals are found in the northern bays (mainly the Bothnian Bay, where the decimated population is slowly and gradually recovering[127], Finnish and Riga Bays - where no recovery is recorded[128]). On the southern Baltic coast, ringed seals are rarely recorded.

Like grey and harbour seals, ringed seals are predators that feed on the most available fish species. They are also similarly capable of longer migrations.

The Baltic subpopulations of ringed seals are geographically isolated; subspecies occur, in addition to the Baltic, in the Ladoga and Saimaa lakes.

A single sighting of a ringed seal in Zatoka Gdańska (the Gulf of Gdansk) was reported to the WWF and Marine Station database in 2017-2019. GIOŚ monitoring from 2016 - 2018 did not result in a single sighting of the ringed seal, hence the species assessment was then set as XX (status unknown)[129] .

No ringed seals were observed in the immediate vicinity of Ustka (and at the land-sea area around the planned ECI) in 2017-2019[130]. Also in the years 2020-2022[131] no reports of sightings of ringed seals in the aforementioned area were entered into the database[132] .

According to HELCOM[133], ringed seals occur very rarely or not at all in the area of the planned Project.

Harbour porpoise Phocoena phocoena

The harbour porpoise is listed in Annexes II and IV of the Habitats Directive. The species is also protected by the HELCOM Agreement under the Helsinki Convention. According to the HELCOM Red List, the Baltic Sea population is considered critically endangered (CR) and the Belts Sea

[126] *HELCOM 2018*
[127] *HELCOM 2013*
[128] *ibidem*
[129] *Barańska et al. 2018*
[130] *WWF 2020*
[131] *WWF and SMIOUG data, as at 6 May 2022, available at baza@wwf.home.pl*
[132] *WWF and SMIOUG data as at 6 May 2022 available at baza@wwf.home.pl*
[133] *HELCOM 2018*

population is considered vulnerable (VU). The harbour porpoise is also protected under the Agreement on the Conservation of Small Cetaceans of the Baltic and North Sea (ASCOBANS), under the auspices of the Bonn Convention, and is listed in Appendix II of the Washington Convention (CITES). It is also protected in four Polish Natura 2000 sites (PLH 220032 Zatoka Pucka i Półwysep Helski, PLH220023 Ostoja Słowińska, PLH 990002 Ostoja na Zatoce Pomorskiej, PLH 320019 Wolin i Uznam). Based on the Regulation of the Minister of the Environment of 16 December 2016 on the protection of animal species (Journal of Laws 2016, 2183), the harbour porpoise, like other Baltic mammals, is under strict legal protection.

The harbour porpoise is an animal that is extremely rarely observed in the proper Baltic Sea, with a subpopulation that is distinct from the population of the Danish Straits. Both are also genetically distinct from the North Sea populations[134]. Although it is likely that the populations of the Belts Sea and the Baltic Proper 'mix' during the winter season, it is presumed that there is a geographical separation between them during the breeding season[135]. In the past (until the mid-twentieth century), porpoise abundance in the southern Baltic was much higher; today, by-catch and pollution are considered to be the main reasons for its drastic decline, whereas previously, purposeful hunting, among other things, was considered[136] .

Porpoises, like seals, tend to be found in coastal waters, and although they can dive above 200 m, they generally remain at shallower depths[137] . They feed on a variety of fish species, depending on their area of distribution and season. The main components of their diet may include pelagic species (herring, sprats), but also cod, demersal species[138] .

Porpoises use the ability of echolocation for navigation, searching for food, communication between individuals and barrier detection. Signals (clicks) are high-frequency (about 130 kHz on average) and are sent as a series in a narrow beam. The frequency of the signals is lower in open water (50 clicks or less per second). When the animal encounters prey, the frequency increases to above 500/s, increasingly directing the hearing and making it more precise towards the object. Porpoises can hear sounds with frequencies between 16 kHz and 140 kHz[139] , and the greatest sensitivity of their hearing apparatus is between 100 kHz and 140 kHz[140] .

As a result of the SAMBAH (Static Acoustic Monitoring of the Baltic Sea Harbour Porpoise) project, based on data from 2011-2013, the population of harbour porpoises from the proper Baltic Sea was estimated to be only about 500 individuals (with a 95% confidence interval - from 80 to 1,090)[141] . The Belts Sea population is estimated at around 21,000 individuals (with a 95% confidence interval - 12,350 to 38,849). Between May and August, i.e. during the breeding season, there is a spatial separation of the two subpopulations of the species: the proper Baltic Sea subpopulation is concentrated south-east of Öland (Central Bank area) at this time, while the Western Baltic subpopulation remains concentrated in areas west of Bornholm. Taking into account the results obtained from the SAMBAH project during the breeding season, a notional boundary between two zones with an increased probability of harbour porpoise detection was drawn. Special attention within conservation and spatial planning in the proper Baltic should be paid to these zones[142]. Based on the results of the project, the largest Natura 2000 site in the Baltic Sea (over 1 million ha) in Sweden, dedicated to the conservation of harbour porpoises, was designated in 2016[143] .

In 2013-2014 and 2017-2018, Poland undertook acoustic monitoring of harbour porpoises in the southern Zatoka Gdańska (Gulf of Gdańsk) (2013-2014) and at 25 stations in Zatoka Pucka (the

[134] *Wiemann, et al. 2010*
[135] *Carlén et al. 2018*
[136] *GDOŚ 2015*
[137] *Bjørge and Tolley 2009*
[138] *Andreasen et al. 2017*
[139] *Marine mammals can generally hear sounds in the range 10 - 200 kHz (Taormina et al. 2018)*
[140] *Górski et al. 2019*
[141] *Data for the period May-October, when the 'separation' of the two populations occurred. A 95% confidence interval of 70-1,105 appears in some citations.*
[142] *Carlén et al. 2018*
[143] *Owen et al. 2021*

Bay of Puck) (2017-2018). The surveys showed (mainly in the Bay of Puck) a slightly higher detection rate of harbour porpoises during the winter season (November-April) (figure 7.40).

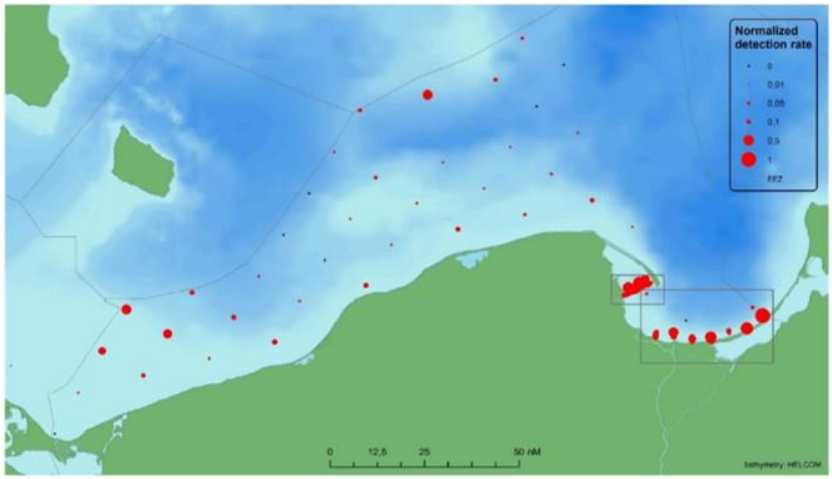


Figure 7.40. *Results of acoustic monitoring of the harbour porpoise in the Polish part of the Baltic Sea in 2017-2018.*

Source: Evans and Similä 2018

During the period 2017-2019, 38 porpoise records were collected in the WWF-SMIOUG database (2017 - 10, 2018 - 15, 2019 - 13)[144] . All reports concerned dead individuals (*strandings*) in various stages of decomposition, found in different locations on the coast.

According to the results of the SAMBAH project, the Project area is an area with a low probability of harbour porpoise detection; this probability is slightly higher in the period from November to April (figure 7.41). The extrapolated probability of detection of individuals in the area of the planned Project is up to approximately 0.03 in May-October and up to approximately 0.11 in November-April.[145]

HELCOM[146] for harbour porpoise describes the location of the planned Project and its surroundings as an area of rare occurrence and no breeding/random occurrence, no regular breeding.

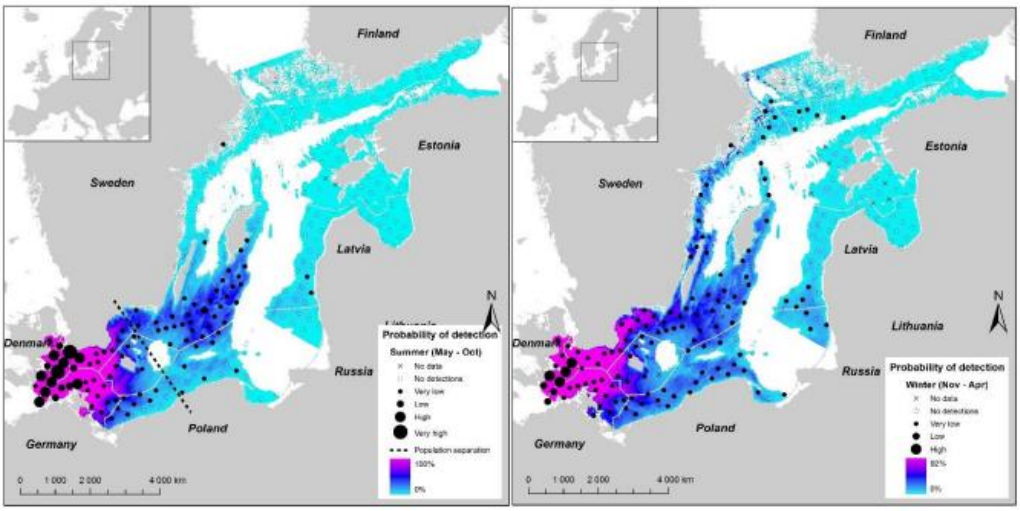


Figure 7.41.*Probability of harbour porpoise detection in the surveyed areas of the Baltic Sea (SAMBAH project results)*

Source: SAMBAH 2016

[144] *WWF 2020*
[145] *HELCOM Map And Data Service https://maps.helcom.fi/website/mapservice/index.html; layers dot SAMBAH*
[146] *HELCOM 2018*

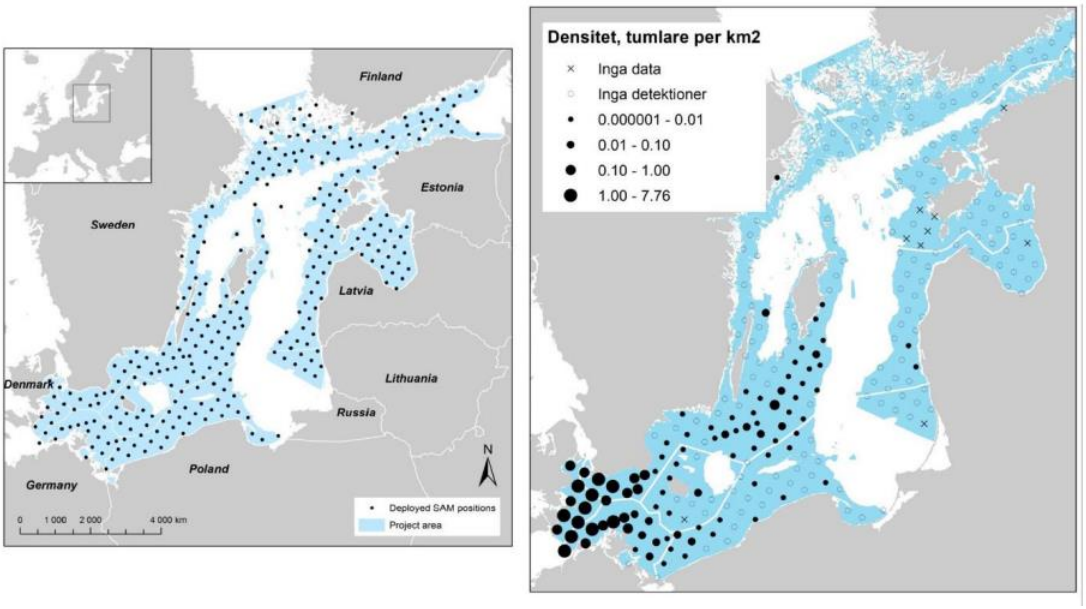


Figure 7.42. *Locations of C-POD detectors in the SAMBAH project (2011-2013) and resulting estimated porpoise density per km² (right). Crosses indicate missing data, circles - no detections*

Source: SAMBAH 2016

In summary, studies conducted as a part of monitoring activities and for offshore wind projects indicate that detection/observation of marine mammals in the area of the planned Project and adjacent waters is rare. The quoted data confirms the sporadic presence of harbour porpoises in the Polish Baltic Sea; results from the SAMBAH project support the data of low abundance/detection of porpoises in the Polish part of our sea. The marine mammals probably use the area of the planned Project and adjacent waters, covered by monitoring studies, incidental as an area of migration in order to seek food (following fish species as a food base). The sea shore is used very occasionally by Baltic seals as a resting place. However, the number of observations collected is so small that no clear trends in animal behaviour or seasonality can be identified. There are currently no regular areas of moulting, resting, feeding or breeding of marine mammals in the area of the planned Project.

7.4.5. Sea birds

The Baltic Sea is used by seabirds as a wintering area or as a stopover site during migration. Most of the birds reach their highest numbers in the open sea, more than 1 km from the shore. The exceptions are gulls, which accompany fishing boats on fishing grounds, and their occurrence on the open sea is strongly influenced by human activity.

The planned Project is partly located within areas considered valuable for birds, i.e. Natura 2000 sites in which seabirds are the subjects of protection (figure 7.43). These areas are:

- PLC90001 Ławica Słupska
- PLB990002 Przybrzeżne Wody Bałtyckie

A section of the connection from MFW BII at km 0.6BII - 18.5BII, the connection from MFW BIII - at km 14BIII - 24.9 BIII and a short section of the common corridor in which sections of both connections will be located at km 0.0-1.5, run through the Ławica Słupska Natura 2000 area. In total, there is **19.4 km** for the connection from MFW Bałtyk II and **12.4 km** for the connection from MFW Bałtyk III. In addition, the considered connector between MFW Bałtyk II and MFW Bałtyk III interferes with the Ławica Słupska for a length of approximately **21.2 km**.

The PLB990002 Przybrzeżne Wody Bałtyku area is crossed by the planned Project at a length of approximately **19.7 km** (both connections).

In order to determine the species composition, abundance and distribution of birds associated with the area of the planned Project, data obtained by the Investor and data collected within the

framework of the PMŚ and the draft plan of protection of the PLC900001 Ławica Słupska site were used.

The data collected was used to determine the value of the water body in the area of the planned Project for birds by modelling the density of selected seabird species within the boundaries of the planned Project. For this purpose, results from the following were used:

- pre-investment monitoring conducted in the area of the planned offshore wind farms MFW Bałtyk II and MFW Bałtyk III and in the buffer zone of 2 nautical miles from their borders, as well as from the reference area, which is the nearest significant concentration of seabirds - Natura 2000 site PLC990001 *Wawica Słupska* (research results are presented in Volume III of this EIA Report in Attachment 1.8);
- Monitoring of Wintering Seabirds (MZPM), carried out within the framework of the PMŚ in the Natura 2000 site PLB990002 *Przybrzeżne Wody Bałtyku*.

Surveys conducted by the Investor for the purpose of pre-investment monitoring were carried out in the period from the beginning of June 2012 to the end of June 2013, and additionally from November 2013 to February 2014. The period covered by the surveys was divided into 4 seasons covering consecutive annual periods of seabird life: summer, autumn migration, wintering and spring migration. Birds were counted from vessels during cruises, in accordance with the current methodology of the Monitoring of Wintering Seabirds (Meissner 2011). The cruise route ran along (table 7.19 and figure 7.43):

- 4 transects with a total length of approximately 65 km in the MFW BII ,
- 4 transects with a total length of approximately 89 km in the area of MFW BIII ,
- 8 transects with a total length of approximately 84 km in the reference area.

The transects were set out in such a way that the results obtained were representative for changing conditions due to changes in depth. Each time, the counting of birds along all transects lasted about 4-5 hours and was carried out in a 600 m wide strip. In total, 31 research transects were carried out in the MFW BII, 24 transects - in the MFW BIII and 18 in the reference area - i.e. Wawica Słupska. A detailed description of the methodology and obtained research results is described in Volume III in Attachment 1.8. 3 transects described in the table below and shown in figure 7.43 were used for the modelling of bird density in the area of the planned Project.

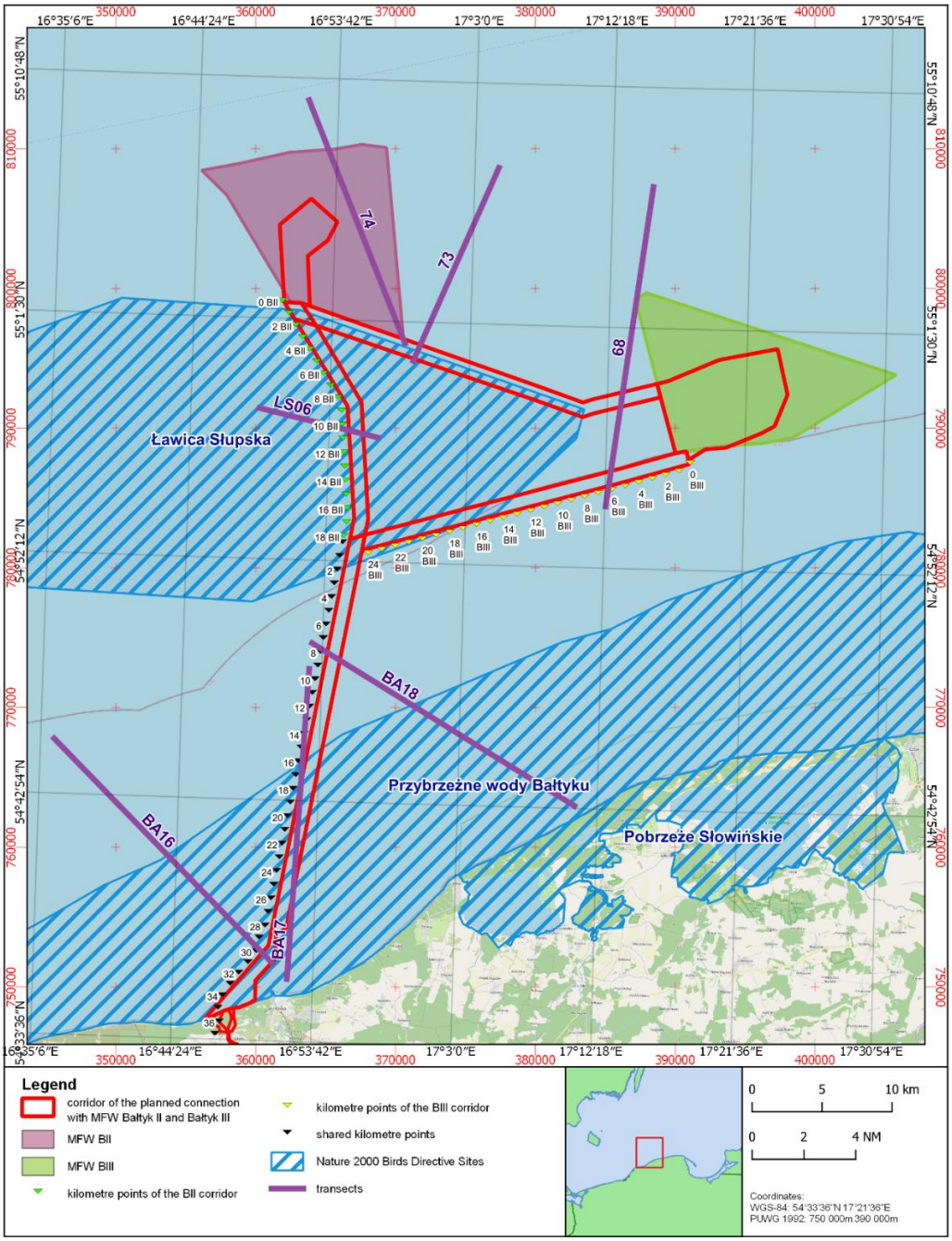


Figure 7.43. *The planned Project against the background of areas where seabirds are the subject of protection and location of survey transects used to analyse the area's value for marine ornithofauna*

Source: In-house study based on surveys carried out in the area of MFW BII and MFW BIII (Volume III, Attachment 1.8.) and results of the MZPM.

Monitoring of Wintering Seabirds (MZPM) is conducted as a part of the State Environmental Monitoring on 56 transects and covers a 12-mile strip of territorial waters and two areas located in the exclusive economic zone, i.e. Wawica Słupska and Zatoka Pomorska. Birds in the above-mentioned areas are counted from vessels during cruises, according to the methodology described in a methodological manual published by the General Directorate for Environmental Protection (Meissner 2011). Of the 56 transects of the MZPM, data from 3 transects within the *Przybrzeżne Wody Bałtyckie* Natura 2000 site and one from Ławica Słupska were used for modelling; data from counts in January and February 2013 and 2014 were used because only for this period data is available for the entire corridor of the planned Project.

Table 7.19. *Location of seabird research transects in the area of the External Connection Infrastructure of the MFW BII and MFW BIII*

Transect	Area	Beginning		End of		Length [km]
		Longitude [WGS 84].	Latitude [WGS 84].	Longitude [WGS 84].	Latitude [WGS 84].	
68	IMF BIII [2Mm].	55.116000	17.250600	54.909700	17.206100	17.15
73	IMF BII [2Mm].	55.125700	17.076700	55.000000	16.986900	15.09
74	IMF BII [2Mm].	55.011100	16.977000	55.165700	16.861600	18.68
LS06	Wawica Słupska	54.966700	16.816700	54.950000	16.950000	9.72
BA16	Przybrzeżne wody Bałtyku	54.610000	16.849999	54.750000	16.599999	22.43
BA17	Przybrzeżne wody Bałtyku	54.600000	16.866600	54.800000	16.880999	22.28
BA18	Przybrzeżne wody Bałtyku	54.716600	17.180000	54.816600	16.883299	22.11

source: In-house study

In the area of the planned Project (in 2013-2014) 1,169 birds were found sitting on the water during their most abundant period in the Baltic Sea. The winter period was considered representative because long-distance movements of birds in winter are much less likely than in other phenological periods, and bird counts are highest. During the aforementioned period, the seabird assemblage in the study area was dominated by the long-tailed duck *Clangula hyemalis*, with a proportion as high as 98.9%. The remaining species were extremely sparse (maximum 6 individuals). These included: the velvet scoter *Melanitta fusca*, the black-throated loon *Gavia arctica*, the razorbill *Alca torda,* the black guillemot *Cepphus grylle* and gulls: the European herring gull *Larus argentatus* and the little gull *Hydrocoloeus minutus*. During the surveys in the area in question, no species from the group of 'waterbirds rarely seen at sea away from the coast' were found. A summary of the survey results is presented in the table below.

Table 7.20. *Numbers and percentages in the grouping of individual bird species sitting on the water found in the area of the ECI of the MFW BII and MFW BIII along the survey transects during the winter of 2013- 2014***.**

Species	Numbers	Participation in the grouping
the long-tailed duck *Clangula hyemalis*	1,156	98,9%
the velvet scoter *Melanitta fusca*	6	0,5%
the black-throated loon *Gavia arctica*	2	0,2%
the little gull *Hydrocoloeus minutus*	2	0,2%
the razorbill *Alca torda*	1	< 0,1%
the black guillemot *Cepphus gryll*er	1	< 0,1%
the European herring gull *Larus argentatus*	1	< 0,1%
Total	**1,169**	**100%**

Source: In-house study based on surveys carried out in the area of MFW BII and MFW BIII (Volume III, Attachment 1.8.) and results of the MZPM.

Of the species found, 6 are under strict species protection in Poland and one is under partial protection (the European herring gull), 2 species are listed on Appendix I of the Birds Directive, i.e. black-throated loon and little gull. 4 species are on the Baltic Sea Red List (HELCOM 2013): the long-tailed duck, the velvet scoter (EN Category), the black-throated loon (CR) and the black guillemot (VU). The first two of the mentioned species also have an increased risk category according to IUCN Global list.

A list of species found within MFW BII and MFW BIII as well as all species that were noticed in the nearby area, along with conservation status and threat category, is provided in the table below.

Table 7.21.*List of seabird species that can potentially use study area with their conservation status and threat category. The species found (observed) in a representative period are distinguished (gray colour of row)*

No	Species	Presence in the phenological period[1]	Protection status		Threat category [4]		
			Species protection in Poland[2]	Annex I of the Birds Directive[3]	CLPP	Helcom	IUCN
Sea birds							
1	The razorbill* *Alca torda*	W, L, J, Z	SP	NO	-	-	LC
2	edredon *Somateria molisima*	W, J, Z	SP	NO	NA	EN	NT
3	the long-tailed duck *Clangula hyemalis*	W, J, Z	SP	NO	-	EN	VU
4	markaczka *Melanitta nigra*	W, L, J, Z	SP	NO	-	EN	LC
5	Little gull* *Hydrocoloeus minutus*	W, L, J, Z	SP	YES	RE	-	LC
6	mewa siodłata *Larus marinus*	W, L, J, Z	SP	NO	-	-	LC
7	the European herring gull * *Larus argentatus*	W, L, J, Z	PP	NO	LC	-	LC
8	mewa trójpalczasta *Rissa tridactyla*	J, Z	SP	NO	-	-	VU
9	mewa żółtonoga *Larus fuscus*	W, L, J	SP	NO	NA	VU	LC
10	the black-throated loon * *Gavia arctica*	W, J, Z	SP	YES	RE	CR	LC
11	nur lodowiec *Gavia immer*	Z	SP	YES	-	-	LC
12	nur rdzawoszyi *Gavia stellata*	W, J, Z	SP	YES	-	CR	LC
13	the black guillemot* *Cepphus grylle*	W, J, Z	SP	NO	-	VU	LC
14	nurzyk *Uria aalge*	W, L, J, Z	SP	NO	-	-	LC
15	perkoz rogaty *Podiceps auritus*	Z	SP	YES	NA	VU	VU
16	the velvet scoter* *Melanitta fusca*	W, J, Z	SP	NO	-	EN	VU
17	wydrzyk ostrosterny *Stercorarius parasiticus*	W, L, J	SP	NO	-	-	LC
18	wydrzyk tęposterny *Stercorarius pomarinus*	W	SP	NO	-	-	LC
Water-marsh birds rarely found far from the shore							
19	bernikla kanadyjska *Branta canadensis*	Z	SP	NO	NA	-	LC
20	cyraneczka *Anas crecca*	W, L, J	W	NO	DD	-	LC
21	czernica *Aythia fuligula*	W	W	NO	NT	-	LC

No	Species	Presence in the phenological period[1]	Protection status		Threat category [4]		
			Species protection in Poland[2]	Annex I of the Birds Directive[3]	CLPP	Helcom	IUCN
22	gęgawa *Anser anser*	W, Z	W	NO	LC	-	LC
23	gęś białoczelna *Anser albifrons*	J	W	NO	-	-	LC
24	gęś zbożowa *Anser fabalis*	W, J	W	NO	-	EN	LC
25	głowienka *Aythia ferina*	W	W	NO	VU	-	VU
26	kormoran *Phalacrocorax carbo*	W, L, J, Z	PP	NO	LC	-	LC
27	krzyżówka *Anas platyrhynchos*	W, L, J, Z	W	NO	LC	-	LC
28	łabędź krzykliwy *Cygnus cygnus*	W, J	SP	YES	NT	-	LC
29	łabędź mały *Cygnus bewickii*	J	SP	YES	-	-	LC
30	łabędź niemy *Cygnus olor*	W, L, J, Z	SP	NO	LC	-	LC
31	mewa siwa *Larus canus*	W, L, J, Z	SP	NO	VU	-	LC
32	nurogęś *Mergus merganser*	J, Z	SP	NO	LC	-	LC
33	ogorzałka *Aythia marila*	W, J	SP	NO	NA	VU	LC
34	płaskonos *Spatula clypeata*	J	SP	NO	VU	-	LC
35	rożeniec *Anas acuta*	W, J	SP	NO	CR	-	LC
36	rybitwa czarna *Chlidonias niger*	W, L	SP	YES	VU	-	LC
37	rybitwa czubata *Sterna sandvicensis*	L	SP	YES	CR	-	LC
38	rybitwa rzeczna *Sterna hirundo*	W, L	SP	YES	LC	-	LC
39	szlachar *Mergus serrator*	W, J, Z	SP	NO	RE	VU	LC
40	śmieszka *Chroicocephalus ridibundus*	W, L, J, Z	SP	NO	LC	-	LC
41	świstun *Mareca penelope*	W, J	SP	NO	CR	-	LC

Source: In-house study
Explanations:
** Speceise found in the study area extremely rare.*
[1] Presence in the phenological period in the area of research (actual) or in nearby reservoirs (potential): W - during the spring migration period; L - in summer (field dispersion); J - during the autumn migration period; Z - during the wintering of wintering
[2] According to the Regulation of the Minister of the Environment of 16 December 2016 on the protection of animal species (Journal of Laws 2016, item 2183): Species protection in Poland: SP - strict protection, PP - partial protection, W -warrantable
[3] Presence in Annex I of Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (OJ EU L 20/7 of 26.1.2010): YES - species listed; NO - species not listed.
[4] IUCN threat categories - International Union for Conservation of Nature classification, also used in the Red List of Birds of Poland - CLPP (Wilk et al. 2020) and Baltic Sea Red List (Helcom 2013)): LC - species of least concern, NT – close to extinct, VU - vulnerable (species at risk of extinction in the near future, although not as strongly as endangered species), CR – critically threat RE - regionally extinct, NA – not classified in the region, DD – not recognised properly.

The results of modelling of the density of birds (i.e. ducks, which constituted approx. 99% of recorded birds) are presented in figure 7.44. The presented results indicate that the highest densities in the entire analysed water area designated for the location of the planned Project occur in the northern part of the planned connections, i.e. at the section length of 8 km of the BII connection (from km 0 to 4 and in km 8-12) and they exceed 250 individuals/km^2. This is the section of the area protected as the PLC90001 *Wawica Słupska* site. In the rest of this Natura 2000 site, densities of long-tailed ducks are lower, i.e. from 0-50 individuals/km^2 in km 13-18 and in 50-250 individuals/km^2 in km 3-12. Lower densities of long-tailed ducks of 0-50 individuals/km^2 were recorded along the BIII connection in km 0-24 and along the connection between the Natura 2000 sites PLB990002 *Przybrzeżne Wody Bałtyku* and PLC990001 *Wawica Słupska* in km 0-14. In contrast, the lowest densities of long-tailed ducks were recorded within PLB990002 Przybrzeżne Wody Bałtyku, i.e. 0-10 individuals/km^2 in km 14-34.

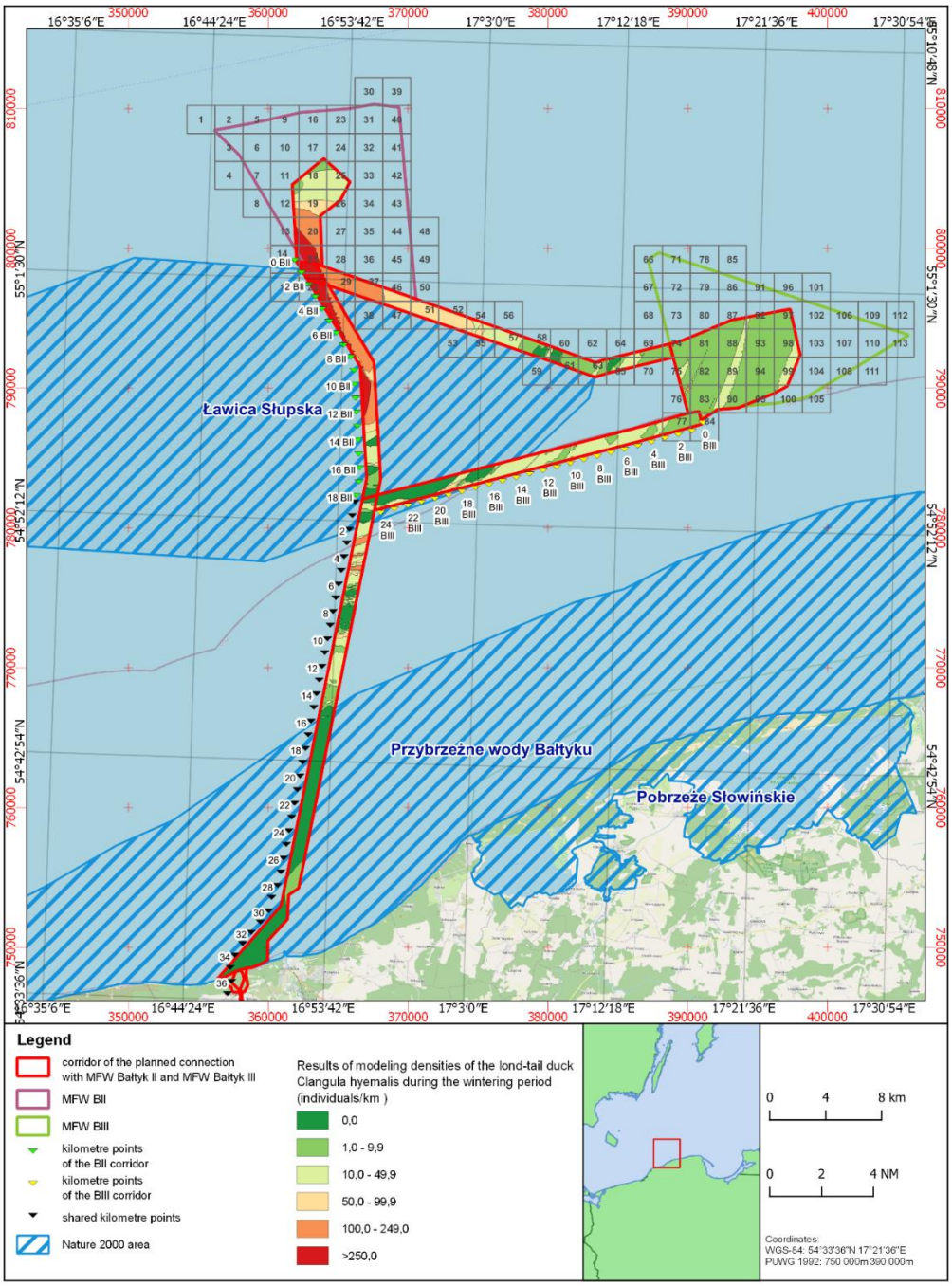


Figure 7.44. *Results of modelling of the long-tailed duck densities during the winter of 2013-2014 against intersected Natura 2000 sites*

Source: In-house study

Summary

In the entire analysed water area intended for the location of the planned Project, the highest density of the dominant species – the long-tailed duck - occurs in the northern part of the planned connections, i.e. in the section of 8 km of connection BII (from km 0 to 4 and in km 8-12), and exceeds 250 individuals/km^2. This is the section of the water body protected as the PLC90001 *Ławica Słupska* site.

Figure 7.45. *Areas of highest natural value in the context of seabirds*

Source: In house study

High densities (above 100 individuals/km^2) were also found at:

- ECI from MFW Bałtyk II:

  - corridor section from km 4BII do 8BII,
  - section of the corridor in the part common to both connections from km 2 to 4,
  - the southern part of the Baltic II offshore wind farm development area - squares 19-21;
- ECI from MFW Bałtyk III:
  - section of the corridor in the part common to both connections from km 2 to 4,
- connector between MFW Bałtyk II and Bałtyk III:
  - north-western fragment, running along the northern border of Ławica Słupska - squares 29 and 37.

The most valuable areas for marine ornithofauna were considered to be the sites of very high and high densities of icefish (figure 7.45 below).

Far fewer long-tailed ducks were found along the BIII connection, outside Natura 2000 sites, and almost none were found at the PLB990002 *Przybrzeżne Wody Bałtyku* intersection. The long-tailed duck is a widely distributed species in the Baltic, concentrating mainly in areas of moderate depth (up to 20-30 m) rich in zoobenthos, which is its main food base.

7.4.6. Sand hopper

The sandhopper *Talitrus saltator* inhabits the sandy beaches of the Polish Baltic zone.[147] Individuals of this species can be found near the shoreline from May to October. During the day, sandhoppers hide in the sand, mainly under plant debris, and feed at night. In autumn, they move further from the shoreline, burrow deeper into the sand and enter a state of dormancy that lasts until spring.

Sandhoppers play an important role in the marine ecosystem by participating in the processing of material on the beach, including animal and plant remains.[148] Sandhoppers are food for beach-feeding birds. Threats to *T. saltator* include tourism, shoreline conversion associated with e.g. coastal protection, and beach works such as mechanical beach cleaning. [149][150]

The characterisation of the sandhopper was based on surveys carried out in August 2015. Details of the survey methodology and a discussion of the results are provided in Volume III Attachment 1.9.

Detailed surveys carried out in August 2015 on the sandy beach to be crossed by the corridor of the planned ECI of the Bałtyk II and Bałtyk III offshore wind farms revealed that it is inhabited by the sandhopper *T. saltator* (Volume III, Appendix 1.9). Its occurrence was recorded over almost the entire study area, most abundantly on the stretch of beach up to 6 m from the waterline. Clustering of occurrence was observed and maximum densities (up to 90 individuals-m^{-2}) were recorded close to the shoreline on the section of beach between km 237.12 and km 237.09 according to the Marine Office.

In surveys conducted on Polish beaches in earlier years, *T. saltator* was often recorded in numbers exceeding 250 individuals-m^{-2}.[151][152] In surveys conducted in 2017, such abundance was recorded in several locations including the beach of the Słowiński National Park and the sandy beaches of the Gulf of Gdańsk.[153]

The sandhopper *T. saltator* is under partial protection in accordance with the Regulation of the Minister of the Environment of 16 December 2016 on the protection of animal species (Journal of Laws 2016 item 2183 of 16 December 2016). It is also listed on the Red List of Threatened Species in the Baltic Sea as a data-deficient but also suspected endangered species (Data Deficient (DD) category).[154] The sandhopper is a food source for bird species (among others of the Plovers group) under species protection (Journal of Laws 2016 item 2183 of 16 December 2016) and listed in Annex I of the Birds

[147] *Tykarska et al. 2019*
[148] *Jedrzejczak 2002*
[149] *Węsławski et al. 2000*
[150] *Żmudziński 2003*
[151] *Drzycimski and Nawodzińska 1965*
[152] *Węsławski et al. 2020*
[153] *Tykarska et al. 2019*
[154] *HELCOM 2013*

Directive (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds). The destruction of habitats or sanctuaries that are their breeding, rearing, resting, migration or feeding areas is prohibited for protected species, both the sandhopper and birds (Journal of Laws of 6 October 2014, item 1348). The section of the seashore inhabited by *T. saltator is* adjacent to the Special Protection Site for Birds *Przybrzeżne wody Bałtyku* (PLB990002) within the NATURA 2000 network.

The abundant occurrence of the sandhopper *T. saltator* is an indicator of the high value of the surveyed section of the shore. It is one of the few sections of natural beach on the Polish coast where this legally protected species occurs.

7.4.7. Environmental assessment of the basin

Biodiversity refers to the diversity of all living organisms found on Earth in terrestrial, marine and freshwater ecosystems and ecological communities. This includes diversity within species, between species and ecosystems.[155] The most common criterion for biodiversity is the number of species and habitats found during an inventory focused on protected species and habitats.

The presence of protected areas (Natura 2000 sites PLC990001 Słupska Ławica and PLB990002 Przybrzeżne wody Bałtyku) within the planned Project and in its vicinity indirectly indicates the conservation value of the analysed basin and the higher biodiversity in this area against the background of the biodiversity of the Southern Baltic.

Despite crossing protected areas, the corridor designated for the planned Project passes through areas of moderate value, and only in some places high (figure 7.46), avoiding the most valuable parts of the seabed - according to the biological assessment of the seabed conducted in 2009.[156]

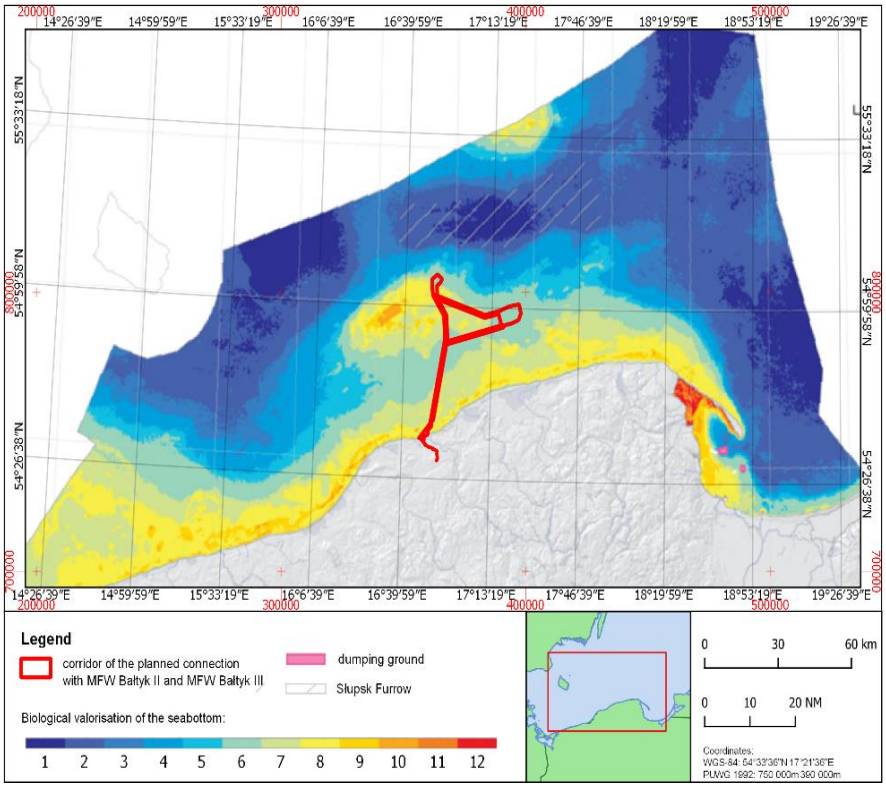


Figure 7.46. *The planned project against the background of the biological valuation of the seabed in the Polish maritime areas*

Source: Atlas siedlisk dna polskich obszarów morskich, 2009[157] - modified

[155] *Convention on Biological Diversity, drawn up in Rio de Janeiro on 5 June 1992 OJ. 2002 No. 184 item 1532*
[156] *Gic-Grusza et al. 2009*
[157] *http://www.iopan.gda.pl/hm/atlas/*

The marine environment research conducted by the Investor in the area of the planned Project revealed the occurrence of species and habitats typical for the South Baltic, with spatial variation in the valuation of species and habitats within the corridor of ECI for the offshore wind farms MFW Bałtyk II and MFW Bałtyk III.

To identify the most valuable sections of the ECI corridor, the results of the surveys of phytobenthos, macrozoobenthos, ichthyofauna, marine mammals and seabirds were summarised and superimposed on the resulting map, thus obtaining a spatial variation of natural valuation within the boundaries of the application for an environmental decision.

Phytobenthos

Based on the investigations conducted by the Investor, it can be concluded that the most valuable areas - because of the presence of rare and protected plants and a high degree of macroalgae seabed cover - are located only pointwise in the section from km 8BII to 13BII and in the rocky area from km 4BII to the shallowest part of the buffer zone of the MFW Bałtyk II area (squares 21 and 22) (figure 7.20 in Subchapter 7.4.2) within the ECI corridor from the offshore wind farm MFW Bałtyk II.

Within the corridor connecting the MFW Bałtyk III with the land, no valuable sites of phytobenthos were found.

In the ECI corridor from the offshore wind farm MFW Bałtyk II along with the buffer zone, two species of red algae under strict species protection in Poland were recorded: *Furcellaria lumbricalis* and *Ceramium diaphanum,* as well as two other species rare in Polish maritime areas: *Coccotylus truncatus* and *Rhodomela confervoides.*[158] Both strictly protected species and *Coccotylus truncatus are* also found in the Puck Bay and in the area of Głazowiska Rowy (boulder site).[159] Optimal living conditions for red algae are found in the rocky areas of the shallows of the central coast.[160]

The inventoried macrophytes within the corridor designated for cable laying from the MFW Bałtyk II offshore wind farm cover less than 1% of the seabed. These areas may provide refuge, breeding and/or feeding grounds for invertebrates and fish (table 7.13). It is noteworthy that the presence of engineered species, i.e. macrophytes such as *Furcellaria lumbricalis,* as well as the mussel *Mytilus trossulus,* has a positive effect on biodiversity, contributing, among other things, to an increase in zoobenthic species diversity.

Macrozoobenthos

Surveys conducted by the Investor in the analysed basin covered by the application for the environmental decision indicate the occurrence of a total of 34 macrozoobenthos taxa (28 were designated to species) - table 7.14. Between 3 and 18 taxa were recorded on soft bottom at individual stations. These values are typical for the southern part of the Baltic Sea. From 9 to 11 macrozoobenthos taxa were recorded in individual samples from the rocky bottom in the area of MFW Bałtyk II. A higher number of taxa (18) was found on the sandy-stone bottom of Ławica Słupska[161], and 28 macrozoobenthos taxa on a large area of the Ławica Słupska boulder seabed.[162] The taxonomic composition, abundance and biomass of macrozoobenthos in the area of the planned Project are typical for the shallow and medium deep seabed zone of the open part of the southern Baltic.

Particularly noteworthy are areas of high zoobenthic biomass as potential sites for intensive biogeochemical transformations taking place in the sediment and overlying water, and as feeding grounds for fish and/or benthic-feeding birds such as the long-tailed duck and the scoter. The main food of these birds is bivalves. The bivalves that played the most significant role in the biomass structure included four species: three sediment burrowing species: *Mya arenaria, Macoma balthica, Cerastoderma glaucum,* and the hard bottom mussel *Mytilus trossulus.*

[158] *Kraśniewski et al. 2018*

[159] *Zalewska and Kraśniewski (ed.) 2021*

[160] *Gic-Grusza et al. 2009*

[161] *Warzocha 1995*

[162] *Andrulewicz et al. 2004*

Based on the macrozoobenthos surveys conducted by the Investor, it can be indicated that the most valuable fragments of the analysed corridor for connections from offshore wind farms MFW Bałtyk II and MFW Bałtyk III are:

- due to the highest macrozoobenthos biomass on the soft bottom:
  ECI from the offshore wind farm MFW Bałtyk II:
  - the section of the ECI corridor from km 15 BII to km 1 common section ,
  - the section of the ECI corridor from km 28 to 32.5,

  ECI from the offshore wind farm MFW Bałtyk III:
  - quadrants 92 and 93 within MFW Bałtyk III field,
  - the section of the corridor from km 28 to 32.5,

  Connector:
  - none,
- due to the the presence of clusters of the mussel *Mytilus trossulus:*
  ECI from the offshore wind farm MFW Bałtyk II:
  - the section of the corridor from km 26 to 28,
  - the section of the corridor from km 11 BII to the end of the connection within the MFW Bałtyk II field,

  ECI from the offshore wind farm Bałtyk III:
  - the section of the corridor from km 26 to 28,
  - the section of the corridor from km 0 BIII to 4 BIII and 8 BIII to 12 BIII,
  - quadrant 89 within the section passing through the field of MFW Bałtyk III,

  Connector:
  - quadrants 21, 28, 29, 37 and 46

The above-mentioned most valuable areas in terms of macrozoobenthos are presented in the map in Subchapter 7.4.2 (figure 7.25).

No protected species were found in the macrozoobenthos in the study area.

Ichthyofauna

A total of 41 fish species were recorded in the inventories conducted on behalf of the Investor in 2012-2013 and 2013-2014, in the inventory for the ECI of FEW Baltic II and in the PMŚ surveys. According to the data contained in the Update of the Preliminary Assessment of the Environmental Status of Marine Waters (GIOŚ, 2018), more than 60 fish species and 2 lamprey species are consistently found in the POM. In addition, around 20 species occur sporadically. This means that the biodiversity of the ichthyofauna in the study area is relatively high. Marine pelagic species (4 species) and freshwater demersal pelagic species (5 species) were found. Demersal fish were represented by 22 marine species, 2 bi-environmental species and 8 freshwater species. The inventory showed the presence of 4 demersal fish species under partial species protection in Poland (Journal of Laws 2016, item 2183): the sand goby (*Pomatoschistus minutus)*, the common goby (*Pomatoschistus microps*), the seasnail (*Liparis liparis*) and the straightnose pipefish (*Nerophis ophidion)*. The round goby and the rainbow trout of the non-native species were recorded.

It should be emphasised that the analysed ECI runs through the area of Ławica Słupska, where more diversified habitat conditions occur, thus increasing the biodiversity of ichthyofauna. The area has adequate depth and suitable substrate for bottomfish spawning (macroalgae) and for the sand goby spawning (stones and empty mollusc shells). The area is also a potential spawning ground for the herring. A section of the BII connection at km approx. 0.6BII - 18.5BII, the BIII connection at km approx. 14BIII - 24.9BIII and a short section of the common connection at km 0-1.5 cross the Natura 2000 site. In addition, a section of the planned connection between MFW Bałtyk II and MFW Bałtyk III with a length of approx. 21.2 km crosses the border of the Natura 2000 site. Therefore, the total length of the ECI corridor within Ławica Słupska is 51.5 km. These sections run through an area of high conservation value and are more important for the listed protected species (figure 7.31 in Subchapter 7.4.*3 Ichthyofauna*).

In addition, Ławica Słupska is a potential spawning grounds for the herring. Within the borders of the planned Project there are areas with moderate probability of spawning of this species (figure 7.31 in Subchapter 7.4.*3 Ichthyofauna*).

- ECI from the offshore wind farm MFW Bałtyk II - over a total length of approx. 10.5 km (km 0.0BII-7.5BII and in the coastal zone at km 32.0-35.0) and within the offshore wind farm MFW Bałtyk II in quadrants 20 and 21; total area of potential herring spawning ground within the Project's boundaries of the connection from MFW Bałtyk II is 13.61 km^2,
- ECI from offshore wind farm MFW Bałtyk III - no potential spawning grounds for herring in Ławica Słupska; potential spawning grounds are located only in the coastal zone (km 32.0-35.0); total area of potential herring spawning grounds within the boundaries of the Project concerning the connection from MFW Bałtyk III is 2.86 km^2,
- Connector - in quadrants 37, 46, 47; the total area of potential herring spawning grounds within the corridor designated for the connector between MFW Bałtyk II and MFW Bałtyk III is 1.26 km^2 .

In total, the corridor designated for the construction of the ECI of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III together with the connector covers an area of 14.87 km^2 of potential herring spawning grounds (of a moderate probability).

Another valuable area for ichthyofauna are the spawning grounds of the sprat of a moderate probability of spawning for this species. These are located (figure 7.31 in Subchapter 7.4.*3 Ichthyofauna*):

- ECI from offshore wind farm MFW Bałtyk II - within MFW Bałtyk II mainly quadrants: 18, 19, 25 and 26; the total area of potential sprat spawning grounds within the boundaries of the Project for the connection from MFW Bałtyk II is approximately 9.68 km^2,
- ECI from offshore wind farm Bałtyk III - within MFW Bałtyk III mainly parts of quadrants: 74, 81, 87, 88, 92, 93 and 97; the total area of potential sprat spawning grounds within the boundaries of the Project for the connection from MFW Bałtyk III is approximately 13.78 km^2 ;
- Connector - no potential sprat spawning grounds.

In total, the corridor designated for the construction of the ECI of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III together with the connector covers an area of approx. 23.46 km^2 of potential sprat spawning grounds (of a moderate probability).

It is worth emphasizing that the study of ichthyofauna, including ichthyoplankton, carried out in the period from autumn 2017 to summer 2018, in close proximity for another connection (at FEW Baltica II, located about a few hundred meters east of the ECI with MFW Bałtyk II), indicates that: "Considering the abundance of ichthyoplankton caught and the species found, it can be concluded with certainty that the area of the planned Project is not a significant area for fish reproduction or feeding of their larval forms."[163]

In the coastal zone (at a distance of up to 4 Mm) there is a migration corridor of anadromous fish, i.e., sea trout and salmon, which probably ascend to the Slupia River, where salmon are the subject of protection of the Natura 2000 PLH220052 Dolina Słupi area.

Marine mammals

Visual (seals and porpoises) and acoustic (harbour porpoise) surveys conducted in the study area between 2012-2017, 2020-2021, aimed at determining the presence of marine mammals in the area of the planned offshore wind farms, revealed the incidental presence of grey seals, harbour seals and harbour porpoises. This presence was probably related to migration and/or local foraging. None of these species dominated the low number of sightings obtained. No reproduction of any species or occurrence of juveniles was observed. There was also no evidence of seasonal aggregation of individuals in the mentioned areas (taking into account data from the SAMBAH project reporting a slightly higher probability of acoustic detection of harbour porpoises in the area during the winter season compared to May-October).

[163] *EIA Report FEW Baltic II Connection Infrastructure, August 2022 (Volume II Attachment 5)*

Considering the high mobility and biology of marine mammals (including predation; food opportunism), their habitat needs (in the case of seals, in terms of access to terrestrial habitats) and the indistinguishable nature of the potential food base compared to other parts of the basin, the entire Project area can be characterised as not very important for marine mammals. There are also no habitats found that would play an important role in the Project area for the existence and development of species. The Project area, as well as the entire South Baltic waters, is of medium value for marine mammals. However, the high importance of marine mammals (especially the critically endangered harbour porpoise) in the context of conservation efforts in the Baltic Sea dictates that the entire Project area should be assessed as moderate.

In case of seals, the coastal area may be of potential importance in the valuation of the area of the planned Project, as a place of short-term rest (the shore/beach is a place of occasional observations of grey and harbour seals in the area) and the immediate area of the estuary of the Słupia River, during spawning runs - as potentially richer in salmonids, which are a component of the food base.

In summary, both the ECI area and the MFW Bałtyk II and MFW Bałtyk III fields represent an area explored by marine mammals that is probably no more important to them than other parts of the southern Baltic.

Seabirds

During the Investor's surveys, conducted during all phenological periods in 2012 - 2014, a total of 41 bird species were found within the MFW BII and MFW BIII development and reference areas. Of these, 18 species were seabirds regularly found in the POM and 23 were waterbirds rarely found far from shore. The highest species richness was found in these areas during spring and autumn migration (32 and 31 taxa respectively). A slightly lower number of species (24) was present in the area, during winter, and the lowest in summer with 17 species, which is typical for the POM.

In the area of the planned Project, 7 species were found sitting on the water along transects during the wintering period, when birds in the Baltic are most abundant. The long-tailed duck accounted for the highest proportion (98.9%) of the grouping, with only 1.1% of the other species. Due to the super-dominance of the long-tailed duck in the grouping of wintering birds, it can be assumed that the species diversity in the area of the connection infrastructure of MFW BII and BIII during the aforementioned period is low.

Due to the low species richness in winter, the valuation was based on the density data of long-tailed ducks. The results of the density modelling (Subchapter *7.4.5. Seabirds*), indicate that the greatest number of long-tailed ducks were present in the northern part of the planned connection infrastructure. The highest densities of the dominant species, exceeding 250 individuals/km^2, were found in the eight-kilometre section of the connection with the MFW Bałtyk II (km 0BII-4BII and from 8BII-12BII), crossing the Natura 2000 site PLC990001 Ławica Słupska.

High densities (above 100 individuals/km^2) were also found at:

- ECI from the offshore wind farm MFW Bałtyk II:
  - the section of the corridor from km 4BII to 8BII,
  - the section of the corridor shared by both connections from km 2 to 4,
  - southern part of the development area of MFW Bałtyk II - quadrants 19-21;
- ECI from the offshore wind farm MFW Bałtyk III:
  - the section of the corridor shared by both connections from km 2 to 4,
- Connector:
  - north-western fragment, running along the northern boundary of Ławica Słupska - quadrants 29 and 37.

The above-mentioned sections of the planned connection have been classified as areas of high conservation value for seabirds and are presented in the marine ornithofauna identification map in (figure 7.45 in Subchapter 7.4.5 *Marine Birds)*. They represent approximately 14.8% of the study area. The remaining area (85.2%) includes areas with lower densities of long-tailed ducks, only in some places exceeding 50 individuals/km^2.

Sand hopper

Inventory surveys carried out in 2015 on the sandy beach located within the boundaries of the planned Project covered by the application for the environmental decision revealed the presence of one species of sand hopper. This was the beach sand hopper *Talitrus saltator.* Neither this year nor other surveys conducted in 2017, in the open part of the Polish coast, found two species of non-native sand hopper present on the coast of the Gulf of Gdansk.

The beach sand hopper *T. saltator* is under partial protection in accordance with the Regulation of the Minister of the Environment of 16 December 2016 on the protection of animal species (Journal of Laws 2016 item 2183 of 16 December 2016). It is also listed on the Red List of Threatened Species in the Baltic Sea as a data-deficient but also suspected endangered species (category: DD).[164]

The abundance of *T. saltator and the* absence of non-native species is an indication of the naturalness and high conservation value of the studied section of shore. The shoreline area within the corridor of the planned Project is one of the few sections of natural beach on the Polish coast where this legally protected species still occurs.

Summary

The characterisation of the living components of the marine environment in terms of species diversity, abundance, biomass, presence of rare/protected species and the presence of potential breeding sites, has allowed for the designation of areas of particular value in the area of the planned Project.

The degree of value was determined based on an overlap analysis of the areas of highest conservation value in terms of: phytobenthos, macrozoobenthos, ichthyofauna, potential spawning sites, bird densities and occurrence of sand hopper. The results of the marine mammal surveys in the study area were not taken into account as no potentially valuable sites were identified. The results are presented in the form of a map (figure 7.47), where the adopted scale denotes the number of overlapping valuable areas. The most valuable regions corresponded to an overlap of between 3 and 6 valuable areas. The others were considered valuable and sensitive.

[164] *HELCOM 2013, Red List of Baltic Sea species in danger of becoming extinct*

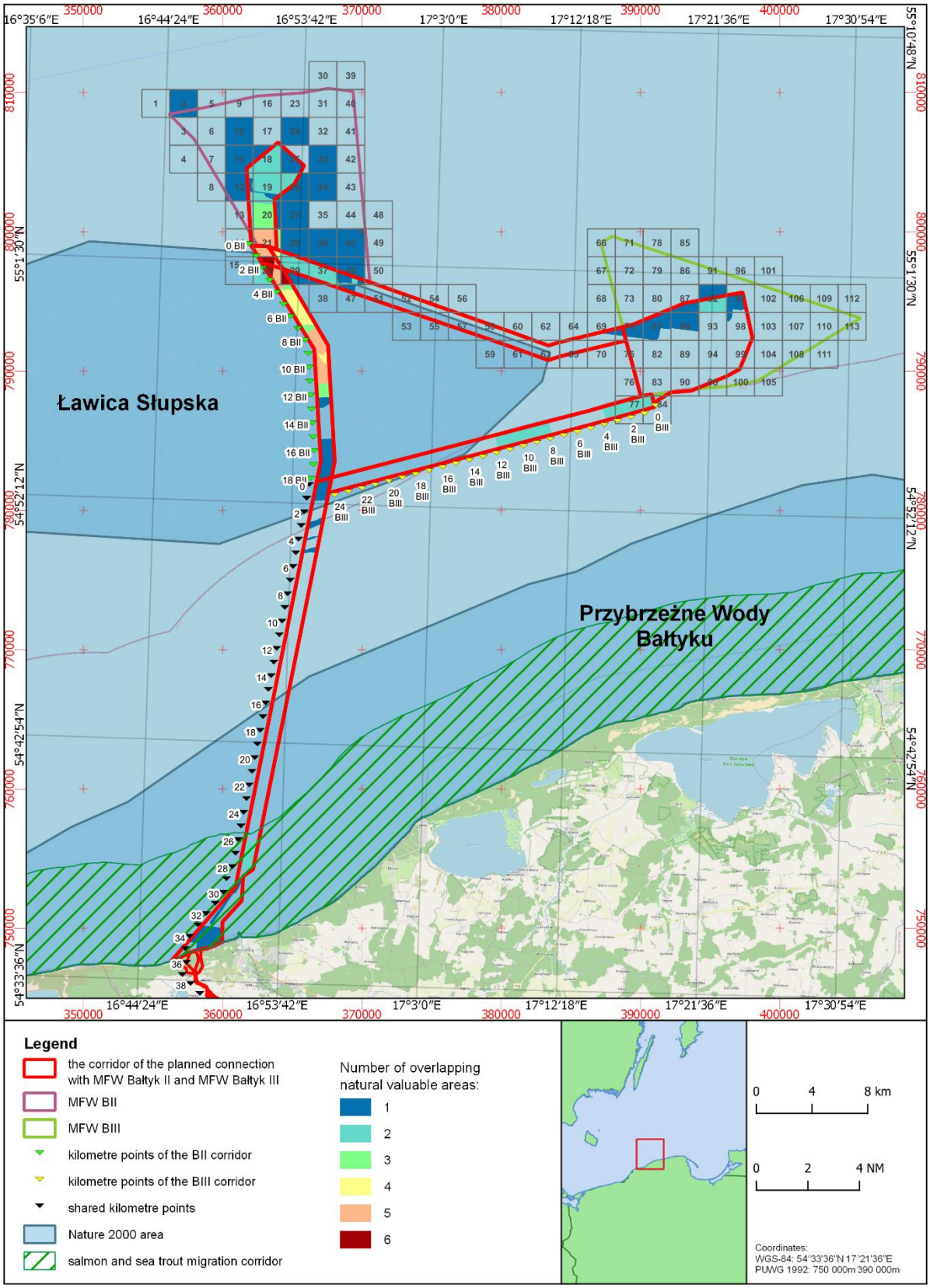


Figure 7.47. *Valuation of vatural assets in the area of the planned Project*

Source: In-house study

Particularly noteworthy are the sections of the ECI running through the Ławica Słupska area (Natura 2000 site - PLC990001 Ławica Słupska), where biodiversity, especially in the context of

ichthyofauna, is relatively high in comparison to the POM, which is favoured by the more varied habitat conditions present in this area. In addition, there are rare, strictly protected plant species such as *Furcellaria lumbricalis* and *Ceramium diaphanum,* two other species rare in the Polish Maritime Areas: *Coccotylus truncatus* and *Rhodomela confervoide,* as well as a higher number of macrozoobenthos taxa than in other areas of the POM, including the occurrence of a rare crustacean species, *Eurydice pulchra,* included in the Red List of Threatened Species in the Baltic Sea, which occurs outside Ławica Słupska only in the vicinity of Klif Orłowski.

A considerable diversity in terms of conservation values occurs within the area of the planned Project. The most valuable regions are on the route of the connection from MFW Bałtyk II, where 6 valuable areas in terms of natural assets overlap. The connection from MFW Bałtyk III is less valuable (figure 7.47).

Connection of MFW Bałtyk II

- the section of the corridor with the highest natural values is the fragment running through Ławica Słupska on ca.13 km from km 0BII-13BII and quadrants 21 and 22 (within the MFW Bałtyk II field) where due to shallowing there is a high level of macroalgae cover on the seabed, and the appropriate substrate in the form of boulders and sandy-stone bottom is conducive to the existence and colonisation of benthic organisms, which constitute an abundant food base for fish, and these in turn for the birds occurring in these areas, especially the long-tailed duck, which by far dominates the group of wintering birds; in addition, the area is a potential spawning ground for the herring,
- in the northern part of the analysed area (within the MFW Bałtyk II field - quadrants 18, 19, and 26) there is a potential sprat spawning ground (of moderate habitat conditions) and high densities of macrozoobenthos on the soft bottom;
- In the section of the corridor common to the connections from both farms in the area of km 2 - 4, high bird densities (the long-tailed duck) were found, while in the coastal zone (section km 26 - 32.5), areas with macrozoobenthos including mussel (substrate for spawning goby - a protected species) and potential herring spawning grounds (section km 32 - 35) (of moderate habitat parameters) were found.

Connection of MFW Bałtyk III

- the section of the corridor of approx. 12 km (from km 0BIII-12BIII) and quadrant 92 within MFW Bałtyk III can be identified as the most valuable natural sites along the route of the connection of MFW Bałtyk III, but less valuable than in case of the connection of MFW Bałtyk II; high mussel biomass was found here, which is also a substrate for the spawning of the sand goby - a protected species and food for fish and birds;
- in the northern part of the analysed area (within MFW Bałtyk III - quadrants 74, 81, 88, 92, and 97) there is a potential spawning ground for the sprat (of moderate habitat conditions) and locally high biomass of mussels and macrozoobenthos on soft bottom;
- in the section of the corridor common to the connections from both farms in the area of km 2 - 4, high densities of birds (the long-tailed duck) were found, while in the coastal zone (section km 26 - 32.5) areas where macrozoobenthos, including mussel (substrate for spawning sand goby - a protected species and food for fish and birds) and potential herring spawning grounds (section km 32 - 35) (of moderate habitat parameters) were found.

Connector

- the most valuable section is quadrants 29 and 37 (western part of the connector between MFW BII and MFW BIII) where potential herring spawning grounds (of moderate habitat conditions), high mussel biomass and a high density of birds, especially long-tailed ducks, were found.

On the beach, within the boundaries of the environmental decision application, a partially protected species, the beach sand hopper, was found along the entire.

7.5. PROTECTED SITES, ECOLOGICAL CORRIDORS AND BIODIVERSITY

Protected areas within the boundaries of the planned Project

The planned Project is located within two protected areas established under the provisions of the Act of 16 April 2004 on Nature Conservation (Journal of Laws 2022.916 consolidated text). These areas include (figure 7.48):

- PLC90001 *Ławica Słupska*: MFW BII – along the length of 19.4 km, MFW BIII – along the length of approx. 12.4 km, the connector between MFW BII and MFW BIII along the length of approx. 21.2 km;
- PLB990002 *Przybrzeżne Wody Bałtyku*; along the length of approximately 19.7 km of the connection from both farms.

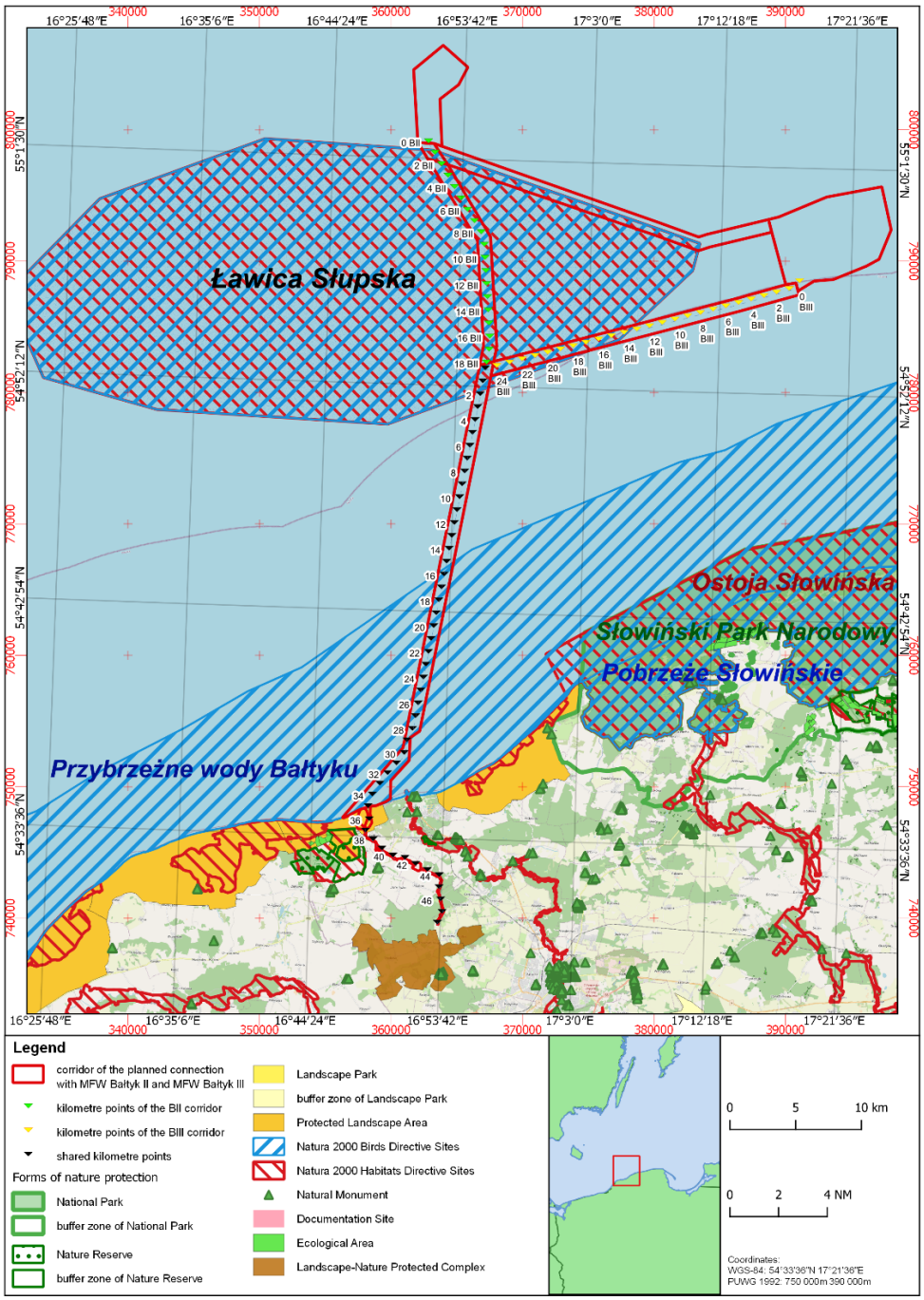


Figure 7.48. *Location of the offshore part of the planned Project in the background of protected areas*

Source: In-house study based on geosewis.gdos.gov.pl

In addition, the offshore part of the Natura 2000 site *Ostoja Słowińska* PLH220023 and the Słowiński National Park is located more than 6 km from the maritime boundaries of the Project.

Ławica Słupska Natura 2000 site PLC990001

A section of the connection from MFW BII at km 0.6BII - 18.5BII, the connection from MFW BIII - at km 14 BIII - 24.9 BIII and a short section of the connector at km 0+000-1+500 run through *the Ławica Słupska* Natura 2000 site. In total, there is a length of 19.4 km for the connection from MFW Bałtyk II and 12.4 km for the connection from MFW Bałtyk III. In addition, the considered connector between MFW Bałtyk II and MFW Bałtyk III collides with Ławica Slupska along the length of approximately 21.2 km.

The site was designated under the Regulation of the Minister of the Environment of 21 July 2004 on Natura 2000 special bird protection areas and the Commission Decision of 12 December 2008 adopting, pursuant to Council Directive 92/43/EEC, a second updated list of sites of Community importance for the Continental biogeographical region (notified under document number C(2008) 8039)(2009/93/EC). The Ławica Słupska site is located in the open waters of the Proper Baltic in the Polish economic zone, approximately 22 km from the coast at the level of the town of Ustka. Its boundaries are defined by a 20 m isobath. The seabed formation in this area is highly variable. Depths in this area vary from 8 to 35 m. The shallowest parts of the seabed are located in the northern and western parts and include elevations of the so-called 'boulder bed' and parts of the sandy bottom.

The objects of protection in the area are as follows (table 7.22 and table 7.23):
habitats:

- sublittoral sandbanks (1110),
- underwater rocky substrate, reefs (1170),

bird species (wintering and migratory):

- the black guillemot *Cepphus grylle* (A202),
- the long-tailed duck *Clangula hyemalis* refrigerator (A064),
- the velvet scoter *Melanitta fusca* (A066).

Table 7.22.*Habitats under protection within the Natura 2000 site Ławica Słupska PLC990001*

Habitat type			Assessment of the area			
Code	**Habitat type**	**Surface [ha]**	**Representativeness**	**Relative surface area**	**State of preservation**	**Overall assessment**
1110	sublittoral sandbanks	30926.65	A	A	A	A
1170	underwater rocky substrate, reefs	13814.64	A	A	A	A

Source: own compilation based on SFD Natura 2000: update 03-2022.

Table 7.23.*Species under of protection within the Natura 2000 site Ławica Słupska PLC990001*

Code	Species	Population in the area					Assessment of the area			
		Type	Size		Unit	Category	Population	State of preservation	Insulation	Overall assessmen
			Min.	Max.						
A202	the black guillemot *Cepphus grylle*	Wintering	98	556	Individuals	Rare	C	A	C	C
		Transient	72	461			C	A	C	C
A064	the long-tailed duck *Clangula hyemalis*	Wintering	101148	231180	Individuals	Common	B	A	C	B
		Transient	76440	214374			B	A	C	B
A066	the velvet scoter	Wintering	5565	23611	Individuals	Common	B	A	C	B
		Transient	910	1789			C	A	C	C

	Melanitta fusca									

Source: In-house study based on SFD Natura 2000: update 03-2022.

In addition, the SDF mentions the harbour porpoise *Phocoena phocoena,* as well as the black-throated loon *Gavia arctica* and the red-throated loon *Gavia stellata,* but these are not protected in the area.

The Maritime Office in Szczecin developed a draft protection plan for the Ławica Słupska Natura 2000 site in 2020, which is available on the website of the Maritime Office in Gdynia. [165]For the development of the draft plan, an analysis of available data and surveys were carried out, which enabled, among other things, the mapping of protected habitats within the boundaries of the area. The results are presented in a study by Michałek M., Osowiecki A., Barańska A., Wróblewski R., Rydzkowski P., Kośmicki A., Strzelecki D., Meissner W., Pieckiel P., Kuczyński T., Gajewski L., entitled 'Dokumentacja przyrodnicza, tj. opis tekstowy, zestawienia tabaryczne, przedstawienie graficzne, kartograficzne oraz dane stanowiące podstawę do sformułowania projektu planu ochrony obszaru Natura 2000 Ławica Słupska PLC990001' ('Nature documentation, i.e. a text description, tabular summaries, graphic and cartographic representations and data constituting the basis for the formulation of the draft plan of protection of the Natura 2000 site Ławica Słupska PLC990001'), October 2020. The conclusions of the above mentioned study are referred to in this chapter.

Characteristic morphological elements are chains of hills composed mostly of erosion-resistant pebbles and boulders[166]. The hard bottom and the relatively high transparency of the water create favourable conditions for the development of species-diverse benthic communities, among which there are so-called habitat-forming species valuable in the Baltic Sea ecosystem [167] [168] [169] [170] . These include the kelp species *Vertebrata fucoides* and the protected species *Furcellaria lumbricalis, Ceramium diaphanum* and the bivalve *Mytilus trossulus*. In many places of the Ławica Słupska boulder bed, species of macroalgae are developing that are rare not only in Polish sea areas - e.g. *Coccotylus truncatus, Desmarestia viridis, Rhodomela confervoides,* but also on the scale of the whole Proper Baltic, e.g. *Delesseria sanguinea* [171][172] [173] .

Based on the draft protection plan, it can be concluded that the planned Project does not interfere with habitat 1170 *Underwater rocky substrate, reefs,* however it interferes with habitat 1110 *Sublittoral sandbanks,* along the section of approx. 3 km (from km 9BII m to km 12BII), over an area of less than 0.05% of the total area of habitat inventoried on Ławica Słupska (figure 7.49 and figure 7.50)[174]

[165] *http://www.ums.gov.pl/projekty_unijne/natura2000_LS/Natura_2000_LS.pdf*
[166] *Kruk-Dowgiałło et al. 2011*
[167] *Andrulewicz et al. 2004*
[168] *Warzocha 2004*
[169] *Kruk-Dowgiałło et al. 2011*
[170] *Michałek et al. 2020*
[171] *Kruk-Dowgiałło et al. 2011*
[172] *Michałek et al. 2020*
[173] *PMŚ data. Environmental Protection Inspectorate data obtained as part of the State Environmental Monitoring 2008-2018.*
[174] *Michałek et al. 2020*

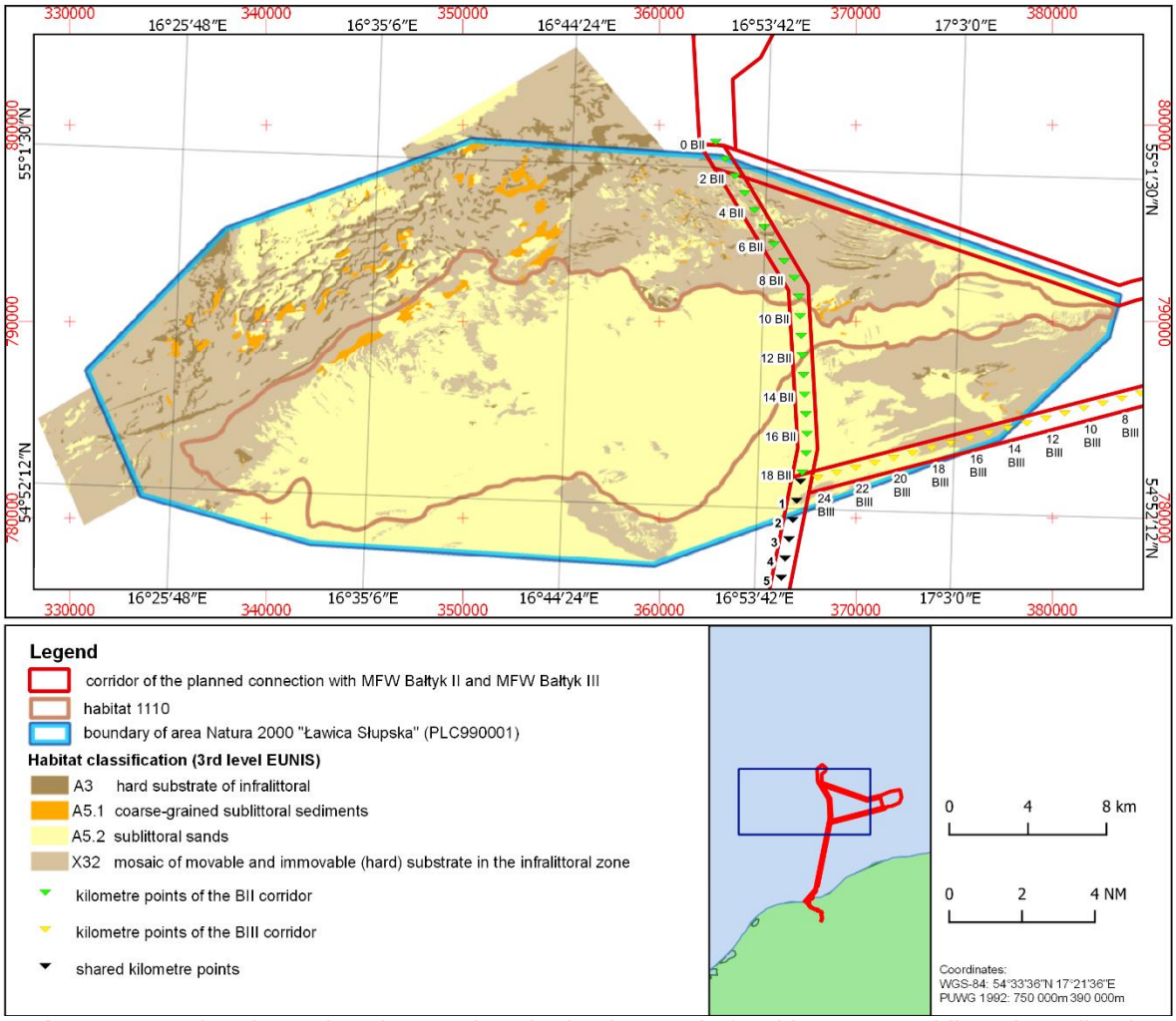


Figure 7.49. *The planned Project against the background of Habitat 1110 Sublittoral sandbanks*

Source: In-house study based on data for the draft Ławica Słupska protection plan posted at http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

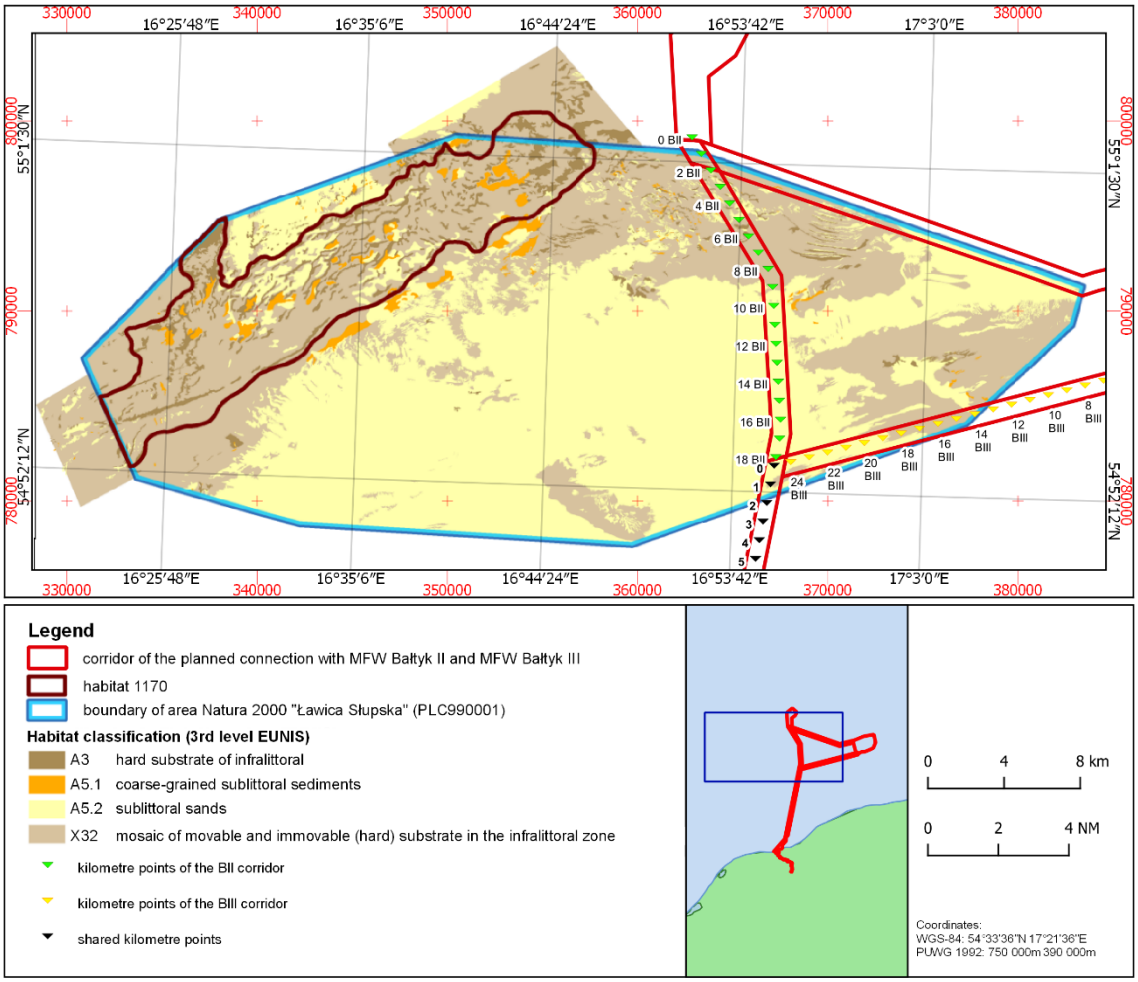


Figure 7.50. *The planned Project against habitat 1170 Underwater rocky substrate, reefs*

Source: In-house study based on data for the draft Ławica Słupska protection plan posted at http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

The Ławica Słupska Natura 2000 site is a bird sanctuary of European importance E79. During the wintering and migration period in spring and autumn, at least 1% of the migratory route (C3) of the following species is present: the long-tailed duck, the black guillemot, the velvet scoter. Waterfowl occur in concentrations of over 20,000 individuals (C4). During the winter period, there are about 101 to 231,000 individuals of long-tailed ducks, about 5.5 to 23.6 thousand of velvet scoters, 98 to 556 individuals of guillemots, as well as 97 – 173 black-throated loons and 28 – 66 red-throated loons. On the other hand, during the migration period, about 76 to 214 thousand long-tailed ducks, 910 to 1,789 velvet scoters and 72 to 461 loons occur.

An assessment of the site's importance for species listed in Article 4 of Directive 2009/147/WE and species listed in Annex II of Directive 92/43/EWG is presented in table 7.23.

Przybrzeżne wody Bałtyku Natura 2000 site PLB990002

The planned Project crosses the protected area along the north-south axis at the length of approximately 19.72 km.

The area was designated under the Regulation of the Minister of the Environment of 21 July 2004 on the special bird protection areas Natura 2000. The Baltic coastal waters area is located in an area of 0-20 m sea water depth from 0 to 20 m. The boundaries of the area extend for 200 km from the tip of the Hel Peninsula to the Pomeranian Bay. The seabed is characterised by unevenness, with denivelations of up to 3 m. The benthic fauna is dominated by small crustaceans.

Six species of wintering birds and one migratory species are protected in the area:

- long-tailed duck *Clangula hyemalis* (A064),
- the razorbill *Alca torda* (A200),
- the black guillemot *Cepphus grylle* (A202),
- the European herring gull *Larus argentatus* (A184),
- the velvet scoter *Melanitta fusca* (A066),
- the common scoter *Melanitta nigra* (A065).

The coastal waters of the Baltic Sea are a bird sanctuary of European importance E 80. Sea ducks winter in the area in large numbers. About 12% of the velvet scoter, 2% of common scoter and 35% of the long-tailed duck in Polish sea areas congregate here. The black-throated loon and the red-throated loon, which are bird species listed in Annex I of Council Directive 79/409/EEC, and the horned grebe are also recorded in the area, although in smaller numbers. During winter more than 1% of the migratory population of the long-tailed duck and at least 1% of the migratory population of the black-throated loon and velvet scoter occur here. Protection is provided for the wintering populations of long-tailed ducks, velvet scoters, common scoters and European herring gulls. It is estimated that 90-120,000 individuals of the long-tailed duck, 14-20,000 individuals of the velvet scoter, 8-15,000 individuals of the herring gulls winter in the area. However, the wintering population of razorbills in this area is estimated at 500-1000 individuals. In the Przybrzeżne wody Bałtyku area, the wintering and transient population of the common scoter and the wintering population of black guillemot are also protected. Large marine mammals - harbour porpoises, grey and ringed seals - are rarely observed here. An assessment of the importance of the area for species listed under Article 4 of Directive 2009I147IWE and species listed in Annex II of Directive 92I43IEWG is presented in table 7.24.

To date, no conservation task plan or protection plan has been developed for the area.

Table 7.24. *Conservation Objectives of the Natura 2000 area Przybrzeżne wody Bałtyckie PLB990002*

Code	Species	Population in the area				Assessment of the area			
		Type	Size		Unit	Population	State of preservation	Insulation	Overall assessment
			Min.	Max.					
A200	The razorbill *Alca torda*	Wintering	500	1000	Individuals	C	C	C	C
A202	The black guillemot *Cepphus grylle*	Wintering	1500	1500	Individuals	B	B	C	B
A064	The long-tailed duck *Clangula hyemalis*	Wintering	90	90	Individuals	B	C	C	B
A184	The European herring gull *Larus argentatus*	Wintering	8000	15000	Individuals	C	C	C	C
A066	The velvet scoter *Melanitta fusca*	Wintering	14	14	Individuals	C	C	C	C
A065	The common scoter *Melanitta nigra*	Wintering	5000	8000	Individuals	C	B	C	C
		Transient	3000	3000		C	B	C	C

Source: In-house study based on SFD Natura 2000: update 03-2022.

Ecological corridors

For the South Baltic area, where the ECI for the MFW Bałtyk II and MFW Bałtyk III are planned, no concept or documentation defining the ecological corridors have been developed. The applicable planning document – the POM Plan does not present ecological corridors at sea.

Analysing the marine water zone, sensitive groups of migratory organisms associated with the marine environment include: fish, birds, mammals and bats.

The characteristics of bird migration in the area of the central Baltic coast have been presented by dividing groups of birds according to their behaviour during migration. The main types of migration in relation to specific species:

- waterbirds migrating mainly over water;
- waterbirds migrating over water optionally;
- day migratory landbirds;
- night migratory landbirds.

In the Central Baltic area both long-distance migrations of land and water birds and short flights and local movements of water birds are observed. Long-distance migration is undertaken by populations of sea ducks, geese, passerines, pigeons and birds of prey (raptors). Short distance movements are undertaken by stationary, moulting and local birds.

According to the general classification of the waterbird migratory system in Eurasia, Poland is located within two large migration corridors - East Atlantic and the Mediterranean-Black Sea ones. Migration tactics as well as migration corridors of seabirds in the Baltic region are very poorly understood. In summer, between July and August, sea ducks (mainly male scoter) are observed migrating from the Gulf of Finland towards the moulting sites in the Danish Straits. They are accompanied by the common eider *Somateria mollissima* and velvet scoters, but the numbers of both species are much lower than scoters. These birds only exceptionally stops in our waters. The period of autumn migration of seabirds is very extended in time. A number of waterbird species can be found within the POM area already from August. Some of them only pass through and do not stay with us for the winter (e.g. terns of the genera *Sterna* and *Chlidonias*), others are observed throughout the whole period of migration and wintering (sea ducks, alks, loons, grebes). In spring, large flocks of sea ducks (long-tailed ducks, velvet scoters, common scoters) are observed moving towards the breeding grounds, stopping in the Polish Baltic zone[175] .

Beaches are also a feeding and resting ground for a number of species of *Charadriiformes* during migration and wintering. The highest concentrations during migration are found at river mouths, where these birds form larger flocks. On the rest of the coast, they appear in smaller groups. Beaches are feeding places for these birds mainly during autumn migration (July-October), while in spring they appear less frequently. Among birds feeding on small invertebrates, the dominant species are: the dunlin *Calidris alpina, the* red knot *Calidris canutus,* the little stint *Calidris minuta,* the curlew sandpiper *Calidris ferruginea,* the sanderling *Calidris alba,* the ruddy turnstone *Arenaria interpres* and the grey plover *Pluvialis squatarola*. Other species from this group are found here less frequently. The beaches are also a resting place for gulls and terns, which forage at sea or in areas beyond the coastaline. The most numerous species here are the above-mentioned terns which occur only during migration and the herring gull, the common sandpiper, the grey-headed gull *Larus canus* and the black-headed gull *Larus marinus,* which are present throughout the year[176] .

The Baltic Sea along the Polish coast forms part of the route for birds migrating between north-eastern Europe, the Urals and the Arctic Ocean, and western Europe (). It is also an important wintering area for many species [177] [178].

[175] *HELCOM 2012, Red List Species Information Sheets (SIS) Birds*
[176] *Michałek et al. 2019*
[177] *Masden et al. 2009*
[178] *Sikora et al. 2011*

Figure 7.51. *Migration routes of birds in the South Baltic area. Classic autumn migration direction.*
Source: Newton I., 2008. Migration Ecology of Birds

Waterbirds, such as sea ducks and geese, undertake long migrations in the north-eastern and south-western directions, crossing the area under study. Stationary birds during moulting (shedding and regrowing feathers), wintering and local birds (nesting along the Polish coast) take short flights in different directions. Many waterbirds are active during the day, but migrate during night[179] . Many species of small land birds migrate at night at high altitudes, in a broad front (i.e. not like 'v' but a vast, shapeless cloud)[180] . Migration direction, flight altitude and periodic flight intensity depend, to some extent, on local weather conditions, in particular wind strength and direction, but also on large-scale weather phenomena (e.g. continental frontal systems) [181] [182] .

Most of the night migrants are passerine birds. Some of these are representatives of the most numerous species in the region, whose populations are given in millions of birds[183]. The migration passage has so far not been measured in any way for the south-eastern part of the Baltic Sea, but it has been estimated that more than 100 million passerine birds migrate through the Baltic Sea from Sweden towards the south each year[184].

Less land birds migrate during the day. Gliding birds, such as raptors, are basically the only typical day migrants[185].

Gliding birds use thermal chimneys to carry them high into the air. The formation of thermal chimneys is due to the heating of the ground by the sun, so these birds must migrate during the day. For the same reason, many gliding species avoid flying over large bodies of water, where thermal fronts do not form strongly enough, which would in effect force the birds to expend energy during energy-intensive flutter flight. Studies of raptors migrating in Poland have shown that they follow the coast. It supports the assumption that raptors perceive the sea as a barrier and do not pass the water body across[186] .

The offshore waters in the shallow coastal zone (up to 4 Mm offshore) are also an important migration route for bi-environmental species, probably associated with spawning access to the Słupia

[179] *HELCOM 2012, Red List Species Information Sheets (SIS) Birds*
[180] *Blew et al. 2008*
[181] *Alerstam 2008*
[182] *Kahlert et al. 2012*
[183] *Langston 2010*
[184] *Alerstam 1993*
[185] *Langston 2010*
[186] *Polakowski et al. 2014*

river. The ECI area can be used as a migration corridor by the sea trout, the smelt, the Atlantic salmon the rainbow trout and river lamprey.

7.6. CULTURAL HERITAGE

Based on the results of bathymetric, sonar, seismoacoustic and magnetic surveys carried out in the area of the planned Project in 2013-2014 (area ECI, MFW Bałtyk II and MFW Bałtyk III) (Volume III, Annex 1.1, annex. 1.2., annex. 1.11.), as well as analysis of data from the Inventory of Underwater Archaeological Sites (EPSA in Polish) collected at the National Maritime Museum in Gdansk, the database of underwater obstacles from the Naval Hydrographic Office, and historical work on maritime disasters in the area of the Project carried out as part of the archival research (Volume III., annex. 1.10.), anthropological objects were identified that could represent potential sites of archaeological, historical and monumental value.

Analysis of the data has shown that directly within the ECI corridor boundary, there are three potential heritage sites/sites..

The first two are located at a depth of up to 10 m - most likely wrecks, which are listed in the Inventory of Underwater Archaeological Sites (EPSA in Polish) of the National Maritime Museum in Gdansk. The first is E.44.1 (according to SIPAM: UST-83; Underwater Object ID WK-0451), listed as an unknown object about which there is no information, and the second is E43.Y.1. (according to SIPAM: unnamed; Underwater Object ID WK-0267), which is an unrecognized bottom obstacle. Sonar and seismoacoustic surveys conducted in the area of the planned Project in 2013-2014 (area ECI, MFW Bałtyk II and MFW Bałtyk III) (Volume III., annex. 1.1, annex. 1.10., annex. 1.11) did not exclude, but also did not confirm the presence of the above mentioned wrecks.

Another potential site of archaeological value is the planned Project passes through the research field of the MACHU project (acronym for Managing Cultural Heritage Underwater) - an area of potential Stone Age archaeological sites (Volume III, Annex 1.10.) through which the Planned Project passes between 18 and 23.5 km IP. This area, measuring 5 x 3 km, is located approx. 8-10 km north of Ustka (within the POM.27.B basin) at a depth of 20 to 27 m (18-24 km IP) (figure 7.52).

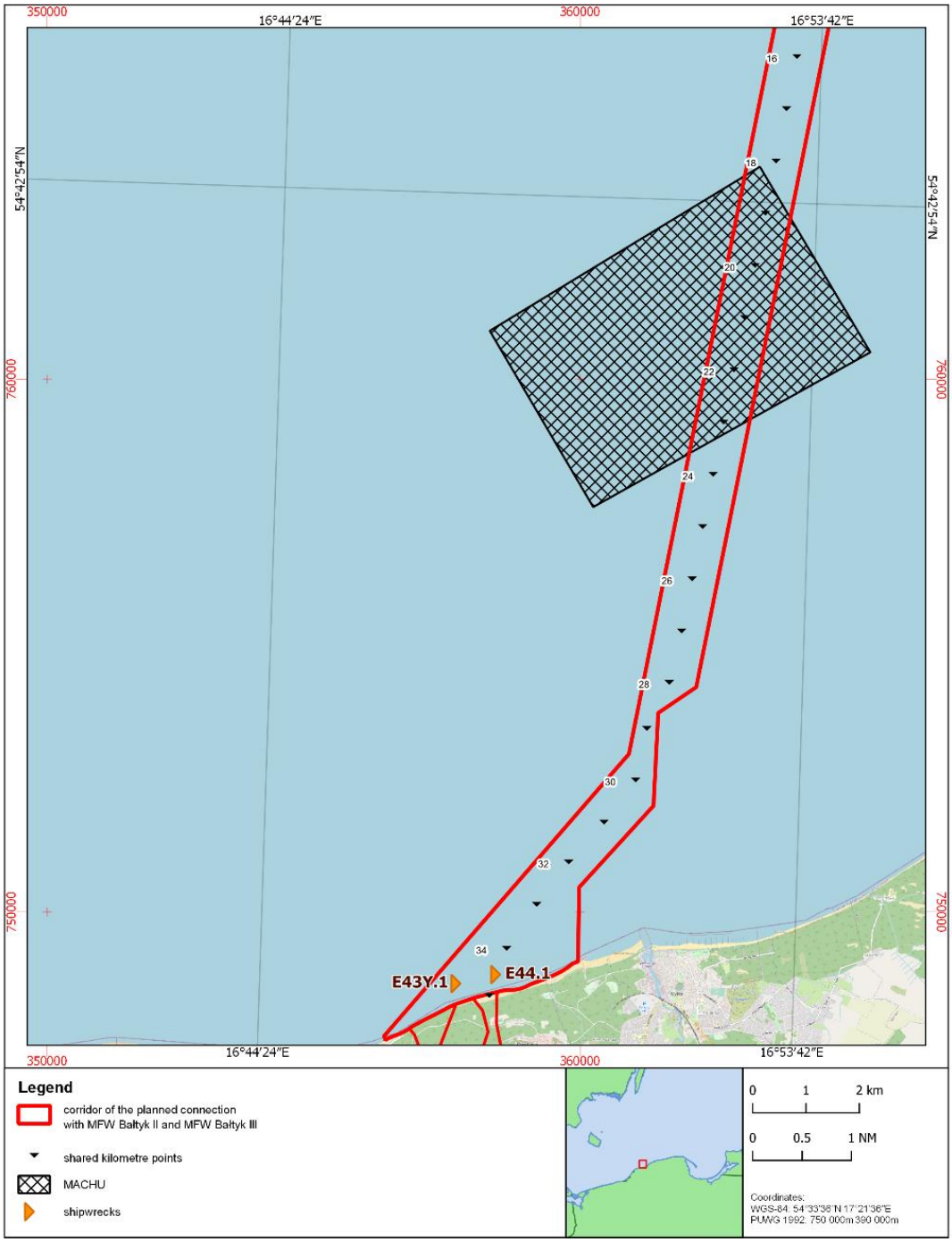


Figure 7.52.*The MACHU (Managing Cultural Heritage Underwater) project research field in the ECI corridor area*

Source: Archaeological surveys in the area of Maritime Transmission Infrastructure (MIP) (VOLUME III, Attachment 1.10)

The results of the very detailed surveys carried out as part of the MACHU project, have shown that until around 8200 BP[187], the area was land with a not very deep freshwater lake. The littoral zone of this lake in the southern exposure areas is the most likely area for the presence of archaeological traces of human activity, and possible sites are located below the layers of marine sands, the thickness of which found for the MACHU area ranges from 0.35 m to 1.2 m, and can reach up to 3 m.

[187] *BP – Best Present – a system of marking years used in geology and archaeology to indicate past events*

The presence of the above-mentioned potential heritage objects has been verified by the Pomeranian Voivodeship Conservator of Monuments and the Director of the National Maritime Museum in Gdańsk.

Based on the opinions for:

- connection infrastructure for MFW Bałtyk II (Volume IV, Attachment 8) issued by:
  - Pomeranian Voivodeship Conservator of Monuments with number ZA.5183.770.2022.SS, dated 18.08.2022,
  - Director of the National Maritime Museum in Gdańsk with number NMM/N-OD/ARL/2418/2022, dated 19.08.2022,

and

- Connection Infrastructure for MFW Bałtyk III (Volume IV, Attachment 8) issued by:
  - Pomeranian Provincial Conservator of Monuments with number ZA.5183.985.2022.SS, dated 27.09.2022,
  - Director of the National Maritime Museum in Gdańsk with number NMM/N-OD/ARL/2667/2022, dated 28.09.2022,

along the route of the planned Project, in the section from the offshore substation to the place where the subsea drilling is planned, there are no elements of the underwater cultural heritage, which proves the lack of occurrence of the above mentioned objects/sites, i.e. wrecks and archaeological sites within the research field of the MACHU Project, through which the ECI route passes.

However, due to the possibility of encountering archaeological artefacts located in deeper bottom structures, it is necessary to proceed in accordance with the provision of Article 32(1)(1)-(3) and (10) of the Act of 23 July 2003 on the protection and care of historical monuments.

7.7. Climatic Conditions and Air Quality

Hydro-meteorological conditions

A characteristic of hydro-meteorological conditions (wind, sea level, waves, currents, icing) in the area of the planned Project has been developed on the basis of data from the IMGW-PIB database from the station in Ustka (for the period of 2010-2020), used for assessing the condition of the environment of Polish marine areas. The quoted data and conclusions on hydro-meteorological conditions in Ustka are from the study Zalewska T., Kraśniewski W. (ed.), 2021, Ocena stanu środowiska polskich obszarów morskich Bałtyku na podstawie danych monitorowych z roku 2020 na tle dziesięciolecia 2010-2019, Inspekcja Ochrony Środowiska, Warszawa (Assessment of the state of the environment of Polish marine areas of the Baltic Sea on the basis of monitoring data from the year 2020 against the background of the decade 2010-2019).

In the case of waves, currents and sediment transport, additional data obtained by the Investor during the surveys carried out as part of the comprehensive pre-investment marine environmental research programme for the environmental impact assessment procedure for the Maritime Transmission Infrastructure (MIP) and the MFW Bałtyk Środkowy II and III (VOLUME III, Attachment 1.4) was used.

Wind

At the station in Ustka, winds from the west dominated in the period 2010-2019. The share of wind from other directions was smaller and did not exceed a few percent. The highest speed (>10-15 $m \cdot s^{-1}$) was recorded for the wind blowing from the western or northern sector (figure 7.53).

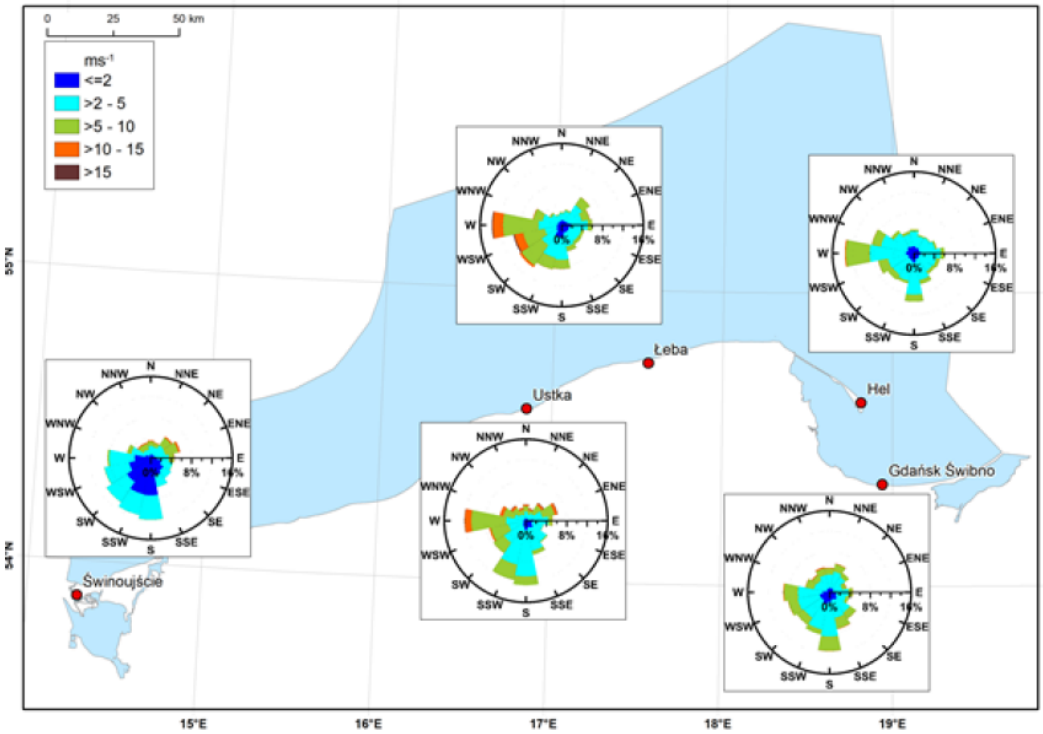


Figure 7.53. *Direction and wind speed at selected stations along the Polish coast – for period of 2010-2019*

Source: Zalewska and Kraśniewski (ed.) 2021

The distribution of wind directions and speeds in 2020 was very similar to the average distribution for the multi-year period. At the station in Ustka, the share of wind from the east and south-east was smaller by 2-4%. An increased share of wind from the dominant south-western sector by a few percent was recorded (figure 7.54).

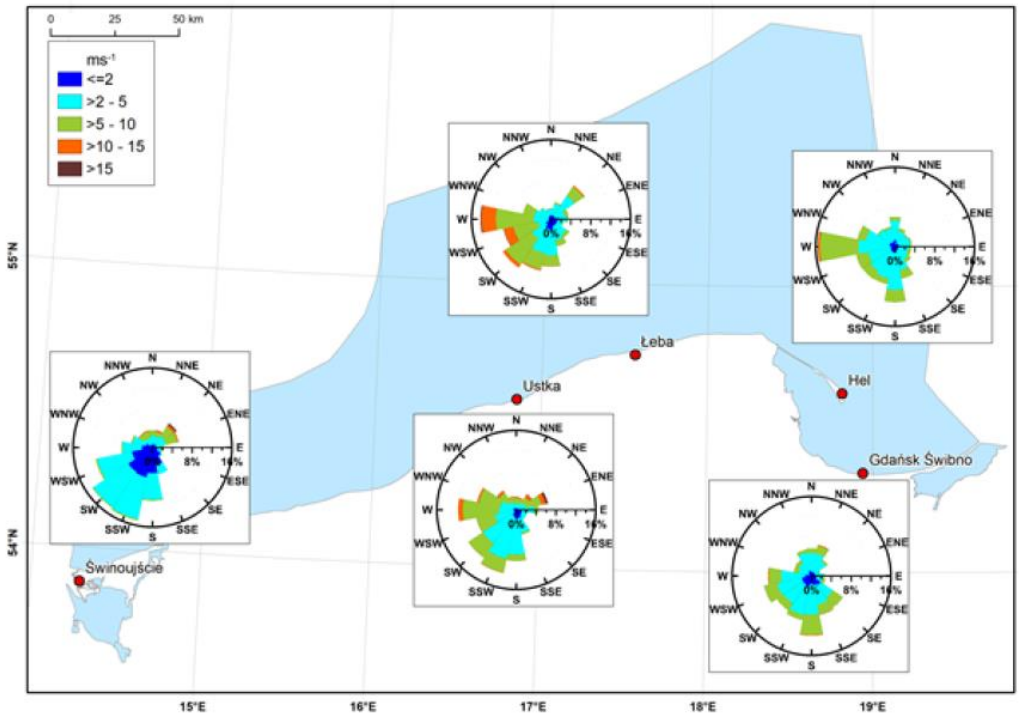


Figure 7.54. *Direction and wind speed at selected Polish coastal stations - year 2020*

Source: Zalewska and Kraśniewski (ed.) 2021

The average wind speed at the station in Ustka in 2020 did not differ significantly from the multi-year averages - absolute differences usually did not exceed ±0.4 m-s^{-1}. In Ustka, the wind speed was slightly higher than in the 2010-2019 multi-year period and amounted to 5.3 m-s^{-1}.

Sea level and storm surges

Storm surges are caused by strong winds blowing toward the land, usually from the north-west through north to north-east direction. If this situation is superimposed on high sea levels caused by inflows from the North Sea, which rise due to prolonged strong storm winds from the western sector, then very high and even extreme storm surges can occur.[188]

A characteristic of storm surges was prepared for the year 2020 against the background of the 2010-2019 multiannual period. The station in Ustka has established warning and alarm levels of 570 cm and 600 cm respectively.[189]

On the basis of the analysis of measurement data, it was established that in 2020, against the background of all water gauging stations on the Polish coast (i.e. Świnoujście, Kołobrzeg, Łeba, Władysławowo, Gdański Port Północny), the warning level was exceeded the least frequently (0.52%) in the water gauging station in Ustka (table 7.25.). The situation was similar in the 2010-2019 multiannual period. (0,45%). Nevertheless, the frequency of exceeding the warning levels at the gauging station in Ustka in 2020 (0.52%) was slightly higher than in the 2010-2019 multiannual period (0.45%). In the case of alarm levels, none were recorded in 2020 (table 7.25).

Table 7.25. *Frequency (%) of occurrence of sea levels reaching or exceeding the warning and alert levels at Polish coastal stations in 2020 and in the multi-year period 2010-2019*

Station/level	Years	Świnoujście	Kolobrzeg	Ustka	Władysławowo	Gdańsk Port Północny
warning	2010-2019	0.72	0.62	0.45	2.07	2.42
	2020	0.89	0.74	0.52	6.6	4.96
alert	2010-2019	0.35	0.09	0.07	0.46	0.52
	2020	0.36	0.0	0.0	0.88	0.63

Source: Zalewska and Kraśniewski (ed.) 2021

The exceedances of warning levels in 2020 in Ustka took place in the first quarter of the year (table 7.26). Compared to the 2010-2019 multiannual period, the storm season was shorter (no surges in October-December), but more intense. The highest frequency of occurrence of warning levels took place in February and March, with surges recorded approximately 14 and 22 times more often, respectively, compared to the multiannual period (table 7.26.).

Table 7.26. *Frequency (%) of occurrence in months of sea levels reaching or exceeding the warning and alert levels at the Ustka station in 2020 and in the multi-year period 2010-2019*

Station	Warning level	period	1	2	3	4	5	6	7	8	9	10	11	12
Ustka	**570**	2010-2019	1,85	0,38	0,03	0,01					0,01	0,99	0,69	1,37
		2020	0,54	5,32	0,67									
	600	2010-2019	0,74									0,03		0,11
		2020												

Source: Zalewska and Kraśniewski (ed.) 2021

[188] *Sztobryn et al. 2012*
[189] *Zalewska and Kraśniewski (ed.) 2021*

In 2020, no alert level or its exceedance at the Ustka gauge station was recorded, while in the 2010-2019 multiannual period, the alert level or its exceedance was recorded in January, October and December, with the highest frequency of exceedance of the alert level occurring in January (0.74%) (table 7.26).

Sea level change forecasts

Projections of sea level change made for various emission scenarios have shown that in the period 2011-2030, average sea level along the coasts will be about 5 cm higher than the values of the reference period (1971-1990).[190]

Waving

For wave characterisation, the PMŚ data from the publication of the Inspectorate of Environmental Protection (2021) from the station representing the conditions of the open sea zone[191] and the results of measurements of wave parameters conducted by the Investor within the fields of the MFW Bałtyk II and MFW Bałtyk III and in the coastal zone in the ECI area were used (figure 7.55) (Volume III, Attachment 1.4.).

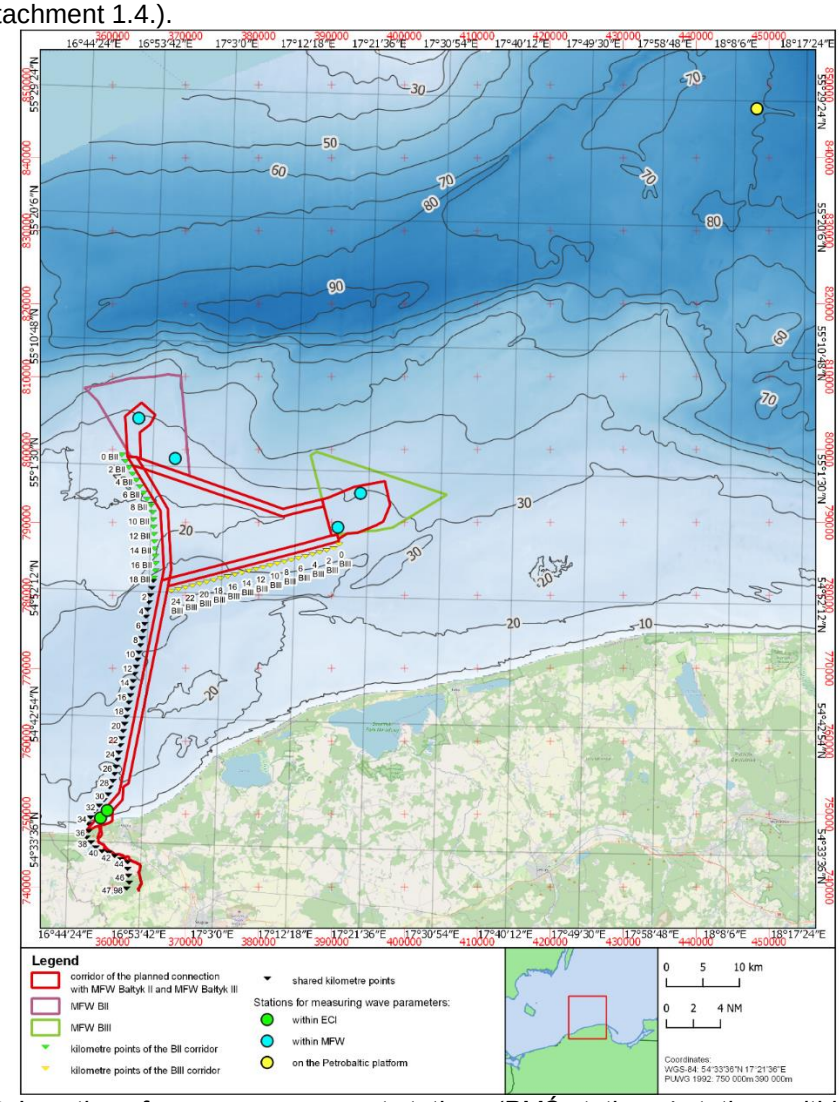


Figure 7.55. *Location of wave measurement stations (PMŚ station, 4 stations within the MFW, 2 stations in the ECI area)*

Source: In-house study

[190] *Assessment of the impact of current and future climate change on the Polish coastal zone and the ecosystem of the Baltic Sea, Study carried out under contract No DZR/2/U/2014 concluded with the Ministry of the Environment, Institute of Meteorology and Water Management Państwowy Instytut Badawczy Oddział Morski w Gdyni, Gdynia, 5.12.2014, 1-90*

[191] *Zalewska and Kraśniewski (ed.) 2021*

Surveys conducted for the PMŚ were carried out between 2010 and 2020, using measuring devices: AWAC and WaveGuide, located on the Petrobaltic platform.

On the basis of the aforementioned data, it was found that in 2020, the open sea zone was dominated by significant waves of 0.2-1.2 m height. The average wave period was in the range of 4-5 s. The distribution of significant wave height and average wave period from 2020 was similar to the distribution of significant wave height and average wave period for the reference period 2010-2019.

In the 2010-2020 multi-year period, the highest values of significant wave height (Hs) were recorded in 2010 (7.22 m), 2015 (7.57 m), and 2019 (7.7 m). In the remaining periods, significant wave height values were in the range of 5.41-7.0 m. The longest average wave period (Tm) was also recorded in 2010, 2015 and 2019. In these years, the average wave period exceeded the value of 9.3 s (table 7.27).

Table 7.27. *Highest recorded values of significant wave height and average wave period in 2010-2020 at the Petrobaltic measurement point*

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
MAX: Hs [m].	7.22	6.96	5.82	7.0	5.28	7.57	6.04	5.79	5.41	7.7	6.68
MAX: Tm [s].	9.332	9.21	8.6	9.33	8.2	9.47	8.85	8.69	8.36	9.37	9.04

Source: Zalewska and Kraśniewski (ed.) 2021

In the period 2010-2020, the longest total duration of storm surges (i.e. sea state above 5 degrees (Douglas scale) corresponding to wave heights above 2.5 m) was recorded in 2020. At that time, storm periods lasted a total of 1,005 hours. In the 2010-2020 multi-year period, except for 2020, cumulative storm surge durations above average were recorded in 2011 (about 840 hours) and 2015 (about 890 hours), 2016 (about 790 hours) and 2017 (about 820 hours). The shortest cumulative storm duration in the 2010-2020 multi-year period occurred in 2018 (approximately 550 hours).

In the offshore areas of the wind farms, in the open sea zone, measurements were made in 2013-2014, at 4 stations located within the MFW fields (2 stations in each field), using AWAC measuring equipment. The average wave height recorded in the period from October 2012 to February 2014 (MFW Bałtyk III) and from January 2013 to April 2014 (MFW Bałtyk II) (calculated as the average of all recorded average waves), ranged between 0.57-0.54 m and 0.57-0.60 m, respectively. In MFW Bałtyk III, the highest recorded wave height was 6.14 m and the highest significant wave was 3.89 m, while in MFW Bałtyk II it was 8.53 m and 5.25 m, respectively. The wave motion was mainly from the west (W) and north-east (NE) directions (Volume III, Attachment 1.4).

Surveys carried out by the Investor in the area of the planned Project, in the shallow water zone, were performed using AWAC equipment, located at two measurement points: IPZ 10 and IPZ 15. Wave measurements were taken between May 2013 and January 2014, with the largest recorded wave being 3.79 m high and the largest significant wave being 2.41 m high. The average wave height (calculated as the average of all recorded average waves) was 0.32 m and 0.39 m for points IPZ 10 and IPZ 15, respectively. Wave motion was almost exclusively from the north-west and north-east directions. The average wave period was in the range of 3.4-3.5 s (Volume III, Attachment 1.4).

Forecasts of wave height changes

The wave climate in the southern Baltic Sea will not change much between 2011 and 2030, irrespective of the analysed emission scenario (compared to values from the reference period 1988-1993). All scenarios predict a slight increase in wave height of between 0.01 m and 0.07 m in the non-storm season. During the storm season, median wave height values show slight decreases.[192]

During the analysed period, the occurrence of high wave heights characteristic of the storm season is expected to shift to the other months. In recent years, the occurrence of storm surges has been observed in the spring period. [193]

[192] *Jakusik et al. 2012a*
[193] *Jakusik et al. 2012a*

Sea currents and sediment transport

Surveys of the distribution of marine currents carried out for the National Environmental Monitoring (PMŚ) were carried out on transects in ship traffic using an ADCP RDI current meter. In the shallow water zones, subsurface currents were measured in 2.5 m thick layers at depths of approximately 9.8 - 12.3 m. In the zone with depths greater than 25 m, currents were measured in layers of thickness ranging from approximately 7.5 to 12.5 m. The surveys were carried out between 2009 and 2020.

On the basis of the aforementioned measurement data, it has been established that south-westerly currents predominate in the area of the planned Project.[194]

Measurements of water flow speed, both in the surface layer and in the vertical profile, were carried out by the Investor in the area of the planned Project in the period from May 2013 to January 2014 in the southern part of the ECI corridor, and in the period from October 2012 to February 2014 and from January 2013 to April 2014 for the MFW Bałtyk III and MFW Bałtyk II, respectively.

Particularly significant speed values were recorded during storm events. In the ECI area, at stations located at depths of 10 and 15 m, the highest variability in water flow was recorded in the near-surface layer (i.e. 0-4 m depth), where the maximum speed was 1.46 m-s^{-1} and was associated with the passage of a strong storm over the Baltic Sea area (Volume III, Attachment 1.4). In the deep-water areas of the wind farms, as in the coastal region, the greatest variability was observed in the layer at 0-4 m depth. During strong storms, speed reached almost 0.9 m-s^{-1} in the MFW Bałtyk II area (maximum: 0.94 m-s^{-1} was recorded at a depth of 4 to 8 m), and up to 1.02 m-s^{-1} in the MFW Bałtyk III area. Water flow speeds in the deeper layers were characterised by much smaller amplitudes and oscillated between 0 and 0.5 m-s^{-1}, while at the very bottom they ranged between 0 and 0.2 m-s^{-1} (Volume III, Attachment 1.4).

In the shallow coastal zone of the Baltic Sea, where wave transformation takes place, the most important currents are those of wave origin. Among them, return currents and longshore currents are distinguished.[195] They are related to the current wave field and the bottom configuration.[196] They significantly influence the transport of sediments in the sub-bottom zone and thus the qualitative and quantitative remodelling of the bottom.

In the coastal zone, in the area of the planned Project, the longshore current reaches a maximum speed of 2.0 m-s^{-1} at a distance of approximately 100 m from the shore, and is the result of a rapid loss of wave height due to wave breaking. At a distance of 150-350 m from the shore, the current value is halved to 1.0 m-s^{-1}. Moving further seawards, the current speed decreases, and at a distance of about 600 m from the shore, does not exceed a few cm per second. The return current reaches its highest values of approximately 0.25 m-s^{-1} at a distance of approximately 100 m from the shore. Further and closer to shore, these values are minimal, on the order of 0.01 m-s^{-1} (Volume III, Attachment 1.3.).

The consequence of currents and water movements of wave origin in the coastal zone is sediment transport. It runs in two directions - a spatially dominant longshore direction and a smaller one transverse to the shore, covering the area of the active transverse profile of the shore. [197][198]

In the shallow coastal zone, maximum longshore sediment transport is mostly observed around stable reefs I and II, disappearing seawards.[199] [200] The volume of longshore debris transport in the area of the planned Project is approximately 10^5 m^3/year (Volume III, Attachment 1.3).

The dynamic wave action on the seabed, and thus the active movement of sediment, is related to the inner depth of closure (hD) which varies in time and space. This depth closes the part of the transverse profile of the shore that is active for a given wave motion. For Polish multi-reef shorelines,

[194] *Zalewska and Kraśniewski (ed.) 2021*
[195] *Ostrowski 2019*
[196] *Pruszak 1998*
[197] *Pruszak 2003*
[198] *Boniecka et al. 2013*
[199] *Pruszak 1998*
[200] *Boniecka et al. 2013*

the depth of closure at average multi-annual storm conditions varies from 5-7 m on a seasonal scale, to 7-9 m on an annual scale.[201] [202] Taking into account the extent of the reef zone in the Project area, the closure depth is within the range for average values of this depth in the Polish shore zone.

Ice phenomena

In the area of the planned Project, the onset of ice phenomena is observed from 2 January to approximately 26 March[203]. The maximum number of days with ice is 59 days, with an average of 8 to 9 days. The thickness of the ice does not exceed 10 cm. Winters in this area are mild to very mild. They are the mildest among winters in other areas of the Polish coast. Surveys conducted in 1971-1990 showed that during that time, no ice was recorded in the area of the planned Project during 14 seasons. Information presented in the Assessments of the Environmental Status of the Polish Maritime Areas of the Baltic Sea made on the basis of monitoring data from decades confirm the absence of hazards related to ice phenomena[204] .

Air quality

The Baltic Sea is one of the most heavily trafficked marine regions in the world. Ship traffic is associated with the emission of a wide range of air pollutants, among them: nitrogen oxides (NOx = NO + NO_2), black carbon (BC), sulphur dioxide (SO_2), non-methane volatile organic compounds (NMVOC) and particulate matter, as well as greenhouse gases (mainly carbon dioxide, CO_2). The amount and size spectrum of particulate matter emitted depends on the fuel type and sulphur content, and the engine type of the vessel.[205] [206]

Atmospheric emissions from ship traffic not only increase air pollution, but also affect the Baltic Sea environment through acidification and eutrophication of marine waters and surrounding terrestrial ecosystems.

In Poland, air quality monitoring is only carried out at stations located on land or close to the shore. It is conducted by the Inspectorate for Environmental Protection as a part of the State Environmental Monitoring.

Due to the lack of detailed measurement information on air cleanliness parameters over the maritime areas designated for the ECI of the MFW Bałtyk II and MFW Bałtyk III, results from simulations of the transport and chemical transformations of atmospheric pollutants in the Baltic Sea region, using three regional chemical transport model (CTM) systems, were used to assess air quality: CMAQ, EMEP/MSC-W and SILAM, performed within the framework of the European project BONUS SHEBA (Sustainable Shipping and Environment of the Baltic Sea region).[207] The main objective of the project was to quantify the impact of ship emissions on regional air quality in the Baltic Sea region. The results of individual models were assessed for sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3) and particulate matter (PM2.5). Vessel emissions data were extracted from the STEAM model, based on vessel movements from AIS records, detailed vessel characteristics and current load-dependent emission factors. The modelling was carried out for 2012 data. Despite the differences in the resulting maps, the used methodological approach allowed for a more accurate estimation of the concentrations of total pollutants over marine areas and the impact of ships on these pollutants.

Pollution levels in the Project area

Based on the results of the simulations carried out as part of the aforementioned project, pollution values over the marine area in the area of the Project were indicated.

Annual average concentrations of nitrogen dioxide (NO_2) range from 3.38 to above 8.29 µg-m^{-3}. The highest values are associated with the Ławica Słupska TSS area. Considering the contribution of vessels to NO_2 concentrations, they range from 1.77 to 4.0 µg-m^{-3} (figure 7.56).

[201] *Różyński et al. 1998*
[202] *Boniecka et al. 2013*
[203] *Sztobryn et al. 2012*
[204] *https://www.gios.gov.pl/pl/stan-srodowiska/monitoring-wod*
[205] *Fridel et al. 2008*
[206] *Moldanová et al. 2009*
[207] *Karl et al. 2019*

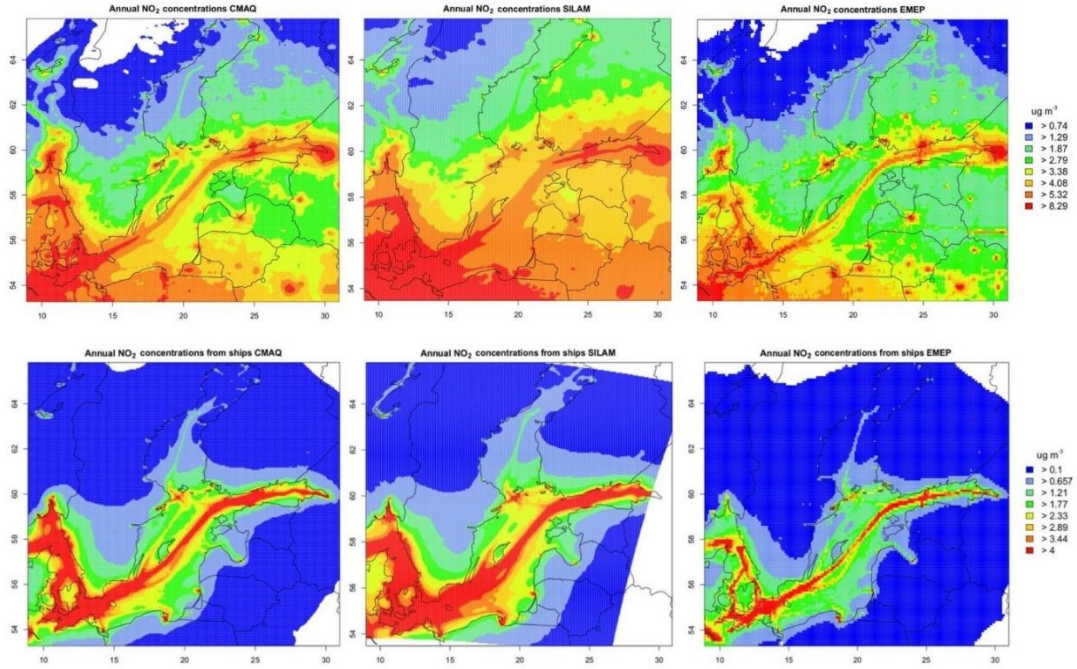


Figure 7.56. *Annual average nitrogen dioxide concentrations in the Baltic Sea area and average ship-source nitrogen dioxide concentrations*

Source: Karl et al. 2019 - modified

Annual average ozone concentrations (O_3) range from 53.6 to above 75 µg-m^{-3}. Considering the impact of ships on ozone, they contribute to a reduction of 2 µg-m^{-3} (figure 7.57).

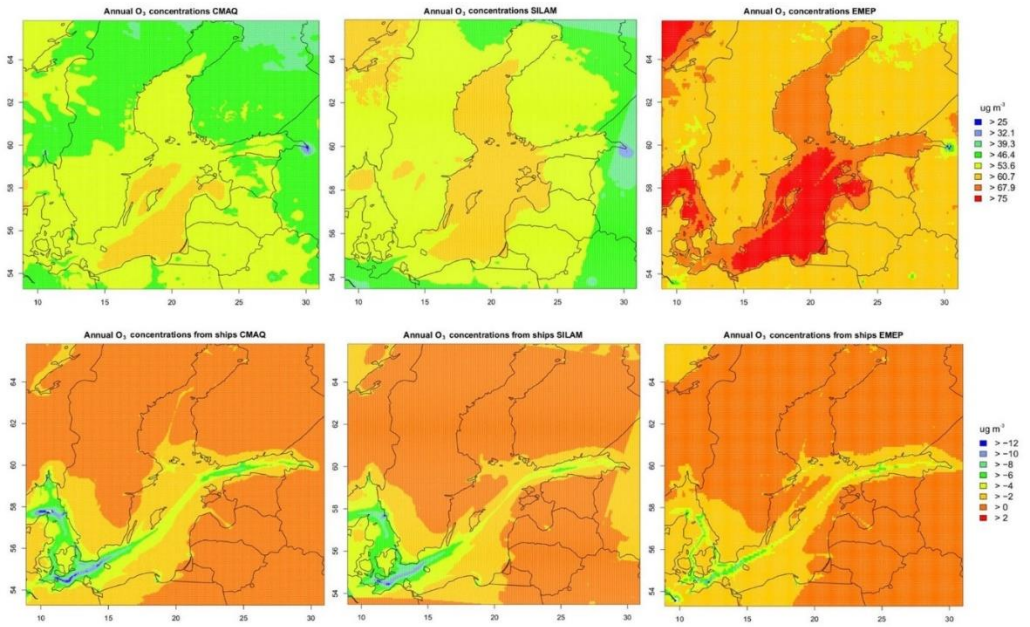


Figure 7.57. *Annual average ozone concentrations in the Baltic Sea area and average ozone concentrations reduced by ships*

Source: Karl et al. 2019 - modified

The annual average concentrations of sulphur dioxide (SO_2) range from 0.704 to 1.84 µg-m^{-3}. Considering the contribution of ships to SO_2 concentrations, they are in the range of 0.129 - 0.521 µg-m^{-3} (figure 7.58).

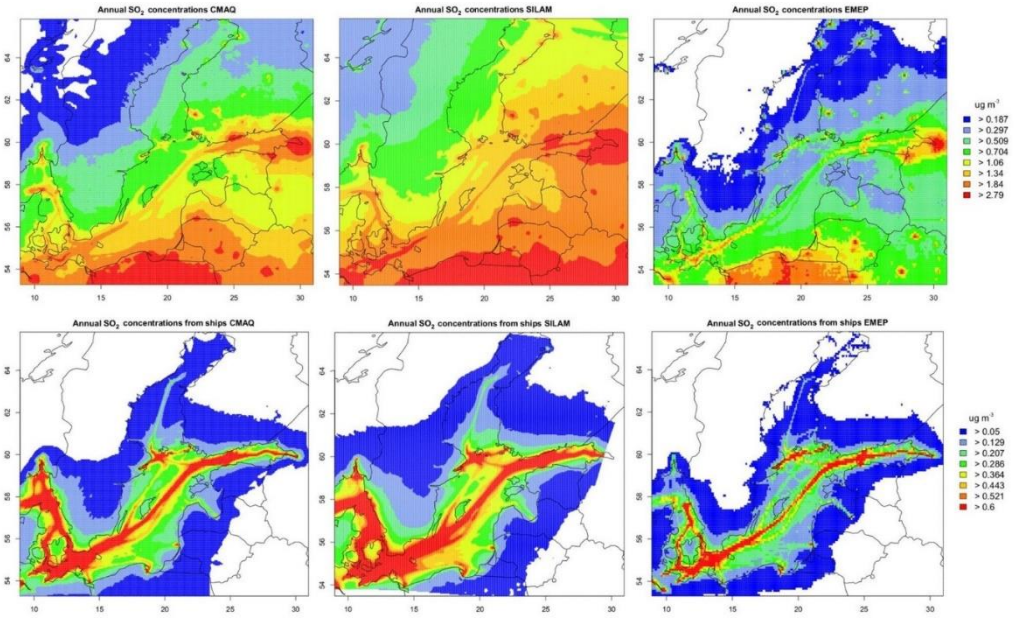


Figure 7.58. *Annual average concentrations of sulphur dioxide in the Baltic area and average concentrations of sulphur dioxide from ships*

Source: Karl et al. 2019 - modified

For particulate matter (PM2.5), the annual average concentrations range from 4.78 to 8.46 µg-m^{-3}. The contribution of ships to the aforementioned concentrations is between 0.507 and 0.621 µg-m^{-3} (figure 7.59).

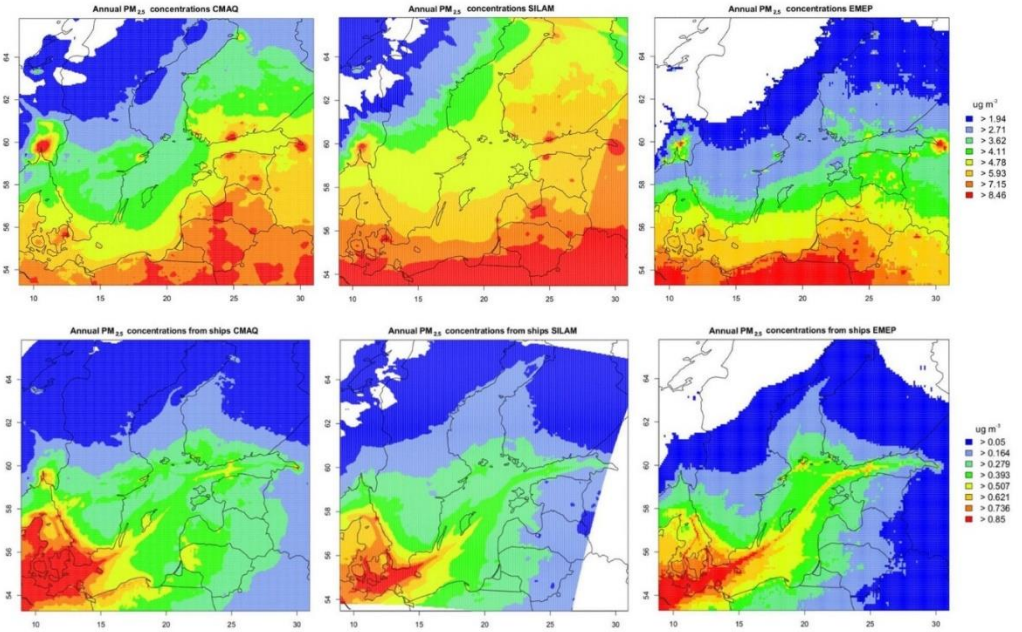


Figure 7.59. *Annual average concentrations of PM2.5 in the Baltic area and average concentrations of PM2.5 from ships*

Source: Karl et al. 2019 - modified

Taking into account the ranges of concentration values according to which the air cleanliness class for land areas is assigned, it should be concluded that in the area of the planned Project, the permissible concentration values for SO_2 (125 µg-m^{-3}), NO_2 (40 µg-m^{-3}), PM2.5 (20 µg-m^{-3}), which allow assigning a cleanliness class A to the marine area in the area of the Project, are not exceeded.

7.8. ACOUSTIC AND ELECTROMAGNETIC BACKGROUND

Acoustic background

There are two types of underwater noise in the marine environment: continuous and impulsive. Natural sources of continuous sound are mainly: wind (frequency bands 100 Hz to 30 Hz), rain (frequency bands 1kHz to 10 kHz), waves, ice and marine animals (frequency bands from a few Hz to more than 100 kHz).[208] Continuous anthropogenic noise is generated by among others marine transport, motorboat tourism or fishing. This noise is characterised by slight variations in frequency and intensity over time.[209] Sources of impulsive noise can include sounds generated, for example, during the detonation of conventional munitions, or when wind turbine foundations are driven into the seabed. This noise, on the other hand, is characterised by its short duration (temporary area loading) and high energy.[210]

The Baltic Sea is permeated by sounds of a very wide frequency range, from infrasound (< 20 Hz) to ultrasound (> 20 kHz). This body of water is considered one of the world's most congested seas, with maritime transport accounting for 15% of global freight transport. A side effect of the sea transport is an increase in underwater noise. The level of this noise depends on the spatial distribution of the ships, their type, speed and acoustic wave propagation conditions, including the characteristics of the seabed. [211]

According to the OSPAR Commission (a commission established under the Convention for the Protection of the Marine Environment of the North- East Atlantic Area), noise generated by the maritime transport can be divided according to vessel types:

- Commercial and tourist vessels under 50 m: 160-175 dB re 1µPa at 1 m; frequency from < 1kHz to > 10 kHz;
- Commercial units of medium tonnage and length between 50-100 m: 165-180 dB re 1µPa at 1 m; frequency < 1 kHz;
- Large units over 100 m; from 180 > 190 dB re 1 µPa at 1 m; frequency below 200 Hz.[212]

In the case of motorboat tourism, which consists mainly of high-speed craft, a noise level of 130-160 dB re 1µPa measured at a distance of 1 m from the noise source is generated. This level can vary by 20-40 dB depending on the class of craft, the material of the hull, the type of propulsion or, finally, the speed of the craft.[213]

The characterisation of the acoustic background in the area of the planned Project is based on data from the Chief Inspectorate for Environmental Protection (GIOŚ) used for the assessment of the state of the environment in Polish maritime areas, results from the BIAS project and research conducted by the Investor within the acoustic background monitoring in the area of the MFW Bałtyk II and MFW Bałtyk III (Volume III, Attachment 1.12).

As part of the PMS, underwater sounds have been measured since 2018 for two indicators: underwater continuous sounds and underwater impulsive sounds. Measurements are made at six monitoring stations, using SM3M hydrophones from Wildlife Acoustics. Hydrophones numbered 1-5 are located in the immediate vicinity of the fairways, except for hydrophone number 6, which is located closer to shore (figure 7.60). Recording is carried out as continuous recording with a sampling frequency of 48 kHz and an audio gain of 0 dB. From the recorded data, changes in sound pressure level (SPL) with respect to 1 µPa are extracted for the frequency bands 63 Hz, 125 Hz and 2000 Hz in the 1/3 octave band. [214]

[208] *Zalewska and Kraśniewski (ed.) 2021*
[209] *Górski et al. 2019*
[210] *Górski et al. 2019*
[211] *Mustonen et al. 2019*
[212] *Górski et al. 2019*
[213] *Górski et al. 2019*
[214] *Zalewska and Kraśniewski (ed.) 2021*

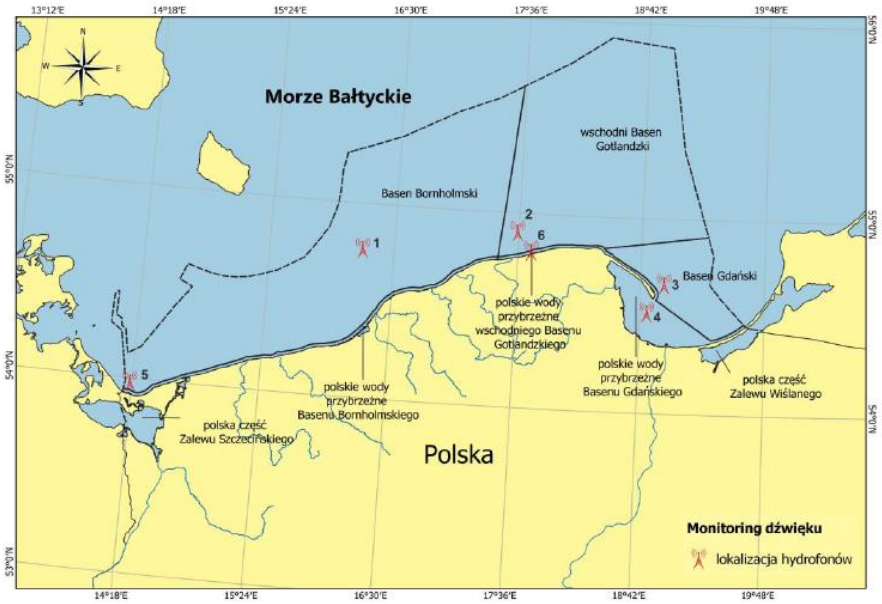


Figure 7.60. *Location of hydrophones in the Polish South Baltic area sited in 2018*
Source: Zalewska and Kraśniewski (ed.) 2021

Continuous noise

An analysis of 2020 data from Station 1, located in the Bornholm Basin, in the area of the planned Project, showed the highest annual SPL values. Due to its foundation in the fairway area, these values are a result of noise generated by shipping.[215]

The temporal distribution of the median noise level (SPL) in the 2000 Hz frequency range in the 1/3 octave band flattened markedly, stabilising over the year. The highest median noise level (SPL) in the 63 Hz frequency range in the 1/3 octave band was recorded in September (116.7 dB) and in the 125 Hz frequency range in May (113.7 dB) (table 7.28). Some occurring periodic fluctuations in sound levels are a direct result of the physical conditions of the water, natural phenomena and intensification of human activities.[216]

Table 7.28. *Noise level statistics (SPL) at 2020, station 1 in the 63 Hz, 125 Hz and 2000 Hz frequency ranges in the 1/3 band.*

Month	63 Hz in the 1/3 octave band			125 Hz in the 1/3 octave band			2000 Hz in the 1/3 octave band		
	percentile 5%	percentile 95%	median	percentile 5%	percentile 95%	median	percentile 5%	percentile 95%	median
1									
2									
3	100.5	114.1	107.8	106.6	116.1	111.0	89.7	93.1	91.2
4	89.7	102.1	95.6	92.5	104.7	96.7	87.8	91.9	89.7
5	97.2	118.0	109.6	99.4	124.7	**113.7**	88.5	103.9	94.1
6	85.4	98.9	90.8	90.6	108.7	96.6	85.6	90.9	88.4
7	90.1	99.4	93.9	92.7	102.1	96.0	84.7	87.3	85.9
8	98.5	130.9	109.2	102.0	122.0	111.7	88.1	102.7	95.0

[215] *Zalewska and Kraśniewski (ed.) 2021*
[216] *Zalewska and Kraśniewski (ed.) 2021*

9	103.0	133.8	**116.7**	99.5	122.3	111.2	85.7	101.0	87.8
10	84.7	103.4	93.1	90.2	99.5	94.5	88.0	96.1	92.9
11	100.5	129.6	115.1	95.2	119.5	103.3	90.6	104.2	95.0
12	85.9	104.7	93.8	92.1	106.2	96.7	90.6	102.5	97.9

Source: Zalewska and Kraśniewski (ed.) 2021

The highest values for noise levels in the Bornholm Basin area, throughout the measurement period, were recorded in 2018. In November and December, SPL reached 140 dB re 1µPa and more.[217]

The results of the BIAS project indicated that noise levels along the main shipping lanes oscillate at 100-130 dB re 1 µPa, while outside the lanes at 60-100 dB re 1 µPa.[218] Based on the results of this project, a level of 108 dB was proposed for the Polish maritime areas as a threshold value for continuous noise in the 95th percentile. This way it was possible to quantitatively assess the state of the environment for individual open sea areas against this criterion.[219] In the context of the assessment of environmental status against the underwater noise criterion for the Bornholm Basin, good environmental status was not achieved.[220]

Similar noise levels were recorded during the surveys carried out in the areas of the MFW Bałtyk II (in 2013-2014) and MFW Bałtyk III (in 2012-2013) (Volume III, Attachment 1.12).

Measurements were made using 6 sound recorders, distributed in the areas of the MFW fields (figure 7.61). For BII, the measurements were made at a distance of about 30 km from the nearest shipping route, for BIII - near the track.

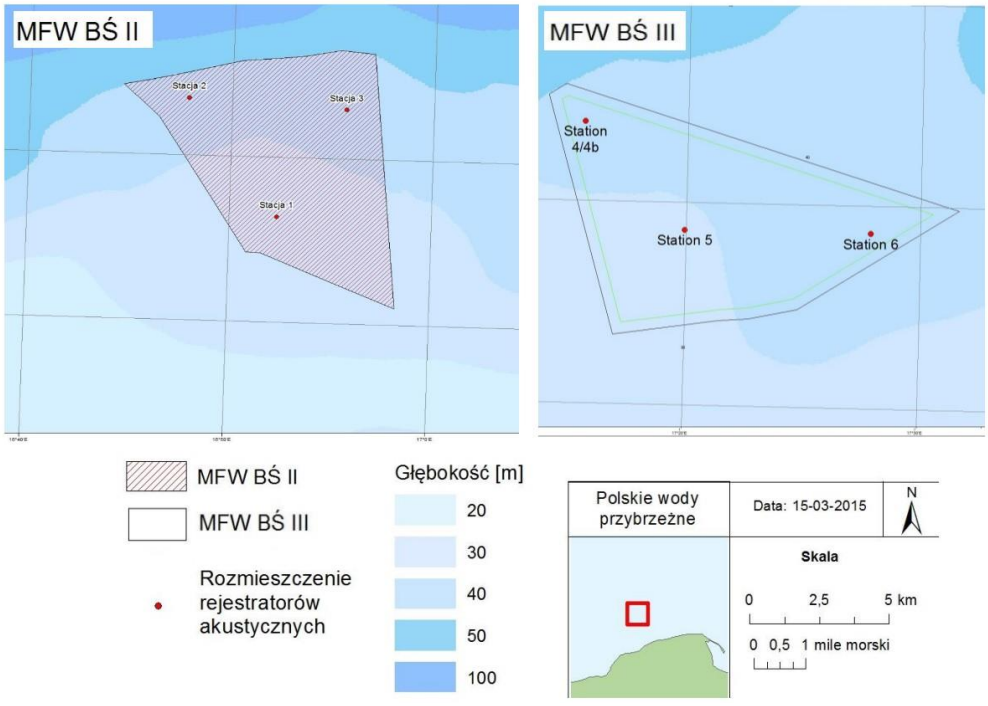


Figure 7.61. *Location of acoustic recorders in the area of the MFW Bałtyk II and Bałtyk III*

Source: In-house study based on acoustic background monitoring in the area of offshore wind farm MFW Bałtyk II and MFW Bałtyk III (Volume III, Attachment 1.12).

[217] *Draft: Update of the Sea Water Protection Program, specialized version, Ministry of Infrastructure, https://chronmorze.eu/wp-content/uploads/2021/07/Projekt-aPOWM-20210629-v1.00.pdf*
[218] *Mustonen et al. 2019*
[219] *Draft: Update of the Marine Water Protection Program, specialized version, Ministry of Infrastructure, https://chronmorze.eu/wp-content/uploads/2021/07/Projekt-aPOWM-20210629-v1.00.pdf*
[220] *Kraśniewski et al. 2018*

Values for broadband sound intensity levels in the 63 Hz - 10 kHz range were between 102 and 111 dB re 1µPa in the MFW BII area and 107 and 114 dB re 1µPa in the MFW BIII area. It was concluded that these areas are characterised by medium underwater noise pressure on the marine environment and that the background sound levels are typical for coastal areas.

In terms of the impact of noise levels on mammals, the acoustic background in the MFW area for frequencies below 10 kHz was found to have a moderate impact on resident harbour porpoises and seals. The recorded acoustic background levels do not adversely affect the use of the area by harbour porpoises.

Impulse noise

The impulse sounds are mainly related to military activities at the eight maritime training grounds located in the Baltic Sea, 5 of which are in the Bornholm Basin area (training grounds: P-32, P-33, P-34, P-20, P-21) and 3 in the Gdansk Basin area (training grounds: P-9, P-10 and P-11).[221]

As the corridor of the planned Project is located in the Bornholm Basin area and passes through Zone No. 6, which is subject to temporary exclusions for navigation and fishing due to activities at the P-20 military training ground, impulsive sounds are a significant component of the marine background noise here.

Military activities at the naval training grounds in 2020 consisted of conducting explosive detonations for national security and defence, within: artillery and rocket firing, situational shooting, bombing, submarine gun fire tasks, OPA exercises, combat grenade throwing and destruction of dangerous objects.[222]

In the Bornholm Basin, the fewest number of impulse noise days were recorded in total in 2020 in relation to the 2011-2019 multiyear period. A total of 40 events were recorded, with three types of explosion (table 7.29).

Table 7.29.*Summary of five types of explosion, with explosion energy levels for specified ranges of TNT charge quantity and including ranges of energy source level produced at the type of explosion (source of the Ministry of Defence data)*

Type of explosion	Cargo volume [TNT]	Source Level of Energy (SEL)	Number of days in 2020
Very small explosions	8 g - 210 g	210.3 dB - 224.4 dB	-
Small explosions	210 g - 2.1 kg	224.4 dB - 234.2 dB	5
Medium explosions	2.1-21 kg	234.2 dB - 244.4 dB	25
Strong explosions	21-210 kg	244.4 dB - 254.2 dB	10
Very strong explosions	Above 210 kg	> 254,2 dB	-

Source: In-house study based on:

Zalewska and Kraśniewski (ed.) 2021, Kraśniewski et al. 2018

Particularly high activity of military activities took place between 2011 and 2016. Of all the training grounds, where a total of 1,375 activities were recorded (figure 7.62), about 58% (790 days) involved the P-20 training ground, where bombing and artillery and rocket firing were the main sources of sound (table 7.30).[223]

[221] *Zalewska and Kraśniewski (ed.) 2021*
[222] *Zalewska and Kraśniewski (ed.) 2021*
[223] *Kraśniewski et al. 2018*

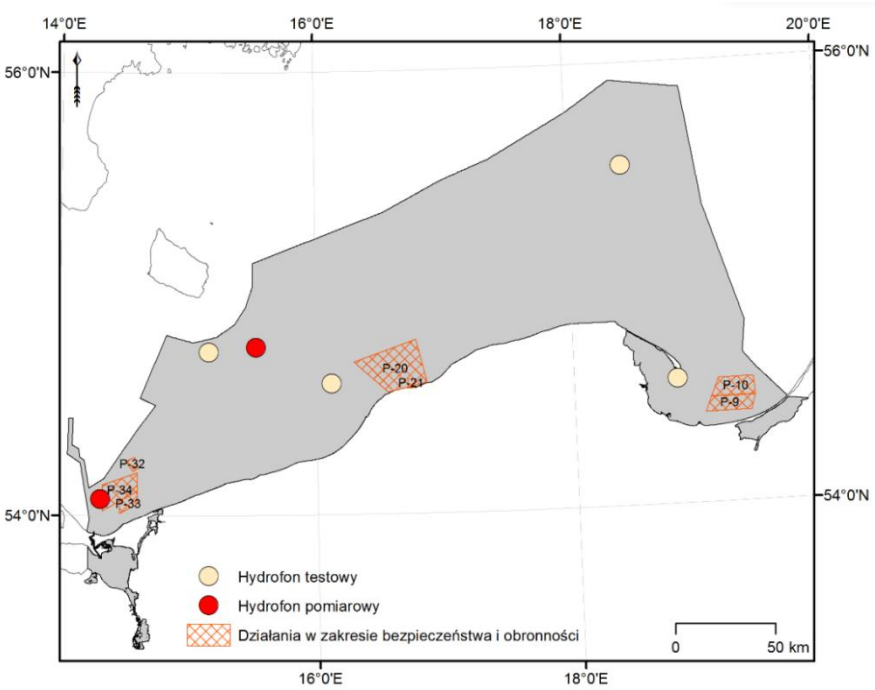


Figure 7.62. *Location of the training grounds*

Source: Kraśniewski et al. 2018

Table 7.30. *Security and defence activities in 2011-2016 within the P-20 training ground (source the Ministry of Defence data)*

Activities in the P-20 training area	Year						Final total
	2011	2012	2013	2014	2015	2016	
Bombing	16	16	18	22	22	29	133
Artillery and rocket shooting	127	137	100	98	133	72	667
Total	143	153	118	120	155	101	790

Source: Kraśniewski et al. 2018 - changed

Impulse noise causes serious disturbance to the marine environment. The lower threshold for noise causing displacement of individuals in marine faunal populations refers to a noise intensity of 210.3 dB re 1 μPa² m² s, generated during the detonation of an 8 g TNT payload. For marine animals relying on underwater sounds and having a particularly sensitive auditory system, sufficiently loud impulsive sounds can affect their behaviour (deterrence, disturbance), affect their auditory system (temporary or permanent hearing loss) and lead to physiological injury and, in extreme cases, death.[224]

With regard to the aforementioned lower noise threshold (during the detonation of an 8 g charge), a threshold value of 1 day has been proposed for impulsive sounds as the average number of exposures in a calendar year. Exceeding this value is associated with a failure to achieve good environmental status.[225] Considering the activity of military operations in the Bornholm Basin area in the period 2011-2020, in the context of the environmental assessment for underwater noise, good status has not been achieved.

[224] *Zalewska and Kraśniewski (ed.) 2021*
[225] *Kraśniewski et al. 2018*

Electromagnetic background

The electromagnetic field found in the environment can be divided into natural and anthropogenic fields. The natural, most recognisable field is the Earth's magnetic field, whose intensity varies from 30 μT (corresponding to a magnetic field strength of 24 A/m) to 60 μT (48 A/m). The average value of magnetic induction in Poland is about 47 μT. In the marine environment, the field strength is at a similar level.

The anthropogenic source of the electromagnetic field in the area of the planned Project is the cable line of the 450 kV direct current transmission system Sweden-Poland (SWEPOL Link), which runs parallel to the ECI corridor, along its western boundary, and in the area of the seashore - directly in the corridor of the planned ECI, at a length of approximately 250 m. In the marine environment, the magnetic field effects occurring around the cable must be taken into account.[226]

The value of the magnetic induction of the field generated by the cable varies with distance (figure 7.63). At a distance of 0.5 m from the cable, the value drops by half[227] , while at a distance of 2 m from the source, it is only 25% of the initial field value.

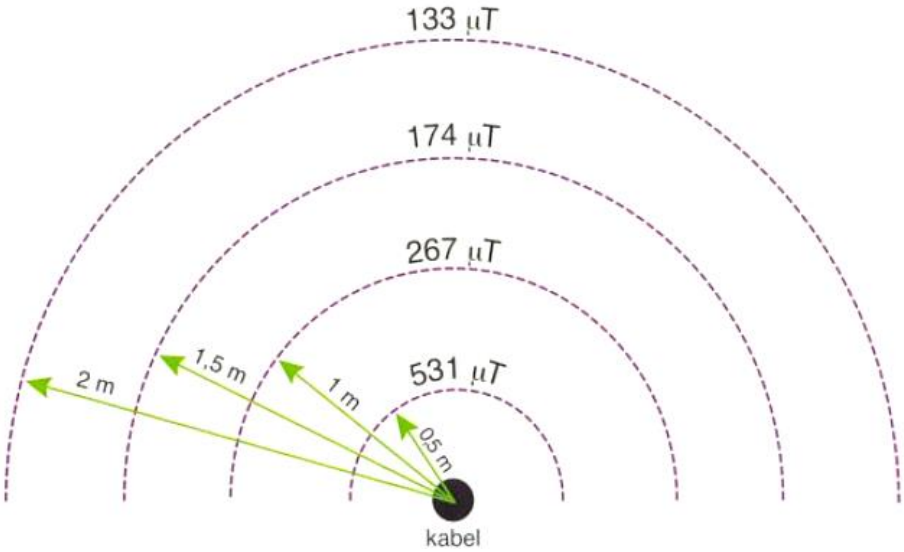


Figure 7.63. *Variation of magnetic field strength with distance from the cable with current I=1.330A*
Source: Argasińska et al. 1997 - changed

In the case of the magnetic field generated in the area of the 450 kV DC transmission system Sweden-Poland (SWEPOL Link), it is comparable to the natural magnetic field of the Earth in terms of its impact on the surroundings. At a rated current of 1330 A, the resulting field at a distance of 6 metres from the cable axis does not exceed 50μ T (figure 7.64). In the cable axis, it reaches just over 250μ T when in direct contact with the copper conductor. Compared with the permissible level recommended by the World Health Organisation of 40,000μ T, this is negligibly small - the phenomenon has no effect on living organisms.[228]

[226] *Szczepański 2013*
[227] *Argasińska et al. 1997*
[228] *Szczepański 2013*

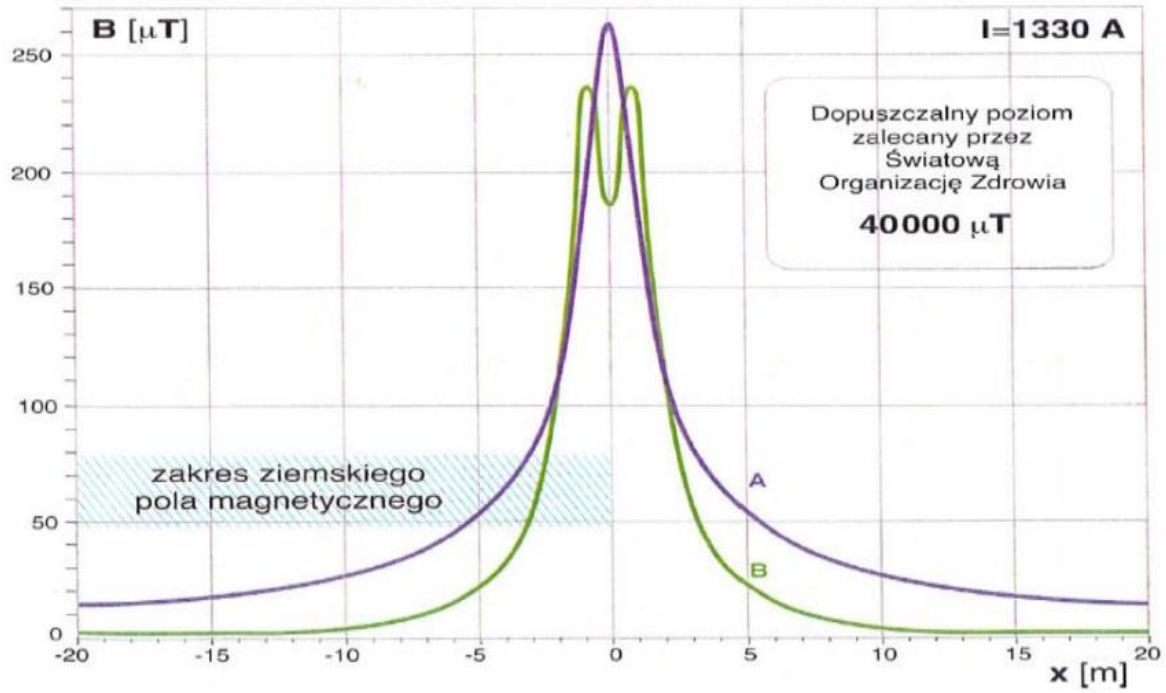


Figure 7.64. *Magnetic field in the vicinity of a DC cable line A, B - magnetic field distribution over one and two high-voltage cable lines*

Source: Argasińska et al. 1997

7.9. NATURAL AND ANTHROPOGENIC OBSTACLES

Based on the results of bathymetric, sonar, seismoacoustic and magnetic surveys conducted in the area of the planned Project in 2013-2014 (the area of the ECI, MFW Bałtyk II and MFW Bałtyk III) (Volume III., Annex 1.1, Annex 1.2., Annex 1.10., Annex 1.11), natural and anthropogenic objects were identified.

Natural objects

The majority of the selected natural objects deposited in the Project area are stone areas of varying densities and larger boulders. In the corridor area they represent 12.97% of the ECI. Within the MFW Bałtyk II field they are located in almost the entire area, while in the MFW Bałtyk III field they are located in the SW part and extend towards the NE (figure 7.65).

Anthropogenic facilities

Anthropogenic objects, i.e. fragments of damaged fishing equipment (remains of nets), logs and linear objects (cables) were found in the ECI corridor area (figure 7.65).

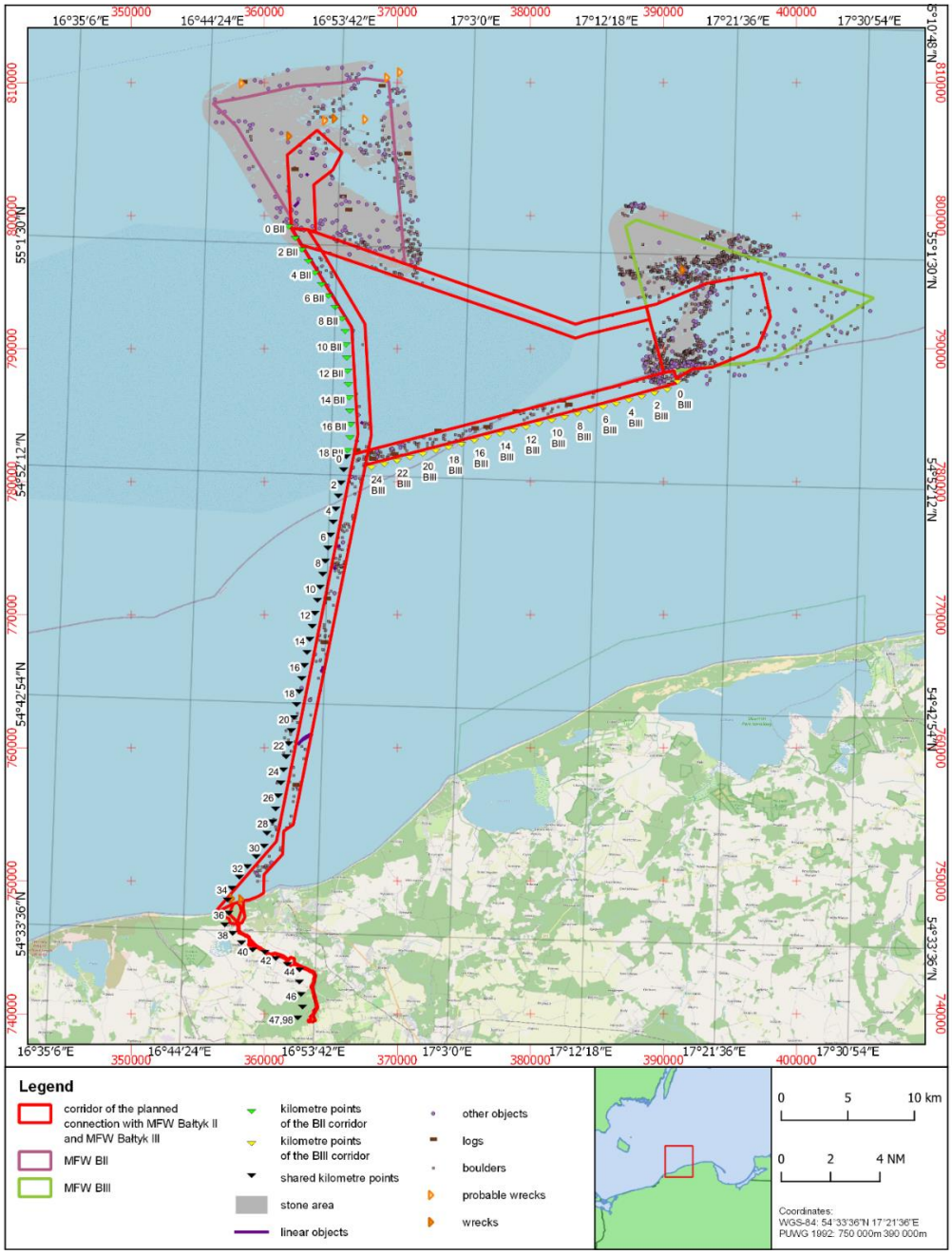


Figure 7.65. *Map of natural and anthropogenic obstacles in the ECI area*

Source: Inventory of natural and anthropogenic obstacles in the MIP area (Volume III, Attachment 1.11)

Magnetic surveys identified the seabed trench and exposed fragments of SWEPOL LINK power cables. An anomalous image was recorded on the ECI section in area 0 BII - 2 BII, indicating a lying linear object. No other signs of cables or pipelines were shown.

According to information from SIPAM, two objects occur directly within the boundaries of the ECI corridor, to a depth of 10 m. The first one is UST-83 (underwater object ID WK-0451) and the second one is unnamed (underwater object ID WK-0267) (SIPAM). Both of them are in the Inventory of Underwater Archaeological Sites of the National Maritime Museum in Gdansk and correspond to designations E.44.1 and E43.Y.1, respectively. Sonar and seismoacoustic surveys conducted in the area of the planned Project in 2013-2014 (area ECI, MFW Bałtyk II and MFW Bałtyk III) (Volume III., Annex. 1.1, Annex. 1.10., Annex 1.11) did not exclude, but also did not confirm the presence of the above mentioned wrecks. The presence of the above-mentioned potential cultural heritage objects was verified by the Pomeranian Voivodeship Conservator of Monuments and the Director of the National Maritime Museum in Gdańsk. Based on the opinions for:

- connection infrastructure for MFW Bałtyk II (Volume IV, Annex 8) issued by:
  - Pomeranian Voivodeship Conservator of Monuments with number ZA.5183.770.2022.SS, dated 18.08.2022,
  - Director of the National Maritime Museum in Gdańsk with number NMM/N-OD/ARL/2418/2022, dated 19.08.2022,

and

- Connection Infrastructure for MFW Bałtyk III (Volume IV, Attachment 8) issued by:
  - Pomeranian Provincial Conservator of Monuments with number ZA.5183.985.2022.SS, dated 27.09.2022,
  - Director of the National Maritime Museum in Gdańsk with number NMM/N-OD/ARL/2667/2022, dated 28.09.2022,

along the route of the planned Project, in the section from the offshore substation to the place where the subsea drilling is planned, there are no elements of underwater cultural heritage, which proves the absence of the above mentioned wrecks.

However, due to the possibility of encountering archaeological artefacts located in deeper seabed structures, it is necessary to proceed in accordance with the provisions of Article 32 (1)(1-3) and (10) of the Act of 23 July 2003 on the protection and care of historical monuments.

Anthropogenic objects, i.e. wrecks, parts of ships, barrels, linear objects (cables, lines, etc.) were found within the MFW Bałtyk II and Bałtyk III fields. Of the objects lying on the seabed in the area of the MFW Bałtyk II field, the closest to the northern edge of the Project area, at a depth of 31 m, is the wreck of BS2_120 (35 m long, 8 m wide). This is a steamer found in 2010 and reported to the BHMW. The wreck is badly damaged, lying on the left side, with two masts next to the hull arranged according to the tilt direction. The find has no historic value.

In the area of the MFW Bałtyk III field, in its northern part, close to the border of the Project, there is a shipwreck, tentatively dated to the beginning of the 20th century. The site is registered in the Inventory of Underwater Archaeological Sites EPSA under the symbol B96.1 and was granted a KEZA card. The wreck is approximately 60.4 metres long and 9 metres wide (remains scattered over a width of 16 metres). The wreck protrudes above the bottom from approximately 2 to 4.5 metres. The depth around the wreck is 32.5 metres and the minimum depth above the wreck is 28.0 metres. The wreck is not of high historic value and can be made available for tourist diving.

The work carried out showed that none of the identified anthropological sites lying in the area of the planned Project (the ECI and the fields of the MFW Bałtyk II and Bałtyk III) constitutes a monument of archaeological, historical or cultural value.

Facilities of a military nature with particular emphasis on torpedo and mine weapons

Geophysical surveys (bathymetric, sonar, seismoacoustic, magnetic) conducted in the area of the planned Project (Volume III, Annex 1.1., Annex 1.2., Annex 1.11.) did not indicate the presence of objects of military character, i.e. torpedoes or mine-like objects. This does not mean that there are no remnants of these weapons, unexploded ordnance and chemical weapons in the area of the Project, especially within the MFW Bałtyk II and Bałtyk III fields.

When estimating the likelihood of such finds in the future, e.g. during the implementation of the Project, it should be assumed that:

- Sea mines or mine remnants (e.g. sunken mine bodies, mine cars) may occur in the area of MFW BII and BIII with a rather high probability, as during WWI there were two anchor mine pens with more than 100 anchor mines there. The literature also reports that a significant number of anchor mines were laid to the northeast and west of Ławica Słupska without specifying the exact position. Although no episodes involving sea mines have been recorded in this area for years, it cannot be ruled out that they are not there;
- combat torpedoes and air torpedoes - although these torpedoes are relatively easy to recognise when they are unscathed, e.g. after hitting the bottom, taking into account the frequent air attacks and Russian submarine operations in the area and attacks by Russian submarines on German

convoy ships, the possibility of finding such torpedo remnants, which could be dangerous, should not be completely ruled out;

- unexploded ordnance (bombs, artillery shells) - it is unlikely that such objects are present at the bottom of the area. However, the problem with detecting them is that they are relatively small and their detection requires a detailed (very labour-intensive) survey of the bottom;
- chemical weapons, dumped munitions - although the official chemical weapons dumpsites in the Baltic are in remote locations, many elements of these weapons have been dispersed by fishermen using trawl nets. The likelihood of finding remnants is indeterminate, but it exists. This is all the more so because the shipping routes along which the chemical weapons stored in Wolgast were transported to the main storage areas located in the Bornholm Basin and Gotland Deep led along Polish shores (figure 7.66). In addition, the dumping of transported weapons took place not only in designated areas, but also in several places along the routes. One such place is Rynna Słupska located to the north of the planned Project. During the course of the CHEMESEA project, a cluster of 70 sites was identified in the area. Fourteen sub-areas (where 29 sites were identified) were classified as highly likely to contain chemical munitions. Six sub-areas (where 61 objects were identified) were classified as medium probability (due to the shape or size of the objects). The remaining sub-areas were categorised as training grounds where the probability of chemical munitions is relatively low.[229] Taking into account the location of the Project in the area of chemical weapons transport routes, it is recommended, in the event of the discharge of chemically active substances (chemical weapons), to put procedures in place and to follow them to protect people and equipment;
- dumped munitions - there have never been any official munitions or explosives sites in the area of MFW BII and BIII, so the likelihood of them occurring in the area is negligible.

Figure 7.66.*Confirmed and unconfirmed dumping zones for chemical munitions*

Source: Bełdowski et al. 2016

Taking into account the existing probability of encountering unexploded ordnance/chemical weapons in the area of the planned Project, the Investor will carry out tests for the presence of the aforementioned objects prior to the commencement of construction works. In the event that unexploded ordnance (UXO)/chemical weapons (CWA) are encountered, the Investor will inform the relevant authorities and institutions and comply with the orders issued by them.

[229] *Bełdowski and Bełdowska 2021*

8. LAND ENVIRONMENT CHARACTERISTICS

8.1. LOCATION AND TOPOGRAPHY

In terms of administration, the planned Project is located in the north-western part of the Pomorskie Voivodeship, in the district of Słupsk, in the municipalities of Ustka and Słupsk (figure 1.2, Subchapter 1.1).

Seashore

Based on the surveys and analyses conducted in the area of the planned Project in 2013-2014 (Volume III, Attachment 1.3), the shore was found to be abrasive or dynamically stabilised (accumulative). The abrasive shore extends over a distance of 237-238.75 km and the accumulative shore extends between 235 and 237 km of the shore (figure 8.1.)[230]. The width of the beach within the accumulation sections ranges from 25 to 85 m and from 15 to 50 m within the abrasive sections.

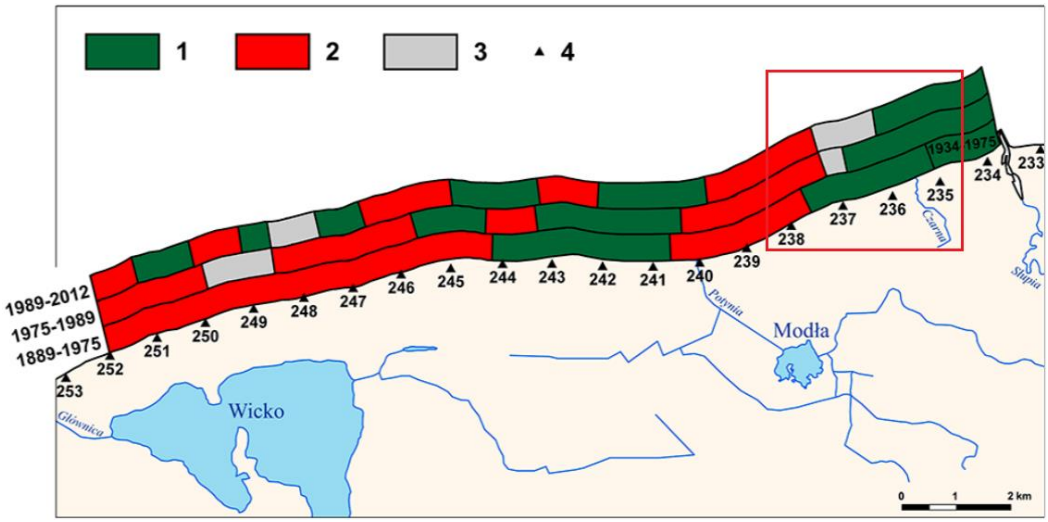


Figure 8.1. *Change in the location of accumulative (1), abrasive (2) and stable sections (3) from 1889 to 2012, 4 - shore kilometre, red box - area of the planned Project*

Source: Sitkiewicz P., Wróblewski R., Rudowski S., 2015, The dune coast – the state just prior to the construction of hard engineering protection structures (Ustka-Jarosławiec, the Southern Baltic), Oceanological and Hydrobiological Studies, 44, 3, s. 352-361 – as amended.

The sediments building up the shore are mainly medium-grained sands (average grain diameter 0.303 mm) with good sorting. In the waterline zone, the sediments are slightly coarser and their sorting is weaker. Their average diameter of 0.524 mm corresponds to coarse-grained sands.[231]

An analysis of the water line and the dune base line from 1889 to 2012 showed that persistent accumulation trends are present in the section directly to the west of Ustka (kilometre 234-237). This is related to the impact of the breakwaters in Ustka port after their expansion in the middle of the 19th century[232] [233] [234] and the construction of the so-called third pier in 1939 in the area of kilometre 235) (figure 8.2). Both the port and the pier force accumulation over a distance of about 3 km.[235]

[230] *Sitkiewicz P., Wróblewski R., Rudowski S., 2015.*
[231] *Helena Boniecka i in. 2013.*
[232] *Florek W., Florek E., 1995.*
[233] *Zawadzka-Kahlau E., 1999.*
[234] *Zawadzka-Kahlau E., 2012.*
[235] *Sitkiewicz P., Wróblewski R., Rudowski S., 2015.*

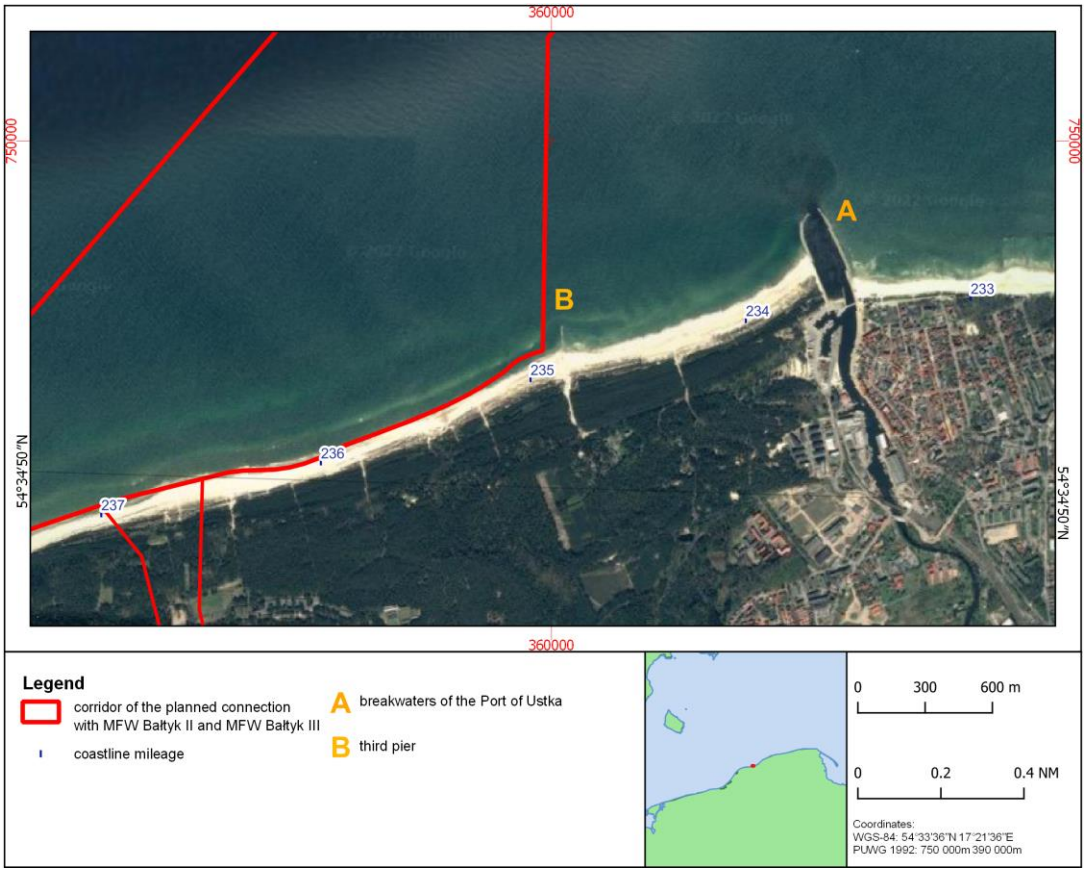


Figure 8.2. *Hydrotechnical structures of the coastal zone in the area of the planned Project*

Source: In-house study

The maximum average annual accumulation rate for the shore and dune base line was approximately +2.0 ± 0.2 m/year between 1989 and 2012 (figure 8.3). Moving further west, the shore changes into an abrasive or fluctuating development section (237-238.75 km). The maximum average annual abrasion rate for this section of shore and dune base line was -2.6 ± 0.2 m/year between 1989 and 2012. [236]

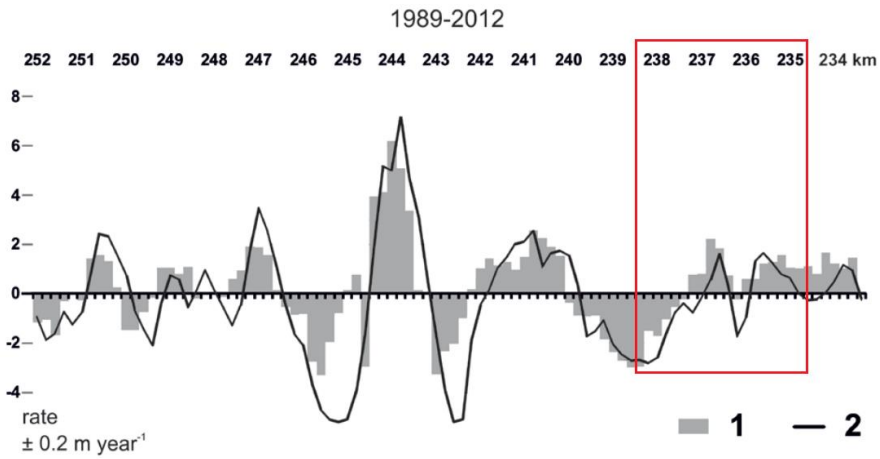


Figure 8.3. *Average annual rate of change in the position of the dune base line (1) and water line (2).*

Source: Sitkiewicz P., Wróblewski R., Rudowski S., 2015, The dune coast – the state just prior to the construction of hard engineering protection structures (Ustka-Jarosławiec, the Southern Baltic), Oceanological and Hydrobiological Studies, 44, 3, s. 352-361 – as amended

[236] *Sitkiewicz P., Wróblewski R., Rudowski S., 2015.*

An analysis of the rate of change between 2005 and 2013 showed that the average rate of the shore retreat was 0.6 m/year. Seasonal shoreline changes can fluctuate around 10 m. Based on the safety standards adopted in the Shore Protection Strategy[237], it was concluded that the shoreline does not require technical protection (Volume III, Attachment 1.3).

Waterfront

In the waterfront area, there are Lędowskie Wydmy overgrown with pine forest (figure 8.4). Morphologically, there are frontal dune ridges and vegetation-reinforced grey dune ridges, compound dunes and many single forms and groups of dunes separated by numerous depressions. In some places the aeolian forms are very fragmented, which may be due to excessive anthropogenic activity in this area (the Wicko military training ground and the Naval Training Centre).[238]

The foreshore dune ridges are arranged in a several kilometre long chain and elevated to an average of 8 m above sea level. The width of a single dune ridge is variable, ranging from 22 to 55 m. The ridges of the grey dunes, which reach 3-4 m, are higher and wider than the front dunes in some places. The highest point is the Ognica Mountain (40 m above sea level), located in the area of the rational alternative variant, western, landfall of cables. The height of the greater part of the dunes is between 20 and 25 m a.s.l. Further to the east, there are two (in some places 3 and more) regular dune ridges, the development of which is connected with the development of breakwaters in Ustka. The first one is situated 35-65 m from the shoreline, extends 22-50 m and rises 7-9.5 m above sea level. The second ridge has similar parameters, while the third one is slightly higher (up to 12 m) and smaller in width. Depressions between the dunes, which reach 25-45 m in width, occur at an ordinate of 1.7-4.0 m a.s.l. The extent of the dune ridges reaches up to 250 m from the coastline. In the part of the upper beach, there are small initial aeolian forms - embryo dunes[239]. The primary source of dune-building material is beach sediments. These are medium to fine-grained sands with good or very good sorting[240].

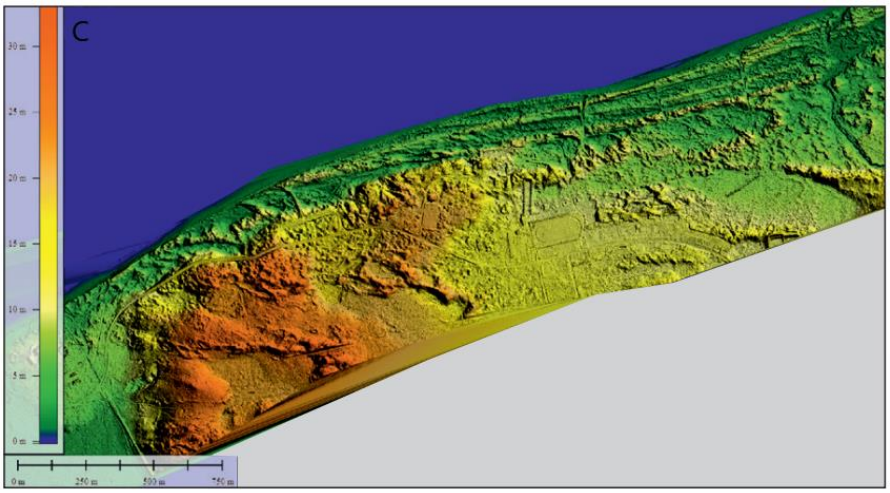


Figure 8.4. *Aeolian formations in the vicinity of Lędów – the lidar picture (2012).*

Source: Florek W., Pasamonik I., Schiefelbein L., 2016, Osady i formy eoliczne nad Zatoką Ustecką [w:] Święchowicz J., Michno A. (red.) Wybrane zagadnienia geomorfologii eolicznej. Monografia dedykowana dr hab. Bogdanie Izmaiłow w 44. rocznicę pracy naukowej, Kraków, 2016, s. 87-110 – as amended

Regionalisation

The area of the planned Project is located within two mesoregions: Wybrzeże Koszalińskie (Coast) and Równina Słupska (Plain) (figure 8.5), forming, according to the physicogeographic regionalisation, the Pobrzeże Koszalińskie macroregion.[241]

[237] *Cieślak A., 2001.*
[238] *Florek W., Pasamonik I., Schiefelbein L., 2016.*
[239] *Florek W., Pasamonik I., Schiefelbein L., 2016.*
[240] *Florek W., Pasamonik I., Schiefelbein L., 2016.*
[241] *Solon, J. i inni, 2021.*

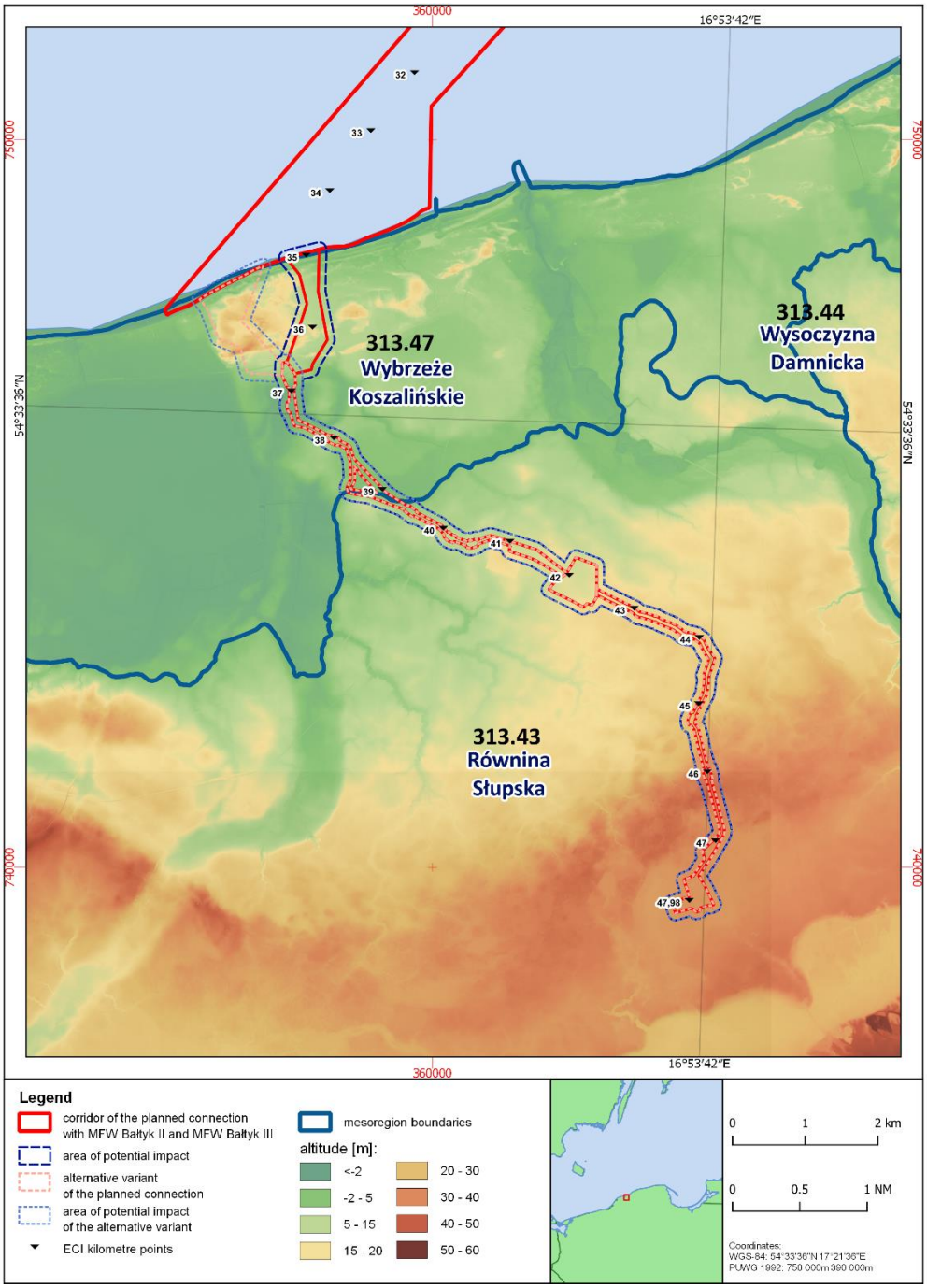


Figure 8.5. *Location of the planned Project against a background of physical and geographic units and hypsometry of the area*

Source: In-house study on the basis of Regionalna geografia fizyczna Polski, Solon, J. i inni (2021).

Wybrzeże Koszalińskie (313.47) covers a relatively narrow and strongly stretched (in latitudinal axis) belt of uplands and coastal lowlands in the north-central and north-western part of the macroregion. The mesoregion is dominated by Pleistocene, relatively low-elevation moraine uplands, generally flat and slightly undulating. There are also alluvial plains and biogenic accumulation plains and spit forms, cutting off the coastal lakes' basins. The varied relief and volatility of the surface formations have contributed to a considerable mosaicism of the soil cover. As for the land cover, apart from forests, the mesoregion's landscape is dominated by agricultural areas, with meadows, pastures and coastal lakes. The coastal zone is mainly covered by sandy beaches.

From approximately 39 km of the cable corridor, the planned Project is located in the Równina Słupska (313.43), which is situated in the central part of the Pobrzeże Koszalińskie macroregion. It is dominated by undulating moraine uplands with a local share of sand surfaces concentrated mainly along the Wieprza and Słupia valleys. On the southern border of the mesoregion, there is a share of terminal moraines, partly located within the region, where the highest altitudes, up to 120-130 m above sea level, are recorded. The region is drained by the Słupia and Wieprza rivers, flowing through wide valleys to the Baltic Sea. The lakes are few and small. The land cover is characterised by a mosaic of agricultural and forest areas. The latter prevail in the southern part of the mesoregion, but large forest complexes can also be found between Sławno and Darłowo.

The route of the planned Project is characterised by significant differences in terrain. At the point where the cables come ashore between 236.5 and 238.5 km of shore (according to the kilometerage of the Maritime Office), the beach is from about 30 to about 60 m wide.

Directly behind the beach, there is a strip of spit built over by a strip of sea dunes, so called Lędowskie Wydmy rising up to 40.4 m above sea level in some places. The background is a flat area of foreland of a flat moraine plateau of about 5 m above sea level. Then a moraine upland begins to form, with heights reaching about 36.6 m above sea level in the area of the PSE S.A. Słupsk Wierzbięcino substation.

In summary: the ongoing morphodynamic changes of the shoreline are of an oscillatory, short-term and local character; only on a long-term scale it is possible to speak of a process of shore retreat. In the area of the planned Project, there is a distinct belt-like relief of the beach, a line of dunes parallel to it, and areas of coastal lowlands and uplands behind the dunes.

8.2. GEOLOGICAL STRUCTURE AND DEPOSITS

Geological structure

The area through which the offshore transmission infrastructure runs is located in the peripheral (western) part of the Łeba elevation structural unit, where in the Cenozoic substrate, under 260 m thick series of Upper Cretaceous carbonate rocks, there are Lower Triassic sediments - the Grey Sandstone, reaching the thickness of over 200 m [242]. They are represented by sandstones and claystones of a regressive marine reservoir. Below the Triassic are Permian sediments represented by sandstones[243].

Within the Cenozoic complex, the following are present in this area:

- Eocene, Oligocene and Miocene sediments. The Eocene sediments are mainly sands, muds and clays occurring in local depressions of the Cretaceous layer. The Oligocene is represented by quartz-glauconite sands and brackish-marine water claystones and mudstones (5.4 - 49 m thick), and, in the upper part of the profile, by Miocene sands and mudstones with brown coal. In the vicinity of Pęplino, the Miocene layer is disturbed glacitectonically and uplifted to 15 m above sea level. Miocene formations often occur as xenoliths among Quaternary formations;
- Quaternary sediments are represented by 2-4 levels of glacial clays separated by water-glacial deposits (sands and gravels) and stagnation deposits (muds and clays). According to the Detailed Geological Map of Poland, sheet of Ustka244, the oldest glacial layer is the glacial till of the Warta glaciation lying directly on the Miocene subsoil. Above, there is a series of sandy and gravelly glaciofluvial deposits and locally stagnant deposits (muds and sands). Above, there are two layers of glacial clays of the upper stage of the Vistula glaciation separated by stagnation deposits (muds) and water-glacial deposits (sands), of thickness amounting to 5-10 m. The upper layer of the clays is strongly intercalated with the upper layer of the Vistula glaciation. The upper level of the clays is strongly eroded and its top lies between 0-5 m below sea level. Quaternary undifferentiated

[242] *Uniejewska M., Nosek M., 1987.*
[243] *Fuszara P., 1998.*
[244] *Uniejewska M., Nosek M., 1982.*

formations are developed here in the vicinity of Pęplin as eluviation of till, and as aeolian sands (including dunes) along the Baltic coast. The youngest Quaternary sediments are Holocene sands found in the coastal zone, as well as silts and peats.

The ECI of the MFW Bałtyk II and the MFW Bałtyk III, on land, begins in the coastal area of the sea in the area of the spit overlain by a belt of coastal dunes, the so-called Lędowskie Wydmy, rising in places to 40.4 m above sea level (figure 8.6). The further part of the infrastructure runs through a form of glacial origin - a flat moraine upland, whose relative height is 2-5 m and the slope does not exceed 2°. It is composed mainly of glacial till and glacial sands (table 8.1). However, it is interrupted in parts by formations of various origins. Thus, there are peat plains at an altitude of about 37 km of the project (counting the kilometre distance from the landfall of the infrastructure), and peat plains on sandy silts at an altitude of about 39 km. These plains are formations created by the accumulative activity of the vegetation cover. Further on, from 39.5 km, there appear fragments of glacial sands lying on stagnant clays and silts and depressions formed after dead ice, filled with peaty muds. At the level of Pęplin (approx. 44.5 km), the ECI turns south and passes through upper stagnation clays and silts, mottling, and at its end again passes through upper stagnation clays and silts as well as valley floor sands.

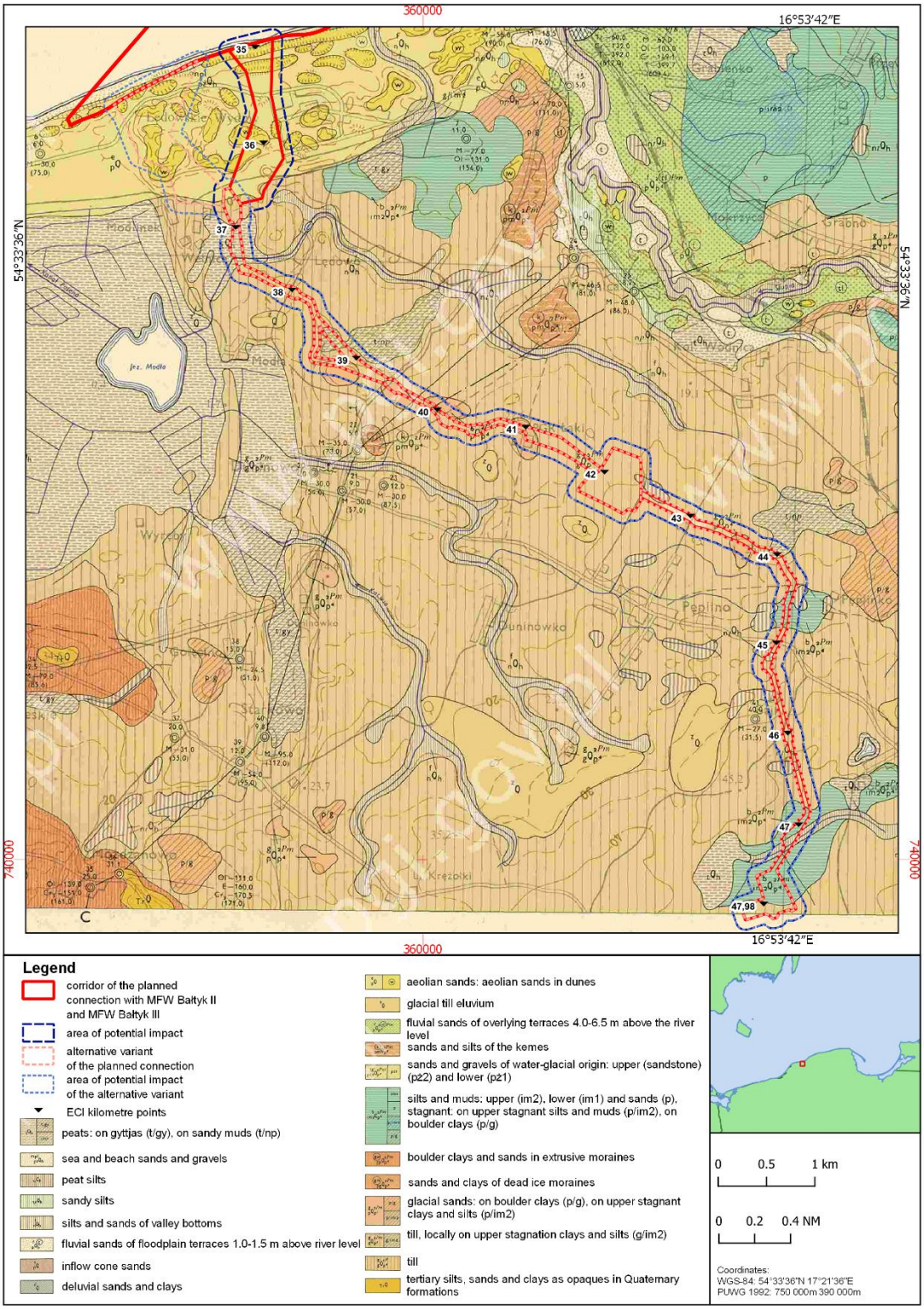


Figure 8.6. *Location of the planned Project against the background of the detailed geological map of Poland at the scale 1:50,000. Ustka Sheet*

Source: In-house on the basis of the detailed geological map of Poland at the scale 1:50,000. Ustka Sheet

Table 8.1. *Lithological separations in the corrider of the onshore part of the planned Project ECI MFW Bałtyk II i MFW Bałtyk III, according to The Detailed Geological Map of Poland at the scale 1:50,000, Ustka Sheet*

Lithological division according to The Detailed Geological Map of Poland at the scale 1:50,000, Ustka Sheet	Section of the ECI from the shoreline (operating mileage km)	Length of the ECI section (km)
Aeolian sands, aeolian sands in dunes	34.954–36.654	1.7
Glacial till	36.654–36.929	0.275
Peat	36.929–37.381	0.452
Glacial till	37.381–38.529	1.148
Peat on sands	38.529–38.820	0.291
Glacial till	38.820–39.560	0.74
Glacial sands	39.560–39.715	0.155
Glacial till	39.715–39.825	0.11
Glacial sands	39.825–40.005	0.18
Glacial till	40.005–40.812	0.807
Glacial sands	40.812–41.154	0.342
Glacial till	41.154–42.484	1.33
Peat silts	42.484–42.711	0.227
Glacial till	42.711–43.490	0.779
Glacial sands	43.490–43.724	0.234
Glacial till	43.724–43.897	0.173
Peat on sands	43.897–44.017	0.12
Glacial till	44.017–44.410	0.393
Peat muds	44.410–44.492	0.082
Upper stagnation clays and muds	44.492–44.803	0.311
Glacial till	44.803–45.084	0.281
Peat muds	45.084–45.187	0.103
Glacial till	45.187–45.544	0.357
Peat muds	45.544–45.599	0.055
Glacial till	45.599–46.282	0.683
Peat muds	46.282–46.379	0.097
Glacial till	46.379–46.776	0.397
Upper stagnation clays and muds	46.776–47.135	0.359
Muds and sands of valley bottoms	47.135–47.297	0.162
Upper stagnation clays and muds	47.297–47.921	0.624
Glacial till	47.921–47.980	0.059

Source: In-house on the basis of the detailed geological map of Poland at the scale 1:50,000. Ustka Sheet

Summary: The lithology of the near-surface layers and the depth of groundwater influence the geotechnical properties of soils especially weak and cohesive soils. Low bearing soils along the ECI route include dune and eolian sands, peats, peats on sands, peat muds, valley bottom muds and sands. These soils may make earthworks using heavy construction equipment difficult. They cover approximately 24% of the onshore connection length and occur along the entire connection route.

Resources and deposits

According to the maps of concessions for prospecting, exploration and extraction of minerals from deposits (as of June 2022), the planned Project in the onshore part is located outside the concession areas. There are no mineral deposits or mining areas within the borders of the planned project and in the area of its potential impact.

The following planned Project deposits occur in the vicinity of the potential impact area of the proposed project (MIDAS database, as of June 2022):

- Bierkowo natural aggregate deposit located over 2.8 km to the south-east of Wierzbięcino substation;
- Bierkowo II natural aggregate deposit (sand and gravel) located more than 3.3 km to the south-east of Wierzbięcino substation;
- Bierkowo II natural aggregate deposit (sand and gravel) located more than 3.8 km to the south-east of Wierzbięcino substation;
- Możdzanowo amber deposit located over 6.3 km west of the Wierzbięcino substation
- healing waters of Ustka located at a distance of more than 3.7 km in the eastern direction from the landfall;
- peat deposit located over 4.3 km to the east of the landfall.

In accordance with Resolution No. XVII.176.2012 of the Ustka Municipality Council of 30 March 2012, the northern part of the ECI of the MFW Bałtyk II and III is located in the spa protection zone ‘C’ (figure 8.7.). Raw materials and a climate with healing properties have been documented in the spa area:

- 3.43 % chloride-sodium, iodine, hypothermic brine from the deposit ‘Ustka IGH-1’;
- deposits of therapeutic peat ‘Ustka – 1’.

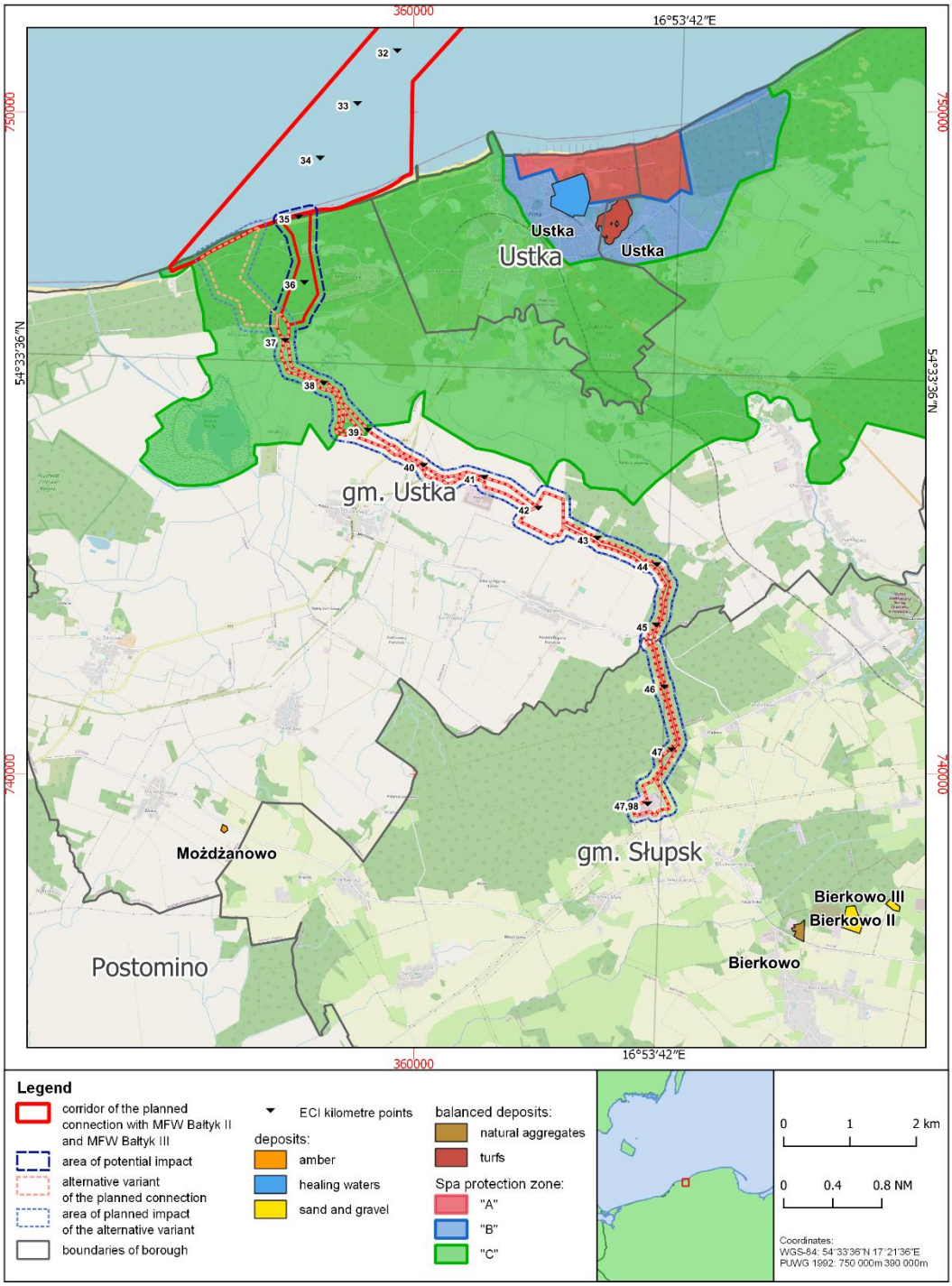


Figure 8.7. *Location of the planned Project against the background of mineral deposits and resources and spa protection zone*

Source: In-house study on the basis of OSM and MIDAS shp database

Summary: There are no mineral deposits or mining areas within the boundaries of the planned Project or in the area of the potential impact. The northern part of the ECI is located in the zone "C" of spa protection. In accordance with the Resolution No. XVII.176.2012 of the Ustka Commune Council dated March 30, 2012 on adopting the Ustka Spa Resort status in zone 'C':

- *"it is recommended to build new residential, residential-service, service, hotel, boarding house and other objects with preservation of the historical character of the town buildings occurring in the immediate vicinity of the erected object,*
- *it is recommended to paint the existing and newly constructed buildings in pastel colours."*

8.3. SOILS

Soil characterisation along the route of the planned MFW Bałtyk II and MFW Bałtyk III has been developed within the planned connection corridor and in the area of the potential impact of the Project. Soil description was prepared on the basis of agricultural and soil maps at a scale of 1:25,000, obtained from the Institute of Soil Science and Plant Cultivation in Puławy and spatial data made available by the State Forests in the Forest Data Bank (BDL).

The dominant soil types are brown earths (leached, acidic, typical), which cover approx. 40,84% of the area. There is also a large share of podsolic soils (about 17,21%) and arenosols, which cover about 14,36% of the area. Approximately 11,65% is occupied by soils within closed and forested areas, for which no data. The smallest areas along the route of the planned Project are occupied by hydrogenic soils (approx. 3,02%) and alluvial soils (approx. 0.14%) (figure 8.8).

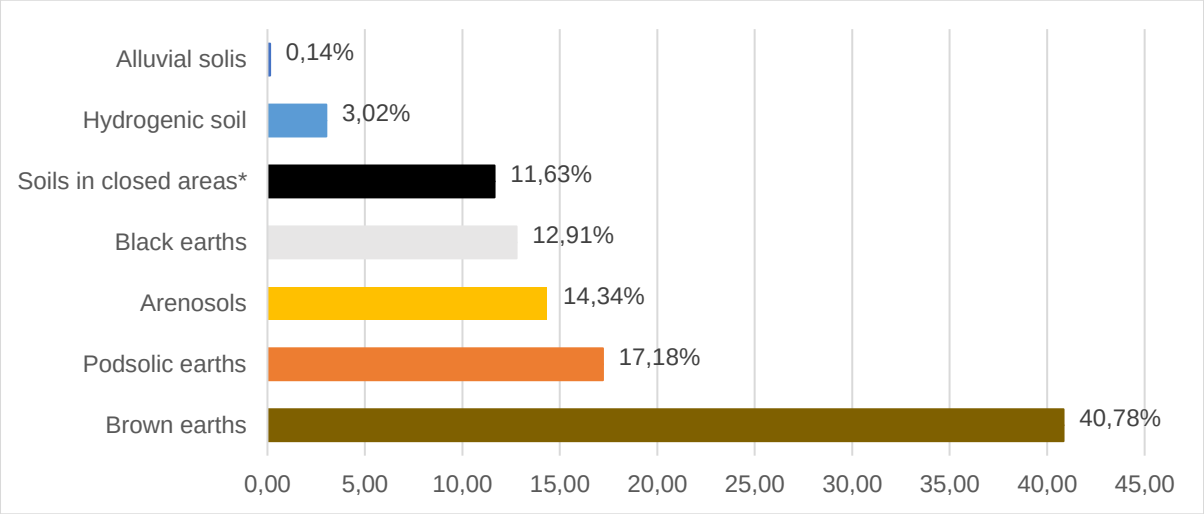


Figure 8.8. *Share of soil types within the corridor of the planned Project and in the area of potential impact*

** in closed areas or private forests, the soil type is not specified*
Source: In-house study on the basis of IUNG in Puławy and BDL.

The northern part of the planned ECI of MFW Bałtyk II and MFW Bałtyk III passes through Lędowskie Wydmy, where arenosols predominate (between 35.5 km - 36.5 km). These are poorly developed soils, the structure of their soil profile is usually simplified. These soils are a further development stage of the initial loose soils formed from sands poor in alkaline compounds. The thickness of the soil profile of arenosols is much greater than in the aeolian initial soils. With the participation of forest vegetation, these soils gradually turn into podsols. In natural conditions, they are a habitat of the coniferous vegetation. In soils of such a light granulometric composition, water is not retained, which determines dry and fresh variants of forest habitats, often dune areas, overgrown e.g. with sand ryegrass and European beach grass.[245]

The northern part is also dominated by podsolic soils, which are mostly formed on sands and gravels and occur mainly on sand dunes or floodplain terraces. The podsolic soils develop on permeable soils. They are not fertile and are among the poorest in trophic terms among mineral soils with a fully developed profile. Only arenosols can be less fertile. They occur between 35 and 37 km of the corridor, in the area of 43 and 44 km and at the PSE S.A. Słupsk Wierzbięcino substation.

The route of the planned Project mainly runs through areas covered by brown earths, which occupies about 40.84% of the surface and occurs from 37.5 km to 47 km of the corridor. Brown earths are mostly formed on clay sands and sandy clays and can be found on moraine uplands. They are moderately fertile soils. The brown earths are characterised by a wide range of pH values, from acid to neutral.

[245] *https://www.encyklopedialesna.pl*

The black earths are formed on loamy sands, moraine clays and muds and dusts of various origins and are mostly found in depressions. These soils are periodically over-wetted but not waterlogged, with a thick humus layer. These soils are intensively used for agriculture. Black earths occur mainly in the southern part of the Project and are located in the area of planned ONSs stations and existing PSE S.A. Słupsk Wierzbięciono substations from 42 km of the ECI corridor to the end of the route and in the area of 39 km.

In the river valleys, on the floodplain terraces, alluvial soils occur. In such soils, the capillary level of groundwater is high. These soils are very fertile and are intensively used in agriculture. Alluvial soils cover only 0.14% of the ECI route and can be found near the Struga Lędowska river (in the area of 38 km).

Marshy peat-mud, mud-peat, peat, muck-peat are formed in the areas without drainage. These are hydrogenic soils, which, along the route of the planned Project, are located in the vicinity of the Struga Lędowska river and the canals and drainage ditches (table 8.2.). Peat and muck soils (marshes) usually develop near open water bodies. In the soil characteristics special attention has been paid to hydrogenic soils as the most sensitive soils to potential impacts of the planned Project (opening of a trench, dewatering of excavations). This type of soil is particularly sensitive to thermal impacts and changes in water conditions, and at the same time it is a habitat for valuable species of flora and fauna and an important water retention component of the environment.

Table 8.2. *Types and location of hydrogenic soils within the planned connection corridor and in the area of potential impact of the MFW Bałtyk II and Bałtyk III*

No.	Kilometrage of the ECI corridor	Type of soils	The nearest stream
1.	37	peat-mud and mud-peat soils	Struga Lędowska
2.	38	muck-mineral and muck soils	drainage ditch
3.	46	muck-mineral and muck soils	drainage ditch
4.	46,7	peat and muck-peat soils	drainage ditch

Source: In-house study on the basis of IUNG in Puławy and BDL.

The location of the planned Project against the background of different soil types is shown in the map below (figure 8.9.).

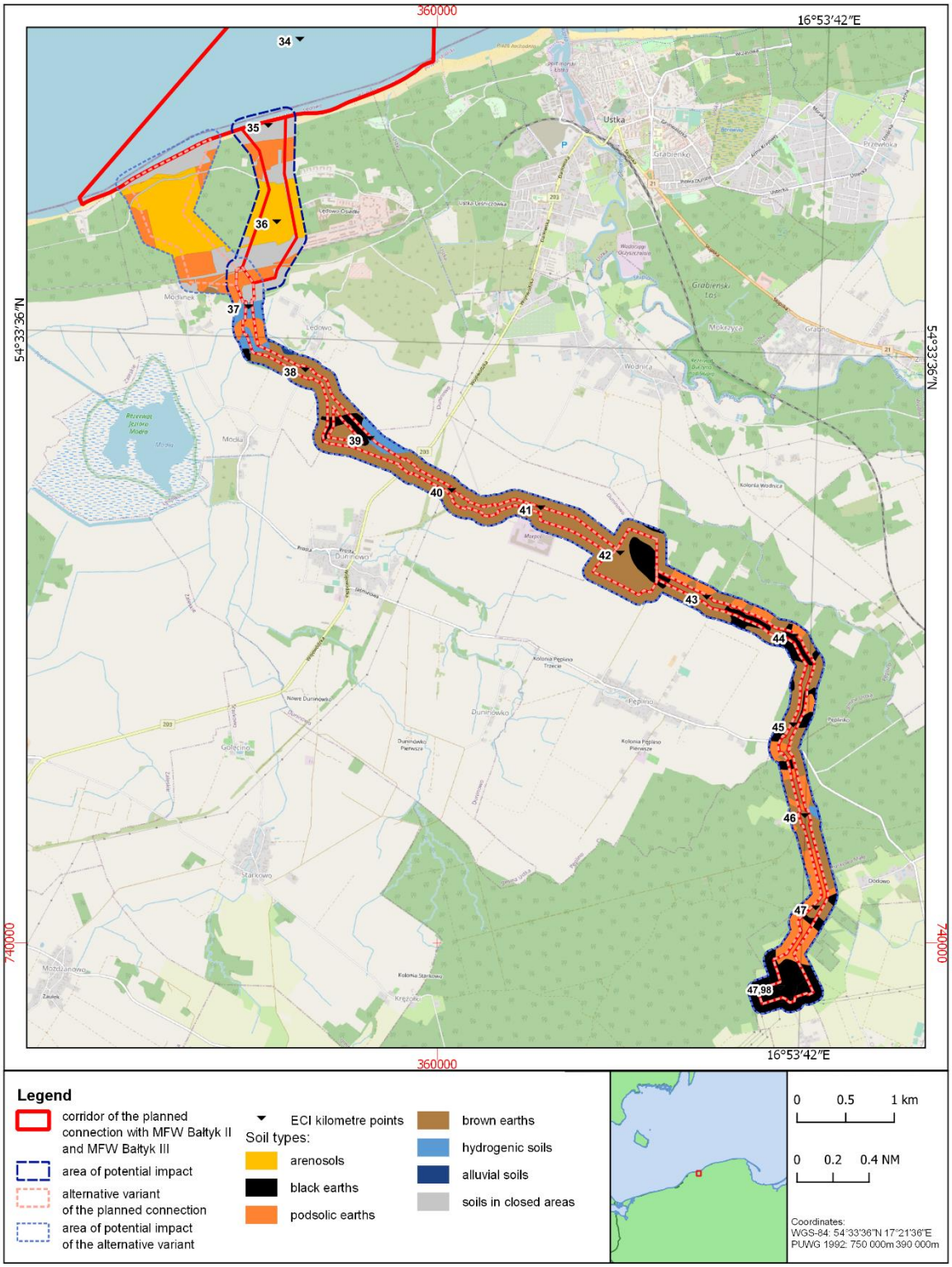


Figure 8.9. *The planned Project against the background of soil types*

Source: In-house study on the basis of IUNG in Puławy and BDL.

The route of the planned Project runs through agricultural areas. It covers about 41.7% of the area. The soils in the agricultural areas can be classified as moderately fertile; there are six agricultural complexes (according to the Polish arability classification) in the area, of which the largest area is occupied by the good wheat complex (figure 8.10).

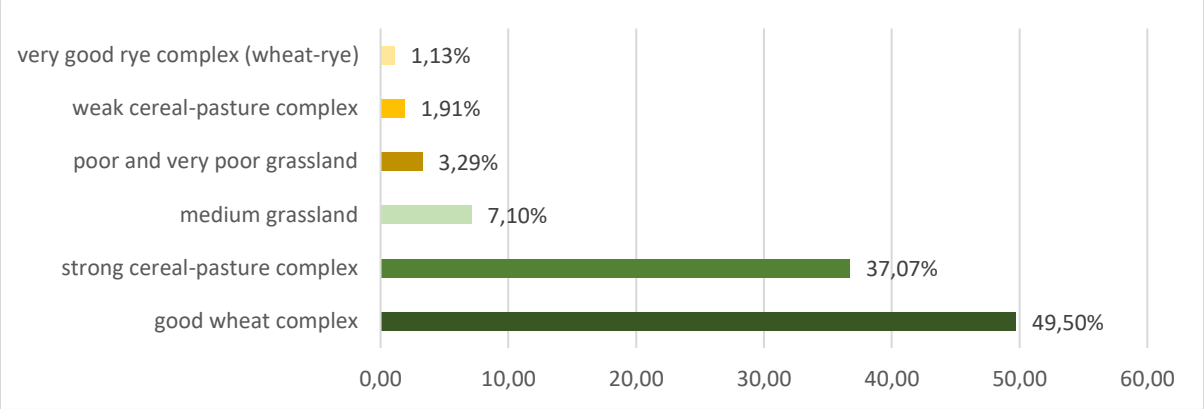


Figure 8.10. *Share of agricultural complexes within the borders of the planned connection corridor and within the area of potential impact of the MFW Bałtyk II and Bałtyk III*

Source: In-house study on the basis of IUNG in Puławy

Located in the ECI corridor the soils used for agriculture are mostly good wheat complex, of soil quality class: II, IIIa and IIIb[246]. There is also a significant share of soils of the strong cereal-pasture complex(IIIb and IVa quality class). The smallest share of agriculturally used soils belongs to the very good rye complex - about 1.14%, (IIIb rating class) and weak cereal-pasture complex - about 1.92%, (IVb and V quality class). Low grasslands are located in V and VI soil quality class, whereas medium grasslands in III and IV - together they cover 10.44% of the agriculture area (figure 8.11).

[246] *The quality class determines the agricultural suitability of the soil.*

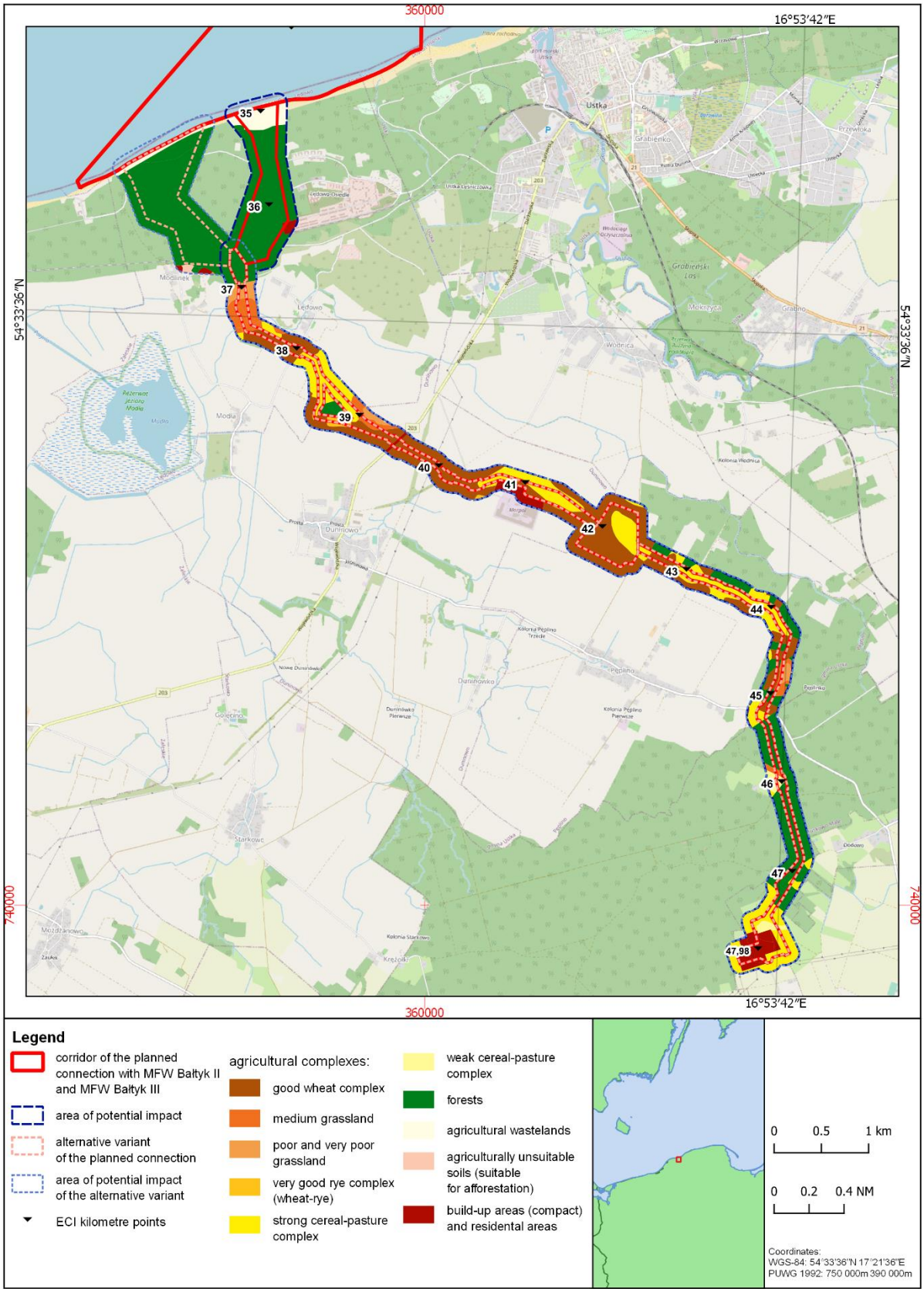


Figure 8.11. *Agricultural complexes occurring within the boundaries of the planned ECI and its impact area*

Source: In-house study on the basis of IUNG in Puławy

In conclusion: along the route of the planned Project, the following have been identified:

- hydrogenic soils of the mud, peat and muck type (approx. 3,02%) which have low resistance to disturbances of the soil profile and the balance of water relations and contamination;
- arenosols i.e. soils in the coastal zone with low resistance to pollution and are sensitive to wind erosion (approx. 14% in the ECI corridor);
- fertile soils such as: black earths and alluvial soils(approx. 13% in the ECI corridor);
- moreover, in the ECI corridor there are soils of good wheat complex of II, IIIa and IIIb quality class.

8.4. SURFACE WATER, GROUNDWATER AND FLOOD RISK

8.4.1. Surface waters

The route of the planned ECI corridor of offshore wind farms MFW Bałtyk II and MFW Bałtyk III will cross two watercourses and water facilities that carry water periodically or episodically. The rivers and canals, which carry water constantly, were selected on the basis of the Hydrological Zoning Map of Poland, Hydrographic Atlas of Poland and satellite images. Subsequently, the field verification was carried out.

The provisions of the Regulation of the Minister of Infrastructure of 16 November 2022 on the Water Management Plan for the Odra River Basin Area (Journal of Laws 2023.335 of 2023.02.23) were also taken into account.

The northern part of the route of the planned Project is partly delimited by a wetland, with a hydrographic network that primarily includes (figure 8.12):

- the Struga Lędowska watercourse,
- the Pogorzeliczka watercourse,
- drainage ditches.

The hydrographic network in this area is in the catchment of the Modla lake, located approximately 900 m to the west of theboundary of the Project corridor.

The planned Project will cross the Struga Lędowska and Pogorzeliczka watercourses. The watercourses, including drainage ditches, are in various states of maintenance. Some of them carry water periodically or episodically.

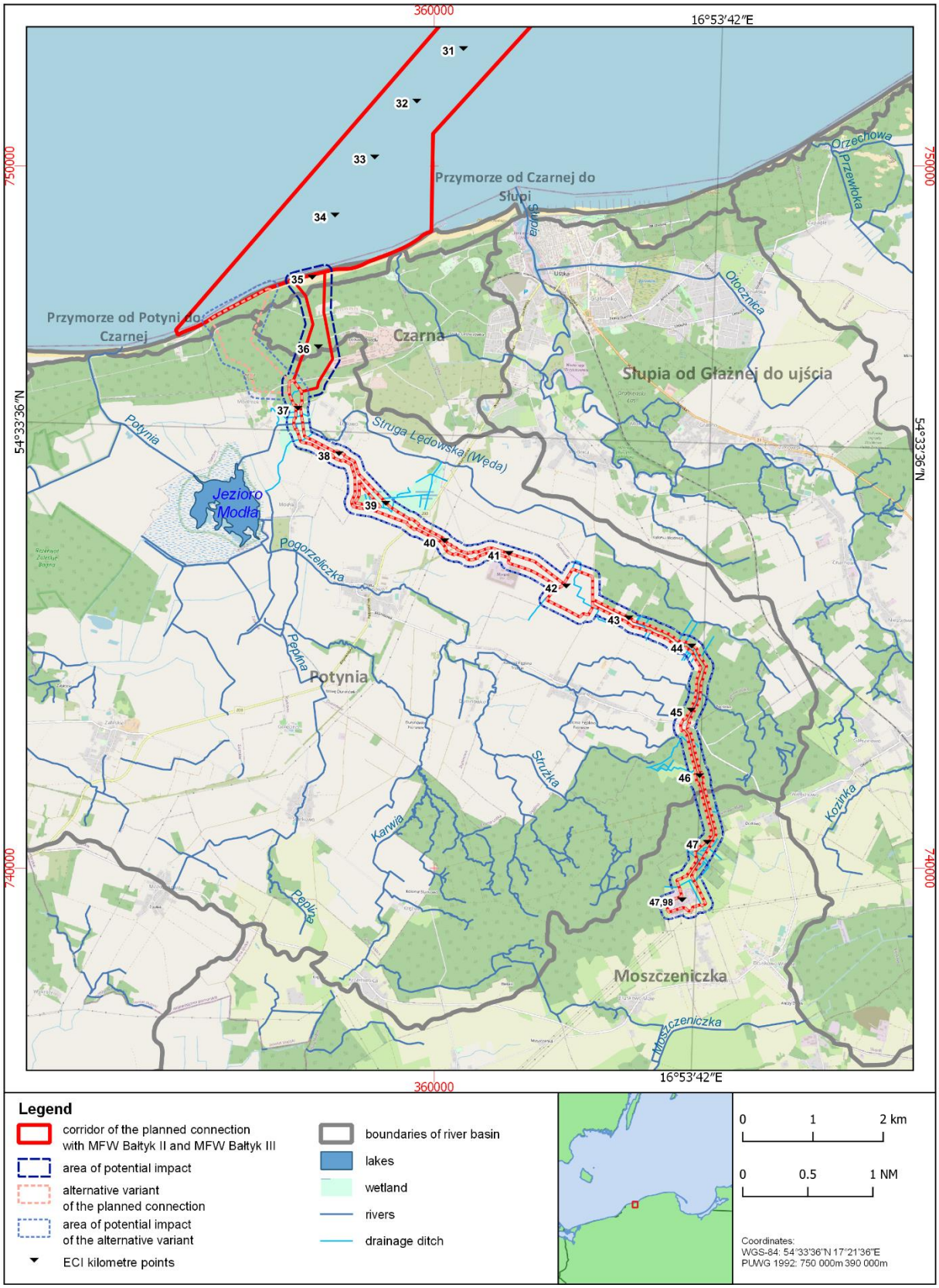


Figure 8.12. *Hydrographic network in the area of the planned Project*

Source: In-house study based on the Hydrological Zoning Map of Poland, BDOT10k, geoportal.gov.pl

Przymorze from Potynia to Czarna

In the area of 35 km the planned Project's corridor crosses the coastal zone. This is a direct catchment area of the sea with no flowing surface water.

Potynia and Czarna

The western variant of the Project's corridor crosses the catchment of the Potynia river. No watercourses were identified within the Project corridor. Between 35,1 km m and 36 km (of the eastern variant) the corridor crosses the catchment of the Czarna river. No watercourses were identified within the corridor of the planned Project.

Struga Lędowska (Węda)

It is a small watercourse flowing into the Modła lake, about 11 km long and with a channel width of about 1.5 m. The catchment area is about 12.8 km^2. The place of the planned crossing through the Struga Lędowska watercourse is regulated (embanked) - Photo 8.1.

Photo 8.1. *Struga Lędowska (Węda) in the area of the ECI of MFW Bałtyk II and Bałtyk III crossing*
Source: EKO-KONSULT Sp. z o.o.

Struga Lędowska is an unmonitored watercourse in terms of water quality and flow values. In the Water Management Plan for the Odra River Basin (Regulation of the Minister of Infrastructure of 16 November 2022, Journal of Laws 2023.335 of 2023.02.23), Struga Lędowska was separated from the water body, as a result of which environmental objectives were not set for it. However, referring to the no longer valid version of the 2016 document, on the basis of data for the water body RW60001046549 Karvina, to which the Struga Lędowska watercourse belonged, the water quality is below good.

The corridor of the planned Project will cross Struga Lędowska at 37.2 km. The corridor area of the planned Project within the Struga Lędowska catchment is about 27 km^2. The corridor is located in the northern (lower) and eastern part of the catchment area.

Kanał (Canal) A

In an area of 37.4 km, the corridor of the planned Project crosses Kanał A, which flows into the Modla lake.

Pogorzeliczka

It is a small watercourse flowing into the Karwina river, about 4.4 km long and with a channel width of about 1.5 m. The catchment area of the Pogorzeliczka is approximately 12.8 km^{2}s. A site inspection carried out on 19 May 2022 confirmed that the river does not carry water during rainless periods.

In the place of the planned crossing of Pogorzeliczka, the watercourse is unregulated - Photo 8.2

Photo 8.2. *Pogorzeliczka in the area of the ECI of MFW Bałtyk II and Bałtyk III crossing*

Source: EKO-KONSULT Sp. z o.o.

In the second update of the Vistula River Basin Management Plan, the Pogorzeliczka watercourse, code RW6000104716129, was identified. A monitoring point was designated in the water body. Based on the results of the 2016-2021 survey, its status was classified below good. Both biological and chemical indicators were exceeded.

The corridor of the planned Project will cross the Pogorzeliczka at approx. 44.7 km.

Modła lake

The surface area of the Modła lake is about 56 ha[247] , while the average depth is 0.5 m. It is a flow-through lake, which is fed by watercourses: Karwia, Pogorzeliczka, Struga Lędowska, mainly regulated, as well as ditches and canals (Kanał 4 Duninowo, Kanał A). The basin of the lake is surrounded by wetlands. The catchment area of the reservoir is about 26.9 km^2. In terms of land use, agricultural and forest areas, as well as wetlands, dominate. The Potynia river, about 2.6 km long, flows out of the Modła lake and provides a direct connection between the lake and the Baltic Sea.

The Modła lake and the surrounding wetlands are under nature reserve protection. The border of the reserve is located at a distance of approx. 800 m from the border of the planned Project (figure 8.13). The purpose of protection in the reserve is to preserve the ecosystem of the eutrophic lake together with its characteristic biotopes, biocenoses and processes, in particular populations and habitats of water and wetland bird species.

The Modła lake is also located within the boundaries of the Natura 2000 special protection site Przymorskie Błota PLH220024, where eutrophic water reservoirs are among the objects of protection. The reservoir is sensitive to changes in water relations or individual components of the hydrographic network, which may cause changes in the water chemistry and, consequently, in the abundance and species composition of fauna and flora.

[247] *Source: Hydrographic Map of Poland*

Moszczeniczka

It is a watercourse flowing into the Wieprza river, about 18.9 km long and with a channel width of about 2 m. The catchment area of the Moszczeniczka is about 68.5 km^2.

The Moszczeniczka is an unmonitored watercourse in terms of water quality and flow values. Water quality data for the water body PLRW60001746729 Moszczeniczka, to which the watercourse belongs, was obtained on the basis of transfer of monitoring results for WB PLRW6000174714149 Klasztorna and Świdnik - the water quality level falls below good.

The corridor of the planned project is located in the northern part of the catchment and is characterised by an extensive network of drainage ditches in the basin of the Moszczeniczka, but does not cross the main channel of the watercourse.

Wetlands and drainage ditches

The route of the corridor of the planned Project, at its 37 km, runs south through wetlands. There are drainage ditches with a total length of approximately 540 m in the corridor of the planned Project in this area. The field inspection (19 May 2022) confirmed that they do not carry water.

In the region of 39 km, the eastern corridor of the planned Project crosses wetlands for approximately 500 m, while in the western variant it is routed along the southern border of the wetlands. In addition, a drainage ditch is crossed in the eastern course of the wetland crossing. The western corridor of the planned Project is routed along the drainage ditch at a distance of approximately 300 m.

Surface waters - surface water bodies

The provisions of the Water Law Act (Journal of Laws 2022.2625, consolidated text, as amended) apply to inland waters and internal sea waters.

The planned Project is located in the Odra river basin area, for which the *Odra River Basin Management Plan* was developed, adopted by the Regulation of the Council of the Minister of Infrastructure of 16 November 2022 (OJ.U.2023.335). The water bodies through which the route of the planned Project is delineated are located in the Oder River Basin, in the Lower Oder and Western Pomerania Water Region.

The corridor of the planned Project includes fragments of 6 catchments of surface water bodies (water bodies) - coastal water bodies (CWB) and direct catchment of the sea from Potynia to Czarna (CWD), and river surface water bodies (RWB) (figure 8.13):

- CW20001WB2 Polskie wody przybrzeżne Basenu Gotlandzkiego (located in the area of the Wisła river basin)
- CW60001WB3 Polskie wody przybrzeżne Basenu Bornholmskiego
- RW60002247169 Potynia,
- RW6000104716129 Pogorzeliczka
- RW60001746729 Moszczeniczka,
- LW90084 Modła.

Due to the proportion of the area and the scale of interference caused by the planned Project in the catchment area of individual water bodies, it is predicted that effects and impact on the possibility of achieving environmental objectives will occur mainly in the following water bodies:

- CW60001WB3 - Polskie wody przybrzeżne Basenu Bornholmskiego
- RW6000104716129 Pogorzeliczka,
- RW60001746729 Moszczeniczka,
- LW90084 Modła (including the catchment area of Struga Lędowska, flowing into Modła Lake).

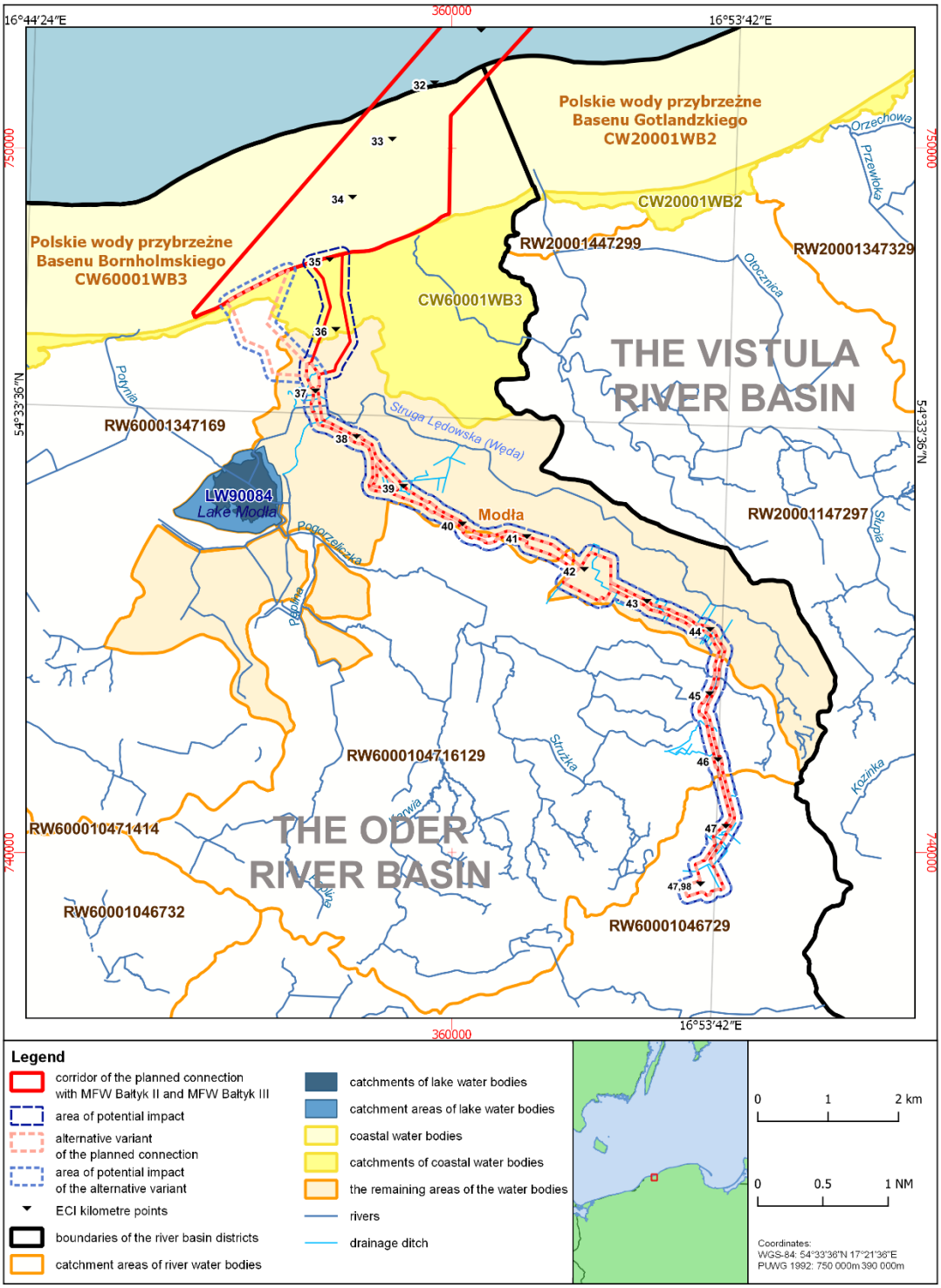


***Figure 8.13**. Planned Project on the background of the catchment areas of coastal and surface water bodies*

Source: In-house study on the basis of apgw.gov.pl

The following table presents the ecological status/potential, chemical status and general status of the water bodies within which the planned Project is located (table 8.3)

Table 8.3. *Status of the surface water bodies with risk assessment of failure to achieve environmental objectives*

Type	Name	WB Code	WB State	Assessment 2016-2021			Assessment of progress – achievement of environmental objectives		
				Ecological status/potential status	Chemical status	General status	Assessment of progress – ecological status/ecological potential	Assessment of progress – chemical status	Assessment of the risk of not achieving the environmental objective
Coastal	Polskie wody przybrzeżne Basenu Bornholmskiego	CW60001WB3	NAT	poor	below good	bad	Goal not achieved - no progress	Impossibility to assess progress	at risk
River	Pogorzeliczka	RW6000104716129	NAT	bad	below good	bad	Goal not achieved - no progress	Goal not achieved - deterioration to bad state	at risk
River	Moszczeniczka	RW60001046729	NAT	bad	data not available	data not available	Goal not achieved - deterioration to bad state	Impossibility to assess progress	at risk
River	Potynia	RW60001347169	NAT	moderate	good	bad	Goal not achieved - deterioration to bad state	Goal not achieved - deterioration to bad state	at risk
Lake	LW90084 Modła	LW90084	NAT	bad	below good	bad	Impossibility to assess progress	Impossibility to assess progress	Not at risk
Not applicable	Struga Lędowska	Not applicable	Not applicable	bad	below good	bad	Not applicable	Not applicable	Not applicable

** Assessment based on the transfer of monitoring data*

Source: In-house study based on https://wody.gios.gov.pl/pjwp/publication/RIVERS/88 : https://wody.gios.gov.pl/pjwp/publication/LAKES/87 https://wody.gios.gov.pl/pjwp/publication/COAST_WATERS/108

River water body RW6000104716129 Pogorzeliczka

The connection route leads through the eastern part of the JCWP RW6000104716129 Pogorzeliczka catchment, crossing Pogorzeliczka in the upper reaches, and then parallel to the eastern border of the catchment. The watercourse belongs to the RWB river type sandy lowland stream or brook. The RWB has been designated as a natural body of water.

The environmental objective for this RWB is good ecological status and good chemical status, and the achievement of this goal was considered threatened.

The RWB catchment area is sensitive to eutrophication caused by pollution from municipal sources, understood as water enrichment with nutrients, in particular nitrogen or phosphorus compounds.

In the RWB catchment area, protected areas have been designated for the protection of habitats or species for which maintenance or improvement is an important factor in their conservation. For the Modła Lake reserve, environmental objectives have been set, including: preservation of the eutrophic lake ecosystem along with its characteristic biotopes, biocenoses and processes, in particular populations and habitats of wetland bird species. For the Pas Pobrzeża na Zachód od Ustki protected landscape area, the environmental objectives set include, m.in. preservation of a distinctive landscape with diverse ecosystems, preservation and protection of surface water ecosystems (natural and artificial, flowing and stagnant, including oxbow lakes) together with the surrounding vegetation belt, as well as preventing the lowering of the groundwater table, in particular by limiting the construction of drainage devices and drainage ditches. For the Natura 2000 PLH220024 Przymorskie Błota site, the environmental objectives include m.in maintaining a high degree of water quality of habitats. For the Kraina w Kratę w Dolinie rzeki Moszczeniczki the environmental goal is i.a. to protect the natural values of the Moszczeniczka river valley in its natural fields.

River water body RW60001746729 Moszczeniczka

The connection route leads through the north-eastern part of the RWB river RW60001746729 Moszczeniczka. The main watercourse flows into the Wieprza, which has an outlet in the Baltic Sea. The corridor of the planned Project is located north of Moszczeniczka, almost 2 km away. The environmental objective for this RWB is good ecological status and good chemical status, and the achievement of this goal was considered threatened.

Surface water body RW60001746729 Moszczeniczka belongs to the RWB type sandy lowland stream or brook. The RWB has been designated as a natural body of water. The RWB catchment area is sensitive to eutrophication caused by pollution from municipal sources, understood as water enrichment with nutrients, in particular nitrogen or phosphorus compounds.

In the RWB catchment area, protected areas have been designated for the protection of habitats or species for which maintenance or improvement is an important factor in their conservation. For the Natura 2000 Dolina Wieprzy and Studnicy PLH220038 sites, environmental objectives have been set i.a. including maintaining or restoring the maintenance or restoration of proper conservation status, proper conservation status of fish species protected in the area, maintenance of ecological continuity and hydromorphological quality. Appropriate conservation status of lobelia lakes (3110), oxbow lakes and natural eutrophic water bodies (3150), natural dystrophic water bodies (3160), lowland and submontane rivers with trichloride communities (3260), raised bogs (7110), transitional bogs and quaking bogs (7140), calcareous springs (7220), mountain and lowland alkaline bogs with the character of thresh, sedge and moss bogs (7230), swampy forests and forests (91D0), willow, poplar, alder and ash riparian forests (91E0). For the Kraina w Kratę w Dolinie rzeki Moszczeniczki, the environmental goal is, m.in to protect the natural values of the Moszczeniczka river valley in its natural fields. The RWB is also designated as an area for aquatic animal species of economic importance – sea trout.

Lake water body LW90084 Modła

The Planned Project is located approximately 800 m from the direct catchment of JCWP LW90084 Modła. The route of the Proposed Project is also located in the Struga Lędowska drainage basin adjacent to Modła Lake.

The direct catchment area of JCWP LW90084 Modła is approximately 11,7 km^2. The following rivers flow into the lake: RWB RW6000104716129 Pogorzeliczka and Struga Lędowska brook, while a watercourse that flows out of the lake is RWB RW60001347169 Potynia, which flows into the Baltic Sea.

The water body LW90084 Modła is unmonitored. The assessment of its status was made on the basis of monitoring data and pressures identified for water bodies with similar parameters (such as catchment area and use).

The environmental objective for this waterbody is good ecological status and good chemical status. No derogations have been designated.

The entire catchment area of the waterbody is an area sensitive to eutrophication caused by pollution from municipal sources, understood as enrichment of waters with nutrients, in particular nitrogen or phosphorus compounds.

In the LWB catchment area, protected areas have been designated for the protection of habitats or species for which maintenance or improvement is an important factor in their conservation. For the Modła Lake reserve, environmental objectives have been set, including: preservation of the eutrophic lake ecosystem along with its characteristic biotopes, biocenoses and processes, in particular populations and habitats of wetland bird species. For the Pas Pobrzeża na Zachód od Ustki protected landscape area, the environmental objectives set include, m.in. preservation of a distinctive landscape with diverse ecosystems, preservation and protection of surface water ecosystems (natural and artificial, flowing and stagnant, including oxbow lakes) together with the surrounding vegetation belt, as well as preventing the lowering of the groundwater table, in particular by limiting the construction of drainage devices and drainage ditches. For the Natura 2000 PLH220024 Przymorskie Błota site, the environmental objectives include m.in maintaining a high degree of water quality of habitats.

Lake Modła catchment area - Struga Lędowska

The connection route runs through the eastern part of the Lake Modła catchment area, designated in the current Oder River Basin Management Plan as "other waterbodies areas". The main watercourse of the area, with a length of approx. 21 km, flows into Lake Modła. The corridor of the planned Project is located between the watercourses: Karvina and Struga Lędowska. In the central part of the catchment area there is a wetland area which, depending on the location alternative, will be bypassed from the east or west (area 39 km of the corridor of the planned Project). The corridor of the planned Project will cross the Struga Lędowska in the region of 37.2 km.

In the repealed Odra River Basin Management Plan (in force in the period 2016-2021), the environmental objective for Struga Lędowska was good ecological status and good chemical status, and the achievement of this goal was considered not threatened.

Coastal water body CW60001WB3 Polskie Wody Przybrzeżne Basenu Bornholmskiego

The connection route was determined in the eastern surface water body (JCWP) of coastal CW60001WB3 Polskie Wody Przybrzeżne Basenu Bornholmskiego, in an area of about 4.8 km^2.

CWB CW60001WB3 Polskie Wody Przybrzeżne Basenu Bornholmskiego covers a strip of Baltic waters from the baseline to 1 Mm, with an area of 221,63 km^2. It belongs to the coastal water body, type Open Coast. In the Odra River Basin Management Plan it has been designated as **a natural water body.** The environmental objective for the CWB is **moderate ecological status and good chemical status, and** the achievement of this target was considered threatened.

The entire CWB catchment area is sensitive to eutrophication caused by pollution from municipal sources, understood as water enrichment with nutrients, in particular nitrogen or phosphorus compounds. Within the JCWP area, areas designated for recreational purposes, including bathing areas, have been designated.

For this CWB, areas have been designated for the conservation of habitats or species for which maintenance or improvement is an important factor in their conservation.

These are, respectively:

1. Koszaliński Pas Nadmorski protected landscape area,
2. Pas Pobrzeża na zachód od Ustki protected landscape area
3. Natura 2000 site PLB320010 Wybrzeże Trzebiatowskie,
4. Natura 2000 site PLB990002 Przybrzeżne wody Bałtyku,
5. Natura 2000 site PLH320041 Jezioro Bukowo,
6. Natura 2000 site PLH320068 Jezioro Wicko i Modelskie Wydmy,
7. Natura 2000 site PLH320059 Jezioro Kopań,
8. Natura 2000 site PLH220052 Dolina Słupi,
9. Natura 2000 site PLH320017 Trzebiatowsko-Kołobrzeski Pas Nadmorski,
10. Natura 2000 site PLH990002 Ostoja na Zatoce Pomorskie,
11. Natura 2000 site PLH220038 Dolina Wieprzy i Studnicy,
12. Natura 2000 site PLH320007 Obszar dorzecza Parsęty,
13. Ekopark Wschodni ecological site

Due to the location, the conditions resulting from the location within the boundaries of the Natura 2000 PLB990002 Przybrzeżne Wody Bałtyku protected area, for which the following environmental objective has been set, will be important for the planned Project: maintaining or restoring the proper conservation status of objects of protection – species of wintering and migratory birds: *Alca torda, Cepphus grylle, Clangula hyemalis, Larus argentatus, Melanitta fusca, Melanitta nigra*.

Direct sea basin CW60001WB3

The direct catchment area of the sea (CW60001WB3) associated with the CWB through which the route of the proposed Project has been mapped has an area of 9.26 km^2, with a potential impact area of approximately 0.86 km^2 for the proposed Project.

In the direct catchment area of the sea, no separate and significant surface water bodies such as a lake or other natural body of water, artificial body of water, stream, brook, river or canal have been identified and therefore no environmental objectives have been set for them corresponding to the environmental objectives for the RWB or CWB. According to PGW Wody Polskie, no characterisation sheets have been drawn up for the direct catchment area of the sea. They are also not included in the compilation of surface water monitoring carried out by the GIOŚ. The boundaries of the water bodies are delineated on the watersheds. Waters from neighbouring river water bodies are discharged via watercourses to Lake Modła and the Baltic Sea.

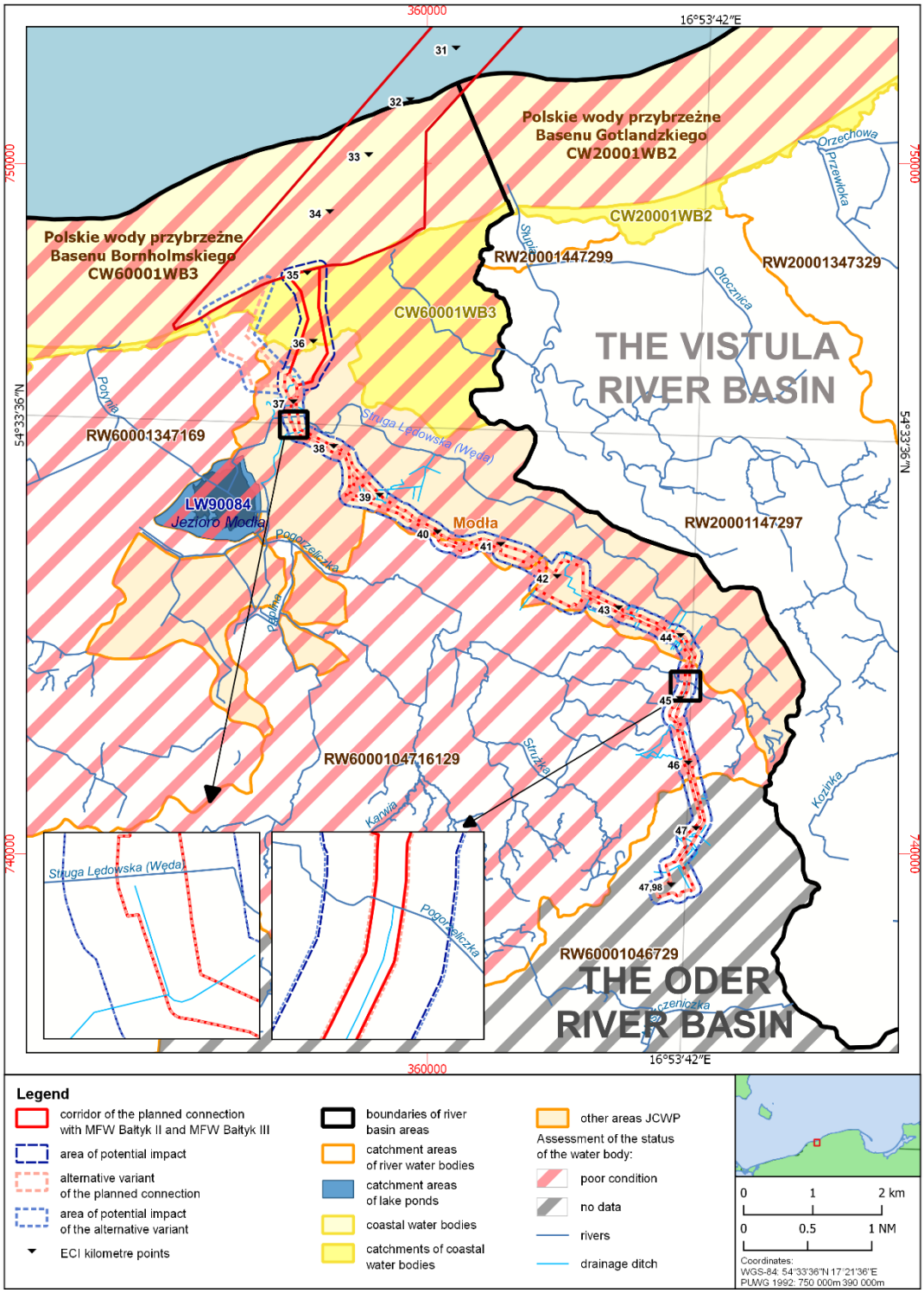


Figure 8.14. *The planned Project on the background of the catchment of coastal and surface water bodies – locations of watercourse crossings*

Source: In-house study on the basis of apgw.gov.pl

Summary: The characterization of the environment in the field of surface water has shown that the passage of the planned ECI of MFW Bałtyk II and Bałtyk III through Struga Lędowska, Pogorzeliczka and the network of drainage ditches, as well as wetlands occurring along the route, is the most significant. The drainage network and watercourses carry water periodically, which causes drying up of hydrogenic soils and may cause insufficient feeding of the Modła lake. During the design, implementation and operation of the planned Project, particular attention should be paid to maintaining

the continuity of the hydrographic network of the area where it will be implemented and the possibility of its impact on the risk of not achieving the environmental objectives included in the *Odra River Basin Management Plan* should be determined.

8.4.2. Groundwater

The characterization of hydrogeological and groundwater conditions was developed on the basis of the Hydrogeological Map of Poland - Ustka sheet (1:50,000). In the northern part of the planned Project (up to 38 km), groundwater occurs at a depth of about 2.5 m, water flow here is from the southwest towards the seashore. In the area of 39 km, groundwater occurs at a depth of 5 m. and the further south their depth gradually increases to 25 m in the area of PSE Wierzbięcino station. Waters flow here from the south and southeast directions (figure 8.15.).

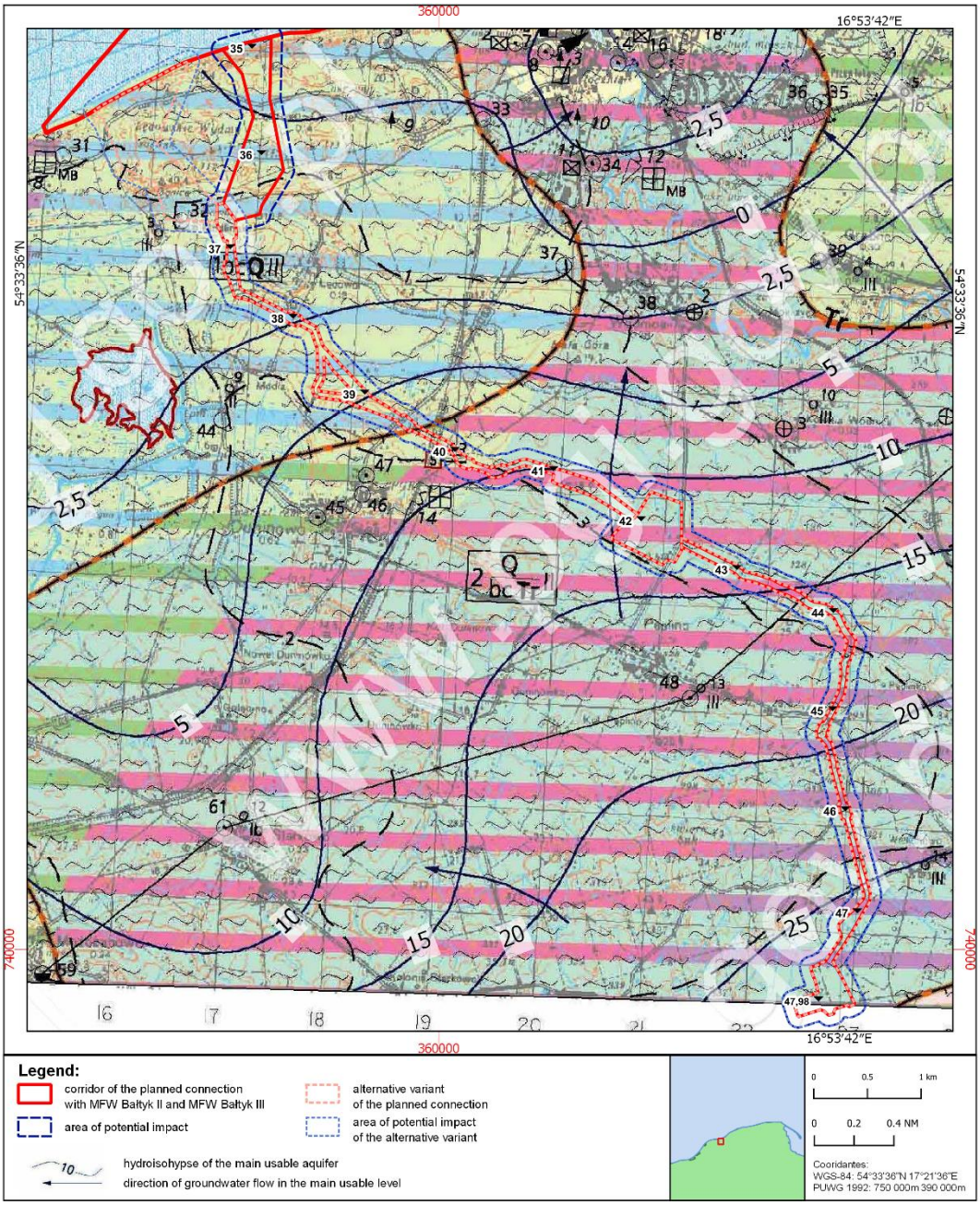


Figure 8.15. *Location of the Planned Project on the background of hydrogeological map of Poland in the scale 1:50 000. Sheet Ustka*

Source: In-house on the basis of the detailed hydrogeological map of Poland at the scale 1:50,000. Ustka Sheet

The corridor of the planned Project is located beyond the borders of Major Groundwater Reservoirs (GZWP). In the distance of about 13 km from the PSE Słupsk - Wierzbięcino substation in south-east direction, the Major Groundwater Reservoir 117 Bytów is situated. It is a Quaternary, valley and intermoraine groundwater reservoir with an area of 524 km^2 and average depth of groundwater 10-50 m.

In the immediate vicinity (up to 500 m from the border of the planned Project corridor - figure 8.16) there are identified groundwater intakes, the characteristics of which are presented in the table below - table 8.4.

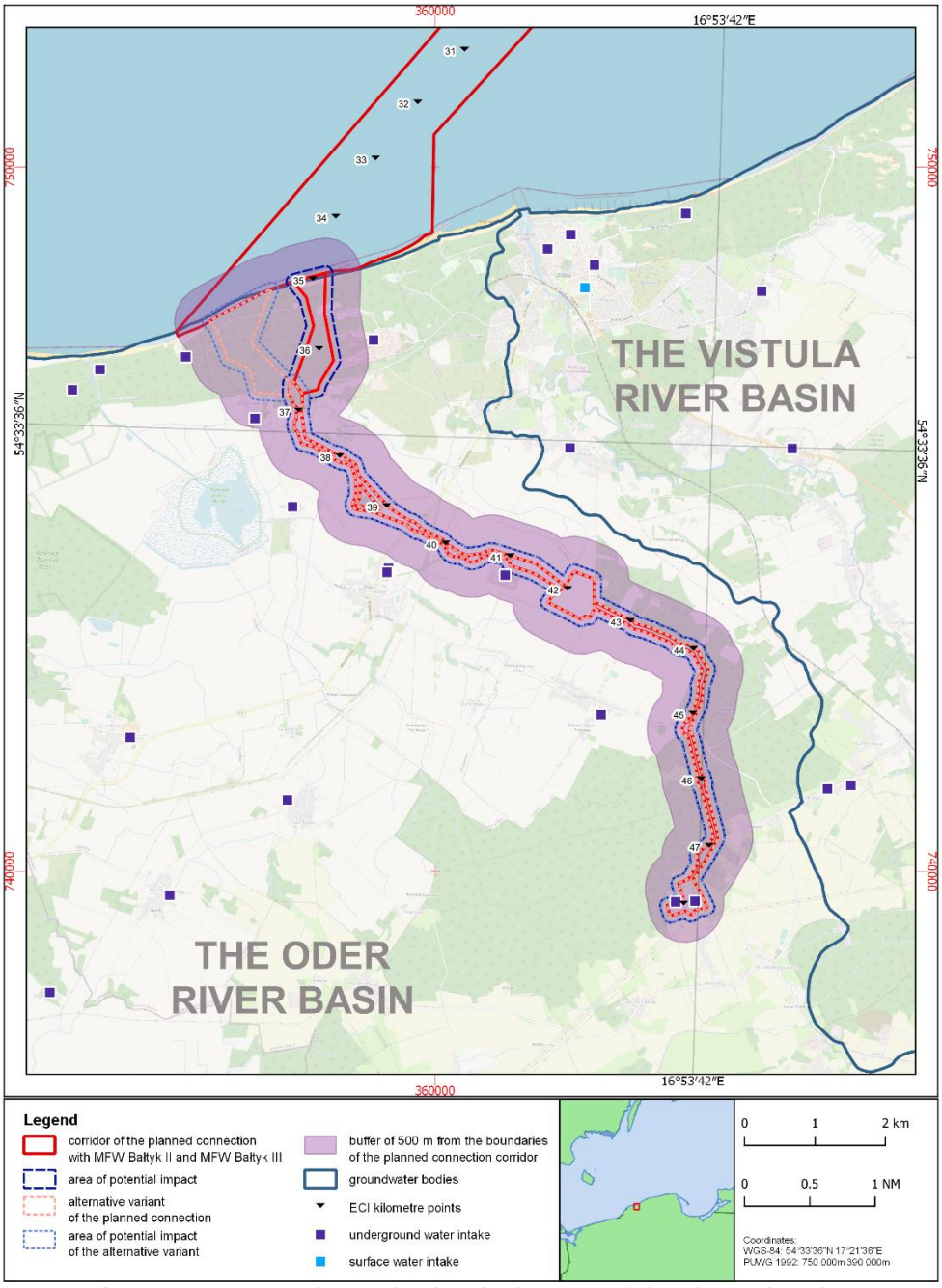


Figure 8.16. *Groundwater intakes in the area of the planned Project*

Source: In-house study based on http://geoportal.gov.pl data

Table 8.4. *List of groundwater intakes within 500 m distance from the corridor of the planned Project*

Name of intake	Kilometer	Town	Municipality	Purpose of water abstraction	Authority granting the water permit	Decision number
Barracks complex 5319 Potena	35,5	Zaleskie	Ustka	Supply to the population	Director of RZGW in Szczecin	ZU-5027-14-9/2013/jw.
Rural water intake	37	Modlinek	Ustka	Supply to the population	The Slupsk Starost	ŚR-II.6341.8.2016
Fish processing plant	41	Duninowo	Ustka	Industrial	The Slupsk Starost	ROŚ.III.6223-4/06; amended by ŚR-II.6341.123.2012
400/110 kV Substation in Wierzbięcino	47,98	Wierzbięcin	Slupsk	Other	Marshal of Pomorskie Voivodeship	DROŚ-SW.7322.21.2015/ JS
Power Transformer Station	47,98	Wierzbięcin	Slupsk	Other	Marshal of Pomorskie Voivodeship	DROŚ-A.7322.113.2012/ EC

Source: In-house study based on http://geoportal.gov.pl data

The following water intakes are located closest to the planned Project:

Modlinek rural water intake

The intake is located approximately 260 m from the western boundary of the Project corridor, at km 37. The intake, with the number 90111-WODOCIĄG WIEJSKI 1m, supplies the village water supply system in Modlinek. Built in 1998, the intake is 71 m deep and captures Quaternary waters.

Fish processing plant

The intake is located approximately 50 m from the western boundary of the corridor of the planned Project, at km 41. The intake supplies the industrial plant MOWI POLAND S.A (table 8.5).

According to data made available by the Polish Geological Institute - National Research Institute[248], there are 8 hydrogeological boreholes. Their basic parameters are presented in the table below.

Table 8.5. *Summary of hydrogeological boreholes - intakes of the Fish Processing Plant*

Intake No.	Depth [m]	Year	Stratigraphy at the bottom	Purpose
90190-MOWI POLAND S.A. 6	95	2019	Neogen	Operation
90166-MORPOL S.A. 1A	91	2016	Neogen	Operation
90167-MORPOL S.A. 2A	95	2016	Neogen	Operation
90168-MORPOL S.A. 3A	99	2016	Neogen	Operation
90118-Z-D FISH PROCESSING MORPOL 3	92	2005	Tertiary	Operation
90170-MORPOL SP 2	38	2000	Tertiary	Operation
90169-MILAREX SC 1	42	1975	Quaternary	Operation
90136-Z-D TRANS. FISH MORPOL (D.MIRALEX) 5	90	2011	Quaternary	Operation
90119-Z-D FISH PROCESSING 4	91,5	2005	Tertiary	Operation

Source: In-house study based on http://geoportal.gov.pl data

Groundwater - groundwater bodies (GWB)

The planned Project is located within the boundaries of GWB PLGW600010, which has an area of 2 559 km^2 (figure 8.17.). Usable aquifers are located in Quaternary, Miocene and Cretaceous formations. In the coastal area, freshwater reaches depths of 100-150 m, while in the upland area it is up to 250-300 m. The state of use is defined as agricultural-forestry. The GWB's status assessment for 2019[249] indicated good chemical, quantitative and overall status of the water body.

[248] *https://mapy.geoportal.gov.pl/ (accessed 16.05.2022)*
[249] *http://mjwp.gios.gov.pl*

The environmental objective for GWB PLGW600010 is a good chemical and quantitative status, and is not at risk of not being met.

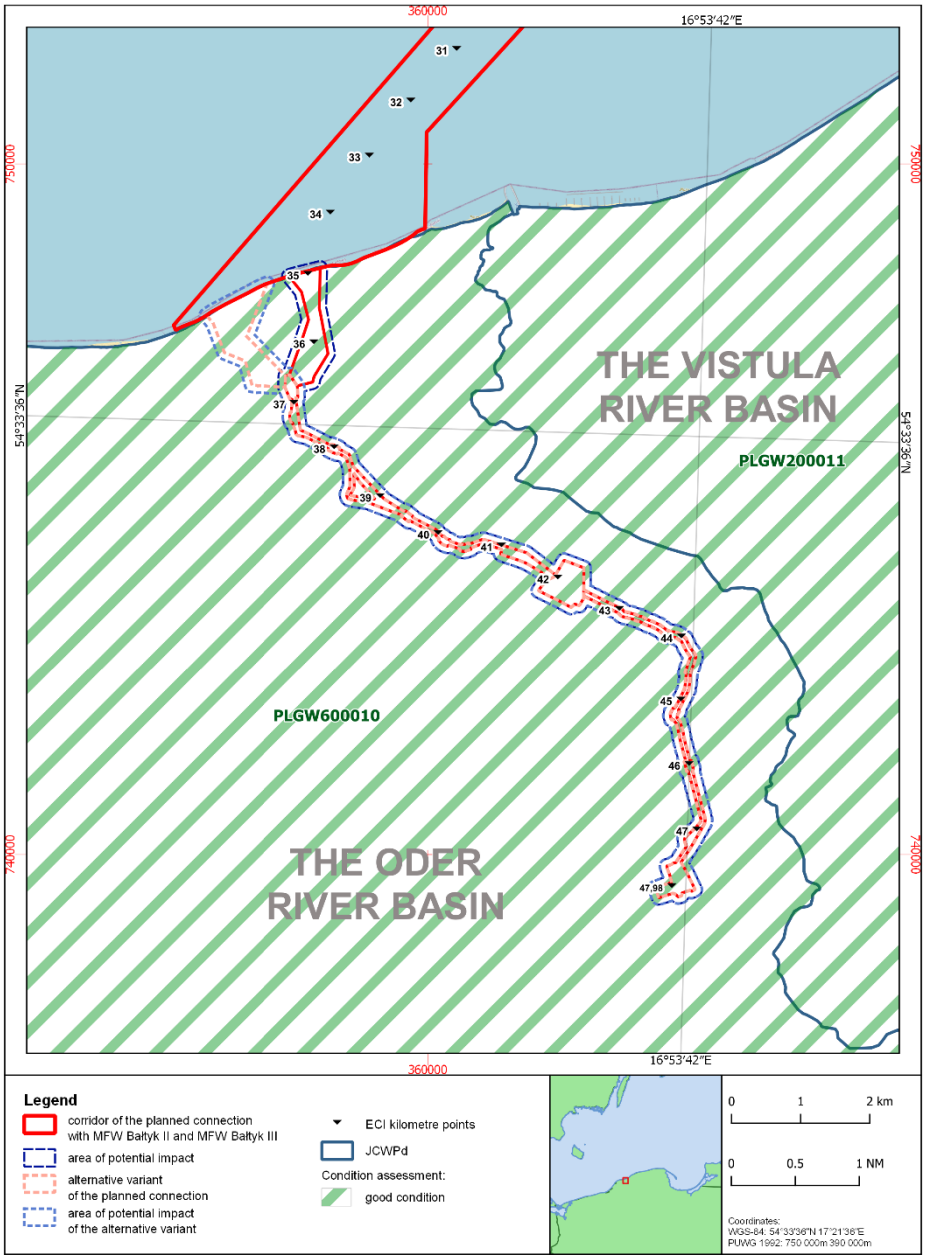


Figure 8.17. *Corridor of the planned Project on the background of groundwater bodies (GWBs)*

Source: In-house study based on http://geoportal.gov.pl data

Summary: The characterisation of the state of the environment in the field of groundwater has shown that in the assessment of the impact on this component, special attention should be paid to the temporary dewatering of excavations, which may cause a temporary lower the water table of the first groundwater level.

8.4.3. Flood risk areas

In accordance with Article 16 (34) of the Water Law Act (Journal of Laws 2022.2625 consolidated text as amended), the planned Project is fragmentarily located within areas of special flood hazard due to its location (figure 8.18):

- between the shoreline and the floodbank, or the natural high bank into which the floodbank is incorporated, as well as the islands and lagoons referred to in Article 224 which constitute registered parcels,
- within the construction corridor.

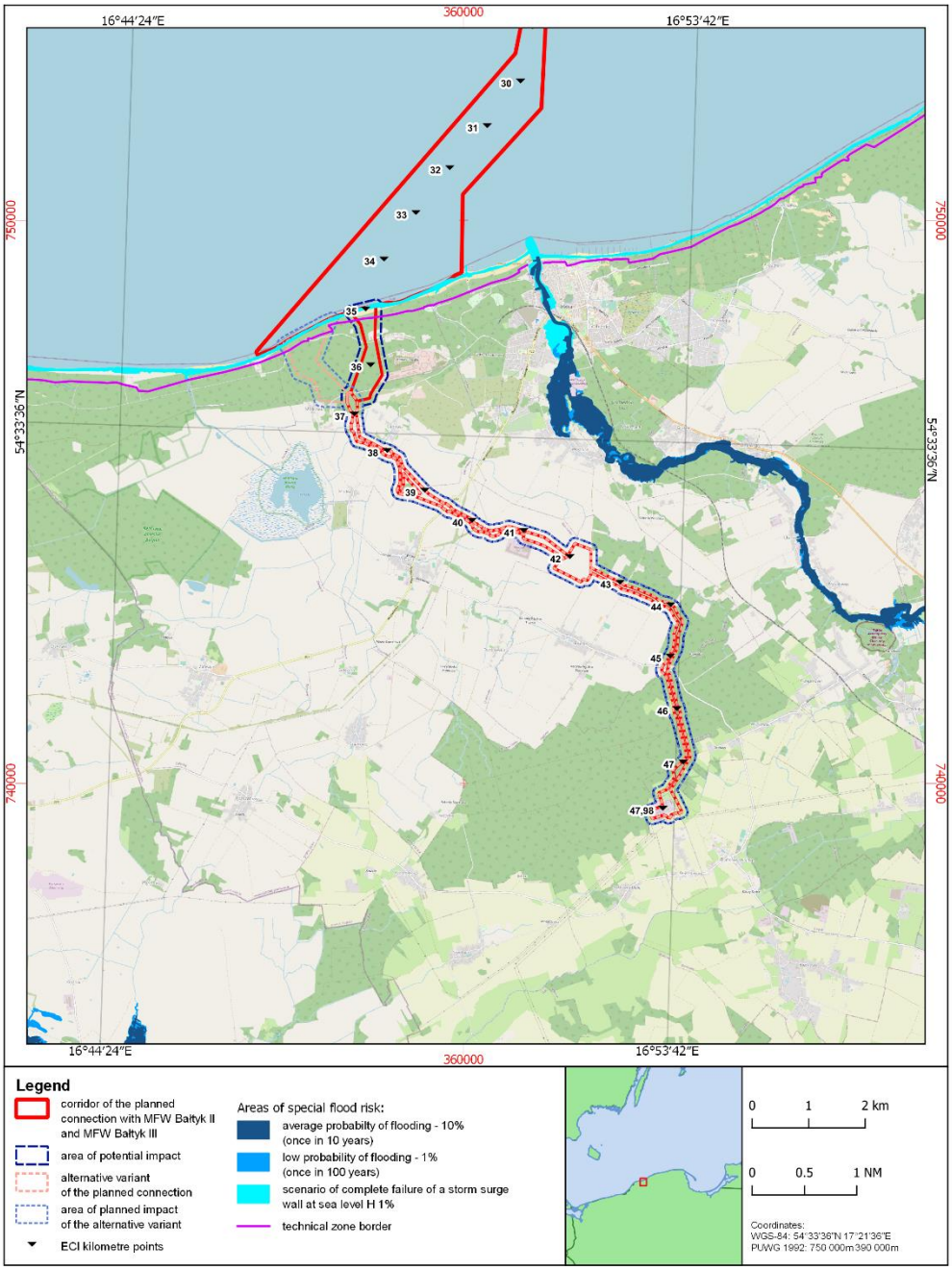


Figure 8.18. *The planned Project on the background of flood hazard areas*

Source: In-house study based on https://wody.isok.gov.pl/imap_kzgw/?gpmap=gpPDF

In summary: There is no risk of flooding in most parts of the planned Project. In the impact assessment, special attention should be paid to the way in which the planned ECI of the MFW Bałtyk II and Bałtyk III is implemented in the coastal zone, where flood risk occurs.

8.5. DESCRIPTION OF ENVIRONMENTAL COMPONENTS

8.5.1. Vascular plants and habitats

The characterisation of vascular plants and natural habitats was prepared on the basis of the annual nature inventory for the 'Connection Infrastructure of the offshore wind farm MFW Bałtyk II and the offshore wind farm MFW Bałtyk III' (Volume III, Attachment 2).

Valuable vascular plant species found within the corridor of the planned connection and in area of potential impact (table 8.6):

The marsh Labrador tea - *Ledum palustre* L.

A partially protected species.

An evergreen shrub common in the lowlands, reaching the southern limit of its range in Poland. Characteristic for swampy coniferous forest and birch bog of raised and valley bogs. Within the corridor of the planned Project, the species was found at one site.

The black crowberry - *Empetrum nigrum* L.

A partially protected species.

A dioecious shrub common on the Baltic coast, whose range of occurrence extends to Wielkopolska in some places. It is common in coastal dunes and dune pine forests, co-forming the coastal crowberry forest complex (*Empetro nigri-Pinetum*). Within the planned corridor, it is very common, growing throughout the coastal crowberry forest and mixed forests. The population within the planned connection corridor is stable, not threatened by increased tourist traffic. It grows in patches in some places..

The sea pea - *Lathyrus japonicus* Willd. *subsp. maritimus* (L.) P.W. Ball

The species is not under legal protection. It is included in the Polish Red List[250] in the NT (near threatened) category and in the Red Book of Pomorze Gdańskie [251] in the VU (vulnerable) category.

A perennial plant found in numerous locations along the entire Baltic coast. It occurs on dune banks, mainly on the white dune, and less frequently on the grey dune. It inhabits substrate that is variable-moist and poor in nitrogen compounds. It is a subspecies characteristic of coastal dune communities of the *Ammophilion borealis* association, which belongs to the class *Ammophiletea*. Within the corridor of the planned connection, the species was found at one site.

The common wintergreen - *Pyrola minor* L.

A partially protected species.

A small perennial plant with scattered sites in the lowlands, also found along the Baltic coasts. The species is characteristic for acidophilous forests mostly dominated by pine from the *Dicrano-Pinion* association. Within the corridor of the planned connection, the species was found on eleven sites.

The round-leaved wintergreen - *Pyrola rotundifolia* L.

A partially protected species. It is listed in the Red Book of Pomorze Gdańskie[252] in the category VU (vulnerable).

A small perennial plant fairly common in lowland, coastal and inland forests. The species has been losing sites in the country quite rapidly in the recent years. Within the corridor of the planned connection, the species was found at one site.

The greenflowered wintergreen - *Pyrola chlorantha* Sw.

A partially protected species.

A small perennial plant with scattered sites in the lowlands, also found along the Baltic coast. The species is characteristic for acidophilous forests mostly dominated by pine from the *Dicrano-Pinion* association. Within the corridor of the planned connection, the species was found on five sites..

The one-flowered wintergreen *Moneses uniflora* (L.) A. Gray

[250] Kaźmierczakowa i in., 2016.

[251] Lazarus M., Afranowicz-Cieślak R. (red.), 2020.

[252] *Lazarus M., Afranowicz-Cieślak R. (red.), 2020.*

A partially protected species. It has been included in the Polish Red List in the NT (near threatened) category[253] and has been included in the Red Book of Pomorze Gdańskie[254] in the NT (near threatened) category.

A small perennial plant with scattered localities in the lowlands, characteristic of fir and mixed forest communities of the *Vaccinio-Piceetalia* order, also found along the entire Baltic coast. Within the corridor of the planned connection, the species was found in four localities among boreal mosses. Population in the area under study is relatively stable, although vulnerable to trample and picking of showy flowers.

The dwarf everlast - *Helichrysum arenarium* (L.) Moench

A partially protected species.

Common throughout almost the entire country, this light-flowering perennial plant grows on various types of sand grasslands, xerothermic grasslands, sandy fallows, sandy anthropogenic sites and coastal dunes along the entire Polish Baltic coast. Within the corridor of the planned connection, the species was found on nine sites. Due to low penetration of dunes and resistance to trample, it is not threatened by increased tourist traffic.

The dark-red helleborine - *Epipactis atrorubens* (Hoffm.) Besser

A partially protected species. It is included in the Polish Red List[255] in the NT (near threatened) category and in the Red Book of Pomorze Gdańskie[256] in the VU (vulnerable) category.

A perennial plant growing in scattered stands on light or slightly shaded diverse sites: fir and mixed forests, grassy slopes, dunes, cliffs, sandy grasslands. On coastal dunes, it occurs in scattered localities along the entire Baltic coast. Within the corridor of the planned connection, the species has been found in numerous localities along the seashore.

The broad-leaved helleborine - *Epipactis helleborine* (L.) Crantz

A partially protected species.

A perennial plant found in numerous sites throughout the country, mainly in deciduous forests and oak-hornbeam forests, but also in light or slightly shaded diverse sites in fir and mixed forests, on grassy slopes, grasslands, and along roads. Undoubtedly, it is the most expansive species of the native *Orchidaceae*. Within the corridor of the planned connection, the species was found on five sites.

The common spotted orchid - *Dactylorhiza fuchsii (Druce) Soó*

A strictly protected species. It has been placed on the Polish Red List[257] in the VU (vulnerable to extinction) category.

A perennial species found in fertile moist alder woodland, water banks, wet meadows and bogs, occasionally in grassland edges and in wet scrub on the woodland boundary. Within the corridor of the planned connection, the species was only found at a single site.

The broad-leaved marsh orchid - *Dactylorhiza majalis (Rchb.) P.F. Hunt & Summerh.*

A partially protected species. It is included in the Polish Red List[258] in the NT (near threatened) category and in the Red Book of Pomorze Gdańskie[259] in the NT (near threatened) category.

[253] *Kaźmierczakowa i in., 2016.*
[254] *Lazarus M., Afranowicz-Cieślak R. (red.), 2020.*
[255] Kaźmierczakowa i in., 2016.
[256] Lazarus M., Afranowicz-Cieślak R. (red.), 2020.
[257] Kaźmierczakowa i in., 2016.
[258] Kaźmierczakowa i in., 2016.
[259] Lazarus M., Afranowicz-Cieślak R. (red.), 2020.

A perennial plant growing in fertile moist peat meadows, banks, wet meadows and bogs, sometimes on grassland edges. Within the corridor of the planned connection, the species was only found at a single site.

The Linaria odora (M. Bieb) Fisch.

A strictly protected species. It has been placed on the Polish Red List[260] in the EN (endangered) category. A protected species under Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) code 2216.

A small perennial plant associated with non-halophilous, sandy coastal communities, on white dunes, between clumps of grasses in communities of the *Ammophilion borealis* association. Its scattered stands range from the Mierzeja Wiślana in the east to Mielno in the west. In the recent years, the plant has been losing sites in the country quite rapidly. Within the corridor of the planned connection, the species was found at five sites. In each site there were several flowering individuals.

The lesser butterfly-orchid - *Platanthera bifolia (L.) Rich.*

A partially protected species. It is listed in the Red Book of Pomorze Gdańskie[261] in the NT (near threatened) category.

A perennial plant growing in light deciduous woodland and scrub, in clearings and glades, on fresh, moderately humus soils. Within the corridor of the planned connection, the species was found on six sites.

The sea rocket - *Cakile maritima* Scop.

The species is not under legal protection. It is listed in the Polish Red List[262] in the category NT (near threatened) and in the Red Book of Pomorze Gdańskie[263] in the category NT (near threatened).

A small perennial plant growing on Baltic coastal beaches in the area of frontal and white dunes, often encroaching on the foregrounds of grey dunes. It plays an important role in the first stage of formation of dunes. The conversion of dune shoreline and mass recreation on beaches are threats to the sea rocket habitat. Within the corridor of the planned connection, the species was found at five sites.

The Callitriche hamulata Kütz. ex W.D.J.Koch

The species is not under legal protection. It is included in the Polish Red List[264] in category DD (degree of threat not specified) and in the Red Book of Pomorze Gdańskie[265] in category VU (vulnerable species).

A perennial species growing in clear, cool, fast-flowing waters poor in calcium carbonate. Within the corridor of the planned connection, the species was found on two sites..

The Callitriche palustris Kütz. ex W.D.J.Koch = C. verna L. emend. Lönnr.

The species is not under legal protection. It is included in the Polish Red List[266] in the category DD (degree of threat not determined) and in the Red Book of Pomorze Gdańskie[267] in the category NT (near threatened).

A perennial species found in clear, cool and fast-flowing or stagnant waters, poor in calcium carbonate. Within the corridor of the planned connection, the species was found at three sites.

[260] *Kazmierczakowa et al, 2016.*
[261] *Lazarus M., Afranowicz-Cieślak R. (eds.), 2020.*
[262] *Kazmierczakowa et al, 2016.*
[263] *Lazarus M., Afranowicz-Cieślak R. (eds.), 2020.*
[264] *Kazmierczakowa et al, 2016.*
[265] *Lazarus M., Afranowicz-Cieślak R. (eds.), 2020.*
[266] *Kaźmierczakowa i in., 2016.*
[267] *Lazarus M., Afranowicz-Cieślak R. (red.), 2020.*

Creeping lady's-tresses - *Goodyera repens* (L.) R. Br.

A strictly protected species. It is included in the Polish Red List[268] in the NT (near threatened) category and in the Red Book of Pomorze Gdańskie[269] in the NT (near threatened) category.

A perennial herb with evergreen leaves, occurring mainly in Pomerania and the mountains in scattered stands, on light or slightly shaded sites in pine, pine-oak, crowberry and pine-spruce forests and, rarely, in oak-hornbeam forests. Within the corridor of the planned connection, the species was found on six sites.

The sand sedge - *Carex arenaria* L.

A partially protected species.

A perennial sedge frequent in the north-eastern part of the country, occurring commonly along the entire Baltic coast. It commonly inhabits coastal dunes and dune pine forests, being an important component of the *Empetro nigri-Pinetum* coastal crowberry forest and coastal heathland complex. Within the corridor of the planned connection, the species was found on nine sites in the area of coastal coniferous forest and coastal dunes.

The pomeranian honeysuckle - *Lonicera periclymenum* L.

A partially protected species. It is listed in the Red Book of Pomorze Gdańskie[270] in the category VU (Vulnerable species).

A species characteristic of oak and mixed forests. Particularly common in birch-oak forests in Pomerania. In the study area, it occurs on sites located within the coastal crowberry forest (*Empetro nigri – Pinetum)*. Within the corridor of the planned connection, it grows mainly in the southern part of the coastal coniferous forest and mixed forests.

The common club moss - *Lycopodium clavatum* L.

A partially protected species. It has been placed on the Polish Red List[271] in the NT (near threatened) category.

A spore-bearing plant that is fairly common throughout the country, mainly in patches of pin oak, acid beech, heathland and blueberry on light and acidic ground. Within the corridor of the planned connection, the species was found on fourteen sites. The population in the study area is relatively stable, although vulnerable to trample and uprooting, as well as destruction associated with commercial forest use.

The interrupted club-moss - *Lycopodium annotinum* L.

A partially protected species. It is listed on Polish Red List in the NT (near threatened) category.

A spore-bearing plant occurring quite commonly throughout the country, mainly in patches of pineland forests and acidic beech forests on shady and acidic ground. Within the corridor of the planned project, the species was found at eleven sites located within the coastal crowberry forest *(Empetro nigri-Pinetum*). The population in the study area is relatively stable, although exposed to trample and uprooting, as well as destruction associated with the economic use of forests.

Table 8.6. *Vascular plant species within the corridor of the planned connection and in the area of its potential impact and alternative variant*

[268] *Kaźmierczakowa i in., 2016.*
[269] *Lazarus M., Afranowicz-Cieślak R. (red.), 2020.*
[270] *Lazarus M., Afranowicz-Cieślak R. (red.), 2020.*
[271] Kaźmierczakowa i in., 2016.

No.	English name	Latin name	Protection Status	Presence in the corridor of the planned Project	Investors variant	Alternative variant
1.	The marsh Labrador tea	*Ledum palustre*	OCz	yes / FV	not	yes
2.	The black crowberry	*Empetrum nigrum*	OCz	yes/ FV	yes	yes
3.	The sea pea	*Lathyrus japonicus*	not	yes/ FV	yes	yes
4.	The common wintergreen	*Pyrola chlorantha*	OCz	yes	not	yes
5.	The round-leaved wintergreen	*Pyrola minor*	OCz	yes/ FV	yes	yes
6.	The greenflowered wintergreen	*Moneses uniflora*	OCz	yes/ FV	yes	yes
7.	Round-leaved pear	*Pyrola rotundifolia*	OCz	in the area of potential impact	yes	not
8.	The dwarf everlast	*Helichrysum arenarium*	OCz	yes	not	yes
9.	The dark-red helleborine	*Epipactis atrorubens*	OCz	yes/ FV	yes	yes
10.	The broad-leaved helleborine	*Epipactis helleborine*	OCz	yes/ FV i U1	yes	yes
11.	Dactylorhiza fuchsii	*Dactylorhiza fuchsii*	AX	in the area of potential impact	yes	yes
12.	Dactylorhiza majalis	*Dactylorhiza majalis*	OCz	in the area of potential impact	yes	yes
13.	Linaria odora	*Linaria odora*	AX	in the area of potential impact	yes	yes
14.	The common spotted orchid	*Platanthera bifolia*	OCz	yes / U1	yes	yes
15.	Baltic Sea rocket	*Cakile maritima ssp. baltica*	not	yes	not	yes
16.	Callitriche hamulata	*Callitriche hamulata*	not	yes/ U2	yes	yes
17.	Callitriche palustris	*Callitriche palustris*	not	yes/ U2	yes	yes
18.	Creeping lady's-tresses	*Goodyera repens*	AX	yes	nie	yes
19.	The sand sedge	*Carex arenaria*	OCz	yes/ FV	yes	yes
20.	The pomeranian honeysuckle	*Lonicera periclymenum*	OCz	yes / FV	yes	yes
21.	The common club moss	*Lycopodium clavatum*	OCz	yes	not	yes
22.	The interrupted club-moss	*Lycopodium annotinum*	OCz	yes	not	yes

AX - species under strict protection; OCz - species under partial protection; Conservation status: FV - favourable status, U1 - unsatisfactory, U2 - poor (the conservation status given for animal species sites reflects the conservation status of their habitat)

Source: Own elaboration based on data from the Final Report on the Nature Inventory of the Offshore Wind Farm Bałtyk III Connection Infrastructure and the Offshore Wind Farm Bałtyk II Connection Infrastructure In addition to valuable vascular plant species, the biological inventory revealed the presence of 16 partially protected bryophyte species. No strictly protected bryophyte species were found.

Partially protected bryophyte species found within the corridor of the planned connection and in area of potential impact (table 8.7 and figure 8.19):

The large white-moss - *Leucobryum glaucum* (Hedw.) Angst

A species common all over the country growing on acidic soils in coastal and inland forests, and often in peatlands. A distinctive species of the *Leucobryo-Pinetum* complex. Within the corridor of the planned connection, the species occurs in a scattered distribution throughout the boreal habitats, both in the coastal belt and inland forests.

The neat feather-moss - *Pseudoscleropodium purum* (Limpr) M. Fleisch. ex Broth.

A species common all over the country growing on acidic soils in coastal and inland forests, and often in peatlands. Distinctive species of the *Empetro nigri-Pinetum* complex. Within the corridor of the planned connection, the species occurs in a scattered distribution throughout the boreal habitats, both in the coastal belt and inland forests.

The springy turf-moss - *Rhytidiadelphus squarrosus* (Hedw.) Warnst.

A species common all over the country growing on soil in deciduous and mixed woodland. Within the corridor of the planned connection, the species occurs in dispersal throughout the boreal habitats, both in the coastal belt and inland forests.

The glittering wood-moss- *Hylocomium splendens* (Hedw.) Schimp.

A species common all over the country growing on acidic soils in coastal and inland forests, as well as on grasslands and occasionally in pine-dominated mixed forests. Within the corridor of the planned connection, the species occurs in a scattered distribution throughout the boreal habitats, both in the coastal and inland forest belt. The population in the study area is stable, not threatened by increased tourist traffic.

The dilated scalewort - *Frullania dilatata* (L.) Dumort.

A fairly common species in the country, occurring on the bark of deciduous trees, mainly beech and oak, less frequently on rocks. Within the corridor of the planned connection, the species occurs in dispersal.

The crisped pincushion moss - *Ulota crispa* (Hedw.) Brid.

A fairly common species in the country, occurring on the branches and trunks of trees, particularly birches. Within the corridor of the planned connection the species is common.

The ostrich-plume feather-moss - *Ptilium crista-castrensis* (Hedw.) De Not.

A species common all over the country grows on acidic soils in coastal and inland forests, as well as on grasslands and occasionally in pine-dominated mixed forests. Within the corridor of the planned connection, the species occurs scattered throughout the boreal habitats, both in the coastal and inland forest belt. In some places it grows in patches..

The Buckiella undulata (Hedw.) Ireland

A fairly rare species in Poland occurring on soil and spruce trunks in spruce-dominated forests. The species is characteristic for the *Piceion abietis* association, a coniferous forest community occurring in the continental-boreal range and in the higher mountain altitudes. Within the corridor of the planned connection, the species was found on two sites.

The bog groove-moss - *Aulacomnium palustre* (Hedw.) Schwägr.

A common species throughout the country, found mainly in transitional bogs and wet forests. Within the corridor of the planned connection, the species was found on two sites.

The red-stemmed feather-moss - *Pleurozium schreberi* (Willd. ex Brid.) Mitt.

A common species throughout the country, occurring commonly on acidic soils in coastal and inland forests, as well as on grasslands and occasionally in pine-dominated mixed forests. Within the corridor

of the planned connection, the species occurs scattered throughout the forest area, in both coastal and inland pine-dominated forest communities, beech fringes, planted pine and mixed young forests. It usually occurs in patches on sites.

The blunt-leaved bog-moss - *Sphagnum palustre* L.

One of the most widespread peat moss species in the country. It can be found both within forest vegetation, mainly in swamp forests and peat alder forests, as well as in open non-forest peatlands with varying degrees of water supply. It also frequently occupies anthropogenic sites - banks of ponds, drainage ditches or overgrown abandoned pits. Within the corridor of the planned connection, the species was found on seven sites. It usually occurs in patches on sites.

The fringed bog-moss - *Sphagnum fimbriatum* Wilson

A nationally dispersed species occurring mainly in open transitional bogs, as well as in swamp forests, peat depressions and peat alder forests. Within the corridor of the planned connection, the species was found on five sites. It is usually found together with the prairie sphagnum on the sites.

The red bog-moss - *Sphagnum capillifolium* (Ehrh.) Hedw.

One of the most widespread peat moss species in the country. It is found in diverse habitats - transitional bogs, acidic low bogs, mosses and forests. It also occupies anthropogenic habitats. A characteristic species of the *Sphagnetalia magellanici* order. Within the corridor of the planned connection, the species was found on four sites. Usually occurs in patches on sites.

The common tamarisk-moss - *Thuidium tamariscinum* (Hedw.) Schimp.

A nationally dispersed species found mainly on humus soils in deciduous forests and on the edges of pine forests, shaded stream banks and in swampy woodlands. Within the corridor of the planned connection, the species occurs scattered throughout the boreal habitats.

The rugose fork-moss - *Dicranum polysetum* Sw. ex anon.

A nationally widespread species, common on acidic soils in coastal and inland forests, as well as on grasslands and occasionally in pine-dominated mixed forests. A characteristic species of the *Cladonio-Vaccinietalia* and *Sphagnetalia magellanici* orders. Within the corridor of the planned connection, the species occurs scattered throughout the boreal habitats, both in the coastal belt and inland forests. In some places, it occurs in patches.

The broom fork-moss - *Dicranum scoparium* Hedw.

A common species throughout the country, commonly found on acidic soils in coniferous, mixed and deciduous forests, in a variety of habitats (aboveground, arboreal and on dead wood), in coastal and inland forests, as well as in grasslands and occasionally in pine-dominated mixed forests. A characteristic species of the *Vaccinio-Piceetetea* order and the *Empetrum nigrum-Vaccinium vitis-idaea* community. Within the corridor of the planned connection, the species occurs in dispersal throughout the boreal habitats, both in the coastal strip and inland forests.

Table 8.7. *Bryophytes species within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No.	English name	Latin name	Protection status	Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
1.	The large white-moss	*Leucobryum glaucum*	OCz	yes / FV	yes	yes
2.	The neat feather-moss	*Pseudoscleropodium purum*	OCz	yes/ FV	yes	yes
3.	The springy turf-moss	*Rhytidiadelphus squarrosus*	OCz	yes / U1	yes	yes

No.	English name	Latin name	Protection status	Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
4.	The glittering wood-moss	*Hylocomium splendens*	OCz	yes / FV i U1	yes	yes
5.	The dilated scalewort	*Frullania dilatata*	OCz	yes / FV	yes	yes
6.	The crisped pincushion moss	*Ulota crispa*	OCz	yes / FV i U1	yes	yes
7.	The ostrich-plume feather-moss	*Ptilium crista-castrensis*	OCz	yes / U1	yes	yes
8.	The Buckiella undulata	*Buckiella undulata*	OCz	yes / U1	yes	not
9.	The bog groove-moss	*Aulacomnium palustre*	OCz	yes / U1	yes	yes
10.	The red-stemmed feather-moss	*Pleurozium schreberi*	OCz	yes / FV	yes	yes
11.	The bog groove-moss	*Sphagnum palustre*	OCz	yes / FV	yes	yes
12.	The fringed bog-moss	*Sphagnum fimbriatum*	OCz	yes / FV	not	yes
13.	The red bog-moss	*Sphagnum capillifolium*	OCz	yes	not	yes
14.	The common tamarisk-moss	*Thuidium tamariscinum*	OCz	yes / U1	yes	yes
15.	The rugose fork-moss	*Dicranum polysetum*	OCz	yes / FV	yes	yes
16.	The broom fork-moss	*Dicranum scoparium*	OCz	yes / FV	not	yes

Explanations: OCz - partially protected species; FV - favourable status, U1 - unsatisfactory, U2 - poor (the conservation status given for animal species sites reflects the conservation status of their habitat)

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

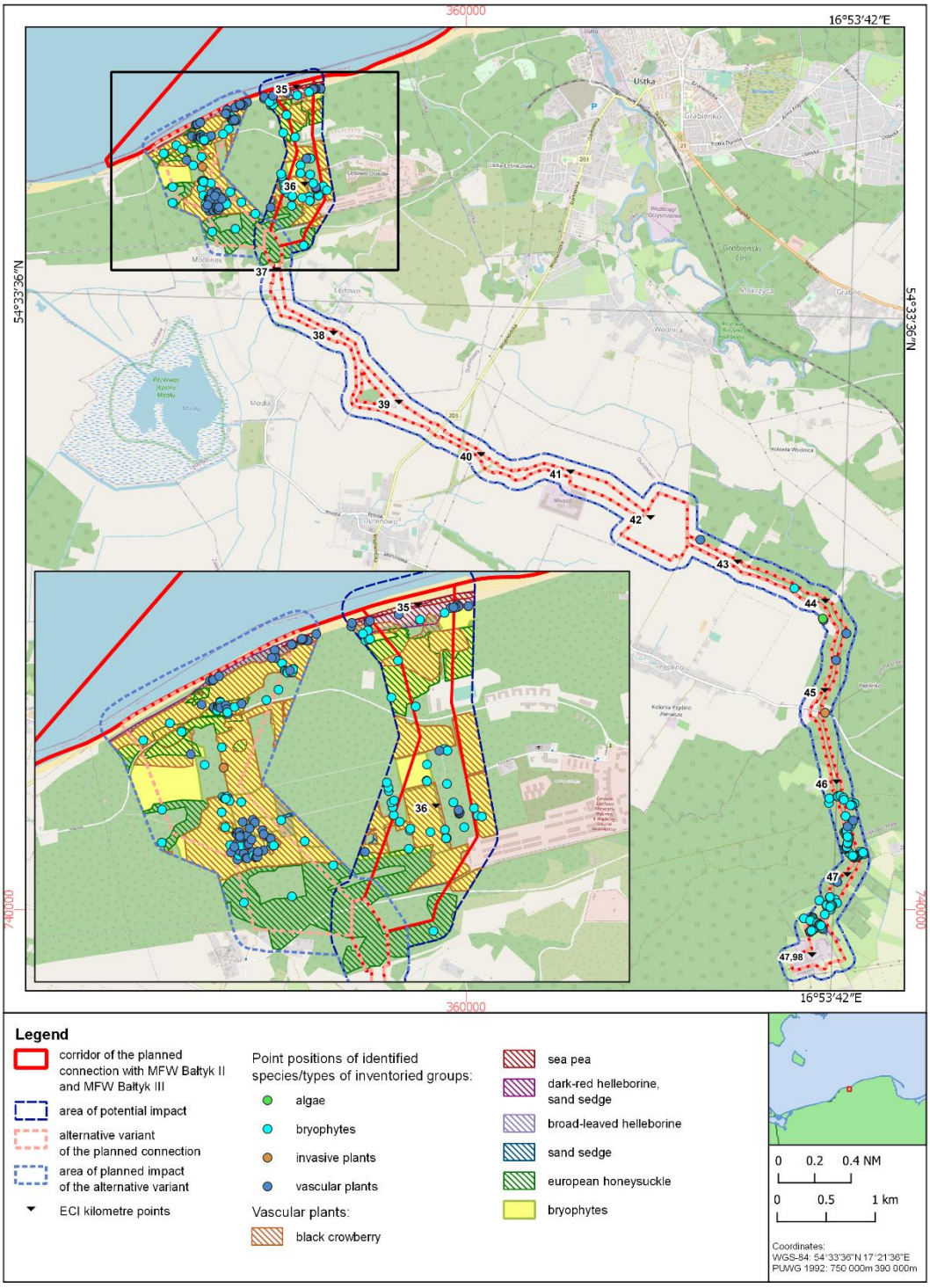


Figure 8.19. *The planned Project against a background of the results of the inventory of vegetation and bryophytes*

Source: In-house study on data from the Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

Summary: The area of the onshore corridor is characterised by a strip pattern of natural habitats typical of Pomerania, parallel to the coast. The inventory survey within the corridor of the planned connection identified 22 valuable vascular plant species, including 18 taxa under legal protection. Three species of vascular plants are under strict protection and should be considered the most valuable vascular plant taxa in the area of the planned onshore Project's corridor. These are: the *Linaria odora*, the creeping lady's-tresses (*Goodyera repens*), and the common spotted orchid (*Dactylorhiza fuchsii).*

However, the species do not occur within the boundaries of the planned ECI corridor in the developer's variant.

In addition to the valuable vascular plant species, the biological inventory revealed the presence of 16 partially protected bryophyte species. No strictly protected bryophyte species were found. The area of the onshore corridor of the planned connection is characterised by a diversity of moss species typical for the forests of Pomorze Gdańskie. Moss species recorded most abundantly within the onshore corridor of the planned Project include aboveground boreal species, common in the area of coastal forests, dune dikes, dune and forest edges, as well as widespread mixed forests dominated by pine. All observed species are commonly recorded in the Pomeranian area.

Given that no strictly protected species were recorded in the study area and that all observed species belong to common in Poland species associated with forests, mixed forests, riparian forests and fresh coastal forests, it can be assumed that all moss species are common taxa. Three species of the genus Sphagnum can be classified as valuable natural resources: the blunt-leaved bog-moss (*Sphagnum palustre),* the fringed bog-moss (*Sphagnum fimbriatum),* and the red bog-moss (*Sphagnum capillifolium)*. These are indicator taxa for peatland habitats increasing the biodiversity of the area that also provide a unique habitat for many valuable plant and invertebrate animal species. The preservation of species diversity is also facilitated by the numerous peatland depressions, with varying degrees of hydration and development of vascular flora species. The presence of well-preserved stands of boreal mosses determines the correct biodiversity of boreal moss species, many of which are under partial protection. The main threat to moss species is the destruction of their habitats, especially forest clearings and changes in water conditions.

The planned cable routes from the MFW Bałtyk II and MFW Bałtyk III come ashore west of Ustka (in two location variants) and cut across two mesoregions Wybrzeże Koszalińskie and Równina Słupska, thus cutting through the zonal arrangement of phytocoenoses characteristic of the Polish Baltic coast.

Patches of coastal communities in the discussed area floristically and physiognomically do not differ from the dune coasts commonly found on Wybrzeże Koszalińskie. In the northernmost part of the area in question, in the immediate vicinity of the sea shore, the degree of the development of vegetation and initial soils depends mainly on the intensity of aeolian processes and the influence of anthropopressure mainly through intensive tourist traffic, and activities connected with active protection of the shore. Aeolian processes are strongest on the unplanted beach and on the frontal and white dunes, populated by the initial and, at the same time, the most resistant psammophilous vegetation.

In the northern part of the onshore corridor, two alternative locations are considered for the landfall of the cables: western and eastern, slightly differing in width of the respective dune phytocoenoses. In the western part, the presence of single specimens of the sea rocket (*Cakile maritima)*, which is a characteristic species of the natural habitat of wash margins, was noted during the inventory survey. Unfortunately, the area has been completely eroded as a result of coastal abrasion caused by the sea. Water erosion caused by the Baltic Sea has also destroyed the previously accumulated white dune here and undercut the edge of the dune in places up to the borders of the crowberry forest. Currently, phytocoenoses representing the *Calkiletea maritimae* class (the wash margin habitat) are not present in the analysed area.

A strip of white dunes (habitat 2120) is present in both landfall alternatives, particularly in the eastern one (Investor's variant) (35 km). This is a narrow, coastal embankment-like strip, where sand blown in from the beach is accumulated. The habitat here is built up by the tall grasses of the sand ryegrass (*Elymus arenarius)*, the European beachgrass (*Ammophila arenaria)* and coastal reedgrass (*Calammophila* x *baltica)*. Phytosociologically, the phytocenosis corresponds fully to the sand ryegrass and coastal reedgrass community *(Elymo-Ammophiletum arenariae).* In the area in question, species such as the sea pea (*Lathyrus japonicus*) NT and the sand sedge (*Carex arenaria*) OCz[272] are found in

[272] *Partially protected*

habitat 2110. All three patches of this habitat found at both cable landfall options were correctly developed and therefore assigned a favourable conservation status (FV).

The presence of grey dunes (habitat 2130) in both variants of the corridor varies in width, but at the scale of the Polish Baltic coast, they are narrow patches developing on terrain of different configuration. They cover depressions at the back of white dunes and more secluded depressions just before the coastal forest. The herbaceous cover varies here and is mainly related to the influence of anthropopressure. Patches of the habitat are covered with vegetation *(Helichryso-Jasionetum typicum*) with the dominant sand sedge (*Carex arenaria*) Ocz. In addition, the European beachgrass (*Ammophila arenaria*,) which is a remnant of the pioneer stages of white dune colonisation, occurs here in large numbers. The largest patches of habitat 2130 occur in the eastern part of the onshore corridor (35 km). The grey dune belt is wide here, and dry crowberry heath (*Carici arenariae-Empetretum nigri*) with small shrubs of the heath family (*Ericaceae*) develops in stabilised places, on humus-rich sites. In patches of the habitat, the strictly protected *Linaria odora* Os[273], an endemic species of the Baltic region, included in the Polish Red List (Kazimierczakowa et al. 2016) in the EN (endangered) category, furthermore protected under Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), code 2216, was recorded. In the patches of the grey dune habitat, stands of the dark-red helleborine (*Epipactis atrorubens*) Ocz were also recorded. The grey dune habitat in the analysed area occurs in a narrow belt, along almost the entire area of the onshore corridor. Eleven patches of this habitat in unsatisfactory (U1) and poor (U2) condition were identified. The main threat to the habitat is the introduction of trees and shrubs to stabilise the dune against abrasive processes.

At the back of the dunes, as along the entire Baltic coast, there are wide areas of mixed forests and coniferous forests on coastal dunes (habitat 2180), constituting the habitat dominant in the northern part of the land corridor of the planned connection (35 km to 36,4 km). In the case of the analysed corridor, the largest area of habitat is occupied by patches of the coastal crowberry forest complex (*Empetro nigri-Pinetum)*, however they are also accompanied in dispersion by communities of acid oak of the *Betulo-Quercetum* complex. Both phytocoenoses cover woodland communities, dominated by the Scots pine (*Pinus sylvestris),* with the participation of the common birch (*Betula pendula),* the common oak (*Quercus robur),* and sometimes also the European beech (*Fagus sylvatica)* or the black alder (*Alnus glutinosa)*. The shrub layer is dominated by the alder buckthorn (*Frangula alnus)* and the rowan (*Sorbus aucuparia)*. Less common is the hazel (*Corylus avellana)* and the bird cherry (*Padus avium)*. The undergrowth is dominated by the European blueberry (*Vaccinium myrtillus)* and the cowberry (*Vaccinium vitis-idea)*, the wavy hair-grass (*Deschampsia flexuosa)*, the heather (*Calluna vulgaris)* and the common cow-wheat (*Melampyrum pratense)*. There are numerous well-developed phytocoenoses with a high proportion of plants from the heath family, above all the crowberry (*Empetrum nigrum*) OCz, the marsh Labrador tea (*Ledum palustre*) OCz, and, in some places, northern winterberry the *Linnea borealis*, the lesser wintergreen (*Pyrola minor*) OCz and the greenflowered wintergreen (*Pyrola chlorantha*) OCz, the one-flowered wintergreen (*Moneses uniflora*) OCz, the broad-leaved helleborine (*Epipactis helleborine*) OCz, the honeysuckle (*Lonicera periclymenum*) OCz, the creeping lady's-tresses (*Goodyera repens*) OCz, and the club-mosses: the common club moss (*Lycopodium clavatum*) OCz and the interrupted club-moss *(Lycopodium annotinum*) OCz. In the patches of habitat 2180, the bryophyte layer is also abundant, comprising the partially protected: red-stemmed feathermoss (*Pleurozium schreberi)* OCz, the neat feather-moss (*Pseudoscleropodium purum)* OCz, the knights plume moss (*Ptilium crista-castrensis)* OCz and the rugose fork-moss (*Dicranum polysetum)* OCz and the broom fork-moss (D*. scoparium)* OCz. In overexposed places with sandy substrate, aboveground lichens such as the shrubby cup lichen (*Cladonia arbuscula)* OCz and the reindeer cup lichen (*C. rangiferina)* OCz and the true Iceland lichen (*Cetraria islandica)* OCz are more common. During the inventory, 9 patches of habitat 2180 - mixed forests and coniferous forests on coastal dunes in unsatisfactory (U1) and poor (U2) conservation status - were recorded. The main threats to the habitat

[273] *Strictly protected*

are large-scale clearing associated with the economic use of this type of habitat and excessive tourist traffic (e.g. camping).

South of the coniferous forest phytocenoses between 35 and 37 km, mainly in the western landfall variant (alternative), there are small patches of acidic *Luzulo-Fagenion* beech forests (habitat 9110), belonging to the group of poor beech forests in terms of flora and habitat. The stand of the acidic beech forest is dominated by the beech (*Fagus sylvatica*). The age of the oldest trees, according to the stand taxation description, is over 150 years. There is a small admixture of the hornbeam (*Carpinus betulus)* and the sessile oak (*Quercus petraea)* and the common oak (*Q. robur)*. The stand density is generally so high that the lower layers of the community are poorly developed. The shrub layer is usually of low density. It consists mainly of beech undergrowth. The most common components of the undergrowth are grasses and other acidophilous monocotyledonous species and small perennials, such as: the wavy hair-grass (*Deschampsia flexuosa)*, the hairy wood-rush (*Luzula pilosa),* the pill sedge (*Carex pilulifera)*, the *Calamagrostis arundinacea,* the wood sorrel (*Oxalis acetosella)*, the May lilly (*Maianthemum bifolium)*, the germander speedwell (*Veronica chamaedrys)* and the heath speedwell (*Veronica officinalis)* and the chickweed-wintergreen (*Trientalis europaea)*. The blueberry (*Vaccinium myrtillus)* occurs with high constancy, but generally in small numbers. Of the species characteristic of the fertile deciduous forests, the most stable are: *Poa nemoralis*, *Carex digitata, Anemone nemorosa, Galium odoratum*, *Viola reichenbachiana* and *Atrichum undulatum*. There are often lichens on the trunks of the beech forests: of the oakmoss (*Evernia prunastri*) (CzL 2006[274] NT) and the large-fruited fungus of the chaga (*Inonotus obliquus*) OCz. The field surveys revealed 12 patches of habitat 9110 - acid beech forests (*Luzulo-Fagenion*) in an unsatisfactory (U1) and poor (U2) conservation status.

In the southern part of the Investor's variant (eastern landfall of the cables) (36,8 km), there is a fairly extensive patch of acidophilous oak woods (*Quercion robori-petraeae*) (habitat 9190) comprising species-poor oak forests occurring on acidic soils. The forest stand is poorly diversified, composed of the sessile oak (*Quercus petraea)* and the common oak (*Q. robur)* with admixtures of common birch (*Betula pendula)*, the Scots pine (*Pinus sylvestris)* and the beech *(Fagus sylvatica)*. The shrub layer is built up by the undergrowth of the aforementioned trees, as well as the common buckthorn (*Frangula alnus)* and the rowan (*Sorbus aucuparia)*. The herbaceous layer is well developed, although species-poor in most of the patch. It is distinguished by the occurrence of acidophilic species derived from the boreal communities. The greatest coverage in the herbaceous layer is achieved by: the blueberry (*Vaccinium myrtillus)*, the wavy hair-grass (*Deschampsia flexuosa)*, the chickweed-wintergreen (*Trientalis europaea),* the May lilly (*Maianthemum bifolium),* the pill sedge (*Carex pilulifera)*, the *Calamagrostis arundinacea*, the eagle fern (*Pteridium aquilinum),* the hairy wood-rush (*Luzula pilosa),* the lily of the valley (*Convallaria majalis),* and the common cow-wheat (*Melampyrum pratense)*. The creeping soft grass (*Holcus mollis)* and the European hawkweed (*Hieracium sabaudum)* are of high diagnostic value. One patch of habitat 9190 - *Quercion robori-petraeae* acidophilous oak woods in poor conservation status (U2) was recorded during the natural inventory. The main threat to this habitat patch is forest management, which manifests itself, among other things, in the introduction of excessive amounts of the Scots pine or the Scots spruce in the regeneration and causing the age structure simplification of the stand and facilitating the spread of alien species - primarily the red oak or the American black cherry.

In the southern part of the Investor's variant (eastern landfall) (36 km) and a small part of the alternative (western landfall) (35,5 km), there are small patches of the *Pohlio-Callunion* European dry heaths (habitat 4030) having the form of low, shrubby communities with a typical two-layer structure. The upper layer is dominated by the common heather (*Calluna vulgaris)*; the lower layer is dominated by the sheep's fescue (*Festuca ovina)*, the common bent (*Agrostis capillaris),* the mouse-ear hawkweed (*Hieracium pilosella),* the heath speedwell (*Veronica officinalis)*, and the heath dog-violet (*Viola canina)*, the lingonberry (*Vaccinium vitis-idaea)*, the *Peucedanum oreoselinum*, the European goldenrod (*Solidago virgaurea),* the common woodrush (*Luzula multiflora)* and the field wood-rush (*Luzula campestris),* as well as spore-bearing plants and lichens, mong others, species of the *Cladonia* sp. As

[274] *CzL 2006 - Red list of plants and fungi in Poland (Mirek et al. 2006)*

a result of the succession, woody species appear – the Scots pine (*Pinus sylvestris),* the common birch (*Betula pendula)*, the aspen (*Populus tremula)* and shrubs, e.g. the common juniper (*Juniperus communis)*. In the course of the natural inventory studies, 2 patches of habitat 4030 in conservation status unsatisfactory (U1) in the Investor's variant (eastern cable landfall) and poor (U2) in the alternative variant (western cable landfall) were found.

In the area of km 39 of the corridor, there is a patch of the *Ficario-Ulmetum* riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia (habitat 91F0), in a poor conservation status (U2), resulting from the drying of the patch as a result of a general lowering of the groundwater level, the deep erosion of watercourses (e.g. as a result of their regulation) and the encroachment of ubiquitous species. The community was originally supplied with groundwater by a branch of the Struga Lędowska stream, the level of which has declined rapidly in recent years.

Between the 42 and 45 km within the corridor of the planned connection, there are three small patches of the *Stellario holosteae-Carpinetum betuli* sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli* (habitat 9160), where the stand consists of the European hornbeam (*Carpinus betulus)*, the common oak (*Quercus robur)* and the sessile oak (*Q. petraea)*, the small-leaved lime (*Tilia cordata)*, the maple (*Acer platanoides)* and the beech (*Fagus sylvatica). The* well-developed shrub layer contains the hazel (*Corylus avellana)* and the common reed (*Euonymus europaea)*, the honeysuckle (*Lonicera xylosteum)*. In the undergrowth, there are the large-flowered greater stitchwort (*Stellaria holostea)*, the sweet woodruff (*Galium odoratum),* the male fern (*Dryopteris filix-mas),* the yellow archangel (*Galeobdolon luteum),* the wood millet *(Milium effusum),* the spiked rampion (*Phyteuma spicatum),* the early dog-violet (*Viola reichenbachiana*), the spring pea (*Lathyrus vernus)*, the common liverwort (*Hepatica nobilis),* the wood anemone *(Anemone nemorosa),* the finger sedge (*Carex digitata),* the ground elder *(Aegopodium podagraria),* the mountain melick (*Melica nutans)*, the wood bluegrass (*Poa nemoralis)*, and others. In the sparsely dense undergrowth layer, the following moss species are found: the *Atrichum undulatum* and the *Eurhynchium angustirete*. During the natural inventory carried out, the conservation status of the patches was assessed as unsatisfactory (U1) and poor (U2). The main threat to the habitat patches in question is forest management and the associated subordination of these phytocoenoses to the wood production function. This manifests itself, inter alia, through the introduction of ecologically alien species, e.g. the Scots pine *Pinus sylvestris* and the spruce *Picea abies*.

Between the 44 km and 47 km within the corridor of the planned connection, there are patches of the *Dentario glandulosae-Fagenion, Galio odorati-Fagenion* fertile beech forests (habitat 9130) with an almost pure beech stand, and other tree species, e.g. the hornbeam (*Carpinus betulus)*, the sycamore (*Acer pseudoplatanus)* and the common maple (*A. platanoides),* the common oak (*Quercus robur)* and the sessile oak (*Q. petraea)*, the small-leaved lime (*Tilia cordata),* are usually only a minor admixture. In the poor shrub layer, apart from the beech undergrowth and the regeneration of admixture species, the rowan (*Sorbus aucuparia)* is usually present. The herbaceous layer is usually well developed, covering between 30% and 60% of the area, and abounds in numerous perennial species and grasses, the most common of which are: the wood sorrel (*Oxalis acetosella)*, the sweet woodruff (*Galium odoratum),* the yellow archangel (*Galeobdolon luteum),* the wood anemone (*Anemone nemorosa),* the common figwort (*Scrophularia nodosa),* the early dog-violet (*Viola reichenbachiana*), the coralroot bittercress (*Dentaria bulbifera)*, the common liverwort (*Hepatica nobilis)*, the wood melick (*Melica uniflora)*, the wood millet (*Milium effusum),* the wood bluegrass (*Poa nemoralis)*, the *Corydalis cava*, the lesser celandine (*Ficaria verna)*. The bryophyte layer is usually less developed and consists of the *Atrichum undulatum* and the *Polytrichum formosum.* During the inventory, 6 patches of habitat 9130 - fertile *Dentario glandulosae-Fagenion, Galio odorati-Fagenion* beech forests within the corridor of the planned connection in conservation status U1 and U2 were recorded. The main threat to the habitat is planned forest management. Amongst other things, it contributes to: simplification of the age and species structure of stands; introduction of ecologically alien species or trees and shrubs alien to the habitat, such as the Scots pine, the European larch or the spruce. Among the patches of fertile beech habitats, single, small patches of acidic *Luzulo-Fagenion* beech forests (habitat 9110) were also

diagnosed, and their conservation status was assessed as bad (U2) and a patch of *Carici elongatae-Alnetum* alder wood, where the tree layer is dominated by the black alder (*Alnus glutinosa)* with admixtures of the downy birch (*Betula pubescens)*, and less frequently by the common birch (*Betula pendula).* In the shrub layer, apart from alder, there is: the buckthorn (*Frangula alnus),* the rowan (*Sorbus aucuparia),* the black currant (*Ribes nigrum),* the red currant (*Ribes spicatum),* the bird cherry (*Padus avium).* In the undergrowth occur: the bittersweet nightshade (*Solanum dulcamara),* the gypsywort (*Lycopus europaeus),* the marsh marigold (*Caltha palustris),* the marsh calla (*Calla palustris),* the milk-parsley (*Peucedanum palustre),* the common marsh bedstraw (*Galium palustre),* the yellow iris (*Iris pseudoacorus)*, the water violet (*Hottonia palustris),* the true forget-me-not (*Myosotis palustris),* the elongated sedge (*Carex 313longate),* the lesser pond-sedge (*Carex acutiformis),* the great water dock (*Rumex hydrolapathum),* the purple small-reed (*Calamagrostis canescens).* On the other hand, moderately acidophilous woodland species occur on the clumps: the wood sorrel (*Oxalis acetosella),* the May lilly (*Maianthemum bifolium),* the blueberry (*Vaccinium myrtillus),* the narrow buckler-fern (*Dryopteris carthusiana).* During the inventory, 1 patch of the *Carici elongatae-Alnetum* alder woodland habitat was recorded. It is of an unsatisfactory conservation status of U1, which is related to overdrying resulting in the disappearance of swamp species, the development of general forest and meadow species.

In the area of 44 km of the corridor, there is a small patch of lowland meadows used extensively (Arrhenatherion elatioris) (habitat 6510) in poor conservation status (U2), resulting from the species impoverishment of the patch and the occurrence of only primary species mainly grasses: Rye-grass (Arrhenatherum elatius), cocksfoot (Dactylis glomerata), meadow fescue (Festuca pratensis) meadowgrass (Poa pratensis) and meadow foxtail (Alopecurus pratensis). The lower layer is dominated by dicotyledonous plants, including species characteristic of fresh meadows: scattered bellflower (Campanula patula), common hawkweed (Leucanthemum vulgare), meadow elder (Geranium pratense), and field scabious (Knautia arvensis). The leading threats to the habitat patch in question are associated with the intensification of meadow management (heavy fertilization, reseeding of grasses and plants of the broad bean family) or with the abandonment of meadow management and the initiation of natural succession processes towards scrub communities.

In the area of 46 km of the corridor there is a small patch of alder (Carici elongatae-Alnetum). Alder communities are not listed in Annex I of the Habitats Directive, but due to their ecological function in the landscape, natural values, as well as the often high degree of naturalness associated with the difficult accessibility of the swampy terrain, as well as the increasing threat, manifested by a decline in their floristic diversity and decreasing acreage (drying of phytocenoses), these habitats deserve attention and protection. The necessity of their monitoring and protection is indicated, among others, in the methodological guide Monitoring of natural habitats - T. 4 (Frost 2015). During the inventory, a small, patch of alder forest (Carici elongatae-Alnetum) was recorded, in an unsatisfactory conservation status of U1. The stand layer here is dominated by black alder (Alnus glutinosa) with an admixture of barnacle birch (Betula pendula). In the shrub layer, in addition to alder, there is: buckthorn (Frangula alnus), rowan (Sorbus aucuparia), black currants (Ribes nigrum) and red currants (Ribes spicatum), and chokecherry (Padus avium). The main threats to the Carici elongatae-Alnetum habitat patch are associated with the drying of a small patch and thus the development of generalist species.

Table 8.8. *Habitats within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No.	Name	Latin name	Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
1.	Sub-Atlantic European oak-hornbeam forests	*Stellario holosteae-Carpinetum betuli*	yes / U1 i U2	yes	yes
2.	Acidophilous beech forests	*Luzulo-Fagetum*	yes / U1	yes	yes

3.	Acidophilous oak forests	*Quercion robori-petraeae*	yes / U2	yes	yes
4.	Mixed forests and coniferous forests on coastal dunes (coastal crowberry forest)	*Empetro nigri-Pinetum*	yes / U1 i U2	yes	yes
5.	Riparian forests with oaks, ashes and elms	*Ficario-Ulmetum*	yes / U2	yes	yes
6.	Coastal yellow dunes	*Elymo Ammophiletum*	yes / FV	yes	yes
7.	Coastal grey dunes (a priority habitat)	*Helichryso-Jasionetum typicum*	yes / U1	yes	yes
8.	Lowland and mountain fresh meadows	*Arrhenatherion elatioris*	in the area of potential impact	yes	yes
9.	Alder forests	*(Carici elongatae-Alnetum)*	in the area of potential impact	yes	yes
10.	Dry heaths	*Pohlio-Callunion*	tak / U1	yes	yes
11.	Fertile beech forests	*Dentario glandulosae-Fagenion, Galio odorati-Fagenion*	yes / U1 i U2	yes	yes

Explanations: Ocz – partially protected species; FV – favourable status, U1 – unsatisfactory, U2 – poor (the conservation status given for animal species sites reflects the conservation status of their habitat)

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

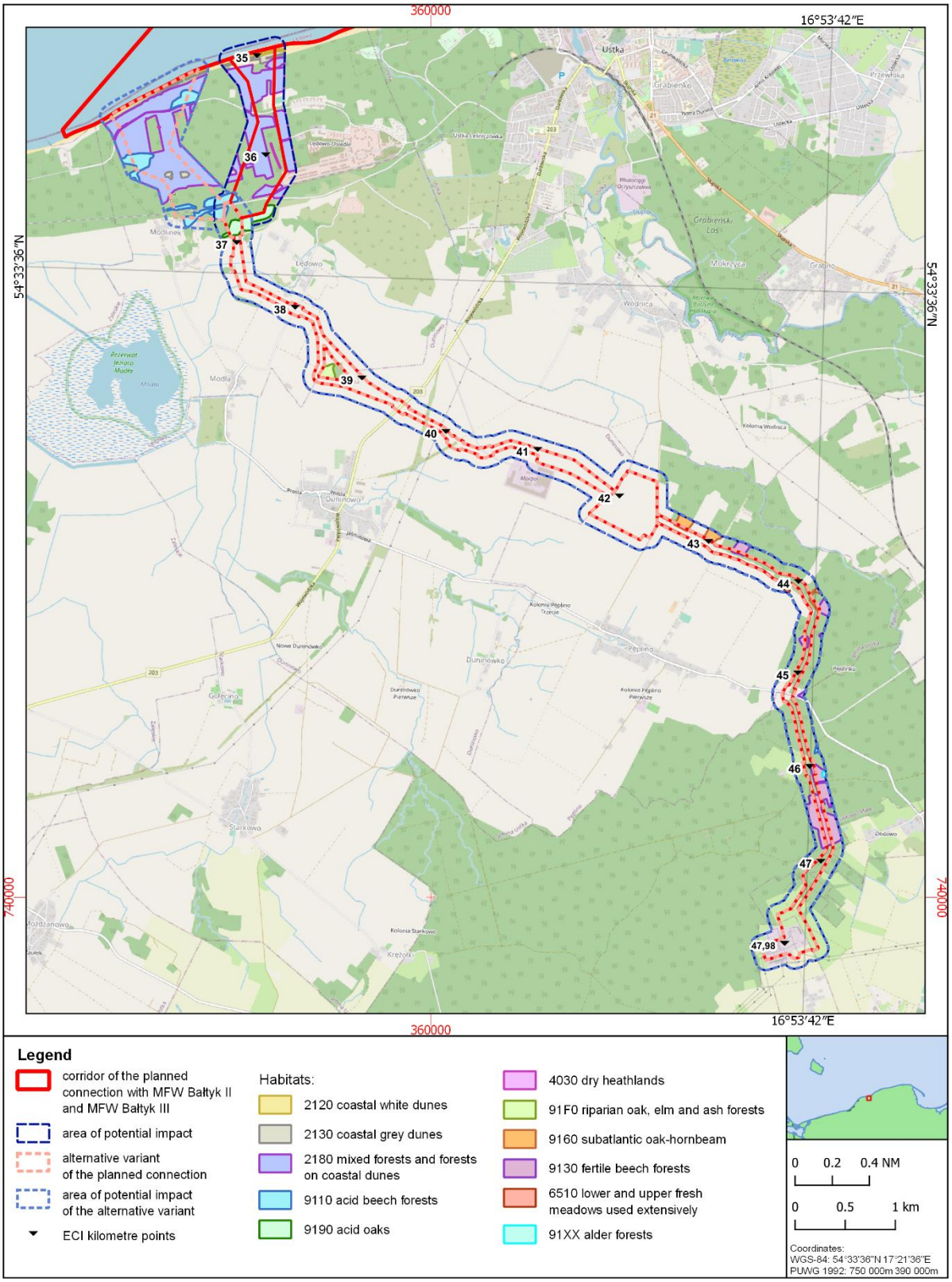


Figure 8.20. *The planned Project against the results of the natural habitat inventory*

Source: In-house study on data from the Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk II

Summary: The habitat inventory in the area of the onshore corridor and in area of potential impact showed the presence of 9 natural habitats (2120 coastal white dunes, 2130 coastal grey dunes, 2180 mixed forests and coniferous forests on coastal dunes, 9110 acidic beech forests, 9130 fertile

beech forests, 9160 sub-Atlantic oak-ash forests, 91F0 riparian oak-ash forests, 9190 acid oak forests, 4030 European dry heath). Their status and perspectives of protection vary, but they constitute an important element of the biodiversity of Pomerania and of the vegetation of the coastal zone of the southern Baltic Sea. Among the most important habitats in terms of biodiversity and floristic specificity are the priority habitats whose ranges are wholly or mostly within the EU, which means that if they do not survive within the EU, they will disappear altogether from the earth, so the member states must take appropriate protective measures. In the area of the onshore corridor, the habitat inventory showed the presence of priority natural habitat 2130 coastal grey dunes. The main threats to the occurrence of this habitat are the introduction of trees and shrubs to stabilise the dunes against abrasive processes and an increase in tourist use, trampling and littering of the patches. Eleven patches of this habitat were identified in unsatisfactory (U1) and poor (U2) condition.

8.5.2. Forests

In the northern and southern part of the planned connection infrastructure, there are forests administered by the Regional Directorate of State Forests in Szczecinek, Forest District Ustka, the Modlinek Forest Division (in the northern part) and the Pęplino Forest Division (in the southern part) (figure 8.21).

In the northern part of the planned Project, fresh coniferous forests dominate, with a small share of dry coniferous forests and fresh mixed forests. In the southern part, there are fresh and wet forests (figure 8.22 and figure 8.23). In total, there are about 49 hectares of forests administered by the State Forests within the boundaries of the ECI corridor, and the extent of necessary logging for construction will be significantly smaller.

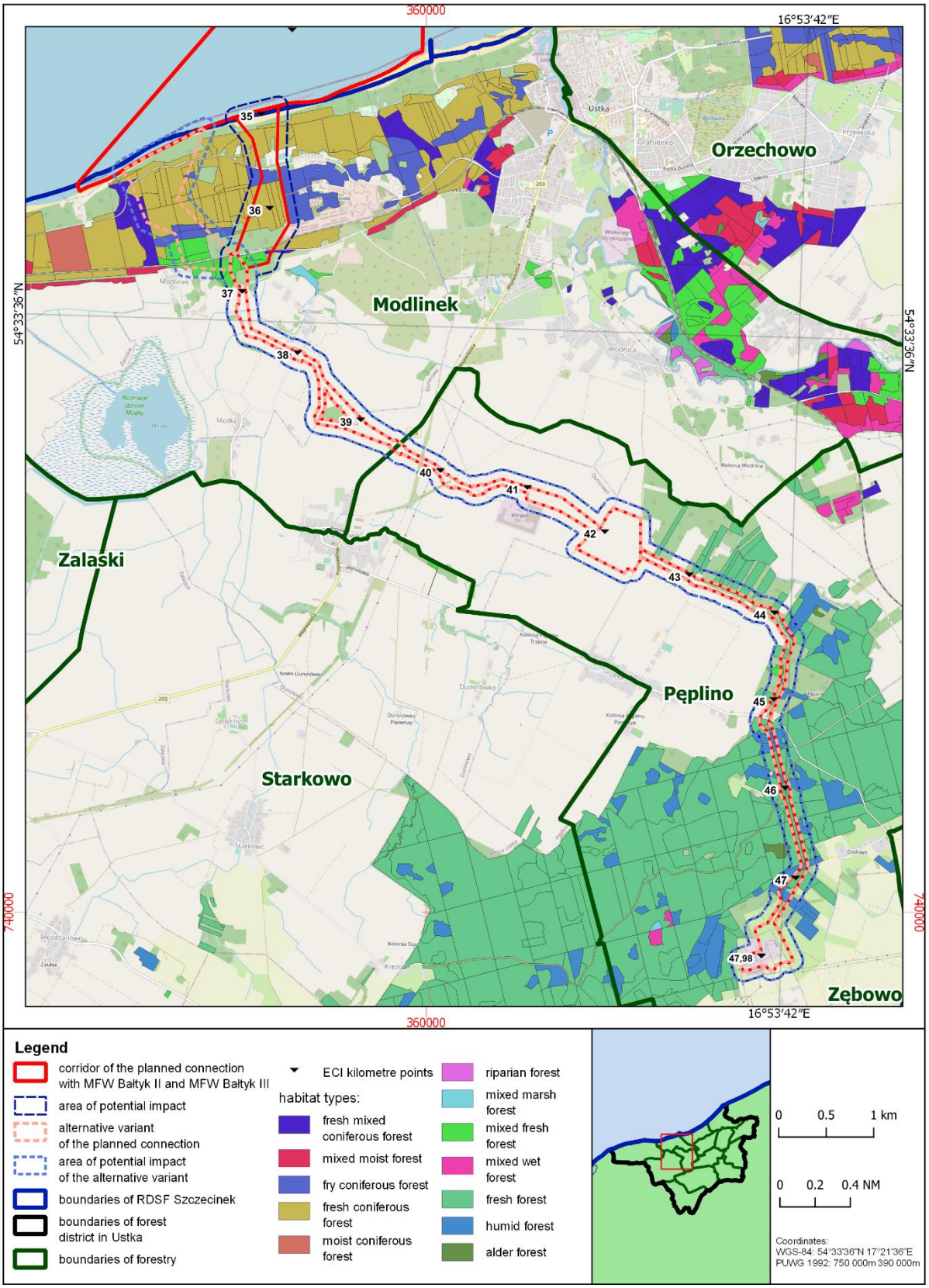


Figure 8.21. *The planned Project on the background of forest habitat types*

Source: In-house study based on data from the Forest Data Bank https://www.bdl.lasy.gov.pl/portal/uslugi-mapowe-ogc – on 2.06.2022 r.

The forest habitat occurring just behind the dunes is predominantly composed of coastal coniferous forest *Empetro nigri-Pinetum* (35 to 37 km ECI corridor) growing on sandy soils of marine origin, arenosols (in the poorest habitats), podzols (in fresh habitats) and gleyic and peaty soils (in a few

moist habitats). The main component of the forest stand is the dominant pine (*Pinus sylvestris*), the age of which usually oscillates around 100 years and sometimes significantly exceeds it, reaching 143-163 years. The pine is accompanied by the common birch (*Betula pendula*), the English oak (*Quercus robur*) and, more rarely, the beech (*Fagus sylvatica*). The locally rich undergrowth consists of understorey trees of the tree stand, in addition to the rowan (*Sorbus aucuparia*), the sand willow (*Salix arenaria*) and buckthorn (*Frangula alnus*).

The stand of fresh forest in the southern part (42.5 to 48 km) is made up of the beech (Fagus sylvatica) with the addition of the English oak (Quercus robur), the green Douglas fir (Pseudotsuga menziesii) and the pine (Pinus sylvestris). These trees range in age from 10 to 153 years and all are of good condition. The wet forests that occur here are built up by the English oak (Quercus robur) and alder trees aged between 80 and 140 years. They are also in good condition.

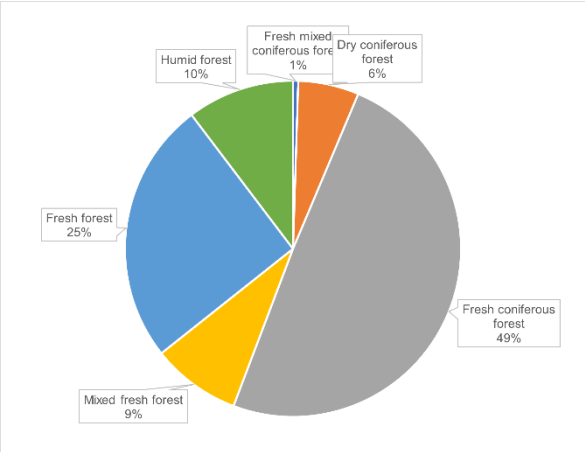


Figure 8.22. *Percentage share of forest habitat types along the corridor of the planned Project*

Source: In-house study based on data from the Forest Data Bank https://www.bdl.lasy.gov.pl/portal/uslugi-mapowe-ogc - as at 2.06.2022

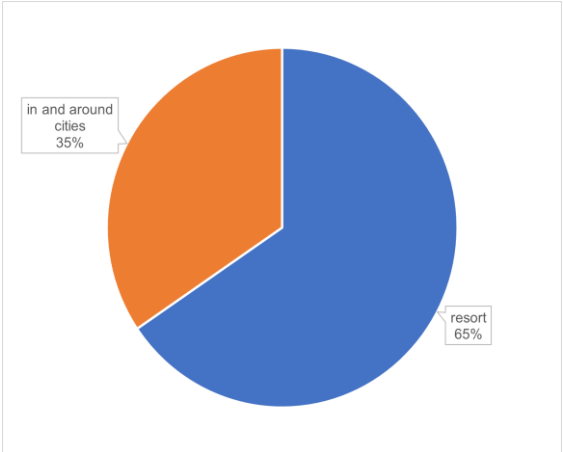


Figure 8.23. *Percentage share of forests with protective functions in the corridor of the planned Project*

Source: In-house study based on data from Forest Data Bank https://www.bdl.lasy.gov.pl/portal/uslugi-mapowe-ogc - as at 2.06.2022

The Ustka Forest District carries out forest management on the basis of a forest management plan drawn up for the period from 1 January 2018 to 31 December 2027, on the basis of the state of the forest on 1 January 2018, approved by the Decision of the Minister of the Environment of 06.09.2018.

In the Ustka Forest District, a division of forests into protection categories was adopted in accordance with the Decision No. 56 of the Minister of Environmental Protection, Natural Resources and Forestry dated 12.08.1999 (DLOPiK.lp-0233-59/99) and the Decision of the Minister of Environment dated 30.10.2001 (BOA – lplo – 283/2439/2001). According to the classification, in the northern part of the corridor of the planned Project there are health-resort protective forests[275], and in the southern part – protective forests in and around towns, because of their location within 10 km from the administrative borders of Słupsk (a city with more than 50 thousand residents) (figure 8.24).

[275] *A small percentage is occupied by soil-protected forests in the area of km 35 IP according to the delimitation outside the PGL LP https://www.bdl.lasy.gov.pl/portal/mapy*

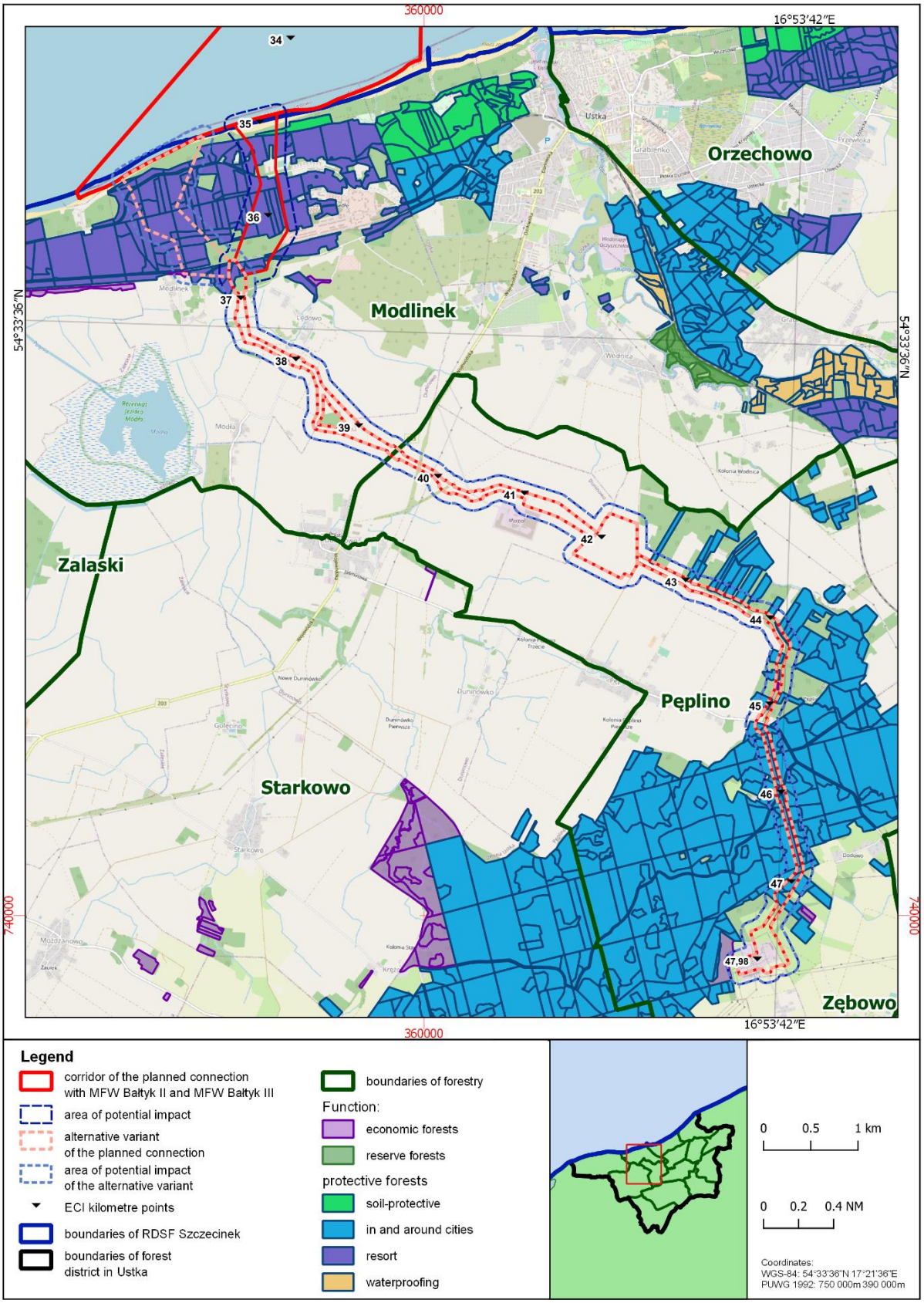


Figure 8.24. *The planned Project on the background of forests with protective functions*

Source: In-house study based on data from the Forest Data Bank https://www.bdl.lasy.gov.pl/portal/uslugi-mapowe-ogc – on 2.06.2022 r

In summary: the corridor of the planned Project is dominated by coniferous and fresh forests. Forests growing on poor sands are quite susceptible to chemical and biological degradation.

Pursuant to Article 9. Of the Act of 3 February 1995 on the protection of agricultural and forest land (Journal of Laws 2022.2409 consolidated text): *Buildings and structures for forest management, defence or state security, navigation marking, surveying, health protection and facilities for tourism may be constructed in protective forests. In cases justified by important social reasons and the lack of other land, protective forests may be used for purposes other than those specified above, after obtaining the consent of the Minister of Climate and Environment with respect to state forests) or the provincial marshal (with respect to other forests).*

However, due to the fact that the Project in question is implemented in accordance with the Act on the preparation and implementation of strategic investments in the field of transmission networks pursuant to Article 18(1) of this Act: *the provisions on the protection of agricultural and forest land covered by the decision on the determination of the location of a strategic investment in the field of transmission network shall not apply to agricultural and forest land*. Further this provision states that: *To the removal of trees and shrubs located on properties included in the decision on the determination of the location of a strategic investment in the field of the transmission network, with the exception of trees and shrubs removed from a property entered in the register of historical monuments, the provisions on the protection of nature in terms of the obligation to obtain permits for their removal and fees related thereto shall not apply.* In addition: The State Forest Holding is obliged to cut down trees and shrubs and to clear them within the time limit and under the conditions established in a separate agreement between the State Forest Holding and the Investor.

8.5.3. Biota of macrofungi and lichens

The characterisation of the macrofungi and lichens was prepared on the basis of the annual nature inventory for the 'Connection Infrastructure of the offshore wind farm MFW Bałtyk II and the offshore wind farm MFW Bałtyk III' (Volume III, Attachment 2).

Within the corridor of the planned and in area of potential impact, connection 4 valuable species of large-fruited fungi were found, including 1 species - subcortical chaga - *Inonotus obliquus* being a subject to partial protection according to the Regulation of the Minister of Environment of 9 October 2014 on the protection of species of fungi (Journal of Laws 2014.1408). No species under strict protection were found (table 8.9).

The chaga - *Inonotus obliquus* (Pers.) Pilát (1942)

Partially protected species, red list status: R - rare, potentially threatened with extinction.

In Poland, the species is fairly common, mainly found on the birch, but rarely on other deciduous trees such as the maple, the hornbeam, the beech, the rowan or the elm. The fruiting bodies also form on dying or dead trees, especially on birch, less frequently on rowan, hornbeam or alder. In Pomerania it is identified in the coastal belt of forests. Due to its medicinal properties, the species has been placed under partial protection to limit over-harvesting of fruiting bodies. Within the corridor of the planned connection, the species was found on six sites, mainly in boreal habitats, in the coastal strip of dune dikes (between 35 and 37 km). Assessment of the impact of the planned connection on the species - a derogation for destruction is necessary to obtain in case of conflict with the course of the connection. Minimising measures - none.

Triple starflower (Geastrum triplex)

Grows on humus-rich soil in thickets, parks and deciduous forests (especially under beech and oak trees), mostly in shady places. It also occurs on forested coastal dunes. It is quite rare in Poland, but it is also possible that the population of this species is greatly underestimated. It is on the Red List of plants and fungi of Poland. It has a status of E - extinct species Within the corridor of the planned connection, the species was found in two sites, in boreal habitats, in the strip of coastal dune embankments. Minimization measures - none. It is not protected so derogation for destruction is not required.

Sand-brittle (Psathyrella ammophila)

Grows only on dune sand in the white or gray dune belt in open and sunny areas. It is rarely reported in Poland, but it is also almost certain that the population of this species is underestimated due to the ephemeral nature of the appearance of fruiting bodies. It is on the Red List of plants and fungi of Poland. It has a status of E - extinct species. Within the corridor of the planned connection, the species was found at a single site in the strip of coastal dune embankments in the variant suggested by the investor. Minimization measures - none. It is not protected so derogation for destruction is not required.

Venomous flytrap (Amanita virosa)

Grows in coniferous forests and mixed mixed and deciduous forests. It is quite rare in Poland It is on the Red List of Plants and Fungi of Poland. It has a status of V - a species in danger of extinction. Within the corridor of the planned connection, the species was found at a single site in the variant suggested by the investor. Minimization measures - none. It is not protected so derogation for destruction is not required.

The study area is also characterised by a significant richness and diversity of lichens (lichen biota), with a high proportion of valuable species (protected, rare, endangered). During the inventory, 16 valuable species were found within the corridor of the planned connection, including 4 species under strict legal protection and 11 species under partial legal protection (figure 8.25).

Table 8.9. *Macrofungi within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No.	Name	Latin name	Protection status	Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
1.	The chaga	*Inonotus obliquus*	OCz	yes / FV	yes	yes
2.	Geastrum triplex	*Geastrum triplex*	not	yes / FV	not	yes
3.	Kruchaweczka piaskowa	*Psathyrella ammophila*	not	yes / FV	yes	not
4.	Amanita virosa	*Amanita virosa*	not	yes/U1	yes	not

Explanations: Ocz – partially protected species; FV – favourable status,

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

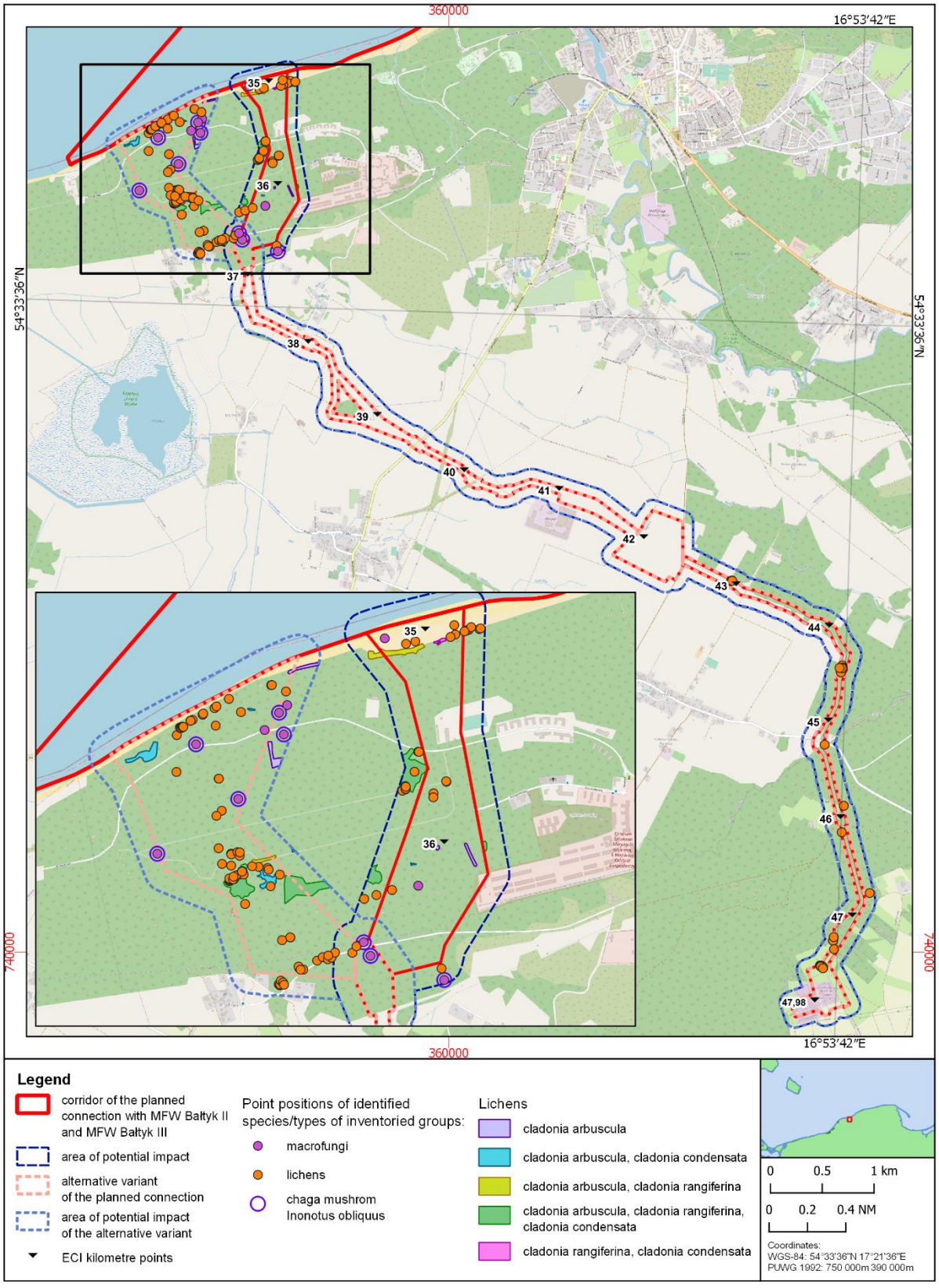


Figure 8.25. *The planned Project against the background of the inventoried large-fruited fungi and lichens*

Source: In-house study on data from the Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk II

The following table (table 8.10) shows the valuable lichen species found within the corridor of the planned connection and in area of potential impact.

Table 8.10. *The valuable lichen species found within the corridor of the planned connection and in area of potential impact and alternative variant*

No	English name	Latin name	Protection status	Occurrence	Number of sites within the corridor of the planned connection			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					point	poligon	total			
Clustered fungi (lichens)										
1.	Silver-lined wrinkle lichen	*Tuckermannopsis (Cetraria) chlorophylla*	OCz CzL 2006 VU - Vulnerable species	It grows on tree bark, wood and rarely on rocky ground.	1	-	1	yes / FV	not	yes
2.	Bristly beard lichen	*Usnea hirta*	OCz CzL 2006 VU - Vulnerable species	It grows on the bark of trees, mainly pin trees. It is much less common on the bark of deciduous trees and on wood	11	-	11	yes / FV	not	yes
3.	Fishbone beard lichen	*Usnea filipendula*	OCz CzL 2006 VU - Vulnerable species	It grows on the bark of trees, mainly pine trees. It is much less common on the bark of deciduous trees and on wood	1	-	1	yes / FV	not	yes
4.	Green reindeer lichen	*Cladonia arbuscula*	OCz, DS V	It grows in light pine forests and mixed forests	13	15	28	yes / FV	yes	yes
5.	Maritime reindeer lichen	*Cladonia portentosa*	OCz, DS V	It grows in light pine forests and mixed forests	2	11	14	yes / FV	yes	yes
6.	Gray reindeer lichen	*Cladonia rangiferina*	OCz, DS V	It grows in light pine forests and mixed forests	7	9	16	yes / FV	yes	yes
7.	Valley oakmoss lichen	*Evernia prunastri*	CzL 2006 NT - near threat	It occurs in forests and open areas, rarely on coastal dunes, growing on the bark of many deciduous and coniferous tree species, less frequently on piles of stones	61	-	61	yes / FV	yes	yes
8.	Ridged ramalina lichen	*Ramalina fraxinea*	AX CzL 2006 EN - declining species	It grows in light areas on the bark of deciduous trees, usually alone. It can be found on roadside trees and by rivers. It is found on living trees.	1	-	1	yes / FV	yes	yes
9.	Dotted ribbon lichen	*Ramalina fastigiata*	AX CzL 2006 EN -	It grows in light areas on the bark of deciduous and coniferous trees.	2	-	2	yes / FV	yes	yes

No	English name	Latin name	Protection status	Occurrence	Number of sites within the corridor of the planned connection			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					point	poligon	total			
			declining species	Rarely found on wood or rocks						
10.	Dotted ramalina lichen	*Ramalina farinacea*	OCz CzL 2006 VU - Vulnerable species	It grows in light areas on the bark of deciduous and coniferous trees,. Rarely found on wood or rocks	15	-	16	yes / FV	yes	yes
11.	Dusty cartilage lichen	*Ramalina pollinaria*	OCz CzL 2006 VU - Vulnerable species	It grows in light areas on the bark of deciduous and coniferous trees. Rarely found on wood or rocks	2	-	2	yes / FV	not	yes
12.	Dog lichen	*Peltigera canina*	OCz CzL 2006 VU - Vulnerable species	It grows on acidic soil as well as on limestone, on humus soil, on peat, on fallen leaves, on bryophytes and liverworts, on fallen tree branches, on bark at the base of tree trunks.	1	-	1	in area of potential impact		
13.	Salted starburst lichen	*Imshaugia aleurites*	OCz	It grows in light areas on the bark of , deciduous and coniferous trees. Rarely found on wood or rocks	12	-	12	yes / FV	yes	yes
14.	Powder-headed tube lichen	*Hypogymnia tubulosa*	OCz CzL 2006 NT - near threatened species	It grows on the bark of trees, mainly pine trees. It is much less common on the bark of deciduous trees and on wood	4	-	4	yes / FV	not	yes
15.	-	*Parmelia submontana*	AX CzL 2006 VU - Vulnerable species	It grows on tree bark, wood and rarely on rocky ground.	1	-	1	yes / FV	not	yes
16.	Gold dust lichen	*Chrysothrix candelaris*	AX CzL 2006 CR - Critically Endangered species	It grows on the bark of deciduous and coniferous trees, less commonly on dead wood	2	-	2	yes / FV	not	yes

Explanations: AX - strictly protected species, OCz – partially protected species; DS V - species listed in Annex V; respectively to the Habitat Directive; CzL 2006 - Red list of plants and fungi in Poland (Mirek et al. 2006), CR - critically endangered species; EN - extinct species; VU - vulnerable species; NT - near threatened species; FV – favourable status,

Source: In-house study on data from the Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

Summary: Within the corridor of the planned and in area of potential impact connection, 4 valuable species of large-fruited fungi were found, including 1 species – the chaga *Inonotus obliquus* under partial protection. No species of macrofungi under strict protection were found. The preservation of populations of valuable taxa of macrofungi is favoured above all by the presence of well-preserved forest communities, especially pine forests and beech forests. The diversity of habitats and plant communities, especially of the pine forests and beech forests in the area of the connection corridor, has largely lost its original high degree of naturalness, and their condition in terms of the occurrence of macroscopic fungi can be described as unsatisfactory or poor, not conditioning the diversity of the macrofungal biota. The preservation of populations of rare saprophytic fungal taxa is favoured by leaving larger fragments of fallen trunks (coarse wood), and the presence of well-preserved stands determines the proper occurrence of mycorrhiza. The main threat to macrofungal species is the destruction of their habitats. The harvesting of fruiting bodies by tourists and mushroom pickers concerns only a few species, which are generally recognised as edible and at the same time allowed for sale in Poland. Destruction of habitats, including trees clearing, changes in water conditions and export of large-format wood (coarse wood) from the forest often cause irreversible changes in the qualitative and quantitative biota of macroscopic fungi, both above-ground species and those associated with tree trunks. In addition, 16 valuable lichen species were found within the corridor of the planned connection, including 4 species under strict legal protection, 11 species under partial legal protection. The preservation of populations of rare aboveground and epiphytic lichen taxa is favoured by the remaining of well-preserved old-growth stands of coniferous, mixed and deciduous trees both in forest communities and along forest and municipal roads. The presence of well-preserved stands determines the correct biodiversity of lichen species.

8.5.4. Invertebrate fauna

The nature inventory for the preparation of this Report was conducted in the period between 06.2021-06.2022, in a buffer of 500 m from the borders of the onshore ECI corridor of MFW BII and MFW BIII, in both directions. The detailed methodology for the inventory of individual natural groups is described in Attachment 2. The valuable fauna species within the corridor of the planned connection and in the area of potential impact are described below.

The valuable entomofauna species found within the corridor of the planned connection and in the area of its potential impact are described below (table 8.11) (figure 8.26):

The red wood ant - *Formica rufa*

A partially protected species.

A common species throughout Poland, typical for maturing and mature coniferous and mixed forests, also found in deciduous forests. It usually establishes anthills in sunny places - on the edges of forests, along forest roads, in the thinness of tree stands, less often in shady places[276, 277]. It mainly inhabits the northern part of the ECI area at kilometres 35-37 of ECI corridor.

The sand hopper - *Talitrus saltator*

A partially protected species.

A species of the sand hopper family (*Talitridae*), an amphipod crustacean living in Europe on the coasts of the North Sea, the Atlantic Ocean (from southern Norway to the Mediterranean Sea) and the Baltic Sea. Its life is linked to the tides and a daily migration of up to 100 m. It spends most of the day buried in the sand at the depth of 10-30 cm, but comes out at night to feed (mainly on rotting seaweed accumulating on the beach). The beach sand hopper is an important food source for shorebirds[278]. It inhabits only beaches in the ECI corridor (34 – 35 km).

Bumblebees - *Bombus sp.*

[276] *Czechowski W., in. 2002.*
[277] *Radchenko A., et al. 2004.*
[278] *A small zoological dictionary., 1984*

All species of this group are under partial species protection in Poland.

A genus of insects from the bee family Apidae. They are of great importance for the environment, because in their search for pollen, which they feed on, they pollinate many species of plants. Insects active from early April to late September. In Poland, 31 species of bumblebees have been found. Bombus spp. bumblebees were present almost throughout the study area - both in agricultural areas, synanthropic areas covered with vegetation with a significant proportion of flowering dicotyledonous herb species, and forest areas. Bumblebee abundance is currently tremendously variable. The literature (e.g. Timberlake et al. 2021, Bilinski et al. 1990, Ruszkowski et al. 1993) shows that in April-June, bumblebee abundance per hectare can average from 0 to about 50 individuals (with fluctuations from 0 to several hundred individuals). This number depends on the food abundance of the habitat. If there are "bumblebee plants" in the environment (e.g., legumes, including clover) the density will increase, with other flora composition the number will decrease. July is the month when bumblebees are most abundant. Their average abundance can rise even to more than 200 individuals per hectare. In the following months, a decline in bumblebee abundance is already observed.

Considering bumblebee abundance depending on the environment (e.g. Bilinski et al. 1990, Ruszkowski et al. 1993), the most abundant bumblebee population is found on forest edges - a several-meter long ecotone belt between the forest and fields offering a great number of nectar-producing plants. In contrast, fields, meadows and pastures offer the most variable conditions for bumblebees from favorable (with the presence of clovers, other hoe plants) to very unfavorable (buckwheat crops). Few bumblebees are also found in forests. They appear in parts of forests that are more open where flowering plants can be found, such as scabious, heather, hawkweed.

However, it should be noted that with the current chemicalization of agriculture and inadequate use of pesticides, bumblebee numbers are declining dramatically in many places.

Table 8.11. *The valuable entomofauna species found within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No	English name	Latin name	Protection status	Occurrence	Number of sites			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					spotlight	poligon	total			
1.	Red wood ant	*Formica rufa*	OCz	Northern part of the area: km 35 to 37	14	0	14	yes / FV	yes	yes
2.	Sand hopper	*Talitrus saltator*	OCz	Northern part of the area: km 34 to 35	0	1	1	yes / FV	yes	yes
3.	Bumblebees	*Bombus sp.*	OCz	throughout the area				yes / FV	yes	yes

Explanations: OCz – partially protected species; CzLZGiZ - The Red List of Vanishing and Endangered Animals in Poland (Głowaciński 2002); NT – near threatened, FV - favourable status

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

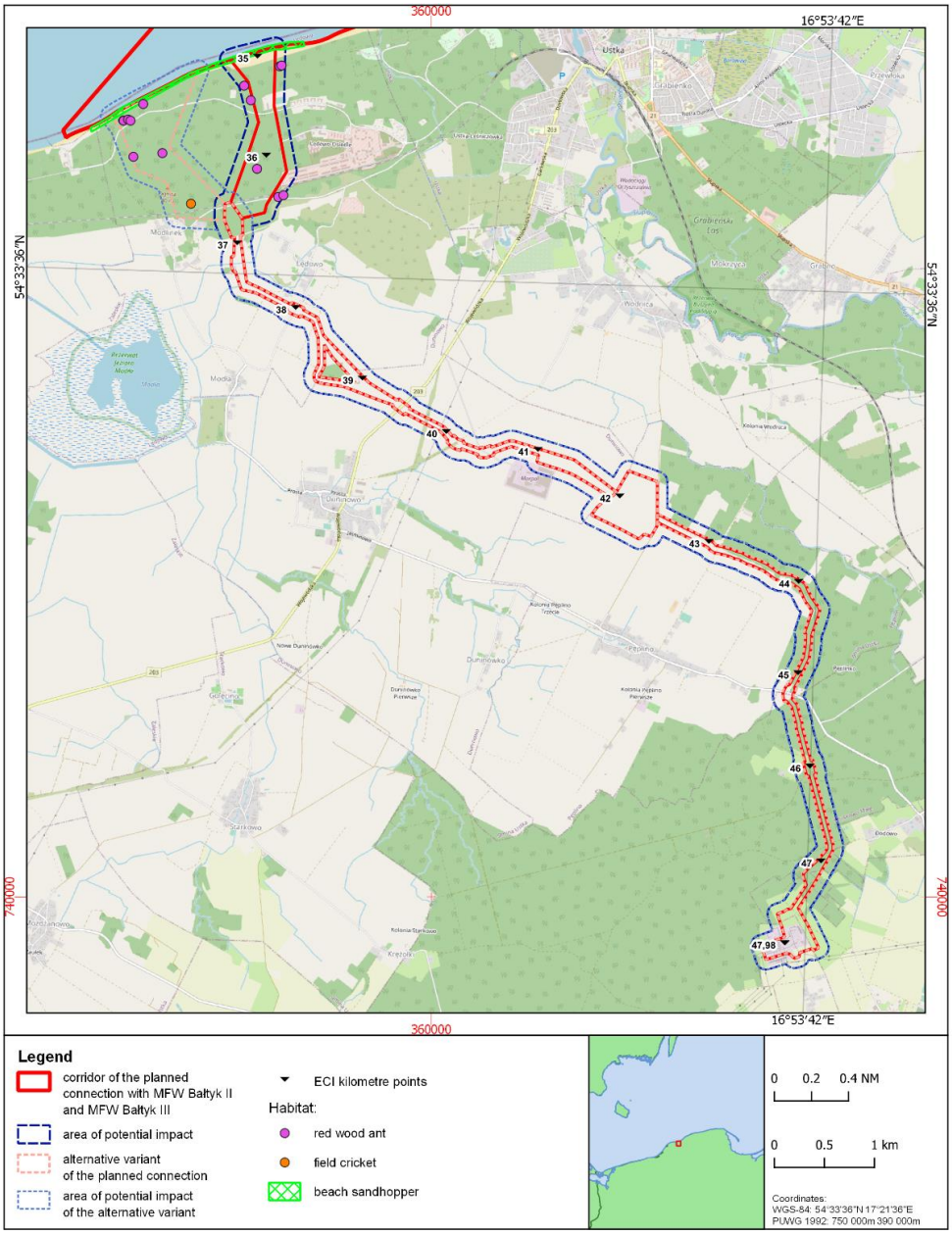


Figure 8.26. *The planned project against the results of the entomofauna inventory*

Source: In-house study based on data from results of Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk II

Summary: within the corridor of the planned Project and in the area of its potential impact, 3 species of invertebrates under partial species protection (Journal of Laws 2016, item 2183, as amended), were found. The most frequently found species was the red wood ant (14 sites within the ECI corridor and 6 within the zone of potential impact). The presence of the remaining species was determined on the basis of single sightings. The most valuable section of the planned Project, in terms of entomofauna, is the northern, coastal part of the corridor: 34 – 37 km.

8.5.5. Ichthyofauna

There is one watercourse along the route of the planned Project - Struga Lędowska, which has the character of a permanent watercourse, with a small longitudinal gradient and a low flow rate. In addition, the cable corridor will cross a few drainage channels and ditches, as well as the Pogorzeliczka watercourse, which are all intermittent in nature. There are no lakes, ponds, rivers or other hydrographic features (apart from those mentioned above) within the route of the planned ECI and within the limits of its potential impact where ichthyofauna may live.

One of the most important watercourses that occur in the further vicinity of the planned Project is the Słupia river, which flows to the east of the analysed corridor, at a distance of approximately 1.2 km.

The ichthyofauna inventory included the Struga Lędowska River, the largest watercourse crossed by the IP corridor. In the Oder River Basin Management Plan, which has been in effect since February 24, 2023, the Struga Lędowska River was not designated as a water body, with the result that no environmental objectives were set for it. On the other hand, referring to the 2016 version of the document, which is no longer valid. Struga Lędowska constituted water body RW60001046549 Karwina.

Smaller watercourses crossed by the IP corridor of the river in the Struga Lędowska sub-basin are intermittent in nature and sectionally do not carry water (as was found in the case of the upper section of the Pogorzeliczka). Rivers of this nature are not permanent habitat for ichthyofauna, hence they were excluded from the inventory.

The inventory of the ichthyofauna of the Struga Lędowska watercourse was carried out on 6 October 2021; a detailed description of the survey results is provided in Attachment 2. in Volume III of this EIA Report.

The study was conducted in Modlinek on the Struga Lędowska watercourse at a distance of several hundred metres before its mouth to the Modła lake (Photo 8.3).

Photo 8.3. *Struga Lędowska – an ichtyofauna fishing site*

Source: EKO-KONSULT Sp. z o.o.

In electrofishing carried out in the Struga Lędowska watercourse, 26 fish were caught at the site. Fish (of 132 g) belonged to 2 species: the pike and the tench (table 8.12). No protected or alien species were recorded.

Table 8.12. *List of fish species found in research catches and observations in Struga Lędowska*

Species	Latin name	Number of individuals	Weight (g)
Pike	*Esox lucius*	8	46
Tench	*Tinca tinca*	18	86
Total:		26	132

Source: In-house study based on detailed findings of the POM Plan

The ichthyofauna of the Struga Lędowska also includes the unprotected stickleback (*Gasterosteus aculeatus*) not caught during electrofishing, but found in this river during surveys of other animal groups.

The composition of the ichthyofauna of the Struga Lędowska was poor and typical for morphologically highly transformed small lowland streams.

In the vicinity of the planned Project (approx. 1.2 km), the Słupia River flows into the Baltic Sea as a migration route and spawning ground for bi-environmental fish and lampreys. These include anadromous species found in the inventory of marine areas: the Atlantic salmon, the sea trout, the zerta, the common whitefish, the smelt and the catadromous species - European eel using the river as feeding ground and breeding in the Sargasso Sea. Moreover, from literature data[279], it is known that the river lamprey (*Lampetra fluviatilis*) is also present in the Słupia river. The study by Błachut et al. 2010 contains requirements for preserving the morphological continuity of the Słupia river for salmon from the Baltic Sea to the mouth of the Kamienica river (km 0.0-84.5). As justification is given: *past and present spawning grounds for the salmon and the sea trout exist here. After the construction of new fish ladders in Słupsk, there is currently a significant increase in spawning migration of sea trout and salmon in this river. When the river is improved to the mouth of the Kamienica tributary, it is expected to increase the spawning area by about 11 ha*.

With regard to bi-environmental species, the potential impact relates to individuals in the marine environment and therefore their occurrence is considered in Subchapter 7.4.3.

The River Słupia and its tributaries are protected within the Natura 2000 network as the PLH220052 Dolina Słupi site. The SDF of this area lists the following fish and lamprey species as protected objects:

the spined loach (Cobitis taenia) - population status C;
the European bullhead (Cottus gobio) - population status C;
the European bitterling (Rhodeus amarus) - population status C;
the brook lamprey (Lampetra planeri) - population status C;
the river lamprey (Lampetra fluviatilis) - population status C;
the Atlantic salmon (Salmo salar) - population status B.

The first four species are associated with freshwater environment only, therefore there is no possibility of impact of the planned Project on their populations, as it does not cross the Slupia River or any of its tributaries. With regard to Atlantic salmon and river lamprey, the potential impact concerns individuals in the marine environment. Atlantic salmon is subject to fishing exploitation in the sea and was both caught by fishermen in the area of the planned Project and indicated in the inventory catches for MFW Bałtyk II (in the deep water zone), as well as for the ECI of FEW Baltic II (in the coastal zone). In contrast, the river lamprey was not indicated in the area of the planned ECI in the inventories or in the PMŚ monitoring - a more detailed description of marine ichthyofauna is presented in Subchapter 7.4.3 of this Report.

According to the Instytut Rybactwa Śródlądowego (Inland Fisheries Institute) data, stocking of the rivers Słupia, Łupawa and Łeba with bi-environmental salmonids was carried out between 2019 and 2021:

- Słupia (river mouth approximately 1.2 km from the cable corridor boundary):
  - 2019 – 12,520 smolts of the Atlantic salmon
  - 2020 – 20,000 smolts and 20,000 summer fry of the Atlantic salmon
  - 2021 - 24,020 smolts and 80,000 summer fry of the Atlantic salmon; 90,000 summer fry of the sea trout.
- Łupawa (river mouth approximately 11 km from the cable corridor boundary):
  - 2019 - 15,020 smolts and 135,000 summer fry of the sea trout
  - 2020 - 16,990 smolts, 150,000 summer fry and 50,000 sea trout hatchlings
  - 2021 - 21,920 smolts, 150,000 summer fry and 40,000 sea trout hatchlings.
- Łeba (mouth of the river more than 40 km from the cable corridor boundary):
  - 2019 - 15,000 Atlantic salmon smolts;
  - 77,660 smolts and 147,030 summer fry of the sea trout;

[279] *Błachuta et al. 2010*

- 2020 - 20,000 the Atlantic salmon smolts;
- 70,000 smolts and 230,000 summer fry of the sea trout.
- 2021 r. – 20,000 the Atlantic salmon smolts;
- 360 smolts and 200,000 summer fry of the sea trout.

In addition, stocking in the Wisła (annually) and in the Rega rivers - in 2020 and 2021 - was carried out for the zerta.

According to the data of the Instytut Rybactwa Śródlądowego, in 2022 eel stocking was conducted in lakes Gardno and Łebsko, which connect with the sea through the Łupawa and Łeba rivers. 48,914 fry were introduced to the Gardno lake, and 141 895 to the Łebsko lake. Other rivers and reservoirs stocked with the species are located at a considerable distance from the planned Project.

In summary: The Struga Lędowska, which is characterised by constant water flow, is the most important for ichthyofauna in the area. However, poor species composition and low fish abundance have been demonstrated here. In the other watercourses, fish may occur periodically, mainly in their estuarine sections.

8.5.6. Herpetofauna

The characterisation of herpetofauna was prepared on the basis of the annual nature inventory for the performed for this Report in 2021-2022 cited in full in the Volume III, Attachment 2. The natural inventory carried out showed that in the area of the ECI corridor two representatives of reptiles (an sand lizard - 3 sites, a grass snake - 2 sites) and 5 representatives of amphibians were found. Among the groups of amphibian species found, there were brown frogs (including grass frog and moor frog) and a complex of green frogs and gray toad. With the exception of the moor frog, which is under strict species protection, all the species found are partially protected. 3 species and representatives of the green frog complex are listed in the appendices of the EU Habitats Directive. Species included in the group of brown frogs and the green frog complex were recorded most often in the area of the planned Project. The wildlife inventory also found a single breeding site of the fire-bellied toad, which is located outside the ECI corridor covered by the application for an environmental decision.

According to the wildlife inventory, existing and potential amphibian breeding sites were selected and are shown in the figure below (Figure 8.27). The largest of these are the habitats of the ditch network and Struga Lędowska, where the brown frog (Rana sp.) and the gray frog (Bufo bufo) are found at km 36.4 to 37.5, the ditch network with the occurrence of the grass frog (Rana temporaria), the pond at km 43.6 , where the brown frog (Rana sp.) is found, and minor ditches and wetlands with the dominance of green frogs (Pelophylax esculentus complex), brown frog (Rana sp.) and grass frog (Rana temporaria).

Photo 8.4. *Potential amphibian breeding site - forest pond in the area of 43.6 km of the ECI corridor*
Source: Raport końcowy z Inwentaryzacji Przyrodniczej Infrastruktury Przyłączeniowej Morskiej Farmy Wiatrowej MFW Bałtyk III oraz Infrastruktury Przyłączeniowej Morskiej Farmy Wiatrowej MFW Bałtyk II

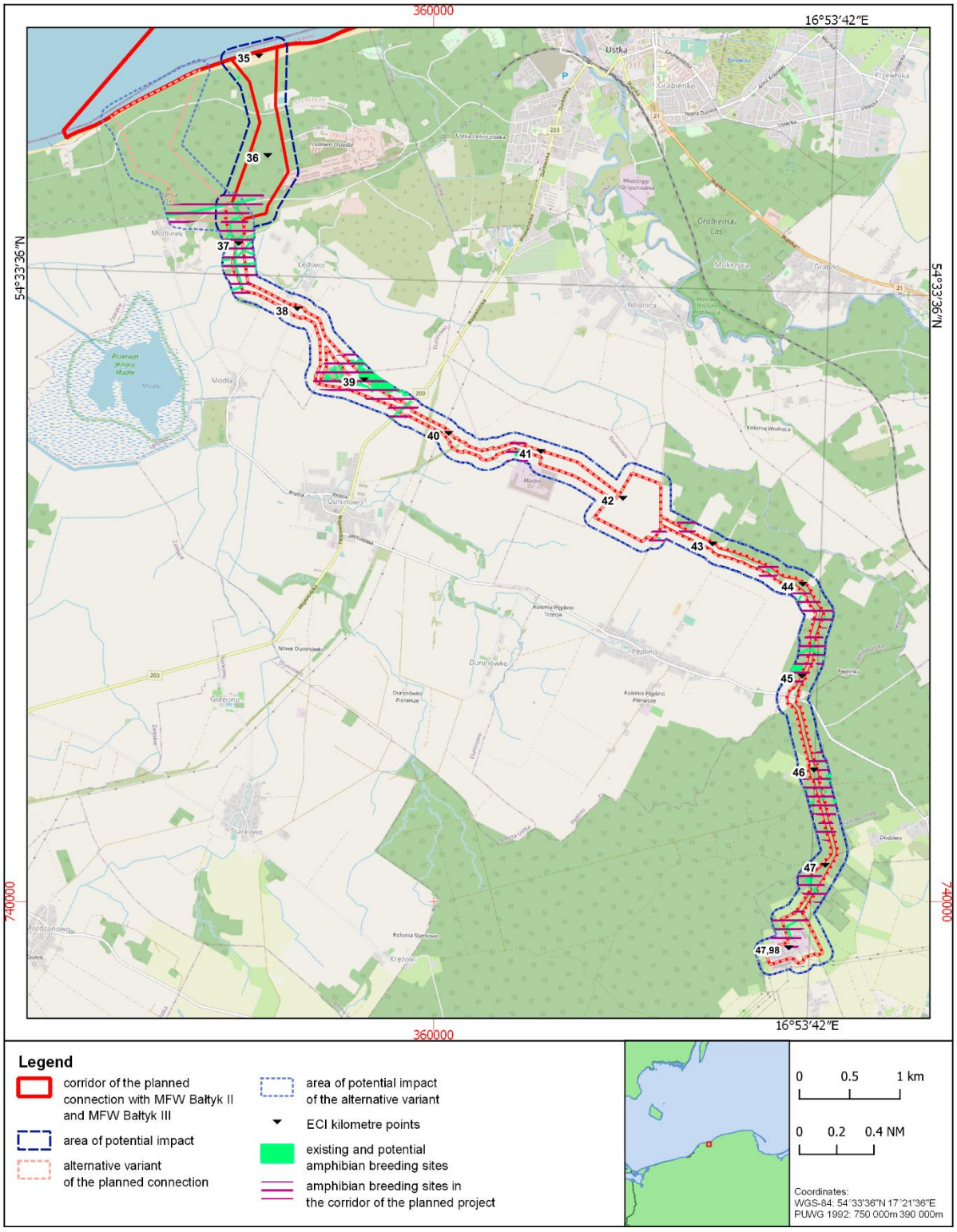


Figure 8.27. *The planned Project against the results of the herpetofauna inventory*
Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

Valuable herpetofauna species found within the corridor of the planned connection and in the area of its potential impact (table 8.13.):

The common toad - *Bufo bufo*

A partially protected species. in the toad family (*Bufonidae*). The largest of the Polish and European toads. It has diverse and variable colouration - light or dark, depending also on the age of the individual. Breeding in early spring. Mass migrations to water bodies as early as March. Breeding in standing or slow-moving waters. In Poland, the species is common throughout the country.[280, 281] It inhabits the northern (km 36-37 ECI corridor) and southern part of the area (km 46 ECI corridor).

The moor frog - *Rana arvalis*

A strictly protected species, included in Annex IV of the Habitats Directive.

A species of the frog family (*Ranidae*) from the brown frog group. Species active from March onwards. Breeds in small, not very deep reservoirs. A dry-humid and eurytopic species - inhabits a variety of habitats: wet meadows, edges of flooded fields, bogs, marshes, scrub, gardens, deciduous, mixed, coniferous forests in agricultural areas. Active during the day.[282] Inhabits the northern part of the area at 36 – 37 km ECI corridor.

The grass frog - *Rana temporaria*

A partially protected species, included in Annex V of the Habitats Directive.

A species of amphibian of the frog family (*Ranidae*) within the brown frog group. A larger species than the moor frog. Dorsal colouration is brown in spots, highly variable. Moisture-loving species. It inhabits a variety of habitats: coniferous, deciduous and mixed forests, groves, thickets, wet meadows and marshes, cultivated fields, gardens, parks. It is active at night. It inhabits the area along its entire length, most abundantly in kilometres 35-37, 38-39 and 44-48.

Green frog complex

This group consists of two species - the Pool frog Pelophylax lessonae and the Marsh frog Pelophylax ridibundus - and their natural, prolific hybridogenetic hybrid - the Edible frog Pelophylax esculentus. Green frogs spend most of their active lives in aquatic environments. Green frogs are among the most difficult domestic amphibians to identify. Therefore, the frogs in this group were referred to collectively as the green frog complex. Occurrence in the ECI corridor".

Inhabits the area in the region of km 46.1 - 46.5 of the ECI corridor.

The common newt - *Lissotriton vulgaris*

A partially protected species.

A species of amphibian in the salamander family (*Salamandridae*). It reaches small sizes. It occurs in the lowlands of Poland. It inhabits various habitats, including anthropogenic ones. It lives near bodies of water. It swims well, but moves clumsily on land. It is active at night or after rain. Daytime hiding places under stones, roots, tree trimmings, clumps of mosses[9,10]. It inhabits mainly the northern part of the area: 35-36 km ECI corridor.

The sand lizard - *Lacerta agilis*

A partially protected species, included in Annex IV of the Habitats Directive.

A species of reptile in the lizard family (*Lacertidae*) of the lizard suborder (*Lacertilia*) of the scaly order (*Squamata)*. Lizards inhabit sunny woods, clearings, banks of ponds and forest roads, and debris fields. They are thermophilic and enjoy basking in the sun near their burrows. Breeds from late March to June. [9,10] They inhabit mainly the northern part of the area at 35 – 36 km ECI corridor.

[280] *Berger L. 2000.*
[281] *Klimaszewski K., 2013.*
[282] *Klimaszewski K., 2013.*

The grass snake - *Natrix natrix* A species of snake from the snake family (*Colubridae*) under partial protection. The most common of Polish snakes. Moisture-loving species. Grass snakes inhabit a variety of forest habitats, most often moist forests, mid-field shelterbelts, banks of water bodies, and moist meadows. They are active, they swim and dive well. Breeds in April and May. Oviparous. Laying eggs in July and August, in compost heaps, leaves, cattle manure, less often in the ground. [9,10] They inhabit the southern part of the area at kilometre 47- 48 ECI corridor.

Table 8.13. *Valuable herpetofauna species found within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No.	English name	Latin name	Protection status	Occurrence	Number of sites			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					Spotlight	Poligon	Total			
1.	Common toad	*Bufo bufo*	OCz	Northern and southern parts of the area: km 36 to 37 and km 45 to 47	3	0	3	yes/FV	yes	yes
2.	Moor frog	*Rana arvalis*	AX; DS. IV	Northern part of the area: km 36 to 37	1	0	1	yes/ U1	yes	not
3.	Grass frog	*Rana temporaria*	OCz; DS. V	Northern, central and southern parts of the area: km 35 to 37; 38 to 39 and 44 to 48	29	4	33	yes/ U1 i FV	yes	yes
4.	Brown frogs not designated to species	*Rana sp.*	AX; DS. IV; DS. V	Northern, central and southern parts of the area: km 35 to 37; 39 to 40 and 44 to 48	31	5	36	yes/ U1, U2 i FV	yes	yes
5.	Green frog complex	*Pelophylax esculentus complex*	OCz; DS. IV; DS. V	Northern, central and southern parts of the area: km 37 - 38; 39 - 41; 42 - 43; 44 - 45 and 45 - 48	7	11	18	yes / U1, U2 i FV	yes	yes
6.	Common newt	*Lissotriton vulgaris*	OCz	Northern part of the area: km 35 to 36	2	1	3	in the area of potential impact		
7.	Sand lizard	*Lacerta agilis*	OCz; DS. IV	northern part of the area: km 35 to 36	3	0	3	yes / FV		
8.	Grass snake	Natrix natrix	OCz	southern part of the area: km 47 to 48	2	0	2	in the area of potential impact		

Explanations: OCz – partially protected species; AX - species under strict protection, DS IV - species listed in Annex IV; respectively to the Habitat Directive, DS V - species listed in Annex V; respectively to the Habitat Directive, FV - favourable status, U1 - unsatisfactory, U2 - poor (the conservation status given for animal species sites reflects the conservation status of their habitat)

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

The following table shows existing and potential amphibian breeding sites (Table 8.14).

Table 8.14. *Existing and potential breeding sites of amphibians in the corridor of the planned connection (Investor's variant) and in the alternative variant*

Lp.	Kilometre points	Length [km]	Species in the cable corridor	Habitat type
1.	36,4 – 37,5	1,1	Brown frog (*Rana sp*.) Common toad (*Bufo bufo*)	Network of ditches and Struga Lędowska
2.	38,6 - 39,6	1	Grass frog (*Rana temporaria*)	Network of ditches
3.	43,6	-	Brown frog (*Rana sp.*)	Water pond
4.	44,6 – 44,8	0,2	Grass frog (*Rana temporaria*)	Ditch network and Pogorzeliczka
5.	46,1 – 46,3	0,2	Brown frog (*Rana sp.*) Green frog complex (*Pelophylax esculentus complex*) Common toad (*Bufo bufo*)	Ruts with water and waterlogging
6.	46,6	-	Green frog complex (*Pelophylax esculentus complex*)	Water pond
7.	47,1 – 47,3	0,2	Brown frog (*Rana sp*.) Grass frog (*Rana temporaria*)	Network of ditches and wetlands
8.	47,6 – 47,8	0,2	Brown frog (*Rana sp*.) Grass frog (*Rana temporaria*)	Network of ditches

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

Summary: within the corridor of the planned Project and in the area of its potential impact, 2 reptile representatives were found. The sand lizard was the most abundant species observed (3 sites) and 5 amphibian representatives were found. The species groups found included brown frogs (the grass frog and the moor frog) and a complex of green frogs (the marsh frog, the pool frog and the common water frog). Brown frogs during the breeding season are easily identifiable, hence the Inventory contractors designated them to species and outside the above-mentioned period as brown frogs collectively (Volume III, Attachment 2). With the exception of the moor frog, which is under strict species protection, all species found are partially protected. 3 species and representatives of the green frog complex are listed in the Annexes of the EU Habitats Directive. The most common species found in the area of the planned Project were those belonging to the brown frog group (70 sites in total) and the green frog complex (18 sites).

8.5.7. Birds

The bird characterisation was prepared on the basis of the annual nature inventory for the "Connection infrastructure of offshore wind farm MFW Bałtyk II and offshore wind farm MFW Bałtyk III" (Volume III, Attachment 2). The inventory showed that 17 species of breeding birds under strict species protection were found in the ECI corridor area and in the area of potential impact, including 6 listed in Annex I of the EU Birds Directive. In addition, a game species that was considered to be of natural value - Eurasian woodcock - was found. In the ECI corridor, the most frequent species were the corn bunting (8 sites), the red-backed shrike (6 sites) and the whinchat (4 sites). The least numerous were northern lapwing, black woodpecker, green woodpecker, lesser spotted woodpecker, grey partridge, European nightjar, woodlark, tawny owl, stock dove, common grasshopper warbler and crane (1 site each).

Valuable bird species identified within the corridor of the planned connection and in the area of its potential impact (table 8.15.) (figure 8.28.):

The northern lapwing - *Vanellus vanellus*

A strictly protected species.

A bird of the family *Charadriidae*, order *Charadriiformes*. A widespread breeding species in Poland, but its numbers are declining. Lapwings inhabit wet meadows, water banks, and cultivated fields. They nest on the ground singly or in colonies. A migratory species, flies during months of 02-03 and 07-09, spends

winters in western Europe and the Mediterranean. Abundance in Poland is estimated at 100-150,000 pairs[283, 284]. They inhabit the northern part of the area of the planned connection: 37-38 km.

The black woodpecker - *Dryocopus martius*

A strictly protected species listed in Appendix I of the Birds Directive.

A bird of the family *Picidae*, order *Piciformes*. A widespread breeding species in Poland. Black woodpeckers inhabit mature forests (most often pine and beech forests). They nest in hollows, which can later be used by, among others, the European roller, the common goldeneye and the stock dove. They breed one brood per year. A sedentary species. Abundance in Poland is estimated at 35-70,000 pairs[285, 286]. They inhabit the northern part of the area of the planned connection: 35 – 37 km.

The lesser spotted woodpecker - *Dryobatesminor*

A strictly protected species.

A bird of the family *Picidae*, order *Piciformes*. A widespread breeding species in Poland. Lesser spotted woodpeckers inhabit forests, woodlots, and parks, preferring deciduous stands. They nest in hollows, which they forge in soft or decayed wood due to their weak beak. They breed one brood per year. A sedentary species. Insectivorous. The number in Poland is estimated at 20-40 thousand pairs.[287, 288] They inhabit the southern part of the planned connection: 47-48 km.

Green woodpecker - Picus viridis

A species under strict protection.

A bird of the family Picidae (woodpeckers), order Piciformes (woodpeckers). In Poland, a fairly widespread breeding species. It inhabits deciduous forests, woodlots, often in river valleys. It nests in hollows. Breeds one brood per year. A sedentary species. Feeds on: ants and their larvae. Abundance in Poland estimated at 4000-8000 pairs17, 20. It inhabits the southern part of the planned connection in the vicinity of the "Slupsk - Wierzbięcino" substation.

The red-backed shrike - *Lanius collurio*

A strictly protected species listed in Appendix I of the Birds Directive.

A bird of the family *Laniidae*, order *Passeriformes*. A widespread breeding species in Poland. Birds inhabit shrubby meadows, forest edges with shrubs. They nest on shrubs. They breed once a year. A migratory species, flies during the months of 04-05 and 08-09, spends winters in Africa. Abundance in Poland estimated at 200-400 thousand pairs[289, 290]. They inhabit the central and southern part of the area of the planned connection: 42-44 km.

Grey partridge - Perdix perdix

A game species with a protection period.

A bird of the family Phasianidae (curlews), order Galliformes (burrowers). A widely distributed breeding species in Poland. Until recently very common, recently in many areas of the country very few. It inhabits fields, meadows, fallow land. Nests on the ground. A sedentary species. Food: seeds, green parts of plants, in spring also insects. Abundance in Poland estimated at 300-600 thousand pairs17, 20. It inhabits the southern part of the planned connection in the vicinity of the substation "Slupsk - Wierzbięcino".

[283] *Aulak W., Rowinski P. 2010.*
[284] *Sikora A. et al. (eds.) 2007.*
[285] *Svensson L. 2012.*
[286] *Sikora A. et al. (eds.) 2007.*
[287] *Sikora A. et al. (eds.) 2007.*
[288] *Cramp S. (ed.) 1977-1994.*
[289] *Cramp S. (ed.) 1977-1994.*
[290] *Sikora A. et al. (eds.) 2007.*

The European nightjar - *Caprimulgus europaeus*

A strictly protected species listed in Appendix I of the Birds Directive.

A bird of the family *Caprimulgidae*, order *Caprimulgiformes*. Birds have a very secretive lifestyle and only become active at dusk. In Poland it is a widespread breeding species. They inhabit dry forests with clearings and woodchips. They nest on the ground. They breed 1-2 times per year. They are a migratory species, flying during the months of 04-05 and 08-09 and spending winters in Africa. Abundance in Poland is estimated at 4,000-6,000 pairs[291, 292]. They inhabit the northern part of the area of the planned connection: 35-37 km.

The woodlark - *Lullula arborea*

A strictly protected species listed in Appendix I of the Birds Directive.

A bird of the family *Alaudidae*, order *Passeriformes*. A widespread breeding species in Poland. The woodlark inhabits the edges of forests and forest crops. It nests on the ground. Breeds twice a year. Migratory species, flies during the months of 03-04 and 09-11, spends winters in western Europe and the Mediterranean. Abundance in Poland is estimated at 50-80 thousand pairs[293, 294]. They inhabit the northern and southern parts of the area of the planned connection: 35 – 37 km and 47 – 48 km.

The red-breasted flycatcher - *Ficedula parva*

A strictly protected species. Listed in Appendix I of the Birds Directive.

A bird of the family *Muscicapidae*, order *Passeriformes*. A rare breeding species in Poland. It inhabits mature deciduous forests with a high proportion of beech and hornbeam. It nests in half-hollows or crevices of cracked trees. It breeds once per year. It is a migratory species - in the country it stays from May to September, exceptionally until early October. In spring, males arrive a few days earlier than females. It overwinters in south-eastern Asia. Abundance in Poland is estimated at 5-10 thousand pairs[295, 296]. It inhabits the northern and southern parts of the area of the planned connection: 36-37 km and 47-48 km.

The common redstart - *Phoenicurus phoenicurus*

A strictly protected species.

A bird of the family *Muscicapidae*, order *Passeriformes*. A fairly widespread breeding species in Poland. It inhabits mixed forests - usually verges, gardens and orchards. It nests in hollows, sometimes on buildings; it also occupies nesting boxes for tits. It breeds twice per year. It is a migratory species, flies during the months of 04-05 and 09-10, spends winters in Africa. Abundance in Poland is estimated at 80-150 thousand pairs[297, 298]. It inhabits the northern and southern parts of the area of the planned connection: 35-36 km and 47-48 km.

The western yellow wagtail - *Motacilla flava*

A strictly protected species.

A bird of the family *Motacillidae*, order *Passeriformes*. A widespread breeding species in Poland. It occurs in Europe in many subspecies differing mainly in the colouring of the head, some of which can be found here in Poland during migration. It inhabits moist meadows. It nests on the ground. It breeds 1-2 per year. It is a migratory species, flies during the months of 03-05 and 08-10, spends winters in

[291] *Svensson L. 2012.*
[292] *Sikora A. et al. (eds.) 2007.*
[293] *Svensson L. 2012.*
[294] *Sikora A. et al. (eds.) 2007.*
[295] *Badzioch M. 1992.*
[296] *Cramp S. (ed.) 1977-1994.*
[297] *Svensson L. 2012.*
[298] *Cramp S. (ed.) 1977-1994.*

Africa. Abundance in Poland is estimated at 400-800 thousand pairs[299, 300]. It inhabits the northern and central part of the area of the planned connection: 38-40 km.

The whinchat - *Saxicola rubetra*

A strictly protected species.

A bird of the family *Muscicapidae*, order *Passeriformes*. A widespread breeding species in Poland. It inhabits fresh and wet meadows. It nests on the ground. It breeds once a year. It is a migratory species, flies in the months of 04-05 and 08-09, spends winters in Africa. Abundance in Poland is estimated at 400-600 thousand pairs[301, 302]. It inhabits the central and southern parts of the area of the planned connection: 39-40 km; 42-43 km and 47-48 km.

The corn bunting - *Emberiza calandra*

A strictly protected species.

A bird of the family *Emberizidae*, order *Passeriformes*. A moderately widespread breeding species in Poland (almost absent e.g. in Mazury and Małopolska regions, numerous in the west and centre of the country). It inhabits fertile meadows and fields with trees and shrubs, avoiding the neighbourhood of forests. It nests on the ground. It breeds twice a year. A nomadic species in winter. Abundance in Poland is estimated at 150-400 thousand pairs[303, 304]. It inhabits the central and southern parts of the area of the planned connection: 38-39 km; 42-44 km and 47-48 km.

The tawny owl - *Strix aluco*

A strictly protected species.

A bird of the family *Strigidae*, order *Strigiformes*. A widespread breeding species in Poland, our most common owl. It inhabits forests, parks, wooded areas and housing estates. It nests in hollows or on buildings, and also occupies nesting boxes. It breeds once a year. A sedentary species. The number in Poland is estimated at 65-75,000 pairs. A strictly protected species with an additional ban on photography, filming and observations that may cause disturbance or alarm.[305, 306] It inhabits the northern part of the area of the planned connection: 36-37 km.

The Eurasian woodcock - *Scolopax rusticola*

A game species with a protection period, valorising the bird sanctuaries of Natura 2000 sites.

A bird of the family *Scolopacidae*, order *Charadriiformes*. A moderately widespread breeding species in Poland. It inhabits moist deciduous and mixed forests. In spring (04-06), males perform courtship flights (known as ‘roding’) at dusk, flying over the occupied area several times and producing characteristic mating calls: snorting and croaking. The woodcock establishes its nest on the ground. It breeds 1-2 per year. A migratory species, flies during the months 03-04 and 10-11, and spends winters in western Europe and the Mediterranean. The number in Poland is estimated at 20-100 thousand pairs. A game species. A hunting season from 1 September to 21 December.[307, 308] It inhabits the northern part of the area of the planned connection: 36-37 km.

The stock dove - *Columba oenas*

A strictly protected species.

[299] *Svensson L. 2012.*
[300] *Sikora A. et al. (eds.) 2007.*
[301] *Svensson L. 2012.*
[302] *Cramp S. (ed.) 1977-1994.*
[303] *Svensson L. 2012. 7*
[304] *Sikora A. et al. (eds.) 2007.*
[305] *Svensson L. 2012.*
[306] *Sikora A. et al. (eds.) 2007.*
[307] *Svensson L. 2012.*
[308] *Sikora A. et al. (eds.) 2007.*

A bird of the family *Columbidae*, order *Columbiformes*. In Poland a moderately common, not very numerous breeding species. It inhabits forests with old hollow trees, preferring beech and pine forests. Unusually for a pigeon, it nests in hollows (usually left by the black woodpecker). It does not use nesting boxes. It breeds 2-3 times per year. A migratory species, flies during the months of 03-04 and 09-10, and spends winters in western and southern Europe. Abundance in Poland is estimated at 10-20 thousand pairs[309, 310] It inhabits the northern and southern parts of the area of the planned connection: 36-37 km and 44-45 km.

The common grasshopper warbler - *Locustella naevia*

A strictly protected species.

A bird of the family *Locustellidae*, order *Passeriformes*. A moderately widespread breeding species in Poland. It inhabits loosely shrubby wet meadows. It nests on the ground. It breeds twice a year. A migratory species, flies during the months of 04-05 and 08-09, spends winters in Africa. Abundance in Poland is estimated at 100-200 thousand pairs[311, 312]. It inhabits the central part of the area of the planned connection: 42-43 km.

The common crane - *Grus grus*

A strictly protected species listed in Appendix I of the Birds Directive.

A bird of the family *Gruidae*, order *Gruiformes*. An increasingly widespread and numerous breeding species in Poland. It inhabits alder forests, mid-forest marshes, swampy meadows and birches, and is increasingly present in agricultural landscapes. The nest is a mound of rotting plants in shallow water. It breeds once a year. A migratory species flying in the months of 03 and 09-10 and spending winters in Africa and the Iberian Peninsula. Abundance in Poland is estimated at 10-12 thousand pairs.[313, 314] It inhabits the southern part of the area of the planned connection: 47-48 km.

Table 8.15. *Valuable bird species found within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No.	English name	Latin name	Protection status	Occurrence	Number of sites			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					spotlight	poligon	total			
1.	Northern lapwing	*Vanellus vanellus*	AX	northern part of the area: km 37 to 38	1	0	1	and in the area of potential impact		
2.	Black woodpecker	*Dryocopus martius*	AX; DP. I	northern part of the area: km 35 to 37	3	0	3	yes/ U1	yes	yes
3.	Lesser spotted woodpecker	*Dendrocopos minor*	AX	southern part of the area: km 47 to 48	1	0	1	and in the area of potential impact		
4.	Green woodpecker	*Picus viridis*	AX	The southern part of the area near the Wierzbięcino station	1	0	1	and in the area of potential impact		
5.	Red-backed shrike	*Lanius collurio*	AX; DP. I	Central and southern part of the area: km 42 to 44	6	0	4	yes/ U1	yes	yes
6.	Grey partridge	*Perdix perdix*	Ł	The southern part of the area near the Wierzbięcino station	1	0	1	and in the area of potential impact		
7.	European nightjar	*Caprimulgus europaeus*	AX; DP. I	Northern part of the area: km 35 to 37	2	0	2	yes/ U1	not	yes

[309] *Svensson L. 2012.*
[310] *Sikora A. et al. (eds.) 2007.*
[311] *Svensson L. 2012.*
[312] *Sikora A. et al. (eds.) 2007.*
[313] *Svensson L. 2012.*
[314] *Cramp S. (ed.) 1977-1994.*

No.	English name	Latin name	Protection status	Occurrence	Number of sites			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					spotlight	poligon	total			
8.	Woodlark	*Lullula arborea*	AX; DP. I	Northern and southern parts of the area: km 35 to 37 and km 47 to 48	5	0	5	yes/ U1	yes	yes
9.	Red-breasted flycatcher	*Ficedula parva*	AX; DP. I	Northern and southern parts of the area: km 36 to 37 and km 47 to 48	3	0	3	yes/ U1	yes	yes
10.	Common redstart	*Phoenicurus phoenicurus*	AX	Northern and southern parts of the area: km 35 to 36 and km 47 to 48	4	0	4	yes/ U1	yes	yes
11.	Western yellow wagtail	*Motacilla flava*	AX	Northern and central part of the area: km 38 to 40	2	0	2	yes/ U1	yes	yes
12.	Whinchat	*Saxicola rubetra*	AX	Central and southern part of the area: km 39 to 40; 42 to 43 and 47 to 48	5	0	4	yes/ U1	yes	yes
13.	Corn bunting	*Emberiza calandra*	AX	Central and southern part of the area: km 38 to 39; 42 to 44 and 47 to 48	8	0	7	yes/ U1, FV	yes	yes
14.	Tawny owl	*Strix aluco*	AX	Northern part of the area: km 36 to 37	1	0	1	yes/ U1	yes	not
15.	Eurasian woodcock	*Scolopax rusticola*	Valorising species	Northern part of the area: km 36 to 37	1	0	1	and in the area of potential impact		
16.	Stock dove	*Columba oenas*	AX	Northern and southern parts of the area: km 36 to 37 and km 44 to 45	2	0	2	yes/ U1	not	yes
17.	Common grasshopper warbler	*Locustella naevia*	AX	Middle part of the area: 42-43	1	0	1	and in the area of potential impact		
18.	Common crane	*Grus grus*	AX; DP. I	Southern part of the area: km 47 to 48	1	0	1	yes/ U1	yes	yes

Explanations: OCz - species under partial protection; AX - species under strict protection; DS. I / IV / V - species included in Annex I of the Birds Directive; Ł - game species (Regulation of the Minister of Environment of March 11, 2005 on establishing the list of game species (Journal of Laws No. 45, item 433, as amended)); W - bird species of value Special Protection Areas - Natura 2000 in Poland (Annex 3) according to the Habitat and Species Protection Guides Natura 2000 (2004); Conservation status: FV - favourable status, U1 - unsatisfactory, U2 - poor (the conservation status given for animal species sites reflects the conservation status of their habitat)

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

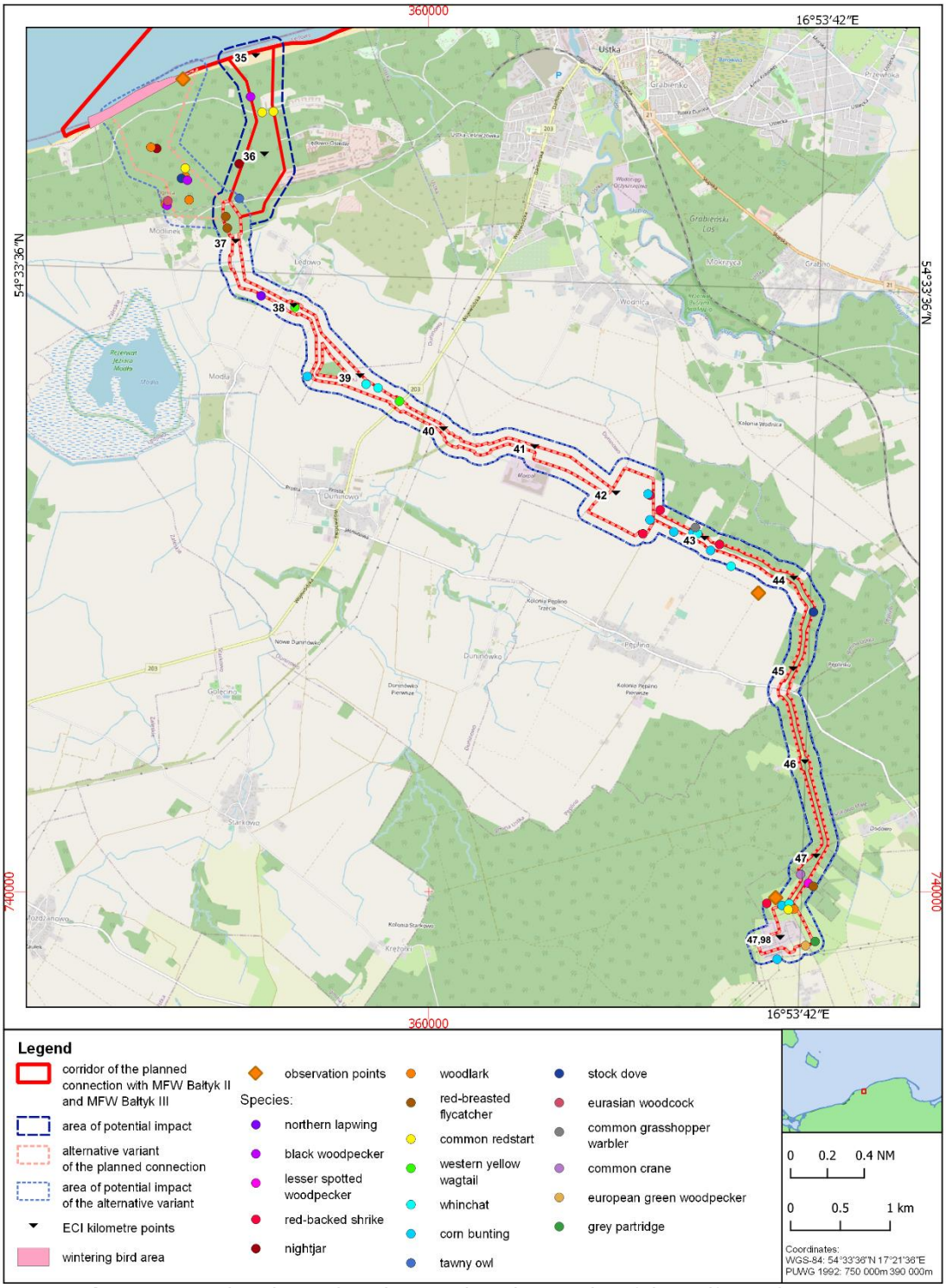


Figure 8.28. *The planned Project against the results of the avifauna inventory*

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

Summary: within the corridor of the planned Project and in the area of its potential impact 18 strictly protected breeding bird species were found, including 6 listed on Annex I of the EU Birds Directive. In addition, two game species were found that were considered valuable in terms of nature - woodcock and partridge. In the area of the planned Project, the most common were bunting (8 sites), red-backed monkeys (6 sites), as well as blackbird and whip (for 1 position).

In addition, within the avifauna observation points, 239 species of birds were found flying over the area of the planned Project during spring and autumn migration. The species found were: Phasianus colchicus pheasant, white bird Oenanthe oenanthe, red bream Calidris ferruginea, red dandelion Calidris canutus, red dandelion Calidris alpina, white-tailed eagle Haliaeetus albicilla, black-tailed harrier Circus pygargus, white stork, Cajiconia communicis, Cajiconia white stork. Vanellus vanellus, Gray Heron Ardea cinerea, Tufted Duck Aythya fuligula, Great Crested Lophophanes cristatus, Carduelis spinus, Barn Barn Hirundo rustica, Black Woodpecker Dryocopus martius, Great Spotted Woodpecker Dendrocopos major, Green Woodpecker Picus Buididis, Greenfinch, Carduelis chlorphalaus , red-backed lanius collurio, greylag goose Anser anser, white-fronted goose Anser albifrons, grain / tundra goose Anser fabalis / serrirostris, gil Pyrrhula pyrrhula, Crested Columba palumbus, Swift Apus apus, Sylvia atricapilla hood, Corvorus monedula Pharaoh, Turdus monedula Pharaoh , Sitta europaea nuthatch, krog succumb to Accipiter nisus, raven Corvus corax, spruce crossbill Loxia curvirostra, mallard Anas platyrhynchos, partridge Perdix perdix, quickie Turdus pilaris, Lullula arborea, Clangula hyemalis, mute swan Cygustrnus markra olorisnahalusworm black-backed gull Larus marinus, gray gull Larus canus, herring gull Larus argentatus, blue tit Cyanistes caeruleus, red gull Regulus regulus, buzzard Buteo buteo, black-throated diver Gavia arctica, merganser Mergus merganser, European house martin Delichon urbicum, common creeper, Ceriosis familiaristubian creeper Phylloscopus trochilus, Primrose Phylloscopus collybita, Redstart Phoenicurus phoenicurus, Gray Wagtail Motacilla alba, Saxicola rubetra, Emberiza calandra, Common Kestrel Falco tinnunculus, Sickleberry Aegithalto, Charithalus plover, Charithalus plover a gold Pluvialis apricaria, plover Pluvialis squatarola, bruise Columba oenas, lark Alauda arvensis, pinewood Periparus ater, jay Garrulus glandarius, magpie Pica pica, magpie Lanius excubitor, wren Troglodytes troglodytes, Larkspurus Lark, Larkspurus vulgarus Turdus philomelos, meadow pipit Anthus pratensis, warbler Phylloscopus sibilatrix, bunting Emberiza citrinella, uhla Melanitta fusca, Oriolus oriolus, Corvus cornix crow, Hippolais icterilla, Griffon griffon, Regulusebawica Fringilla

The most valuable areas in terms of avifauna are the sections within the woodland, shrubland and wetlands, particularly at km 35 to 41 and km 42 to 48 ECI corridor.

8.5.8. Land Mammals

The characterisation of the terrestrial mammals was prepared on the basis of the annual nature inventory for the ‘Connection Infrastructure of the offshore wind farm MFW Bałtyk II and the offshore wind farm MFW Bałtyk III’ (Volume III, Attachment 2). Within the corridor of the planned Project and in the area of potential impact, 2 species of mammals under partial species protection have been observed - the European beaver (also listed in Annexes II and V of the EU Habitats Directive) and the squirrel. The observation of the beaver refers to single old bites.

In addition, there were 686 observations of representatives of 13 mammal species that crossed the study area during migration. The recorded species were: the badger Meles meles, European beaver Castor fiber, Eurasian wild boar Sus scrofa, red deer Cervus elaphus, red fox Vulpes vulpes, European roe deer Capreolus capreolus, European ferret Mustela putorius, European squirrel Sciraus vulgaris, European otter Lepus europaeus, raccoon dog Nyctereutes procyonoides, marten Martes sp., European bison Bison bonasus (Figure 8.29).

Valuable terrestrial mammal species found within the corridor of the planned connection and in the area of its potential impact (table 8.16.):

The European beaver - *Castor fiber*

A partially protected species, listed in Annexes II and IV of the Habitats Directive.

A widely distributed species of rodent in the beaver family (*Castoridae*). It is the largest rodent in Europe. It inhabits watercourses, marshes, bogs, ponds and lake shores. On small watercourses it builds dams

of branches to dam up the water.[315, 316] Beaver bites were observed in the southern part of the area in kilometres from 47 to 48.

The common squirrel - *Sciurus vulgaris*

A partially protected species.

A widely distributed species in Poland belonging to the order of rodents, the squirrel family (*Sciuridae*). Squirrels inhabit hollows, nesting boxes or build nests. Nesting material is usually lime phloem or small twigs. Occasionally, they can be found in buildings.[10, 317] The findings apply to the northern and southern parts of the area in kilometers 35 - 37 and 46 - 47 of the ECI corridor - a total of 5 sites.

Table 8.16. *Valuable terrestrial fauna species found within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No.	English name	Latin name	Protection status	Occurrence	Number of sites			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					Spotlight	Poligon	Total			
1.	European beaver	*Castor fiber*	OCz, DS. II; DS. V	Southern part of the area: km 47 to 48	1	0	1	yes/ U1	yes	yes
2.	Common squirrel	*Sciurus vulgaris*	OCz	Northern and southern parts of the area: km 35 to 37 and 46 to 47	5	0	5	yes/ FV	yes	yes

Explanations: OCz – partially protected species; DS II - species listed in Annex II; DS V - species listed in Annex V, respectively to the Habitat Directive, FV - favourable status, U1 - unsatisfactory

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

In addition, in the area of the planned onshore corridor of the ECI of the MFW Bałtyk II and MFW Bałtyk III European moles *Talpa europaea*, covered by partial species protection in Poland, were found. As these species are numerous and widespread, it should be assumed that they inhabit the entire area of the planned Project.

[315] *Batbold J., et al. 2016.*
[316] *Mitchell-Jones A. J., et al. 1999.*
[317] *Bosch S., Lurz P. 2012.*

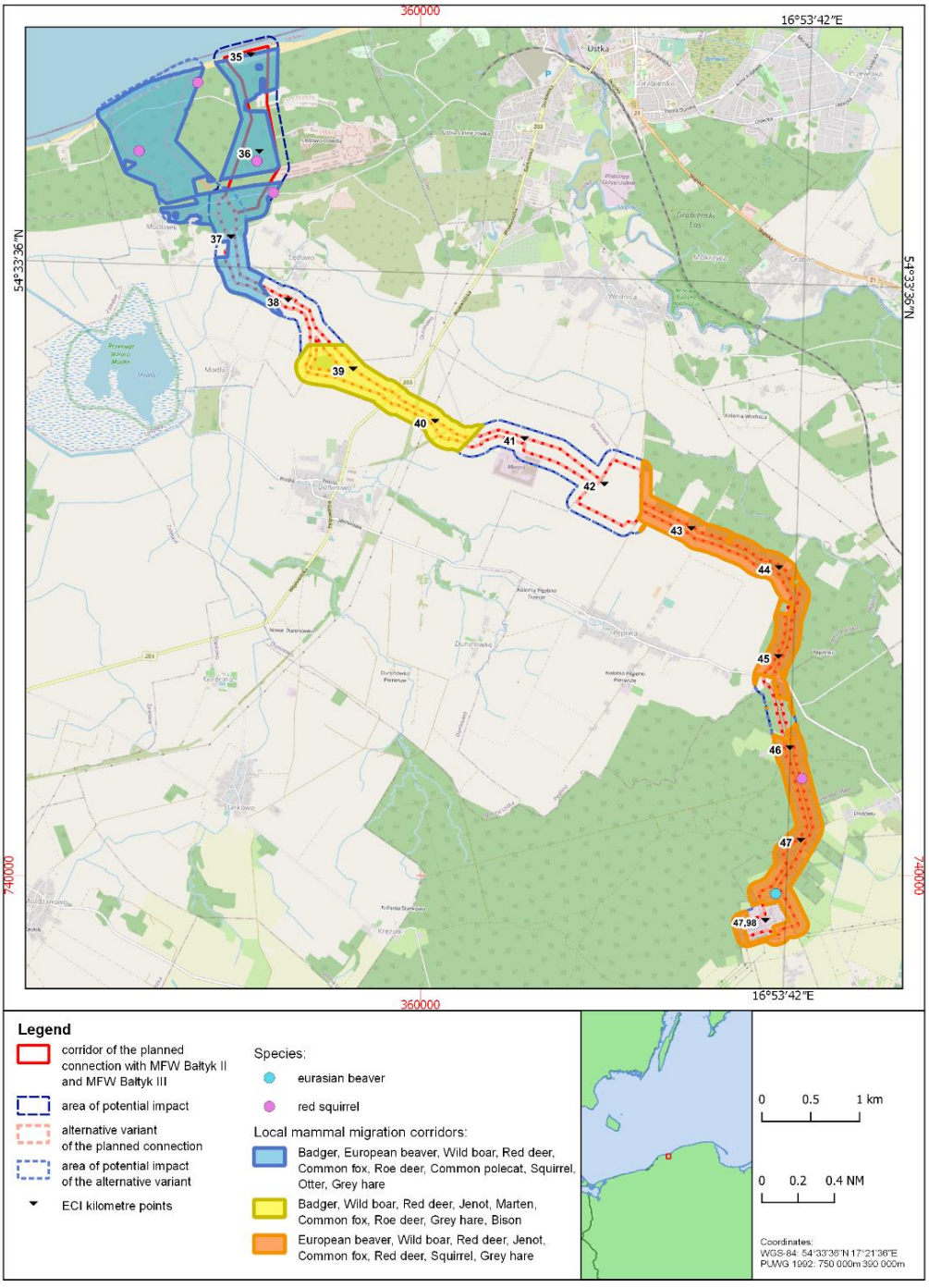


Figure 8.29. *The planned Project against the results of the terrestrial fauna inventory*

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

8.5.9. Bats

The characterisation of bats was prepared on the basis of the annual nature inventory for the 'Connection Infrastructure of the offshore wind farm MFW Bałtyk II and the offshore wind farm MFW Bałtyk III' (Volume III, Attachment 2).

Valuable bat species found within the corridor of the planned connection and in the area of its potential impact (table 8.17.) (Photo 8.5. and Photo 8.6.) (figure 8.30.):

Daubenton's bat - *Myotis daubentonii*

A strictly protected species, listed on Annex IV of the Habitats Directive.

A species of bat in the subfamily of *Myotinae*, in the family *Vespertilionidae*. One of the most common bats in Poland, widespread throughout the country. It prefers areas with plenty of surface water. It inhabits wooded and open areas, also built-up areas.[318, 319] It inhabits mainly the northern part of the area in kilometres 35-36. Within the ruins of the 9th Permanent Artillery Battery in Ustka, one of the wintering grounds of this species (35.1 km) was found in position No. 504 (gun emplacement).

Photo 8.5. *Remains of the 9th BAS in Ustka - object 504 - wintering site of the Daubenton's bat Myotis daubentonii*

Source: Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

Photo 8.6 *Wintering Daubenton's bat Myotis daubentonii in Remains of 9. BAS in Ustka – object 504*

Source: Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

[318] *Sachanowicz K., in. 2008.*
[319] *Kowalski K., et al. 1984.*

Natterer's bat - *Myotis nattereri*

A strictly protected species, listed on Annex IV of the Habitats Directive.

A species of bat in the subfamily of *Myotinae*, in the family *Vespertilionidae*. It prefers wooded biotopes or field-forest mosaics, mainly in lowlands and uplands. Breeding colonies often in bird hollows. It often winters in cities. Wintering hides also in farm buildings.[12, 13] It inhabits mainly the northern part of the area at 35-36 km.

The soprano pipistrelle - *Pipistrellus pygmaeus*

A strictly protected species, listed in Annex IV of the Habitats Directive.

A species of bat in the subfamily *Vespertilioninae*, family *Vespertilionidae*. The smallest bat in Europe. A widespread species. It inhabits anthropogenic areas and it is found in agricultural areas, villages and cities. Roosts in buildings near trees, in the vicinity of woods. It overwinters in above-ground parts of buildings.[12, 13] It inhabits the northern and southern parts of the area at kilometres 36-37 and 45-47. Mating hides were found in these sections.

Table 8.17. *Valuable bat species found within the corridor of the planned connection and in the area of its potential impact and alternative variant*

No.	English name	Latin name	Protection status	Occurrence	Number of sites			Presence in the corridor of the planned Project	Investor`s variant	Alternative variant
					Spotlight	Poligon	Total			
1.	Daubenton's bat	Myotis daubentonii	AX; DS. IV	northern part of the area: km 35 to 36	6	0	6	yes/ FV	yes	yes
2.	Natterer's bat	Myotis nattereri	AX; DS. IV	northern part of the area: km 35 to 36	2	0	2	yes/ FV	not	yes
3.	Soprano pipistrelle	*Pipistrellus pygmaeus*	AX; DS. IV	northern and southern parts of the area: km 36 to 37 and km 45 to 47	0	5	5	yes/ FV	yes	yes
4.	unmarked pipistrelle	*Pipistrellus sp.*	AX; DS. IV	northern part of the area: km 35 to 36	1	0	1	yes	not	yes

Explanations: AX – species under strict protection; DS IV - species listed in Annex IV, respectively to the Habitat Directive, FV - favourable status

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

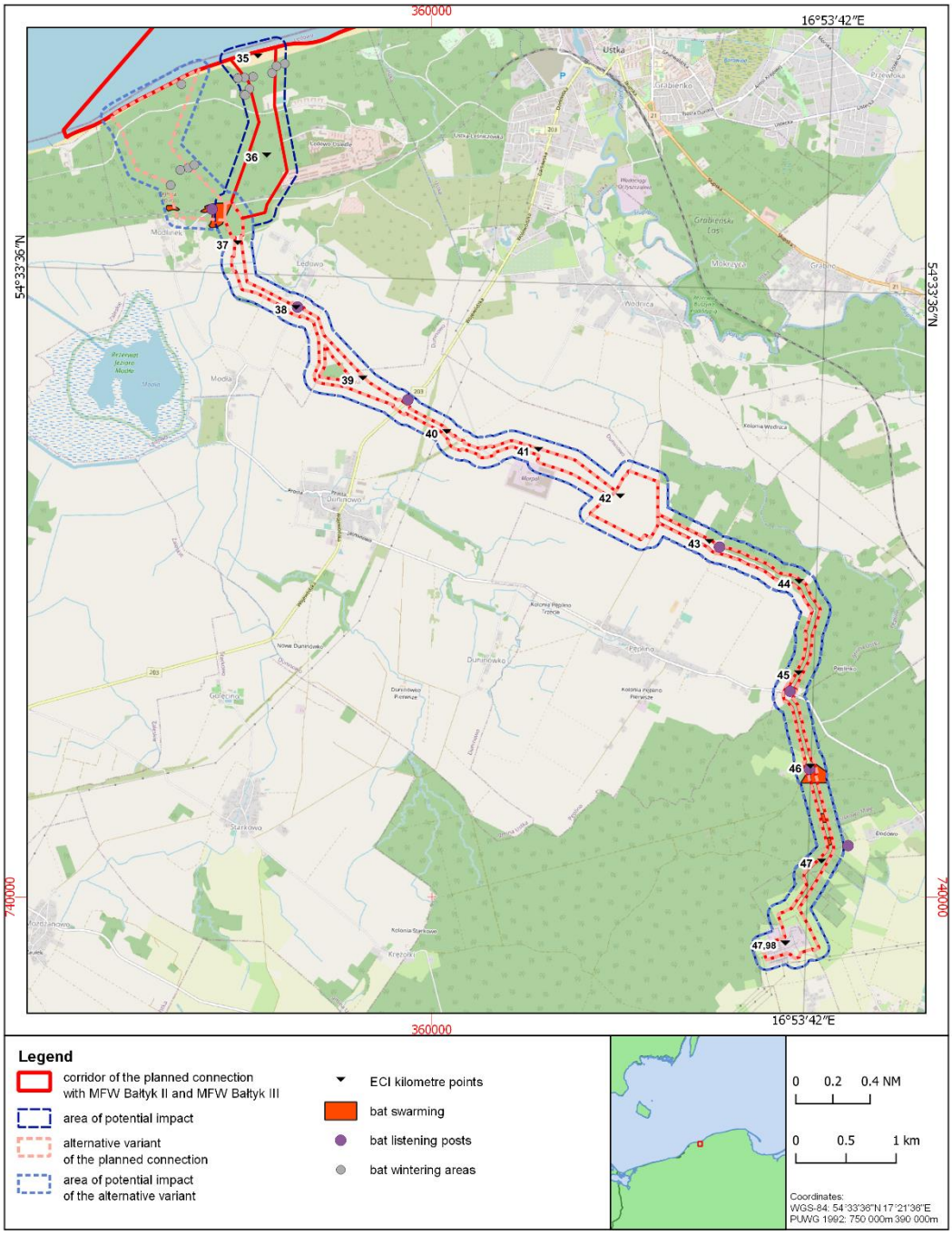


Figure 8.30. *The planned Project against the results of bats inventory*

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

Summary: within the corridor of the planned Project and in the area of its potential impact, 4 bat species have been identified. All of them are under strict species protection in Poland and are listed in Annex IV of the EU Habitats Directive. The largest number of roosts, providing places for breeding and hibernation, are found for the Daubenton's bat (6 sites) and the soprano pipistrelle (5 sites). The remaining species were less abundant in the vicinity of the planned Project.

In addition, 10 bat species were found flying over the area of the planned connection within the detector points. They were most abundant along roadside canopies, watercourses and the borders of patches of dense forest. The species reported were: the great marsh Nyctalus noctula, the leprechaun Pipistrellus sp., Including the small Pipistrellus pygmaeus, the tiny Pipistrellus pipistrellus and the larger Pipistrellus nathusii, Barbastella barbastellus, Myptis sp. Myotis daubentonii.

The most valuable areas of the planned Project in terms of bats are in the northern, coastal part of the study area (35 – 37 km ECI corridor), where most bat roosts were found, including within the ruins of the 9th Permanent Artillery Battery in Ustka, one of the wintering grounds of this species (35.1 km) was found at site No. 504 (gunnery no. 4). In addition, a section of the forest in the area of km 36.6 of the ECI corridor, where swarming Soprano pipistrelle were found, should be considered particularly valuable.

8.5.10. Recognition Natural elements in the area of roads along access roads

Due to the specific nature of the construction of the planned Project, it is necessary to determine access roads to the construction corridor during the construction, so that machinery and equipment can enter the site. The Investor plans to use the existing road infrastructure, and if this is not possible, he will allow for the possibility of temporary roads to be constructed.

Since the annual nature inventory was conducted in a much broader corridor than the area covered by the ED application, this enabled the identification of natural conditions in the area of likely access roads to the future construction site. A summary of the identified species and migration corridors is shown in Table 8.17, and the road sections that were analyzed are shown in Figure 8.31.

Table 8.18. *Existing roads (potential access roads) in areaof the ECI of MFW Bałtyk II and MFW Bałtyk III*

Number of the road on the Figure 8.31	Approximate km	Road characteristics	Natural objects identified in the area of potential access roads
1	35.6	Bosmańska Street (public road). An asphalt road leading to the Central Air Force Polygon in Ustka. Will be the main access road to the cable exit construction site. It is surrounded by forests.	• herpetofauna (local migration corridor), • avifauna (2 stands of the common redstart), • terrestrial fauna (local, regional and national migration corridor), • natural habitat: 2180
2	36,5	District road DP 1102G from Ustka - Modlinek - Duninowo. The paved road with a soft shoulder, in good technical condition. It is surrounded by forests.	• Herpetofauna (site of moor frog, grass frog (2 individuals) and brown frogs in total (2 individuals); local migration corridor, • avifauna (the black redstart and the tawny owl site), • terrestrial fauna (the squirrel site; local, regional and national migration corridor), • entomofauna (site of the red ant (5 individuals), • bats (site of the soprano pipistrelle; local migration corridor), • epiphytic lichens (a site of the oakmoss (4 individuals) • natural habitats: 9110, 2180 on both sides of the road
3	38	District road DP 1103G Lędowo - Modła. A dirt road, paved with concrete slabs, surrounded by agricultural fields.	• Herpetofauna (site of green frogs (10 individuals); local migration corridor), • avifauna (site of the white stork, the mallard and yellow wagtail), • terrestrial fauna (local and national migration corridor), • bats (local migration corridor),
4	39.5	Regional road no. 203 Darłowo - Ustka, asphalted. Two-lane road with an unpaved shoulder in good technical condition. Along the road there is a fragment of a	• herpetofauna (site of the grass snake, the fire-bellied toad, the moor frog, brown frogs in total (2 individuals) and green frogs (8 individuals); local migration corridor),

		seaside tourist route (cycle path). On both sides of the road there are herpetological fences (to protect amphibians during migration) and under the road there is an amphibian passage.	• avifauna (site of the common grasshopper warbler, yellow wagtail (4 individuals) and the red-backed shrike), • terrestrial fauna (local and national migration corridor), • bats (local migration corridor)
5	40.15	Municipal road No. 101047G-1, Duninowo - Wodnica (a dirt road). Single trees and shrubs grow along the avenue.	• Terrestrial fauna (local and national migration corridor)
6	40.4	Access road to MOWI S.A. (the municipal road D 101202G-1). Two-lane road, paved, with asphalt surface, in good condition. The road is surrounded by agricultural land. There are trees along the road.	• Herpetofauna (local migration corridor), • avifauna (the yellow wagtail and the red-backed shrike site), • terrestrial fauna (local and national migration corridor)
7	42.5	Road paved with concrete slabs, access to fields and the POLIART Printing Company. It constitutes the international cycling route EuroVelo R10. There are forest and agricultural areas all around.	• Herpetofauna (site of green frogs; local migration corridor), • avifauna (site of the red-backed shrike (3), the yellow wagtail and the corn bunting (3), • terrestrial fauna (local and national migration corridor)
8	45.2	District road DP 1108G Duninowo - Bruskowo Wielkie. It is an asphalt road, in good technical condition. It is surrounded by forest areas.	• Herpetofauna (habitat of the sand lizard, the grass frog; local migration corridor), • avifauna (site of the red-backed shrike and the black redstart), • terrestrial fauna (local, regional and national migration corridor), • bats (local migration corridor), • epiphytic lichens (the oakmoss site) • habitat: 9130 on one side of the road
9	45.6	Forest road leading from district road No. DP 1108 G.	• Herpetofauna (local migration corridor), • Terrestrial fauna (local, regional and national migration corridor) • habitat: 9110
10	46.0	Municipal road No. 1107 G to the village of Krężolki, through Gajki to the district road No. 1108 G. It is a gravel, paved road leading through forest areas.	• Herpetofauna (site of the common toad (2 individuals), the grass frog (4 individuals) and brown frogs in total (3 individuals); local migration corridor), • terrestrial fauna (local, regional and national migration corridor) • bats (site of the soprano pipistrelle; a local migration corridor), • epiphytic lichens (the site of the oakmoss and Ramalina farinacea)
11	46.3	Forest road leading from communal road 1107 G.	• Herpetofauna (site of the common toad, the grass frog (3 individuals) and green frogs (2 individuals); local migration corridor), • terrestrial fauna (local, regional and national migration corridor), • bats (the soprano pipistrelle site) • epiphytic bryophytes (the crisped pincushion moss and the common tamarisk-moss Thuidium tamariscinum) • epiphytic lichens (the oakmoss site) • natural habitat: 9130 on both sides of the road

Source: In-house study basen on Inwentarisation (Volume III Appendix 2)

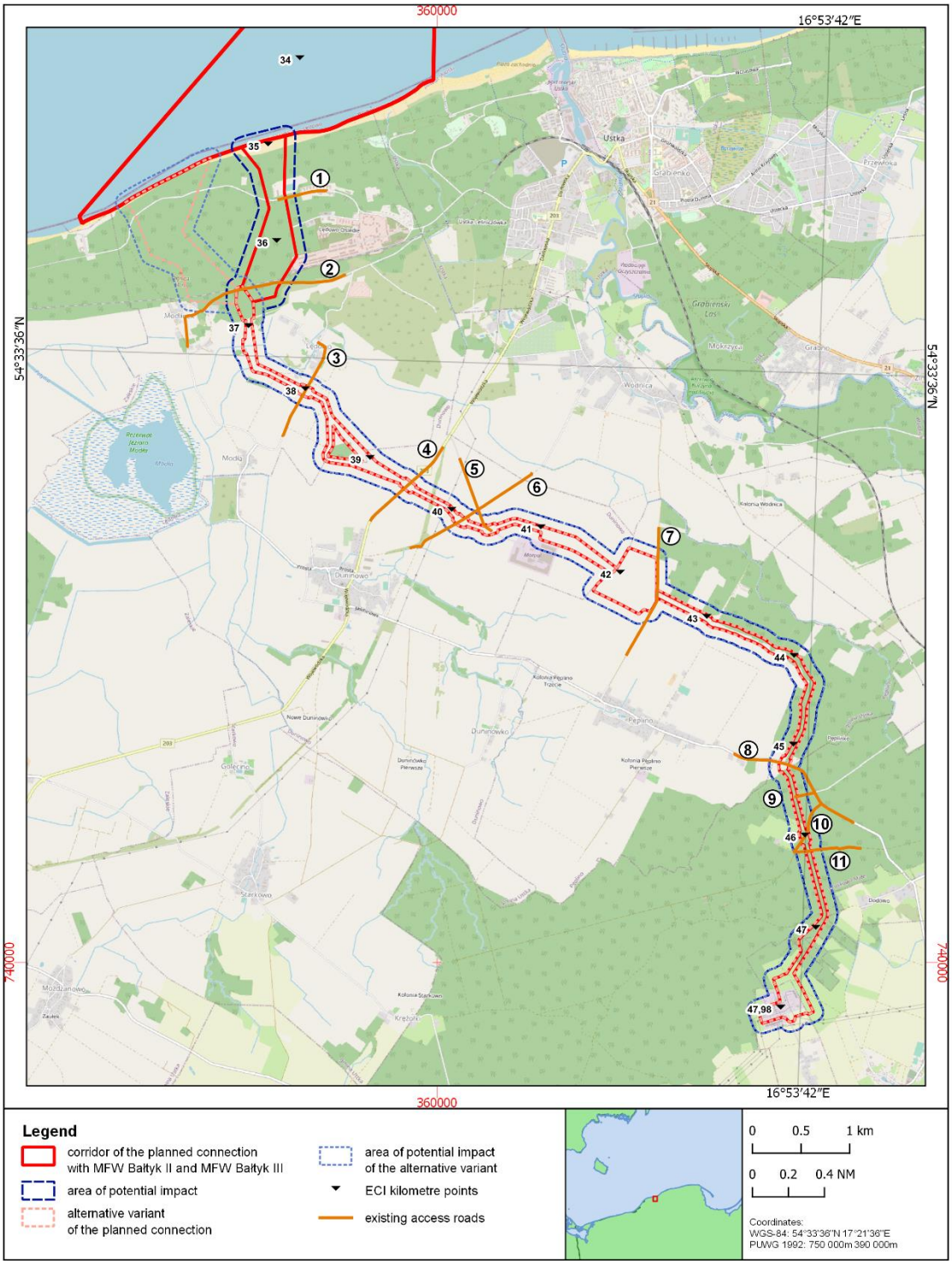


Figure 8.31. *Location of existing access roads*

Source: In-house study

Protected species and habitats were found in the vicinity of the analyzed roads, but common to the country, as well as potential migration sites for amphibians.

Due to the fact that the route of the planned Project runs partly through forest areas, special attention should be paid to carrying out construction works and using heavy equipment in such a way as not to endanger the habitats and fauna present in the surroundings.

8.5.11. Environmental evaluation

On the basis of the information gathered and the nature inventory (Volume III, Attachment 2), the most valuable nature areas along the route of the planned Project were selected.

Km 35 *Coastal grey dunes*

Coastal grey dunes with psammophilous grassland *Helichryso-Jasionetum litoralis* with strawflowers and *Jasione*. Priority natural habitat 2130, in spatial arrangement and succession occupying the area between the white dunes and the established landforms of forests on the dunes. Valuable natural taxa are found here, of which the following should be mentioned in particular: *Linaria odora*, the dark-red helleborine *Epipactis atrorubens,* the dwarf everlast *Helichrysum arenarium,* the sand sedge *Carex arenaria,* as well as the one-flowered wintergreen *Moneses uniflora* and the common wintergreen *Pyrola minor* growing at the interface between grey dunes and coastal forests. In the area of 35 km, wintering sites of bats (3 species) were identified within the ruins of the 9th Battery of Fixed Artillery in Ustka. In addition, localities of 2 valuable invertebrate species were found here: the sandhopper - *Talitrus saltator* (habitat) and the red ant *Formica rufa* (1 site) and 1 reptile species: the sand lizard *Lacerta agilis (*2 sites).

Km 35 - 36.5 *Mixed forest and coniferous forest on coastal dunes*

Mixed woodland and forest on coastal dunes. Natural habitat 2180, in spatial arrangement and succession occupying a wide area adjacent to the sea just behind the strip of dunes. In the area of the Project, the largest area of the habitat is occupied by patches of the coastal crowberry forest complex *Emperto nigri-Pinetum*, only dispersedly accompanied by small patches of acid oak *Betulo-Quercetum* complex. The habitat is home to a number of valuable species such as the black crowberry *Empetrum nigrum*, the Pomeranian honeysuckle *Lonicera periclymenum*, the creeping lady's-tresses *Goodyera repens*, the one-flowered wintergreen *Moneses uniflora*, the sand sedge *Carex arenaria* and the dark-red helleborine *Epipactis atrorubens*. In patches of habitat 2180, the bryophyte layer is also rich, comprising the red-stemmed feather-moss *Pleurozium schreberi,* the neat feather-moss *Pseudoscleropodium purum*, the ostrich-plume feather-moss *Ptilium crista-castrensis* and the rugose fork-moss *Dicranum polysetum* and the broom fork-moss *D. scoparium*. In the humid depressions, there are also microhabitats suitable for peat mosses such as the red bog-moss *Sphagnum capillifolium*, the fringed bog-moss *S. fimbriatum* and the blunt-leaved bog-moss *S. palustre*. In overexposed areas with a sandy texture, aboveground lichens such as the shrubby cup lichen *Cladonia arbuscula* and the reindeer cup lichen *C. rangiferina* or the true Iceland lichen *Cetraria islandica* are found in greater numbers. On the bark of pine trees there is also the bristly beard lichen *Usnea hirta*. Valuable species were found here: invertebrates, i.e., the red ant *Formica rufa*, 5 species of herpetofauna: the sand lizard *Lacerta agilis* (1 site), the newt *Lissotriton vulgaris* (2 breeding sites), the moor frog *Rana arvalis (*1 site), the grass frog *Rana temporaria* (11 sites) and the brown frog not designated to the species Rana *sp.* (6 sites and 1 breeding site), 7 valuable bird species: black woodpecker *Dryocopus martius* (3 sites), the European nightjar *Caprimulgus europaeus* (1 site), the woodlark *Lullula arborea (*4 sites), the common redstart *Phoenicurus phoenicurus (*3 sites), the tawny owl *Strix aluco (1 site)*, the stock dove *Columba oenas (1 site)* and the Eurasian woodcock *Scolopax rusticola (1 site),* and 1 valuable mammal species: the common squirrel *Sciurus vulgaris (*4 sites). There is a migration route for mammals and amphibians.

Km 36.9 - 37.5 *Wet meadow complex with the Struga Lędowska watercourse*

A complex of wet meadows with Struga Lędowska (37.2 km) flowing here towards the Modła Lake and drainage ditches in the surroundings. There are hydrogenic soils in the subsoil, the presence of which determines the low groundwater table. This area is particularly sensitive to changes in hydrographic conditions that may affect the hydrology of the Modła lake which is under nature reserve protection and is Natura 2000 Przymorskie Błota PLH220024 special habitat protection site. Three breeding sites of the green frog *Pelophylax esculentus complex* have been identified here. A migration corridor for mammals and amphibians occurs here.

Km 43, 44, 46-47 *Fertile Beech Forest*

Natural habitat 9130-1 - Fertile lowland beech forest (*Galio odorati-Fagetum*). The patches of this habitat in the area of the planned Project are small and scattered, but they constitute a habitat for

bryophyte species of high natural value, mainly, the crisped pincushion moss *Ulota crispa,* the common tamarisk-moss *Thuidium tamariscinum*, the dilated scalewort *Frullania dilatata*, and the rugose fork-moss *Dicranum polysetum* and the broom fork-moss *D. scoparium*. There are also some epiphytic lichen species on aged beech trees which are valuable in terms of nature, although not protected by law. Seven valuable bird species have been identified here. In the area of 47 km, before the entrance to the PSE S.A. substation, there is a mosaic of forest and meadow areas. Five species of herpetofauna were found here: the common toad *Bufo bufo* (2 sites), the grass snake *Natrix natrix* (1 site), the grass frog *Rana temporaria* (6 sites and 1 breeding site), the brown frog not designated to the species *Rana sp.* (6 sites and 1 breeding site), the green frog *Pelophylax esculentus complex* (1 site and 2 breeding sites), 4 valuable species of bats: the common noctule *Nyctalus noctula* (1 site), the common pipistrelle *Pipistrellus pipistrellus (1 site)*, the Nathusius' pipistrelle *Pipistrellus nathusii* (1 site) and the serotine bat *Eptesicus serotinus (*2 sites), 5 valuable species of avifauna: the red-backed shrike *Lanius collurio* (1 site), the whinchat *Saxicola rubetra (*1 site), the corn bunting *Emberiza calandra* (2 sites), the stock dove *Columba oenas (*1 site) and the common grasshopper warbler *Locustella naevia* (1 site). There is a mammal and amphibian migration route.

Km 36.5, 45.8 *Acidic beech forests*

Natural habitat 9110 - acidophilous beech forests (Luzulo-Fagion). As in the case of the fertile beech forests in the area of the planned Project, the patches of this habitat are small and scattered in the area, but they constitute a habitat for lichen species of great natural value, mainly the oakmoss Evernia prunastri, the salted starburst lichen Imshaugia aleurites, the chaga Inonotus obliquus, and the dotted ramalina lichen Ramalina farinacea, the dotted ribbon lichen R. fastigiata and the dusty cartilage lichen R. pollinaria.

The acid beech forests in the area of 36.5 km are a valuable site for bats, as 5 species have been found here: the common noctule Nyctalus noctula, the soprano pipistrelle Pipistrellus pygmaeus (2 mating groups), the common pipistrelle Pipistrellus pipistrellus, the western barbastelle Barbastella barbastellus, the serotine bat Eptesicus serotinus and the greater mouse-eared bat Myotis myotis. In addition, 1 valuable invertebrate species was found here: the field cricket Gryllus campestris (1 site), and the breeding site of brown frogs not designated to the species Rana sp. was also found here. The area is also located within a mammal and amphibian migration corridor.

In addition, habitat 91F0 Riparian oak-elm-beech forest occurs in the area 38.6-39.0 km. This is an area surrounded by agricultural fields and is valuable for herpetofauna. A site and breeding site of the grass frog Rana temporaria and a site of a valuable avifauna species, i.e. the corn bunting Emberiza calandra, were found here. As a result of the annual natural inventory (Volume III, Attachment 2), the status of the habitat patch was assessed as bad (U2), due to: dominance in the undergrowth of habitat alien species (Rubus sp.), occurrence of invasive species (Solidago canadensis and Impatiens parviflora) and pronounced drying of the patch. This habitat is not as important as the ones mentioned above, but due to its agricultural surroundings it is a place where fauna is concentrated and has been highlighted in the nature valorisation.

In the vicinity of km 39.7, the planned Project crosses the historic railway line ‘Szlak zwiniętych torów’. There is a depression of land with periodic wetlands. The area is overgrown by trees and shrubs. It acts as an ecological corridor, allowing fauna to migrate in the monotonous landscape of the surrounding agricultural fields. Sites of 3 species of bats have been recorded here: the serotine bat *Eptesicus serotinus* (4 sites), the common noctule *Nyctalus noctula (*4-8 sites) and the Daubenton's bat *Myotis daubentonii* (4-8 sites), as well as a site of a valuable avifauna species, i.e. the yellow wagtail *Motacilla flava* and a migrating individual of the brown frog not designated to the species *Rana sp.*

The distribution of the most valuable natural fragments of the area intended for the planned Project in terms of the occurrence of valuable vascular plant species, bryophytes, fungi and lichens, as well as associated fauna species and the ecosystem of wet meadows with the Struga Lędowska watercourse is shown in the figure below. The sections indicated therein require special attention and nature monitoring, especially during the construction phase.

According to the figure below (figure 8.32.), the selected areas of natural value in the northern part of the planned Project coincide with the borders of the Protected Landscape Area Pas Pobrzeże na Zachód od Ustki.

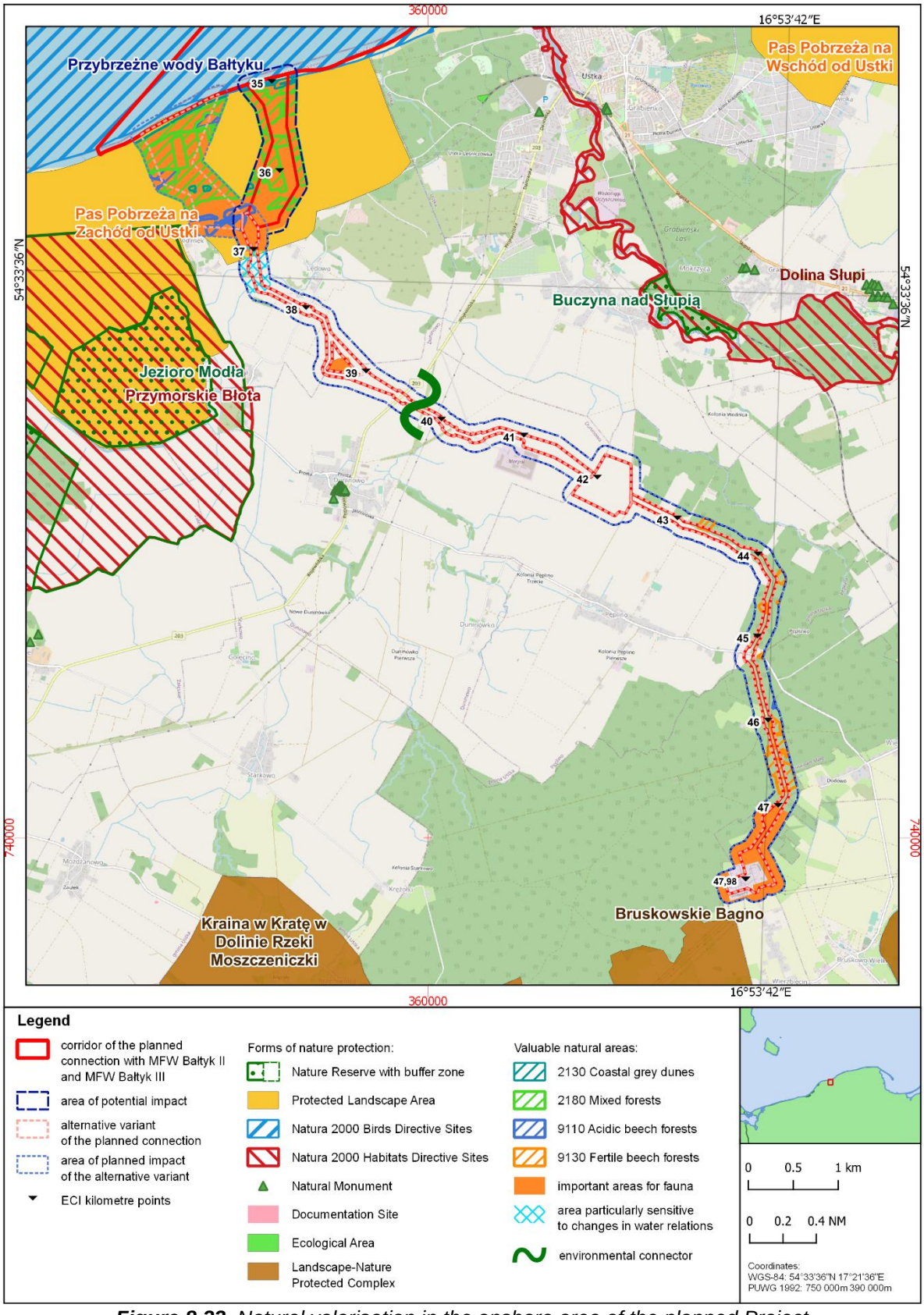


Figure 8.32. *Natural valorisation in the onshore area of the planned Project*

Source: In-house study

8.6. PROTECTED SITES, ECOLOGICAL CORRIDORS AND BIODIVERSITY

8.6.1 Protected sites

In accordance with Art. 6. par. 1. of the Act of 16 April 2004 on Nature Conservation (Journal of Laws 2022.916, consolidated text), the northern part of the planned Project onshore is located within the borders of the Protected Landscape Area Pas Pobrzeża na Zachód od Ustki (figure 8.33.).

Pas Pobrzeża na Zachód od Ustki' Protected Landscape Area was established by the Resolution No. X/42/81 of the Voivodeship National Council in Słupsk of 8 December 1981 concerning the creation of the Landscape Park 'Dolina Słupi' and protected landscape areas (Journal of Laws of 1981 No 9, item 23). The area covers 2 500 ha and it is situated in the mesoregion 'Pobrzeże Koszalińskie. Its value is the direct vicinity of the sea and plants connected with the sea. Species of pioneer coastal dune vegetation such as seaside eryngo *Eryngium martinum*, swamp vegetation of the Modła Lake area and coastal forest complexes occur here. Within the area there are two sea lakes Modła and Wicko, of which Modła Lake is an ornithological and aquatic-plant reserve. Numerous breeding grounds of waterfowl are characteristic for this area[320].

The planned Project passes through the Protected Landscape Area 'Pas Pobrzeże' to the west of Ustka, at a distance of about 2 km.

The binding legal act for the Landscape Protected Area "Pas Pobrzeże na Zachód od Ustki" is Resolution No. 259/XXIV/16 of the Sejmik of Pomorskie Voivodeship of 25 July 2016 on areas of protected landscape in Pomorskie Voivodeship, which includes, inter alia, arrangements for the protection of ecosystems and prohibitions based on conservation needs.

Pursuant to Article 24 of the Act of 16 April 2004 on Nature Conservation (Journal of Laws 2021.1098 uniform text as amended), the prohibitions indicated in the Resolution do not apply to public purpose investments, such as the planned Project.

Approximately 300 m from the boundaries of the planned connection corridor is the Natura 2000 site Przymorskie Błota PLH220024. It has been designated by the Commission Decision of 13 November 2007 adopting, pursuant to Council Directive 92/43/EEC, the first updated list of sites of Community importance for the Continental biogeographical region (notified under document C(2007)5043)(2008/25/EC). The Natura 2000 site Przymorskie Błota PLH220024[321] includes a fragment of the Przymorskie Błota plain and the Modła lake, located west of Ustka. It includes three nature reserves - the Modła lake, Zaleskie Bagna (swamp) in the Pomeranian Voivodeship and Zaleskie Bagna (swamp) in the West Pomeranian Voivodeship - and a fragment of the Protected Landscape Area Pas Pobrzeże na zachód od Ustki. The substrate is built of boulder clays and their weathering, as well as sands and glacial gravels associated with the North-Polish glaciations. At the surface, Holocene sediments are present, developed in the form of river sands and silts and peats. Locally, lake silts and clays occur. The soil cover is formed by mosaics of black earth muds and organic soils - peaty and mucky soils, in the western part there are ranges of brown soils and luvisols. The Potynia river flows through the eastern part of the Przymorskie Błota site, including the Modła lake. The whole area is cut by a network of drainage ditches. Land reclamation is one of the main threats in the Przymorskie Błota site. In the western part of the area there are water reservoirs created as a result of peat exploitation, (former peat excavation ponds). In geobotanical regionalisation by J. M. Matuszkiewicz the Natura 2000 area is situated in the South Baltic Coast Land (A.2.), in the Słupsk District (A.2.3.), in the Darłowo subdistrict. The area in question is dominated by reed and sedge rushes. They overgrow the eutrophic Modła lake. There are also very well-preserved raised and transitional bogs and thickets of European waxwort, as well as patches of swampy coniferous and birch forests, as well as alder forests.

[320] *geoserwis.gdos.gov.pl*
[321] *SDF Obszaru Natura 2000 Przymorskie Błota PLH220024, aktualizacja 2020-10*

The site contains 9 habitats[322] listed in Annex I of the Habitats Directive, which cover about 15 % of the area. Very well preserved are the Baltic peat bog communities, the European waxwort scrub and the site-specific bog birchwoods. Most of the area is covered by reed communities and periodically flooded wet meadows, which are a bird sanctuary. The area is inhabited by numerous strictly protected species, including relict boreal plants and those of the Baltic range, considered to be extinct. The Modła lake and the surrounding meadows and rushes are a bird sanctuary. The assessment of the conservation status of the habitats carried out during the work on the Conservation Tasks Plan (PZO) showed that the conservation status of the habitats: 7150 Depressions on peat substrate with plants of the *Rhynchosporion* association and 91F0 Riparian elm-oak-ash forests is appropriate, 3150 oxbow lakes and natural eutrophic water bodies, 7110 raised bogs with peat-forming vegetation (*Oxycocco-Sphagnetea*), 7140 transitional bogs and marshes (predominantly with *Scheuchzerio-Caricetea* vegetation) is unsatisfactory, while the status of the habitat 91D0 swamp forests and woodlands is poor.

Within the area, significant surfaces occupied by vegetation on peat or post-peat soils were inventoried, where synusiae of characteristic species of transitional peats of the class *Scheuchzerio-Caricetea nigrae* are present. The permanently wet or periodically flooded areas of these sites are fed by mineral-trophic waters. On the fringes of raised peat bogs, there is an ongoing process of overgrowth of peat with European waxweed thickets and an overgrowth of the European white birch. Such areas have been classified within the PZO as raised peat bogs or boggy birch, respectively. 3150 Old river beds and natural eutrophic reservoirs with *Nympheion, Potamion* communities. Two sites with a total area of about 53 ha were inventoried, the Modła lake and 2 small mid-forest reservoirs located within the Zaleskie Bagna reserve, which are in the last phase of the terrestrial process. In the Modła lake the physiognomy of the community is defined by the broad leaved pondweed *Potamogeton natans*, and the yellow water lily *Nuphar lutea*, (at the inflow and outflow). In some places, in the canals near the pumping station, the Canadian waterweed *Elodea canadensis* and the spiked milfoil *Myriophyllum spicatum* were also found. The site is represented by 1 eutrophic lake (former lagoon), which is today mostly overgrown with reed and sedge reeds. In places overgrown with reeds, the water surface contains communities belonging to the class *Lemnetea.* This allows to classify the habitat as an eutrophic lake (3150.1). The catchment area of the reservoir is under low anthropopressure. Arable fields and built-up areas are not directly adjacent to the lake. The overall condition of the habitat is described as adequate. The lake is currently under reserve protection (for bird protection).

A potential threat is any action de-watering the habitats. Passive protection of these habitats consists of limiting water management and any activities that cause eutrophication of the habitats. The following threats and pressures were identified in the Natura 2000 Site Przymorskie Błota PLH220024:

- high level:
  - deforestation,
  - change in species composition (succession),
  - eutrophication (natural),
- medium level:
  - poaching,
  - trampling, overuse,
  - pollution of surface waters (limnic, terrestrial, marine and brackish),
  - refuse and solid waste,
  - siltation,
- low level:
  - removal of dead and dying trees;
  - other man-made modifications to water relations.

For the Natura 2000 site Przymorskie Błota PLH220024, a Protection Task Plan is in force in accordance with the Regulation of the Regional Director for Environmental Protection in Gdańsk and

[322] *According to the draft update of the SDF of the Przymorskie B;這ta Natura 2000 area (data from RDOŚ in Gdansk), 12 habitats listed in Annex I of the Habitats Directive were found to occur in the area, which cover about 30% of the area*

the Regional Director for Environmental Protection in Szczecin of 25 September 2014. (Journal of Resolutions of the Zachodnie Pomorskie Voivodeship dated 29 September 2014, item 3620).

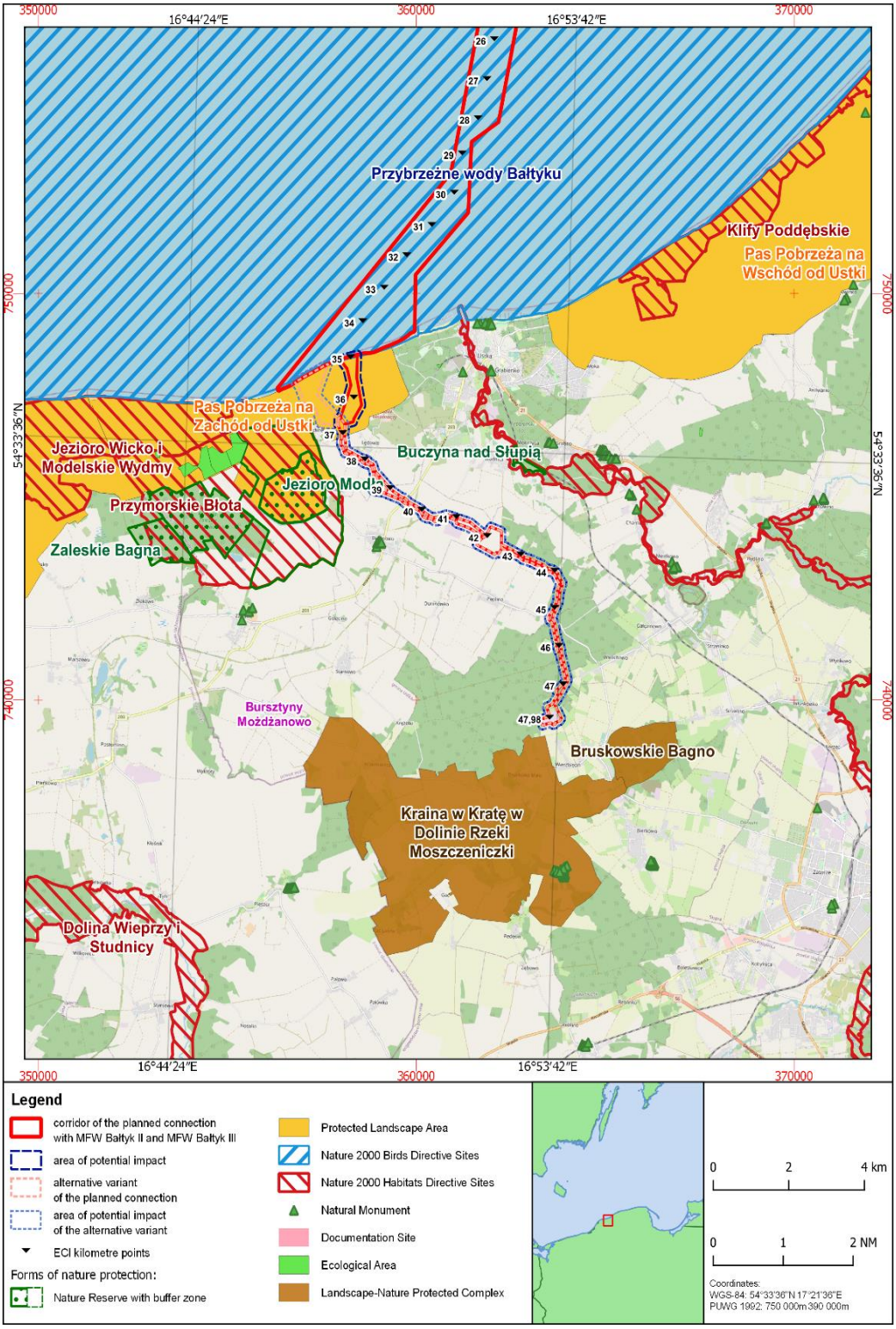


Figure 8.33. *Location of the onshore part of the planned Project in the background of protected areas*
Source: In-house study on the basis of geosewis.gdos.gov.pl

In the vicinity (up to 2 km) of the planned Project, there are 9 protected areas established under the Nature Conservation Act (table 8.19.).

Table 8.19. *Forms of nature conservation within 2 km of the planned Project*

No.	Form of nature protection	Characteristics
1.	Rezerwat przyrody Jezioro Modła (Modla Lake Nature Reserve)	Located approx. 800 m west of the planned Project (the buffer zone of the reserve located 167 m from the corridor of the Project; the aim of the protection is to preserve the ecosystem of the eutrophic lake together with characteristic biotopes, biocenoses and processes, in particular populations and habitats of water and marsh bird species; a protection plan is in force in the reserve
2.	Rezerwat przyrody Buczyna nad Słupią (Buczyna nad Słupią Nature Reserve)	Located about 1.6 km north-east of the planned Project; the aim of protection is to preserve forest ecosystems - in particular fertile *Galio odorati - Fagetum* beech forest with characteristic species and old beech forests; there is no protection plan in force for this reserve
3.	Natura 2000 site Dolina Słupi PLH220052	Located approx. 1.5 km north-east from the planned Project; in the area there are numerous water reservoirs of various types, peatbogs and other non-forest communities with valuable plants; a large part of the area is covered by beech and oak-hornbeam forests, and a strip of a riparian forest above the watercourses; the area does not have a protection plan in force
4.	Natura 2000 site Jezioro Wicko i Modelskie Wydmy PLH320068	Located approx. 1.4 km from the border of the area, to the west of the planned Project; the area is characterised by very well-developed and well-preserved coastal white dunes and initial stages of coastal white dunes as well as the best-preserved patches of coastal crowberry forests (*Empetro nigri-Pinetum)* in the West Pomeranian Voivodeship; there is also a large eutrophic lake - Wicko; no protection plan is in force for this area
5.	Natural monuments	In the form of a group of 23 trees: horse chestnut, small-leaved lime, ash, sycamore, English oak - growing about 1 km to the south-west of the planned Project
6.	A group of unnamed ecological uses with inspire codes: PL.ZIPOP.1393.UE.2212102.10, PL.ZIPOP.1393.UE.2212102.11, PL.ZIPOP.1393.UE.2212102.12, PL.ZIPOP.1393.UE.2212102.13	Located approximately 1.8 km west of the planned Project
7.	Zespół Przyrodniczo-Krajobrazowy Kraina w Kratę w Dolinie Rzeki Moszczeniczki (Natural and landscape complex Kraina w Kratę w Dolinie Rzeki Moszczeniczki)	Located approx. 270 m south of the planned Project; the aim of the protection is to preserve valuable fragments of traditional rural landscape with well-preserved regional architecture, as well as high natural values of the Moszczeniczka river valley
8.	Zespół Przyrodniczo-Krajobrazowy Bruskowskie Bagno (Natural and landscape complex Bruskowskie Bagno)	Located approximately 1.4 km south-east of the planned Project; includes raised bogs which are a local biodiversity hotspot and protection sites of protected and rare plant and animal species

Source: In-house study on the basis of geoserwis.gdos.gov.pl

The nearest national park, i.e Słowiński National Park is located at a considerable distance from the planned Project. The park boundary is 16 km to the east of the planned Project (12.7 km from the park buffer zone).

In summary: The northern part of the planned project will be located within the Pas Pobrzeże Protected Landscape Area to the west of Ustka (along a section of about 2 km), which is characterised by very high landscape values due to a stripe-like arrangement of moraine uplands, vast coastal plains, dunes and beaches. In impact assessment (Chapter 10.6) was presented a detailed analysis of the impact of the planned Project on this area, as well as the species and habitats listed in Annex I of the EP and Council Directive 2009/147/EEC, and the habitats listed in Annex II of the Habitats Directive 92/43/EEC that are the subject of protection in Natura 2000 sites.

8.6.2 Ecological corridors

An ecological corridor is defined as a natural structure that enables the migration of animals, plants or fungi. It is a natural route, which has natural or near-natural characteristics and at the same time constitutes a kind of an ecological reserve[323]. On land, these are most often strips of forest, areas covered with shrubs or grasses, river valleys, and the coastal zone, which all enable species to move between patches of similar habitats and provide shelter and access to food. Maintaining ecological corridors is one of the basic conditions for preserving biodiversity and preventing inbreeding.

The effectiveness of the functioning of ecological corridors determines the main objectives of nature protection and possibilities of maintaining the natural balance, as well as the durability of ecological processes, which are the determinant of the ecological and spatial policy. A major obstacle to the connectivity of the ecological network is the progressive urbanisation and development of technical and transport infrastructure, which often occupy environmentally valuable areas (including forests, meadows and river valleys), serving as ecological corridors[324].

Taking into account the rank of ecological corridors, they are divided into those of European, international, national and regional importance. Ecological corridors include structural elements of the natural environment necessary for its proper functioning: linear, non-linear, band or area, continuous or discontinuous, natural, semi-natural or anthropogenic, biotic or abiotic, including airspace. It is assumed that depending on the function of a corridor, its structure will be the same. Corridors at the national level are often depicted as linear and continuous landscape structures, but upon closer analysis at the regional level, they may be characterised by a more complex structure.

A map of migration routes of large mammals on a national scale has been created for the land area[325], for the purpose of analysis of influence of road and railway investments causing fragmentation of the landscape and the formation of a significant barrier for migrating animals. According to this conception, the land part of the planned connection infrastructure is located entirely in the northern zone, in the area of the corridor of national importance Pobrzeże Słowińskie (figure 8.34.).

[323] *Kistowski M., Pchałek M. 2009.*
[324] *Bezubik K., i in. 2014.*
[325] *Mapa korytarzy ekologicznych w Polsce opracowana przez Zakład Badania Ssaków Polskiej Akademii Nauk w Białowieży pod kierownictwem prof. dr. hab. Włodzimierza Jędrzejewskiego*

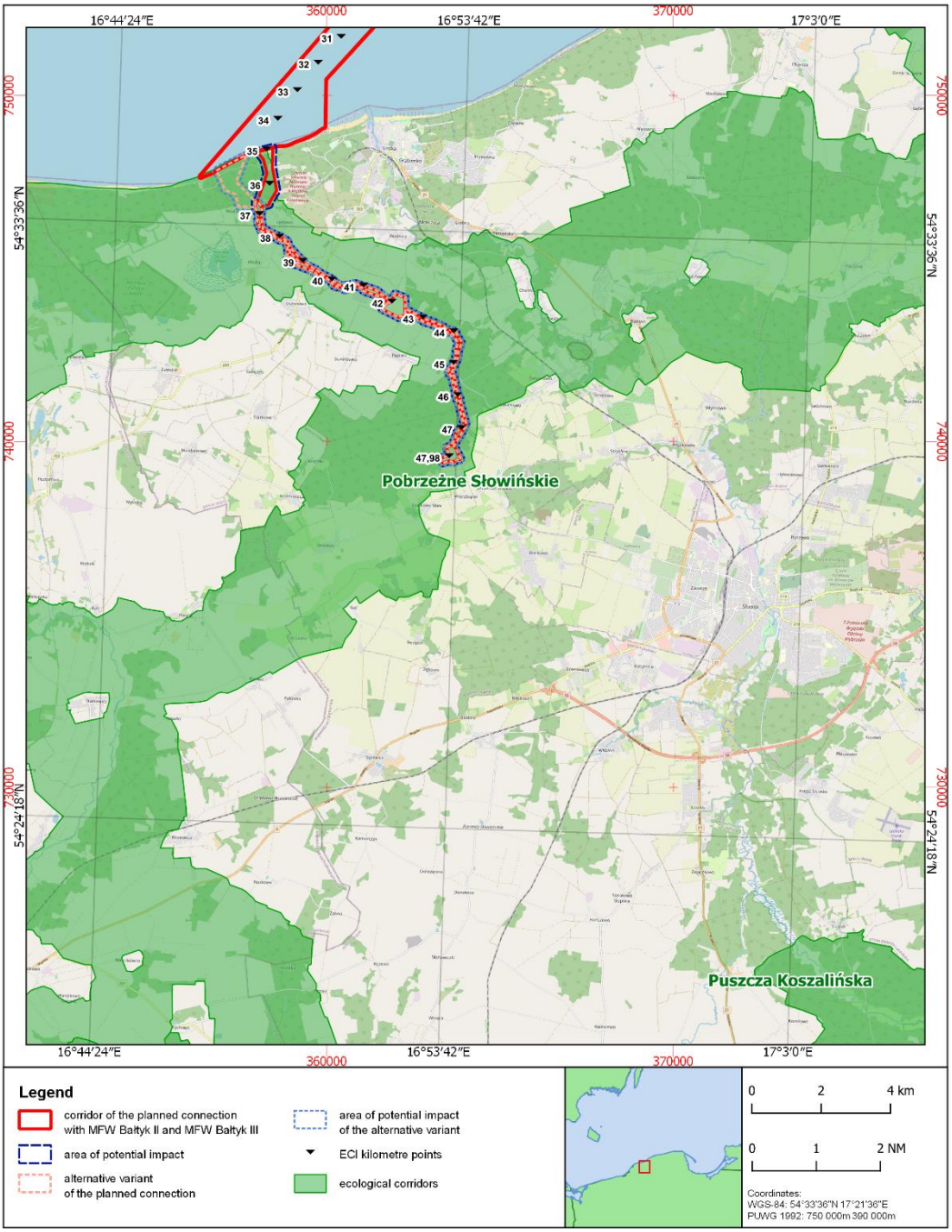


Figure 8.34. *The planned Project against the background of ecological corridors according to the concept of W. Jędrzejewski (2011)*

Source: In-house study on the basis of Jędrzejewski and others, 2011

Another concept of ecological corridors has been developed by the Pomorskie Voivodeship for the needs of regional planning. Depending on the scope, space and rank, the land corridors were divided into: supraregional, regional, subregional and local ones[326]. In accordance with this concept, the planned Project is located within the supraregional 'Korytarz Nadmorski' corridor (figure 8.35.), which includes a forest-water-meadow-peat-bog belt leading along the coastline from the border of Pomorskie voivodeship in the western part to the Hel Peninsula in the east. It is a two-lane, irregular, discontinuous corridor of variable width, which maximally reaches 12 km in the region of the Łebsko Lake. The corridor is structurally diversified and includes a belt of dunes, including within the limits of the Słowiński National

[326] *Pomorskie Biuro Planowania Regionalnego: Koncepcja sieci ekologicznej województwa pomorskiego dla potrzeb planowania przestrzennego, Gdańsk 2014*

Park, on the Hel Pennisula, forests and seaside meadows, marshes, swamps and two seaside lakes: Łebsko and Gardno. There are smaller concentrations of development in the corridor, mainly residential and recreational, and larger ones along the Baltic coast have been excluded from the corridor boundaries[327].

Figure 8.35. *The planned Project against the background of ecological corridors according to the concept of Pomorskie voivodeship*

Source: In-house study on the basis of the Concept of Ecological Network of Pomorskie Voivodeship for the Needs of Spatial Planning. Pomorskie Biuro Planowania Regionalnego (Pomeranian Regional Planning Bureau), Gdańsk

The above mentioned publications do not take into account the needs of birds, their places of concentration and migration routes. According to Berthold 1993 and Newton 2008, one of the branches of the East Atlantic migratory route runs along the southern coast of the Baltic Sea, connecting breeding grounds in northern Europe with wintering grounds located in southern and western Europe, Africa and,

[327] *Kruk-Dowgiałło L., Michałek M., Mioskowska M. (red.), 2018, Prognoza oddziaływania na środowisko projektu planu zagospodarowania przestrzennego morskich wód wewnętrznych, morza terytorialnego i wyłącznej strefy ekonomicznej w skali 1: 200 000– wersja v. 1, Wydawnictwa Wewnętrzne Instytutu Morskiego w Gdańsku, Nr 7127, Gdańsk*

for some species, also in Asia. A schematic layout of this route, including the location of the study area, is presented in figure 8.36.

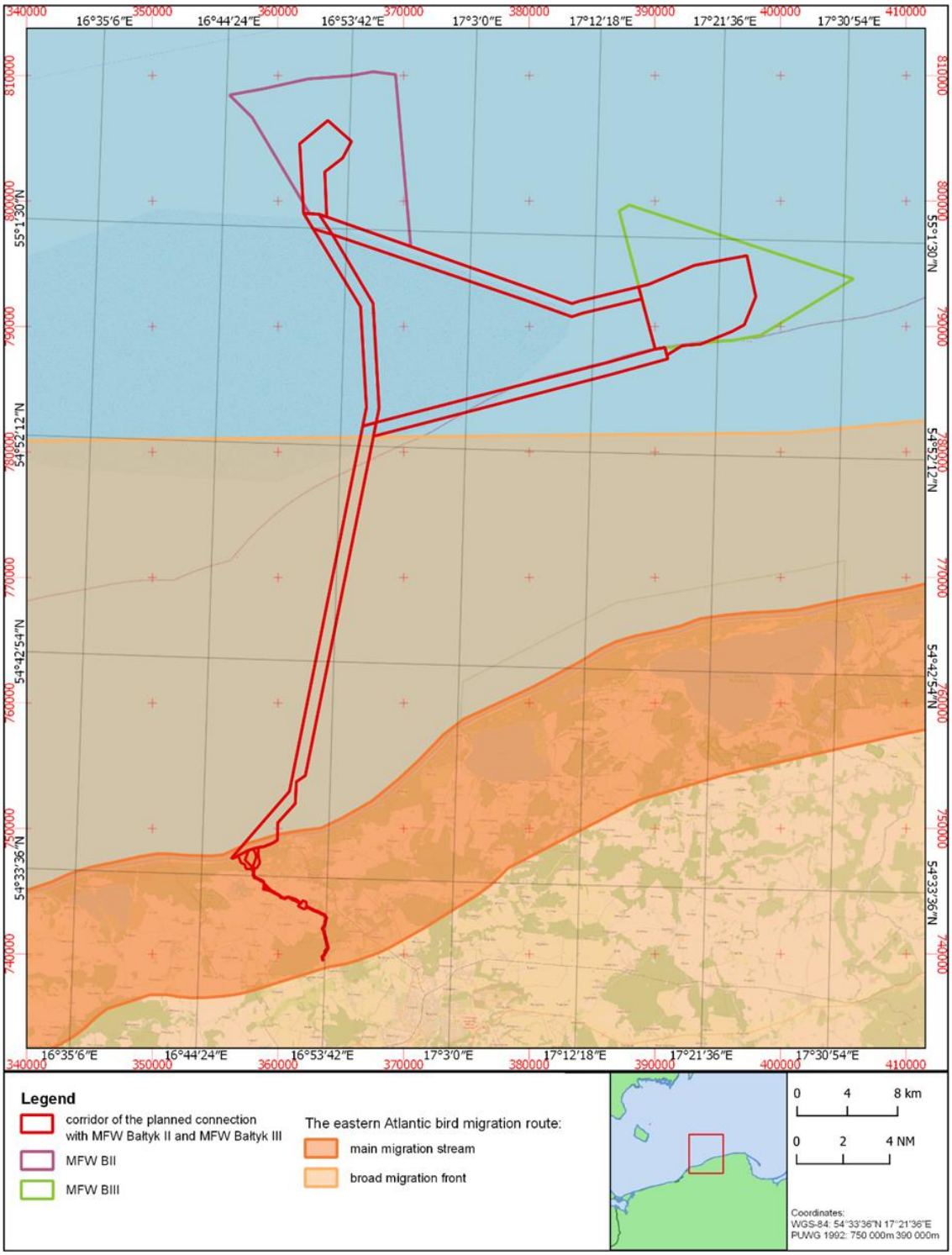


Figure 8.36. *East Atlantic Flyway (a migration route of birds along the southern borders of the Baltic Sea)*

Source: Berthold 1993 and Newton 2008.

In addition, the planned Project crosses local migration routes identified during the nature inventories conducted for this Report. Local migration routes include, for example, riverbeds of seminatural character (fragments of the Struga Lędowska and Pogorzeliczka valleys) and the former route of the railroad line overgrown with trees and shrubs. In summary, migration routes of mammals, birds and bi-environmental fish, and on a much smaller scale - migration of amphibians may

occur in the area of the planned Project. The impact assessment of the planned Project will include an analysis of the impact on the ecological corridors within the range of its potential impact and examine whether the planned ECI will affect the maintenance of their spatial continuity.

8.6.3 Biodiversity

Biological diversity, according to Article 2 of the Convention on Biological Diversity, means the variability among all living organisms from, inter alia, terrestrial, marine and other aquatic ecosystems and the ecosystems of which they are part. It refers to diversity within species (genetic diversity), between species and between ecosystems. Studies on biodiversity loss identify five main factors affecting biodiversity: habitat loss and fragmentation, overexploitation and misuse of natural resources, pollution, invasive alien species and climate change.

The biodiversity of a site is not uniform and is related to the number and mosaicity of habitats. Biodiversity variability also depends on the season, the inter-relationship between the abundance of the organisms concerned and the study group. An area of high biodiversity of plant species may "not be particularly attractive for mammal or reptile species and conversely areas favourable for birds may not necessarily be rich in vascular plant species (e.g. dunes).

The greatest biodiversity is exhibited by the areas that have been identified as the most valuable, and these are listed in Section 8.5.12, Natural Valorization.

The most biodiverse sections along the ECI route include areas:

- coastal gray dunes (35 km),
- mixed forests and forests on coastal dunes (35-36.5 km),
- wet meadow complex with Struga Lędowska (36.9-37.5),
- fertile beech forests (43, 44, 46-47 km),
- acidic beech forests (36.5, 45.8 km).

In addition, the ECI route distinguished areas that are characterized by biodiversity in a monotonous setting of agricultural fields:

- in the area of 38.6-39.0 km there is habitat 91F0 Riparian oak-elm-beech forest. This is an area surrounded by agricultural fields, valuable for herpetofauna,
- in the area of 39.7 km, the planned Project crosses the historic railroad line "Route of the rolled-up tracks". There is a depression of land with periodic wetlands. The area is overgrown by trees and shrubs. It serves as an ecological link, allowing the migration of fauna in the monotonous landscape of agricultural fields in the surrounding area.

8.7. LANDSCAPE

According to the typological classification[328], the planned Project is located within a lowland landscape. The northern part of the Project is an aeolian lowland landscape of hills, the central part is a glacial lowland landscape of hills and the southern part is a glacial lowland landscape of hills (table 8.20.).

Table 8.20. *Landscape units in the area of the planned Project*

Class	Type	Species	Place of occurrence
Plains	Eolian	Hilly	35-36.5 km
	Glacial	Hills	38.2-39.5 km
	Glacial	Hilly	36.5-38.2 km 39.5-SE Słupsk Wierzbięcino

Source: In-house study based on Richling A., Ostaszewska M. (ed.), Geografia fizyczna Polski, Wydawnictwo Naukowe PWN, Warszawa 2005

[328] *Richling A., Ostaszewska M. (ed.), Geografia fizyczna Polski, Wydawnictwo Naukowe PWN, Warszawa 2005*

The aeolian lowland landscape is characterised by the occurrence of aeolian hills in the form of parabolic and rolling sand dunes. In the northern part of the planned Project, the landscape consists of beaches (Photo 8.7.), interdune depressions (Photo 8.8 and Photo 8.9) and large areas of fresh forests on dunes (Photo 8.10). There are Lędowskie Wydmy with its highest peak - Ognica (40 m above sea level) and buildings of the Naval Training Centre (76-270 Ustka). In the neighbourhood of the planned Project there is a nature reserve Modła lake[329] together with adjacent wetlands.

Photo 8.7. *Beach in the area of the eastern variant of the cable landfall*

Photo 8.8. *Interdune depressions in the area of the eastern variant of the cable landfall*

Photo 8.9. *Back-up facilities for dune shafts*

Photo 8.10. *Fresh forests on dunes*

The lowland glacial landscape of hills in the area of 38.2-39.5 km of the planned Project is characterised by significant elevations. There is an extensive depression with a system of drainage ditches and developed riparian forest, which is characterised by biodiversity in the monotonous surroundings of arable fields (Photo 8.11 and Photo 8.12). In the case of the planned Project, in this landscape there are buildings of the Duninowo village together with adjacent wastelands and agrocenoses of arable fields, as well as a relatively strongly developed hydrographic network crossing the area in various places and determining its hilly character.

[329] *approximately 800 m west of the planned Project (167 m to the reserve buffer zone)*

Photo 8.11. *Riparian area surrounded by farmland*

Photo 8.12. *Riparian Forest in 39 km*

The lowland glacial landscape of hills is characterised by significant denivelations, variable slopes and varied relief, and a developed hydrographic network. In the case of the planned Project, this landscape is mainly determined by significant areas of agricultural land, as well as buildings of the MOWI POLAND S.A. (Photo 8.13) company and PSE S.A Słupsk Wierzbięcino substation (Photo 8.14), which stand out in the landscape.

Photo 8.13. *Buildings of the company MOWI POLAND S.A. in the area of km 41*

Photo 8.14 *PSE S.A. Słupsk Wierzbięcino substation in the area of km 48*

Taking into account the physicogeographic regionalization of Poland[330] [331], the planned Project is located on Wybrzeże Koszalińskie (Coast) (northern part from the coastline to approx. 39.2 km) and Równina Słupska (Plain) (southern part from approx. 39.2 km to PSE S.A Słupsk Wierzbięcino), characteristics of which are presented in Subchapter 8.1.

According to the Corine Land Cover 2018, the planned Project runs mainly through forest, agricultural areas and seminatural ecosystems. Agricultural land is visible in the middle course (between 38 and 42.5 km) of the planned Project - the landscape of these areas should be considered as culturally disharmonious, where human activities relatively strongly transform the surrounding landscape. Further down the corridor of the planned Project runs through forest edge and forest up to the station of PSE S.A Słupsk Wierzbięcino. Forest areas occur also in the area of the coastal belt - the landscape of these areas should be regarded, depending on the place, as disharmonious natural-cultural or harmonious natural-cultural ones.

[330] *Kondracki J., Geografia regionalna Polski. Wydawnictwo Naukowe PWN, Warsaw, 2011.*
[331] *Richling A., Solon J., Macias A., Balon J., Borzyszkowski J., Kistowski M. (eds.) 2021. Regional Physical Geography of Poland. Bogucki Wyd. Naukowe, Poznań*

The Act of 23 July 2003 on the protection and care of historical monuments (Journal of Laws 2022.840, consolidated text) defines the cultural landscape as a space perceived by people, containing natural elements and products of civilisation, historically shaped as a result of natural factors and human activity. In the surroundings of the planned Project, there are no historical elements which would determine the cultural landscape. The closest historical objects of significance for the cultural landscape (monuments entered in the register of historic monuments) are located in Duninowo and Pęplino (Subchapter 8.8.). Moreover, historical objects, important as the historical fabric forming the cultural landscape of the municipality (monuments entered in the communal register of monuments), are located in the villages of Pęplino, Duninowo, Lędowo and Modlinek.

The planned Project will be located in the northern part within the Protected Landscape Area Pas Pobrzeże na Zachod od Ustki (Subchapter 8.6.1). The applicable legal act is Resolution No. 259/XXIV/16 of the Sejmik of Pomorskie Voivodeship of 25 July 2016 on protected landscape areas in Pomorskie Voivodeship, which includes provisions resulting from landscape protection needs. This area is characterised by very high landscape values due to the direct vicinity of the sea and the associated significant variety of habitats occurring here - dunes with pioneer coastal dune vegetation, coastal lakes and wetlands with marsh, rushes and aquatic vegetation, as well as pine forest complexes.

According to the Study of conditions and directions for spatial development of the Ustka municipality (Resolution No. XXVIII.338.2013 of the Ustka Commune Council dated 24 May 2013) and the study on conditions and directions of spatial development in the Słupsk commune (Resolution No. IX/83/2011 of the Słupsk Commune Council dated 5 August 2011 as amended), the planned Project does not run through natural and cultural landscape protection zones, view corridors, exposure areas or in the vicinity of viewpoints.

In summary: In the northern part of the planned Project, there are high scenic qualities, due to the banded landscape system of moraine uplands, extensive coastal plains, dunes and beaches. There are transformations associated with the facilities that have been operating here for years (the Naval Center). In the assessment of the impact of the planned Project, an analysis of the impact on landscape values, including cultural landscape in all phases of implementation was conducted (Chapter 10.7.).

8.8. CULTURAL HERITAGE

In the vicinity of the planned Project, remains of settlements most often date from the Middle Bronze Age to the end of the Iron Age and from the early Middle Ages. Less frequently, they are dated to the Neolithic, late Middle Ages and modern times. Settlement in this area was very rich, the predominance of land estates over villages was characteristic. Many medieval manor settlements have lost much of their historical value and cultural resources. However, most of the historical manor complexes have survived. The most intensive colonisation took place in a wide belt including the area of Zaleskie village through Możdżanowo, Starkowo, Golęcino to Pęplin and Duninowo, further places of intensive colonisation are located along the Slupia river and in the belt from Dębina to Dominek.

In the corridor of the planned Connector (35.3 km) there is an extensive complex of fortifications of the 9th Battery of Permanent Artillery in Lędów (9 BAS) listed in the provincial register of historical monuments.

The 9th Battery of Permanent Artillery in Lędów is an extensive fortification complex that was created as a result of the concept adopted by the Naval Command in the 1950s to defend the coast and fight on artillery and mine positions. The 9BAS consists of four fire positions, the main fire control point (tower) with an artillery headquarters, a backup fire control point (tower), an artillery radar tower, a basic and special ammunition store, two service shelters, a power plant with a transformer station, reinforced two-way observation points (towers), two reflector and aggregate shelters. In addition, the unit's fortifications are surrounded by numerous field fortifications that make up the 4th Battalion Fortified Area.

In the corridor of the planned Project are (figure 8.37):

- stand no. 503 - gun emplacement no. 3,
- stand no. 504 - gun emplacement no. 4,
- stand No. 511- crew shelter 503 and 504.

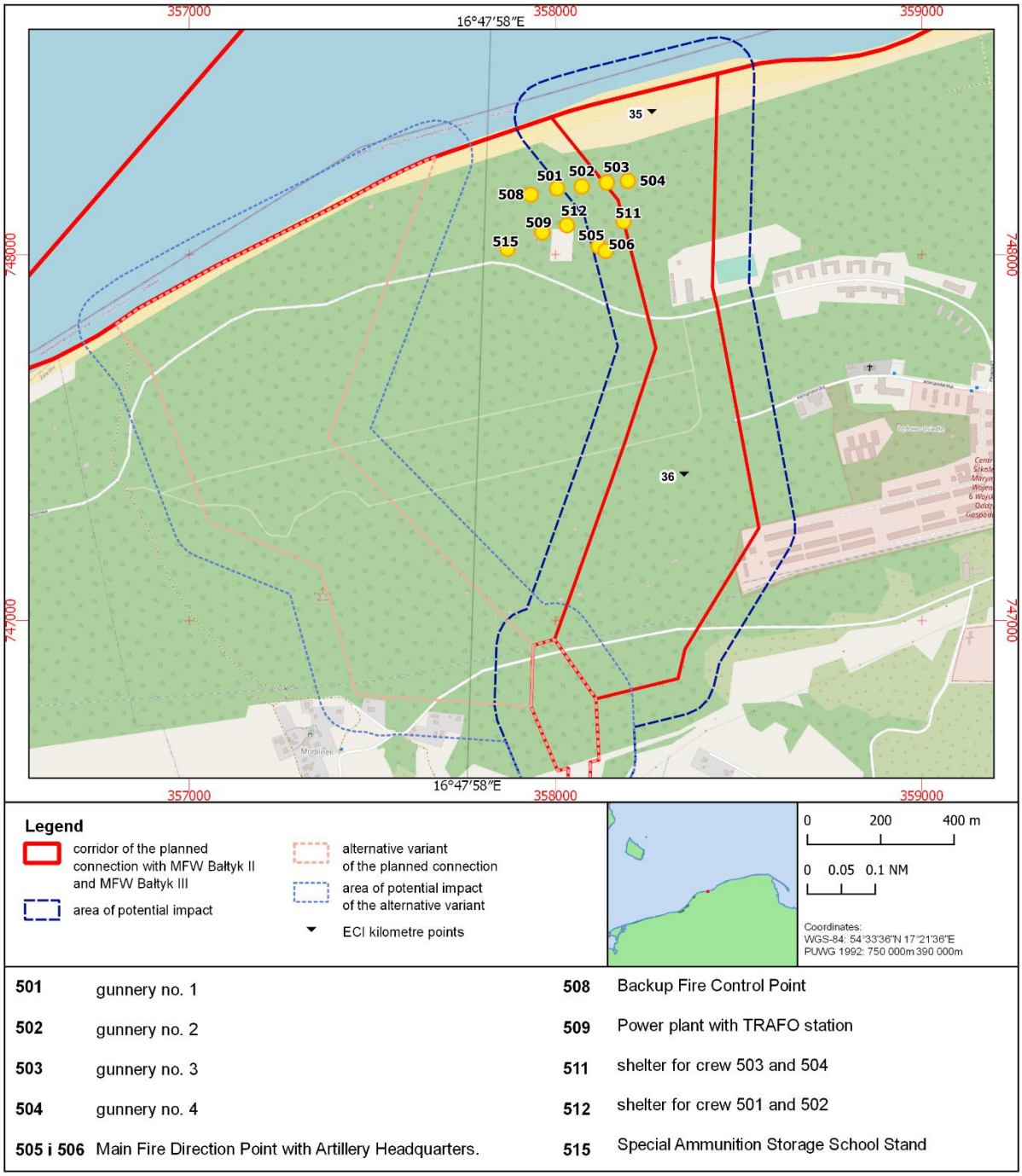


Figure 8.37. *Location of the planned Project against the background of the fortification complex of the 9th Permament Artillery Battery in Lędów (9BAS)*

Source: In-house study based on https://zabytek.pl/

According to the Archaeological Picture of Poland[332], there are no archaeological sites in the corridor of the planned connection. In the area of the potential impact of the planned connection, there are the following sites (figure 8.38.):

- the archaeological site No. 14 (sheet 7-27) - a settlement of Lusatian-Pomeranian culture from the Bronze Age, included in the W.III zone of limited archaeological and conservational protection;
- the archaeological site No. 15 (sheet 7-27) - a settlement of Lusatian-Pomeranian culture from the Bronze Age, included in the W.III zone of limited archaeological and conservational protection;
- the archaeological site No. 26 (sheet 7-27) - a burial ground of Pomeranian culture, included in the partial archaeological and conservational W.II protection zone;
- the cottage Modlinek 14 entered in the register of historical monuments;
- the forester's lodge at Gajki 1, entered in the municipal register of monuments.

The area of the impact also includes the Naval Training Centre complex, of which 46 buildings are listed in the register of historical monuments[333] .

Additionally, in close proximity (up to 200 metres from the corridor of the planned Project) are:

- stand 16 (sheet 7-27) – a Bronze Age settlement trace entered in the register of monuments, included in the W.III. archaeological and conservational limited protection zone;
- stand 16 (sheet 8-28) - a prehistoric settlement trace entered in the register of historical monuments.

According to the Study of conditions and directions for spatial development of the Ustka municipality, the villages of Modlinek and Lędowo are villages with preserved cultural elements; in these villages there are objects listed in the municipal register of historic monuments. Moreover, according to the Study, the planned Project is crossed by a disused historical railway line (39,7 km) During the field inspection (19 May 2022) it was found that there are no tracks in this place (Photo 8.15 and Photo 8.16).

Photo 8.15. *The disused historical railway line*

Photo 8.16. *The disused historical railway line - used as a horse trail*

According to the Study, the area in the zone of partial archaeological and conservational protection (W.II.) is available for investment purposes on a condition that archaeological rescue research is carried out prior to investing in the area. Each time, the scope is determined for the investor by the Voivodeship Conservator of Monuments in the form of a permit.

In the zone of limited archaeological and conservational protection (W.III) for all engineering, construction and other works connected with earthworks, there is an obligation to carry out intervention archaeological research in the form of archaeological supervision carried out during the implementation of the investment, to the extent on every occasion specified to the investor by the Voivodeship Conservator of Monuments, in the form of a permit. After the completion of the research, the area can

[332] *Archaeological Picture of Poland sheets 7-27 and 8-28, Provincial Office for the Protection of Monuments Delegation in Slupsk.*
[333] *Update adopted by the Rresolution no. XXVIII.338.2013 of the Ustka Municipality Council dated May 24, 2013 on accession to an update of the Studium uwarunkowań i kierunków zagospodarowania przestrzennego Gminy Ustka*

be permanently invested in. There is also an obligation to carry out archaeological rescue research in the case of finding archaeological relics.

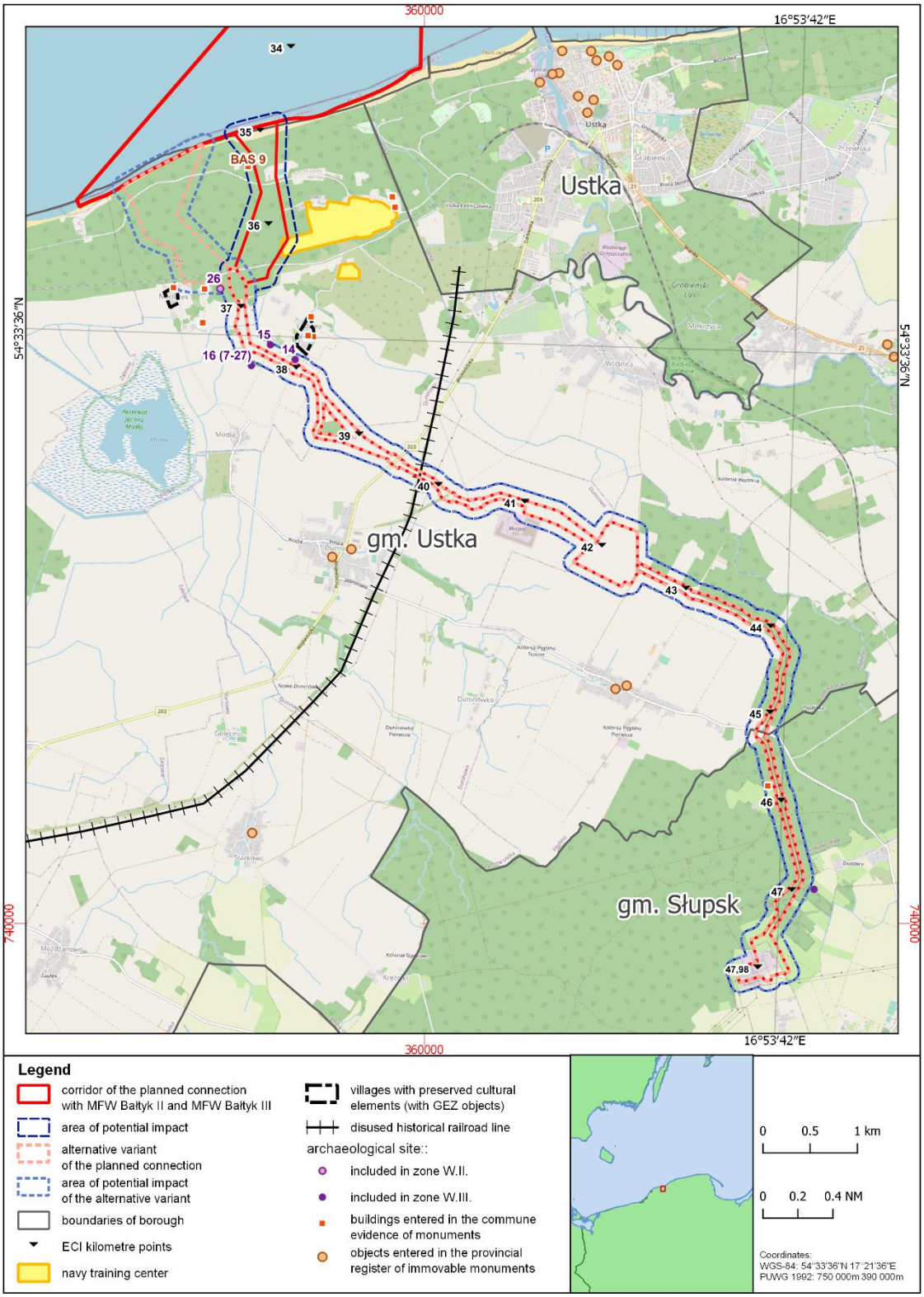


Figure 8.38. *Cultural heritage within the borders of the planned MFW Bałtyk II and Bałtyk III Project and in the area of its potential impact*

Source: In-house study based on Archaeological Picture of Poland sheets 7-27 and 8-28 and Appendix 2 Directions of cultural heritage protection to the Study of conditions and directions for spatial development of the Ustka municipality

A list of historical monuments entered in the Voivodeship register in the vicinity of the planned Project is presented in table 8.21.

Table 8.21. *List of historical monuments in the vicinity of the planned Project*

No	Town	Object	Address	Pomeranian Voivodeship Reg. No.	Date of entry in the register of historical monuments	Distance from planned Project
1.	Bierkowo	Hut	Bierkowo 10	361	12.04.1965	3.7 km
2.	Bruskowo Wielkie	Parish Church of the Immaculate Conception of the Blessed Virgin Mary	Bruskowo Wielkie	1739	07.11.2002	1.3 km
3.	Charnowo	Church of the Discovery of the Holy Cross and its surroundings	Charnowo	214	07.02.1961	2.6 km
4.	Duninowo	Parish church of Our Lady of Czestochowa and its surroundings	Duninowo	197	02.02.1961	1.2 km
5.	Duninowo	Park	Duninowo	1679	15.12.1998	1 km
6.	Pęplino	House	Pęplino 65 (d. 28)	399	15.02.1966	1 km
7.	Pęplino	Forge No. 21	Pęplino 21	1832	11.07.2008	1 km
8.	Starkowo	Residential building No 30 and the land underneath	Starkowo 30	1863	20.05.2010	4 km
9.	Strzelino	Filial church of St. Anthony of Padua	Strzelino	57	24.10.1955	4.4 km
10.	Strzelino	Palace	Strzelino	1347	13.02.1991	4.6 km
11.	Swołowo	Church of the Assumption of the Blessed Virgin Mary and its surroundings	Swołowo	209	08.12.1961	4.1 km
12.	Swołowo	Homestead: /cottage; gatehouse; livestock building; barn /	Swołowo 8	1670	21.07.1998	4.1 km
13.	Swołowo	Homestead (house, barn)	Swołowo 18	1758	16.05.2005	4.3 km
14.	Swołowo	Homestead No. 9: 1. residential building; 2. livestock building; 3. farm building; 4. passage building with surroundings	Swołowo 9	1798	15.12.2006	4.1 km
15.	Swołowo	Barn No. 12	Swołowo 12	1824	04.03.2008	4.3 km
16.	Swołowo	Barn with livestock part (cowshed) No. 17 together with a fragment of land within the contour of the building	Swołowo 17	1826	12.03.2008	4.3 km
17.	Swołowo	Cowshed and barn No 15 together with the land under the buildings	Swołowo 15	1827	12.03.2008	4.3 km
18.	Swołowo	Residential building No 14 and the land underneath	Swołowo 14	1828	12.03.2008	4.4 km
19.	Swołowo	Homestead no. 5 consisting of the following buildings: 1.cottage, 2.passage building, 3.livestock building, 4.barn, 5.farm building, 6.farm building with a bread oven within the boundaries of the plot of land no. 13	Swołowo 5	1944	06.04.2017	3,9 km
20.	Swołowo	Residential building No. 39a	Swołowo 39a	1945	06.04.2017	3,9 km

21.	Swołowo	Barn No. 26	Swołowo 26	1946	06.04.2017	4 km
22.	Ustka	Urban layout of the town of Ustka	Ustka	79	28.08.1957	3,1 km
23.	Ustka	House	Marynarki Polskiej 10	92	15.10.1958	3 km (1.5 km to the offshore part)
24.	Ustka	Villa with an outbuilding (stable)	Chopin 8-8a	1285	01.09.1989	3.6 km (2 km to the offshore part)
25.	Ustka	Parish Church of the Holiest Saviour	Ustka	1407	30.08.1993	3.3 km (1.8 km to the offshore part)
26.	Ustka	Lighthouse	Limanowskiego 1	1408	30.08.1993	3.1 km (1.5 km to the offshore part)
27.	Ustka	Residential and farm complex: 1. residential building, 2. outbuilding	Żeromskiego 1	1598	22.05.1996	3.4 (1.8 km to the offshore part)
28.	Ustka	Villa with an outbuilding and a garden	Kopernika 5	1613	12.12.1996	3.7 (2.1 km to the offshore part)
29.	Ustka	Villa	Chopin 4	1661	27.04.1998	3.4 (1.9 km to the offshore part)
30.	Ustka	School building and surroundings	Ks.Kardynała Stefana Wyszyńskiego 3	1756	01.04.2005	3.4 km (1.9 km to the offshore part)
31.	Ustka	Residential building	Kosynierów 21	1786	30.06.2006	3.2 km (1.7 km to the marine part)
32.	Ustka	Granary building together with a part of the land underneath the building	6 Port Boulevard	1857	12.10.2009	3 km (1.4 km to the marine part)
33.	Ustka	Transshipment tower (post-industrial building) including a part of the plot of land within the contour of the building	Bohaterów Westerplatte 12	1880	06.12.2011	2.8 (1.3 km to the offshore part)
34.	Zaleskie	Filial church of St. Stanislaus the Bishop and its surroundings	Zaleskie	213	02.02.1961	4.6 km
35.	Zaleskie	Manor-park complex /manor house, park	Zaleskie	367	15.04.1965	4.5 km
36.	Zaleskie	Gatehouse	Zaleskie 67 (d.11)	368	15.04.1965	4.7 km
37.	Zimowiska (Grabno)	Church of St. John the Baptist and St. Nicholas / unused former Evangelical church / with surroundings	Zimowiska (Grabno)	220	08.05.1961	3.1 km
38.	Zimowiska (Grabno)	Manor-park complex/ manor house, park	Zimowiska (Grabno) 221		08.05.1961	3.2 km

Source: https://www.ochronazabytkow.gda.pl/wojewodzka-ewidencja-zabytkow/

Summary: In the area of the planned Project there are high scenic qualities, due to the banded arrangement of landscapes of morainic highlands, extensive coastal plains, dunes and beaches. In the corridor of the planned Connector (35.3 km) there is an extensive fortification complex of the 9th

Permanent Battery in Ledów (9 BAS), which is listed in the provincial register of historical monuments Besides, there are no archaeological sites or historical objects in the corridor of the planned Project. There are archaeological sites in the area of potential impact, as well as the complex of the Naval Training Center, 46 of whose buildings are listed in the register of historical monuments. In addition, the planned Project is crossed by a disused historic railroad line (39.7 km).

8.9. MATERIAL ASSETS AND POPULATION

Due to the linear nature of the investment, the route of the planned ECI will run through areas used in various ways, mainly through forest and agricultural areas, as well as in the vicinity of residential areas or areas used for industrial or economic purposes. Forests occupy more than half of the area in the corridor of the planned ECI - about 51,1%, agricultural land about 41,7% of the area (figure 8.39.). Urbanised areas account for only 4,2% and these are:

- roads, railways (area of km 36.5; 38; 39.5 and 45),
- residential development (area of km 36, 37, 38, 45 and 46),
- the area of the Naval Training Centre in Ustka (area of km 36),
- industrial buildings:
  - fish processing plant of MOWI S.A (approx. km 41),
  - Poliart printing company (approx. km 42.5),
- PSE S.A Słupsk Wierzbięcino substation.

The planned Project is located on the territory of two municipalities: Ustka, through which the major part of the Project runs and Słupsk, where the last 3 km of the route is located.

Ustka belongs to the municipalities attractive for tourists. Such towns as Lędowo, Modlinek or Duninowo - located in the vicinity of the planned Project - have a function of the holiday resort. The main functions of the municipality are tourism and agriculture. Ustka is a rural municipality with a population of 8,295 inhabitants, i.e. approx. 8.4% of the population of the Słupsk district.[334] The planned Project is located approx. 0.9 km from the town borders of Ustka.

The main factors for the development of the Słupsk municipality include: its location in the neighbourhood of the city of Słupsk, the good condition and attractiveness of the natural environment, as well as large areas of land to be developed and opportunities for the development of technical infrastructure. The Słupsk municipality has 18,206 inhabitants, i.e. 19.0% of the population of the Słupsk district.[335] The planned ECI runs in its part mainly through forest areas, away from residential buildings, in the distance of about 5.4 km from the borders of Slupsk.

In the corridor of the planned Project, there are some buildings within the closed areas of the Marine Training Centre in Ustka i.e., railroad ramps, military buildings (barracks), roads and warehouses, sports field. The planned MFW Bałtyk II and Bałtyk III are located away from the dense residential development in Lędowo and Modlinek.

In the area of the potential impact of the planned Project, there are scattered residential buildings, in the municipality of Ustka it is: one household in Lędowo and one in Pęplino, and a few houses in Modlinek. In the Słupsk municipality, there is one household in the Bruskowo – Leśnictwo precinct at a distance of approx. 60 m from the corridor border. The closest to the planned Project are:

- two single-family houses in Modlinek at a distance of: approx. 29 m from the corridor border (plot 121/4, Lędowo precinct) and approx. 39 m from the corridor border (lot 137/2, Lędowo precinct, Ustka municipality),
- one house in Lędowo village at a distance of approx. 67 m from the corridor border (plot 248, Lędowo precinct, Ustka municipality),
- one house in Pęplino village at a distance of approx. 53 m from the corridor border (plot 285/2, Pęplino precinct, Ustka municipality).

[334] *https://bdl.stat.gov.pl and https://www.polskawliczbach.pl/gmina_Ustka*
[335] *https://www.polskawliczbach.pl/gmina_Slupsk*

In the area of the Project's impact, in Duninowo, the fish processing company - MOWI S.A. is also located, which employs about 4 thousand workers, and the Poliart printing company, which is located is behind the road located at the border with the ONS. The substation of PSE S.A. Słupsk Wierzbięcino, to which the planned Project is connected, is located over 300 m from the residential area.

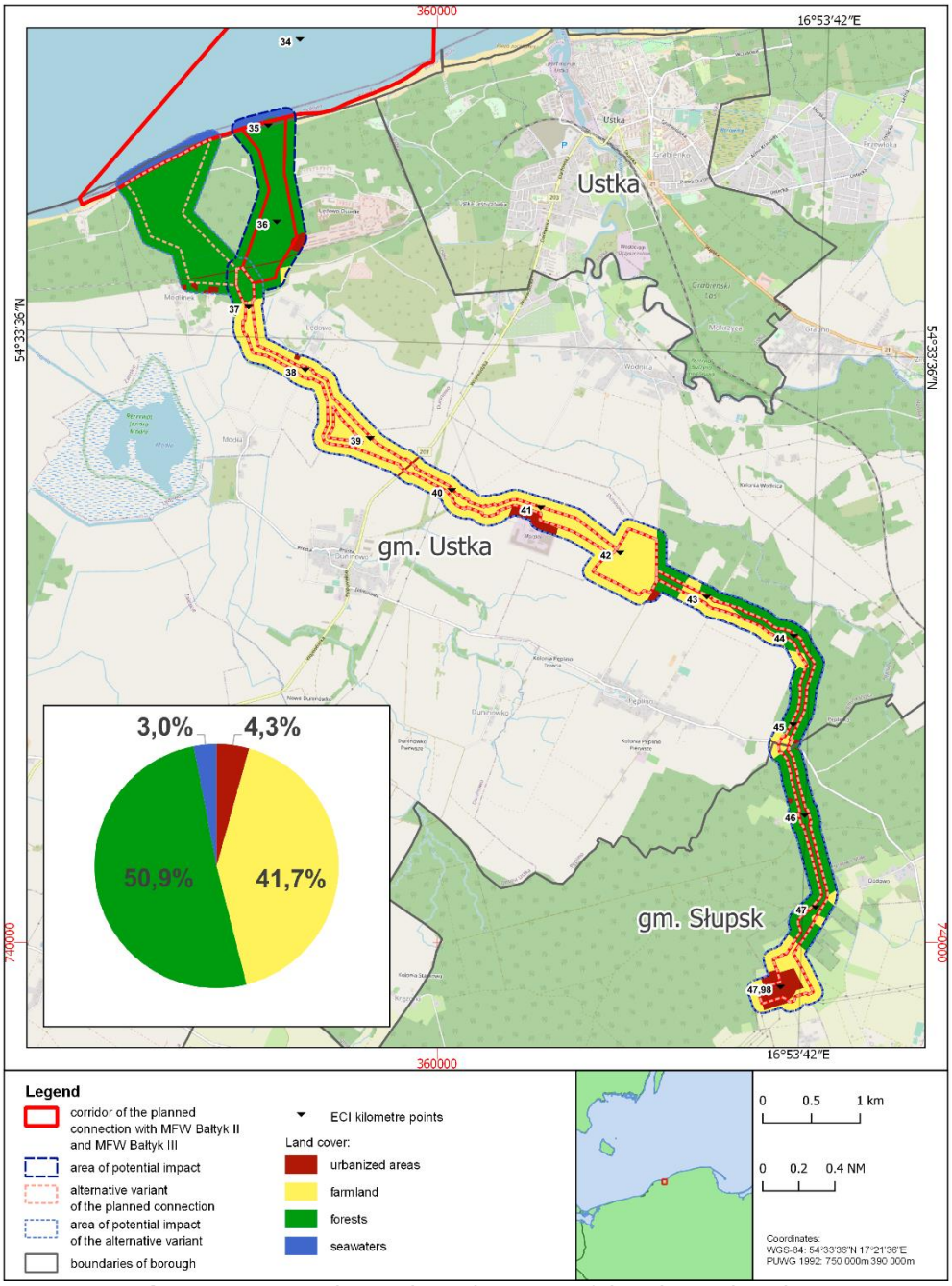


Figure 8.39. *Land use along the route of the planned Project*

Source: In-house study based on CLC 2018

In summary: The planned Project runs mainly through forest and agricultural areas. Urbanized areas account for approx. 4,2% of the analyzed area. There is no single-family residential development in the cable corridor. There are cubic objects of the Naval Center and a fragment of the MOWI S.A. company. In the area of potential impact there are a total of 10 single-family residential buildings (8 in the municipality of Ustka, 2 in the municipality of Slupsk). The distance of residential buildings from the cable corridor is important for the calculation of noise and electromagnetic field emissions.

8.10. CLIMATIC CONDITIONS AND AIR QUALITY

The planned Project is located in the Pomorskie zone according to the classification used in the Report on the state of the environment in Pomorskie Voivodeship[336]. From the analysis of air purity monitoring data from measurement stations in 2018 in the Pomorskie zone, exceedances, in terms of health protection, are found:

- the target level for benzo(a)pyrene in PM10,
- the limit value for particulate matter PM10,
- the long-term objective level for ozone,
- the long-term objective level for PM2,5.

In terms of plant protection, no exceedances of the target levels of substances in the air were recorded for 2018.

According to the Low Emission Management Plan for the Ustka Municipality[337] the main sources of air pollution are:

- point sources of emissions: individual heating - household furnaces and boilers emitting dust, benzo(a)pyrene, carbon oxides, nitrogen oxides, sulphur dioxide and heavy metals and hydrocarbons,
- linear sources of emissions: transport - causes of excessive emissions include heavy traffic and lack of traffic flow, poor technical condition of vehicles, improper operation; this type of emission affects the concentration of particulate matter, benzene, carbon oxides, NOx, hydrocarbons and heavy metals.

The area of the planned Project is located far from objects that could be a significant source of pollution, the corridor of the planned connection runs mainly through forest and agricultural areas. In the Air Protection Programme for the Pomorskie zone[338] the exceedance areas and types of corrective actions for air quality improvement were determined. Part of the planned Project coincides with the area of exceedances of the average annual target level of B(a)P related to individual heating of buildings.

Data on annual average concentrations of air pollution for the area of the planned connection corridor were obtained from the Regional Department of Environmental Monitoring in Gdańsk. Air pollution in the area of the planned Project, according to the letter (No. DMS-GD.731.1.62.2022) dated 08.03.2022, do not exceed permissible concentrations (table 8.22).

Table 8.22. *Average annual concentrations of air pollution in the Project area*

No.	Substance	Value [µg/m^3]	Limit level [µg/m^3]
1.	NO_2	6	40
2.	SO_2	1	20
3.	PM10	8	40
4.	PM2,5	5	20
5.	Benzen	0,5	5
6.	Ołów	0,01	0,5

Source: Chief Inspectorate for Environmental Protection, Environmental Monitoring Department. Regional Department of Environmental Monitoring in Gdańsk

Concentration values indicate that in the area of the planned Project, the air quality is good and there is no risk of exceeding the pollution limit values.

[336] *Raport o stanie środowiska w województwie pomorskim w 2018 roku. WIOŚ, Gdańsk 2020.*
[337] *Plan gospodarki niskoemisyjnej dla Gminy Ustka. Doradztwo Ekoenergetyczne Michał Wierzbicki przy współpracy Urzędu Gminy Ustka, Nowy Sącz 2015.*
[338] *Uchwała Nr: 308/XXIV/20 Sejmiku Województwa Pomorskiego z dnia: 2020-09-28 w sprawie programu ochrony powietrza dla strefy pomorskiej, w której został przekroczony poziom dopuszczalny pyłu zawieszonego PM10 oraz poziom docelowy benzo(a)pirenu*

Climate

The planned Project is located in the Pomorskie climatic region, where the Baltic Sea strongly influences the climate. The area is characterised by a high variability of weather conditions. The impact of maritime and continental climate is noticeable, with the dominance of the maritime climate shaping mild and humid weather. There are no sharp fluctuations in temperature, winters can be warm and summers cool[339] .

The average temperature in the area is 8.8°C. The coldest months are January and February and the warmest is July. The average annual rainfall is 626 mm, with the heaviest rainfall falling in the summer months of June, July and August. The lowest rainfall occurs in April and October (figure 8.40.). The growing season lasts for about 214 days, which is favourable for agricultural development.

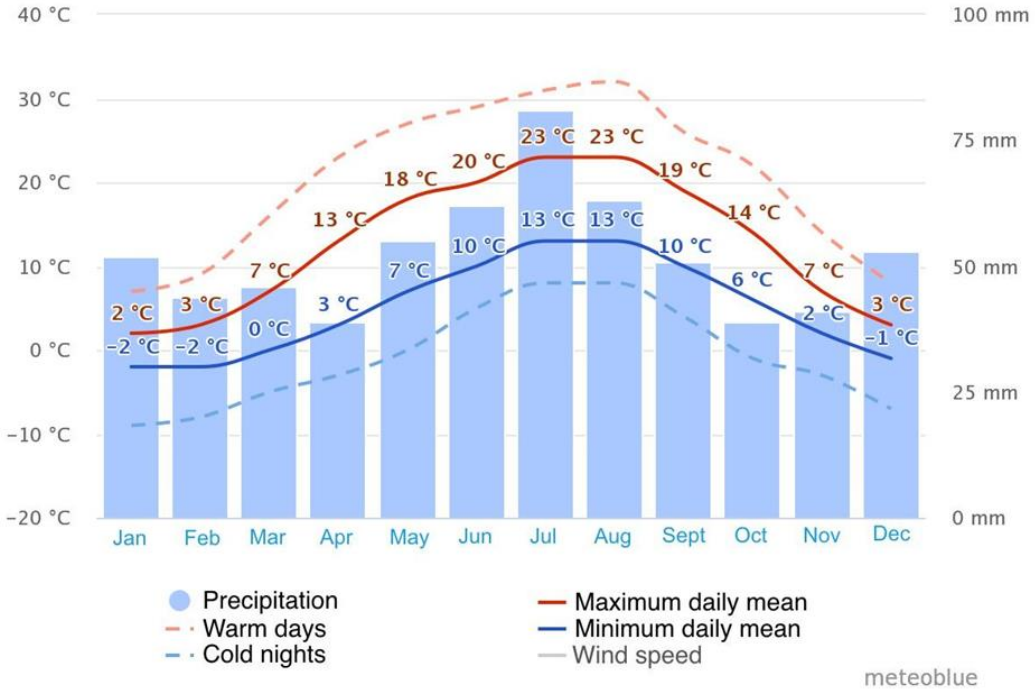


Figure 8.40. *Average monthly atmospheric air temperatures and precipitation for Ustka*

Source: meteoblue.pl

Wind speed and direction

In the area of the planned Project, the wind rose is very strongly dominated by westerly and southerly directions (figure 8.41). Winds from the WSW and W directions dominate in the onshore area, reaching speeds of up to 60 km/h. In autumn and winter, winds of higher strength are recorded than in the other seasons. This is the time when most storms at sea are observed. In other periods, the wind is weaker and moderate. Strong winds occur sporadically during this period and usually accompany weather phenomena such as storms. The average wind speed in the area is 22 km/h.

[339] *Prognoza oddziaływania na środowisko zmiany i aktualizacji studium uwarunkowań i kierunków zagospodarowania przestrzennego Gminy Ustka, 2012*

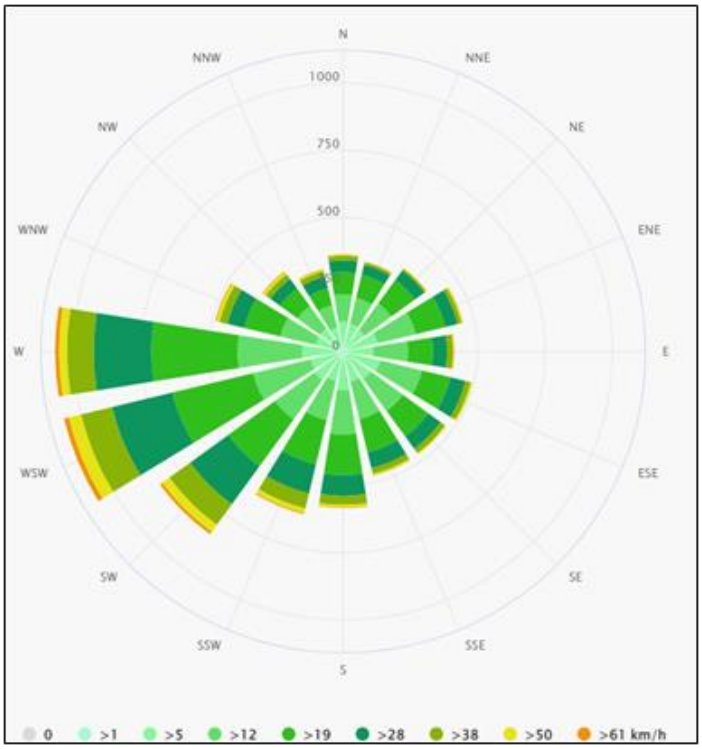


Figure 8.41. *Wind rose pattern in the area of the planned Project location*

Source: https://www.meteoblue.com/pl/pogoda/historyclimate/climatemodelled/ustka_polska_3082756

Climate change

As a consequence of climate change in recent decades, average temperatures have risen and extreme events have become more intense and more frequent. Climate warming is caused by an increase in the concentration of greenhouse gases in the atmosphere, as a result of emissions from human activity. In order to reduce the risks associated with climate change, the United Nations Framework Convention (the so-called Climate Convention) was created, which sets out measures to limit greenhouse gas emissions. These actions include improving energy efficiency, carbon capture and storage and increasing the share of renewable energy sources in the economy[340]. The temperature in the area of the planned Project has increased by approximately 2°C since 1979[341]. As it is impossible to completely stop climate change, adaptation to changing climatic conditions is necessary.

In the coastal zone, the effects of climate change include an increase in the intensity, frequency and duration of storms and a reduction in the winter ice cover, which protects the beach from erosion. The average annual sea level along the entire coast according to the scenarios will increase by about 5 cm between 2011 and 2030 compared to 1971-1990. Coastal infrastructure will be significantly affected by storm flooding and inundation of low-lying areas and erosion of the sea shore and cliffs[342]. As a consequence of climate change, which causes strong winds and excessive ice, overhead networks are at risk of damage. This risk does not apply to cable networks[343] .

Summary: The planned Project is located away from facilities that could be a significant source of pollution. Air quality is good and there is no risk of exceeding pollution limits. The climate in the area of the planned Project is mainly influenced by the Baltic Sea. In terms of climate change, the most

[340] *klimada2.ios.gov.pl*
[341] *meteoblue.com*
[342] *Wpływ zmian klimatu na środowisko, gospodarkę i społeczeństwo (zmiany, skutki i sposoby ich ograniczania, wnioski dla nauki, praktyki inżynierskiej i planowania gospodarczego), projekt Instytut Meteorologii i Gospodarki Wodnej w ramach Programu Operacyjnego Innowacyjna Gospodarka.*
[343] *Poradnik przygotowania inwestycji z uwzględnieniem zmian klimatu, ich łagodzenia i przystosowania do tych zmian oraz odporności na klęski żywiołowe. Ministerstwo Środowiska, Departament Zrównoważonego Rozwoju, Warszawa 2015.*

significant is the increase in the intensity, frequency and duration of storms, as well as the reduction of winter ice cover and the rise in sea level.

8.11. ACOUSTIC AND ELECTROMAGNETIC BACKGROUND

In the vicinity of the planned connection with MFW Bałtyk II and MFW Bałtyk III, acoustic nuisance is mainly related to transport noise, accumulated mainly along the provincial road No. 203 from Ustka to Koszalin and along district and municipality roads. Additionally, the fish processing plant MOWI POLAND S.A. operates in the vicinity of the planned connection corridor. The plant is not located near residential buildings and does not emit intense noise. The main cause of noise in such facilities are refrigeration, ventilation and air conditioning equipment, delivery vehicles and alarm systems[344] .

Pursuant to the Act of 27 April 2001. - Environmental Protection Law (Dz.U.2022.2556 consolidated text as amended), which implemented the provisions of the Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise, an acoustic map for voivodeship roads in Pomorskie Voivodeship with traffic volume exceeding 3 million vehicles per year was drawn up in 2016. The map for the road No. 203 was prepared only for the section of the town of Ustka and 500 meters outside the town, therefore the noise level for the section crossing the corridor of the planned connection is not known. The noise level for the day-evening-night time on the examined section exceeds the standards slightly in some sections, for the night time no exceedances were recorded[345] .

The permissible levels of noise in the environment by individual groups of noise sources are set out in the Regulation of the Minister of Environment of 14 June 2007 on permissible levels of noise in the environment. These levels are expressed by the indicators L_{AeqD} and L_{AeqN}.

The indicators L_{AeqD} and L_{AeqN} are used for setting and monitoring the conditions of use of the environment for one day. For road noise the indicator L_{AeqD} refers to a reference time interval of 16 hours of the day and the indicator L_{AeqN} refers to a reference time interval of 8 hours of the night. For installation noise the indicator L_{AeqD} refers to the assessment time of the 8 most unfavourable hours of the day and L_{AeqN} refers to one least favourable hour of the night[346]. Table 8.23 shows permissible noise levels in the environment.

The basis for the categorisation of the areas being a subject to noise protection is, in accordance with Article 114, paragraph 1 of the Act of 27 April 2001. - Environmental Protection Law the provisions of local spatial development plans. In order to elaborate analysis of noise from ONS, the authorities of the Ustka and Słupsk municipalites were asked for acoustic classification of the areas which are not covered by the provisions of local spatial management plans.

[344] *Raport o zanieczyszczeniu środowiska hałasem wg. Stanu na 31 xii 2018 r. Ocena roczna. GIOŚ.*
[345] *www.zdwgdansk.kei.pl/mapa_akustyczna/daneakus/#*
[346] *Rozporządzenie Ministra Środowiska z dnia 14 czerwca 2007 r. w sprawie dopuszczalnych poziomów hałasu w środowisku (Dz.U. 2007 Nr 120, poz. 826 ze zm.)*

Table 8.23. *Permissible noise levels in the environment*

Lp.	Type of terrain	Permissible noise level [dB]			
		roads or railways		other facilities and activities that generate noise	
		$L_{Aeq\ D}$ a reference time interval of 16 hours	$L_{Aeq\ N}$ a reference time interval of 8 hours	$L_{Aeq\ D}$ a reference time interval equal to the 8 least favourable hours of the day, consecutively	$L_{Aeq\ N}$ a reference time interval equal to 1 least favourable hour of the night
1.	a. Protective zone "A" of the resort b. Hospital area outside the town	50	45	45	40
2.	a. Area of single-family residential development b. Area of buildings connected with permanent or temporary residence of children and young people c. Nursing home area d. Hospital area in towns	61	56	50	40
3.	a. Area of multi-family housing and collective residence b. Area of homestead development c. Recreational and leisure area d. Residential and service area	65	56	55	45
4.	a. Area in the inner zone of towns with more than 100,000 inhabitants	68	60	55	45

Source: Regulation of the Minister of Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws 2007 No. 120, item 826 as amended)

Electromagnetic fields

Electromagnetic fields (EMF) consist of electric, magnetic and electromagnetic fields with frequencies from 0 Hz to 300 GHz, which form the range of non-ionising electromagnetic radiation. Electromagnetic fields are divided into those originating from natural and artificial sources. Sources of artificial (anthropogenic) radiation are equipment and installations such as high-voltage lines, cell phones, computers, electrical appliances, satellite dishes, radar, etc.

In the area of the planned Project are located existing power stations that are elements of the NPS, including a transformer stations GPZ Słupsk Wierzbięcino 400/110 kV, GPO Starkowo 30/110 kV and GPZ Ustka 110 kV. The Słupsk Wierzbięcino substation is supplied by:

- - 450 kV SwePol HVDC line;
- - 400 kV Dunowo LV line;

- - 400 kV Żydowo Kierzkowo LV line;
- - 400 kV Słupsk - Żarnowiec LV line;
- - 110 kV Marszewo HV line;
- - double 110 kV Slawno/Poznańska HV line;
- - double 110 kV Grunwaldzka/Rowy HV line;
- - 110 kV Starkowo HV line;
- - 110 kV Bięcino HV line.

The Starkowo substation is powered by the 110 kV Wierzbięciono HV line, whereas the Ustka substation is powered by two 110 kV Pieńkowo and 110 kV Rowy HV lines[347] .

The technical condition of the elements of the electricity infrastructure is assessed as good, the expansion and modernisation is mainly due to the socio-economic development of the area[348] .

In the nearest vicinity of the planned Project there are four mobile phone base stations, three in Duninowo and one in Wierzbięcino. The configuration of the antenna system of a base station cannot cause the occurrence of non-ionising electromagnetic radiation with levels exceeding the permissible level (in the area accessible to people) specified in the provisions of the Environmental Protection Law.

Pursuant to the Act of 27 April 2001. - Environmental Protection Law since 2005 the Inspectorate for Environmental Protection has been assessing levels of electromagnetic fields in the environment as a part of the State Environmental Monitoring. Monitoring measurements of electromagnetic radiation were carried out in accordance with Regulation of the Minister of Environment of 15 November 2007 on the scope and method of periodic tests of electromagnetic field levels in the environment (Journal of Laws 2007, item 1645)[349]. The nearest measuring station is located in Ustka - the maximum value of EMF intensity in 2018 was 1.14 V/m, while the limit value of EMF intensity for broadband measurements in Poland is 28 V/m[350].

Summary: The main sources of noise are traffic routes and industrial facilities. For the provincial road crossing the Project, no significant exceedances of noise levels are recorded. In the context of electromagnetic fields in the area of the planned Project are located substations and power lines that are elements of the NPS from GPZ Słupsk Wierzbięcino 400/110 kV, GPO Starkowo 30/110 kV and GPZ Ustka 110 kV transformer stations. The Słupsk Wierzbięcino substation is supplied by one HVDC line, three 400 kV lines and six 110 kV lines.

[347] *www.openinframap.org*
[348] *Low emission management plan for the Ustka Commune. Nowy Sącz, 2015*
[349] *According to the State of the environment in Pomorskie voivodeship. Report 2020. GIOŚ. On 1 January 2021 a new Regulation of the Minister of Climate and Environment of 15 December 2020 on the scope and method of periodical tests of electromagnetic field levels in the environment (Dz.U.2020.2311) came into force*
[350] *si2pem.gov.pl*

9. IDENTIFICATION OF IMPACT OF THE INVESTOR'S VARIANT ON THE MARINE ENVIRONMENT

The planned Project in the offshore area was analyzedin one location variant, as the connection corridor from the offshore wind farms MFW Bałtyk II and MFW Bałtyk III must fit into the infrastructure corridor established in the POM Plan, and must be in line with the PUUK decisions obtained earlier.

The potential impact of the planned Project mainly concerns the construction phase[351] and is related to:

- the necessary works on the seabed resulting in the temporary agitation of sediments and increased suspended solids in the water during the construction works of laying and burying the cable lines;
- periodic underwater noise emissions from vessels and equipment necessary to lay and burial the cable lines;
- periodic atmospheric emissions from vessels involved in preparatory work (cleaning of the bottom) cable laying burying/burrowing cables and making trenchless passage;
- restrictions on the movement of vessels, including fishing boats from Ustka and vessels travelling on the TSS Ławica Słupska.

In the context of assessing the impact of turbidity in the water-depth on abiotic and biotic elements of the marine environment, suspended solids spreading modeling was performed (Volume IV, Appendices 2a and 2b.). The water jetting method was considered, which causes agitation of sediments and spreading of sediments in resuspension to neighboring areas. If the developer uses the mechanical cutting or plowing method for more difficult ground conditions, then the level of turbidity and spreading of resuspended sediments will be less than predicted for the thawing method.

Two approaches were analyzed in the modeling, with different assumptions and parameters for the planned Project (Volume IV, Attachments 2a and 2b). In the first one (Appendix 2a), two scenarios were adopted to assess the maximum extent of suspended solids dispersion during construction activities, i.e. the scenario with two cable laying speeds: V100 m cable/h and V200 m cable/h. For modeling, an excavation depth of 3 m was assumed (on most of the route) and the amount of excavated material passing into the water table was assumed to be 20-50% of the excavation volume. The results of the modeling with these assumptions are included in the study "Modeling of suspended solids dispersion during submarine cable laying for offshore wind farms MFW Bałtyk II and MFW Bałtyk III" dated August 2022 included in Appendix 2a in Volume IV).

In the second approach (Appendix 2b), the basic design assumptions have been fundamentally changed, following a feasibility and technical feasibility analysis, based on the latest geotechnical studies of bottom sediments in the ECI area. The cable burial speed was increased to 250 and 350 meters of cable per hour. In addition, the extent of bottom interference has been reduced from 3 m to 1.5 m along most of the route. Assumptions regarding the assumed amount of excavated material that will pass into the waterbed during construction work were also revised. In accordance with literature assumptions[352] [353], 10% was assumed for non-cohesive sediments (sands) and 30%-35% for cohesive sediments (clays, silts, clays). Modeling verification was performed for these assumptions - as V250 and V350 scenarios. The results of this verification are included in the December 2022 Annex, included in Volume IV as Appendix 2b.

The assessment of the impact of the spread of suspended solids on the biotic and abiotic environment was made with reference to the results of calculations for scenarios V250 and V350 as the most current design assumptions.

During the operation phase, the impact on the marine area will be related to the operation of the cable, which causes heat and electromagnetic field emissions, and periodic maintenance of the connection infrastructure.

[351] *The impact of the decommissioning phase is similar to the impact of the construction phase.*
[352] *Foreman, J., 2002. Resuspension of sediment by the jet plow during submarine cable installation. Submitted to GenPower, LLC, Needham, MA. Submitted by Engineering Technology Applications, Ltd, Romsey, Great Britain, May, 2002*
[353] *HDR, 2014, Application fof Construction of the Rockaway Delivery Lateral Project Appendix G – Hydrodynamic and Sediment Transport Analyses for Rockaway Delivery Lateral Project, January, 2014.*

9.1. IMPACT ON THE FORMATION OF THE SEABED

This chapter analyses the potential impact of the planned Project on the formation of the seabed during the construction and operation phases.

9.1.1. Construction phase

A total of 6 cable lines with a total length of approximately 314 km are planned to be laid in the ECI corridor, including:

- 2 lines of the length of approx. 60 km of the connection from the MFW Bałtyk II,
- 2 lines of the length of approx. 67 km of the connection from the MFW Bałtyk III,
- 2 lines of the length of approx. 30 km for the connector between MFW Bałtyk II and MFW Bałtyk III.

Two methods will be considered for burying/burrowing the cable laying: water jetting and in more cohesive soils - mechanical cutting.

During the construction phase, there will be a 5 m wide strip of bottom for each cable in the direct impact area, where the bottom preparation work for cable laying and its burying/burrowing will be carried out, as well as a trench – maximum approximately 1.5 m wide.

The construction will be associated with the alteration of the seabed due to:

- bottom preparation, burying/burrowing and cable laying,
- the use of alternative cable protection methods (in places where it will not be possible to avoid obstacles such as stonewalls and clusters of boulders),
- deposition of sedimentary material stirred up and mobilised during the burying/burrowing of cables,
- anchoring of vessels.

Optionally, in the event that the trenchless passage through the coastal zone does not go beyond the last revetment, due to the need for deeper excavation, there will be a strip of bottom up to about 20 m wide in the sub-bottom zone for a distance of up to about 800 m within the direct impact range, resulting in additional changes to the bottom formation, including those associated with the need to store excavated material in the ECI corridor.

Bottom preparation, cable laying and burying/burrowing

During the ECI construction phase, the following works will be carried out:

- preparation of the bottom for the smooth and collision-free installation of the cables, including cleaning the bottom from, among other things, boulders and various anthropogenic objects,
- laying the cable on the prepared bottom,
- burying/burrowing cable, using the following methods: water jetting, mechanical cutting.

The bottom surface in the ECI corridor area is morphologically diverse. In the deeper parts of the route (20-30 m), it has the character of flat plains, while in the northern part of the corridor - convex forms built of boulder clays. Within the MFW fields, the bottom surface is diversified by hills and moraine hills (MFW BII) and complexes of kame terraces (MFW BIII).

A number of sedimentary structures are present in the ECI area. Submarine sand dunes extend in the shallowest part of the corridor in the foreshore zone up to approximately 400-500 m offshore, 900 m in some places. Ripples and sand dunes are particularly visible in the relief in the northern sections of the route and occupy approximately 16% of the total ECI area. Pebbles and individual boulders are scattered along almost the entire route, with the highest concentrations within the fields Areas designated for the construction of offshore wind farms MFW Bałtyk II and MFW Bałtyk III.

During the preparatory works, a 5 m wide strip will be used to level out any unevenness on the bottom and disturb the sedimentary structures mentioned above. Due to the laying of 4 cables (plus 2 connector cables) with a total length of approximately 314 km during the route cleaning phase, the area of seabed disturbance will amount to 1.55 km², representing respectively 0.89% of the area of the corridor designated for the planned Project.

During the cable burying/burrowing works, the bottom relief will be disturbed, as a result of performing will be excavated to maximum a width of 1.5 m and a maximum depth of 1.5 m (except for a length of 9 km running through the Slupsk Shoal TSS, where the depth will be 2.5 m), in which the cable

will be laid and backfilled. Due to the laying of 6 cables with a total length of 314, the area of direct interference with the seabed resulting from the excavation will amount to 0.46 km², which is 0.26% of the area of the corridor designated for the planned Project.

Upon completion, the bottom surface in the excavation area will be uneven. During the excavation works, it is assumed that between 10 and 30% of the excavated material will pass to the water, and the amount will depend on the proportion of silty and clay fractions in the sediment. As the sections with a significant content of the above fractions account for 44% of the ECI route, it is likely that in these sections the amount of sediment that will remain in the trench after completion of the works will be smaller, and some of the material that will be resuspended will be carried further away, in accordance with the prevailing current directions. In addition, once the cables have been buried, settlement of the bottom just above the cables and the formation of irregularities may occur due to sediment compaction. This impact will be most noticeable in areas of clayey silty sediments and loosely packed sands and variably grained sediments, but less noticeable in areas of clays, which have a lower sensitivity to compaction under pressure.

In terms of the impact described above, the most sensitive area is the sand dunes zone, which has an important function as a natural shore protection system. It is the first line of defence during storm surges, promoting the dispersion of wave energy approaching the shore. It is an area that is subject to the systematic influence of wave action and the continuous transformation of the bottom as a result of erosion, redeposition and accumulation of coastal debris. This zone will be within the range of direct construction work only if the planned HDD trenchless crossing does not go beyond the last revetment. In the course of the work of excavating 4 trenches with a maximum depth of up to about 5 m and a maximum length of up to about 800 m, a strip of bottom with a width of up to about 20 m per cable will be disturbed, and the area of direct interference with the bottom will amount to 0.064 km², In the event of a disturbance of the bottom relief during the construction phase, taking into account the dynamics of the area, the bottom is expected to return to its original state before the cable was buried in a short time. The sand dunes system will be restored by the natural action of waves and currents. In an area with such high dynamics, any disturbance of the bottom is levelled within days to weeks. [354] [355] [356]

Due to the lowering of the bottom surface above the cable, there is a risk of exposing the connection infrastructure as a result of dredging, resuspension of the excavated material and compaction of the sediment overlying the cable, there is a risk of exposure of the connection infrastructure and its potential failure. However, taking into account:

- routing the cable using a trenchless method through the most dynamic section of the foreshore,
- expected maximum cable burial depth - 5 m - in the sand dunes zone (in the case of implementation of deeper excavations, if the HDD passage does not go beyond the last revetment - only in the section up to about 800m),
- average cable burial depth – approx. 1.5 m - outside the sand dunes zone, in deeper parts of the route,
- the dynamics of morphological changes of the seabed in the area of the Project, where the changes of the seabed ordinate resulting from sand dunes shifting in the most active zone of the foreshore reach 1-2 m in a year,
- the gradually decreasing extent of the effect of waves and currents on the bottom with increasing water depth,

it must be concluded that the risk of exposing the cables is minimal.

Taking into account the overall impact on the seabed relief during preparatory works and cable laying, it should be concluded that it will be local, limited directly to the construction site, and any resulting disturbance of the bottom surface will be short-term and reversible with the participation of natural hydrodynamic processes. Therefore, the impact should be considered **insignificant**.

[354] *CEE 2006*
[355] *Carter and Lewis 1995*
[356] *Carter et al. 2009*

Use of alternative cable protection methods

In areas where there will be limited opportunities to bury/burrow the cable using either thawing or mechanical cutting technology, laying the cable on the bottom and then securing it is considered. Two methods of cable protection are being considered, i.e. stone surcharge or concrete mattress. These locations include: fields of boulders, pebbles, gravels or very hard seabed, where excavation will be impracticable or uneconomical, and areas with high mobility of bottom sediments where high water dynamics may lead to cable exposure.

As a result of the above-mentioned methods, changes to the seabed level will occur. The extent of the impact will be local, directly limited to locations where cable burial is not possible and the resulting gradient will be insignificant in relation to the relief and character of the surrounding seabed, which is characterised by stonework and isolated boulders throughout the route. Therefore, the impact should be considered insignificant.

Deposition of sedimentary material stirred up and mobilised during bottom preparation and cable laying works

Agitation and mobilisation of bottom sediments will occur during the plunge phase of the works (jetting method). In order to analyse the possible extent of turbidity for this Report, the suspended solids spreading modelling provided in Volume IV, Attachment 2a and 2b, was carried out.

The suspended solids spreading analysis for the jetting method, showed that the spatial extent of turbidity in water will depend on the type of bottom sediment and the depth of the water body at the works site (the greater the depth, the lower the water velocities, and therefore the lesser the extent of turbidity).

The highest turbidity is to be expected where the bottom is made up of cohesive sediments (muddy-silty deposits, clays), and these are the sections:

- within the connection with MFW Bałtyk II: 32-31 km, 29-28 km, 24-23 km, 19-13 km, 8-7 km, 3-0 km, 18 BII-14 BII km, 10 BII-0 BII km,
- within the connection with MFW Bałtyk III: 32-31 km, 29-28 km, 24-23 km, 19-13 km, 8-7 km, 3-0 km, 24 BIII-9 BIII, 3 BIII-0 BIII,
- within the connector between MFW Bałtyk II and MFW Bałtyk III: the western part.

The lowest turbidity will occur in sections where the bottom is built up by sandy sediments (other sections of the ECI route).

After completion of the works, the deposition of suspended solids for one cable line may cover a smallarea. It is estimated that under the extreme hydrometeorological conditions under which seabed works may be carried out, the maximum possible area of deposition with a thickness of 0.1 to 0.2 mm for one cable line may amount to:

- MFW Bałtyk II - approx. 27.43 km²,
- MFW Bałtyk III - approx. 42.86 km²,
- the connector - approx. 22.17 km².

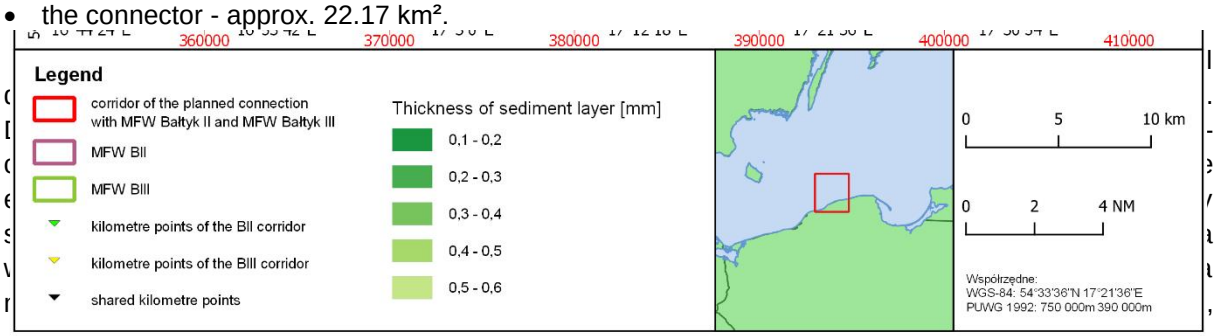


figure 9.2.).

In the case of better conditions (less wind and wave action) during the construction works, it is expected that the area of deposition will be smaller.

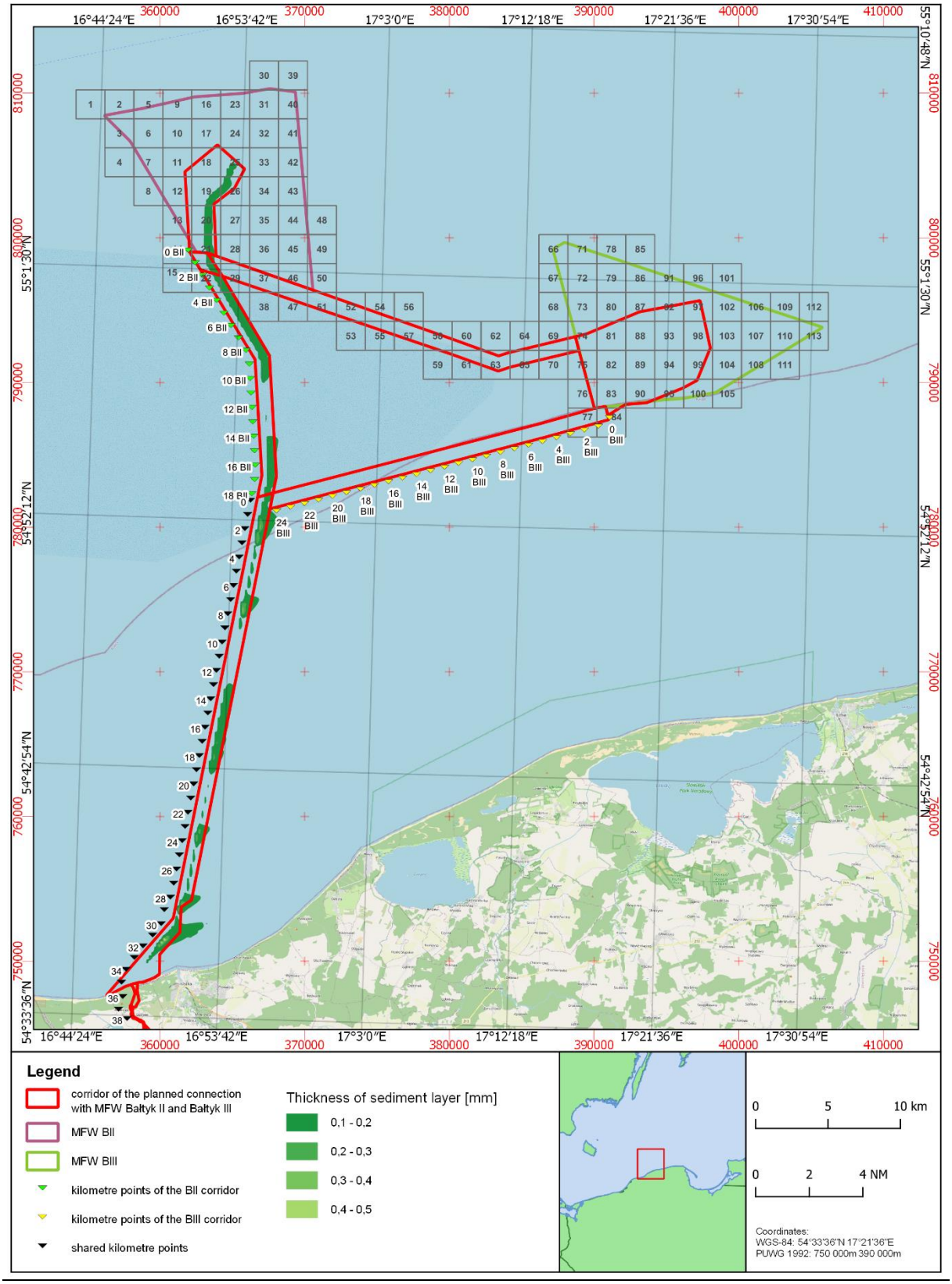


Figure 9.1. *Thickness of the deposited sediment layer when laying one cable line from the MFW Bałtyk II, at a cable laying speed of 250 m/h*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

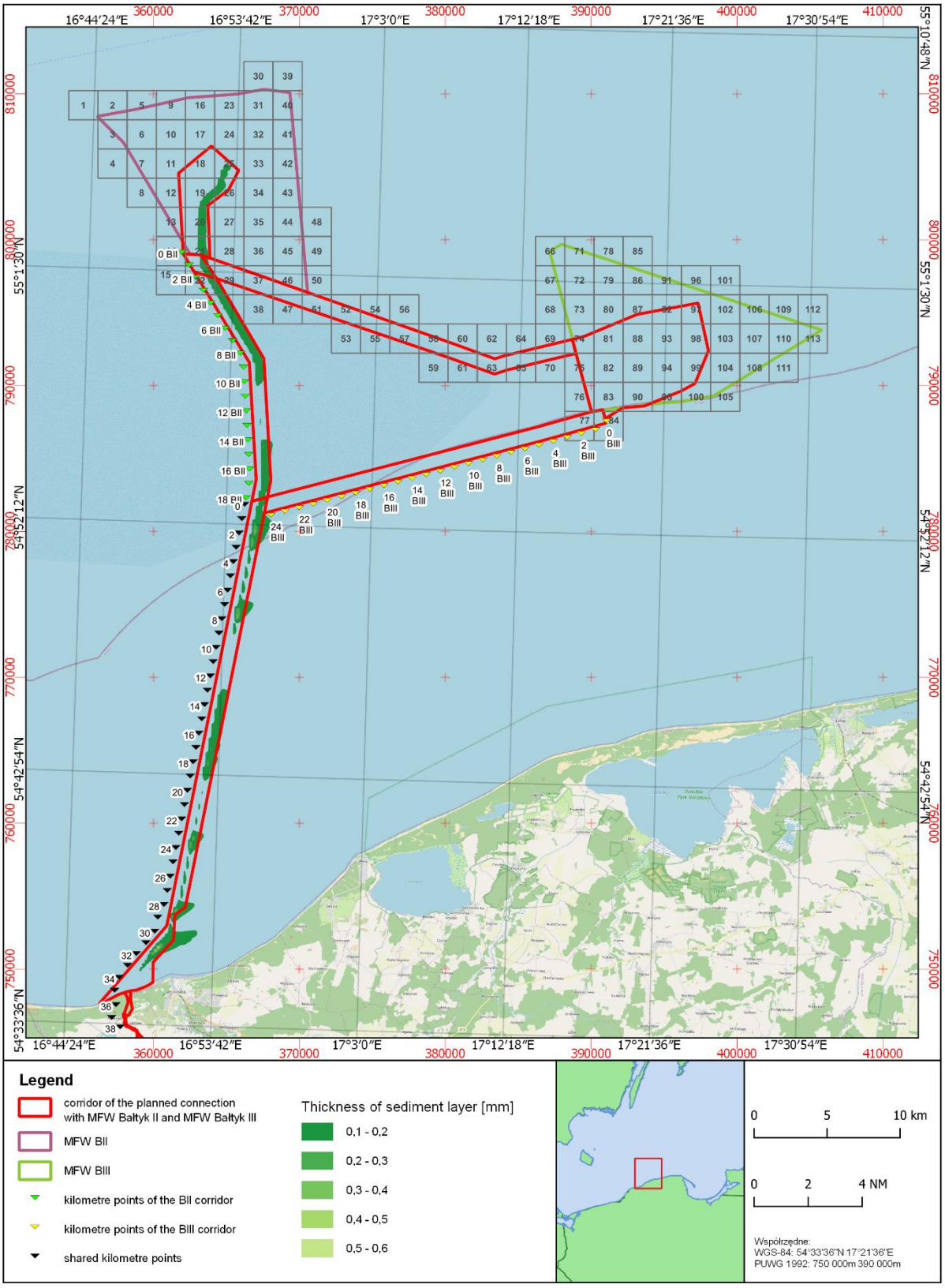


Figure 9.2. *Thickness of deposited sediment layer when laying one cable line MFW Bałtyk II at a cable laying speed of 350 m/h.*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

Considering the thickness of sediment that will be deposited after the laying of all 6 cable lines and the maximum possible spatial extent of the deposition area, it must be concluded that the impact of deposition on the seabed formation will be negligible.

Anchoring of vessels

During the preparation and construction phase, depressions will occur in the seabed at the berths of vessels installing elements of the connection infrastructure. These disturbances will be local - point-like (up to a maximum depth of 3 m - depending on the type of sediment), short-lived and reversible, so the impact of anchoring on the seabed should be considered insignificant.

Storage of excavated material

In the case of implementation of a shorter trenchless passage, there will be a need for deeper cable foundation in the shallow part of the coast, and thus deeper excavation, e.g. using a small dredger (max. load capacity of about 2,500 m³). If it becomes necessary to deposit the dredged material from the bottom dredging, this will take place in the ECI corridor perimeter in the form of small piles at a depth of 10-12 m (between 32 and 30 km of the ECI corridor), east of the MFW Bałtyk II cable lines and/or east of the MFW Bałtyk III cable lines ECI. The maximum assumed area for storage of excavation spoils for the 4 cables will cover a bottom area of up to about 0.1 km², which is only 0.06% of the area of the corridor of the planned Project.

As a result of the work carried out, there will be local changes in the level of the bottom and the formation of irregularities. According to the geological-engineering valorization and regionalization of the seabed, the planned dredged material storage site is located in the zone of the range of impact on the bottom of cut storm waves (zone II). Accordingly, during storm surges, the surface of embankments may be smoothed and sandy sediments may be redeposited into neighboring areas in accordance with the prevailing directions of currents.

In summary, the extent of the impact will be local and limited directly to the dredged material disposal site, and the resulting gradients will be small in relation to the morphologically diverse bottom surface in the ECI corridor area. The impact should be considered insignificant.

Summary of the assessment of the impact on the formation of the seabed:

Having analysed the potential impact of the planned Project on the bottom formation, taking into account aspects such as: bottom preparation, laying and burying/burrowing of cables, use of alternative means of securing cables, deposition of sedimentary material stirred up and mobilized during works related to burying/burrowing of cables in the bottom, anchoring of vessels, and possible storage of dredged material from bottom dredging, it was concluded that in most cases the scale of these impacts will be small (within the corridor) and the impacts will be insignificant.

In addition, the adopted shoreline crossing technology was assessed to minimise the risk of the cables exposure and their potential failure. Solutions adopted comply with the POM Plan condition in basin sheet No. POM.27.B on adequately protecting the linear technical infrastructure by burying it at a minimum depth of 3 m below the mean depression of the bottom, between submerged sand dunes.

Summary of the assessment of the significance of the adverse impact of the planned Project on the formation of the seabed during the **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(11) insignificant**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **11**, meaning that the **impact on the seabed formation will be insignificant**.

9.1.2. Operation phase

The operation of the planned Project will not result in changes to the seabed.

Local landform changes may occur due to:

- the presence of alternative methods of cable protection, i.e. stone dumping or concrete mattress,
- anchoring of vessels.
- the occurrence of the ECI emergencies and the taking of corrective action.

Presence of alternative methods of cable protection

Due to the possible use of alternative methods of cable protection in the form of a stone dumping or concrete mattress, an unevenness will be created on the bottom. Transport, accumulation or abrasion processes may be disturbed in the area of these obstacles. As a result, the relief of the seabed may be altered in the form of abrasive depressions or accumulations of sediment, either upstream or downstream of the obstacle, depending on the current wave-current field and the depth at which the obstruction is located.

The resulting changes will be local, directly related to the immediate vicinity of the concrete dumping/mattress, so the impact should be considered insignificant.

Anchoring of vessels

At the stage of operation of the planned Project, depressions in the seabed will occur in the areas of servicing vessels. The disturbance will be local - point-like (up to a maximum depth of 3 m - depending on the type of sediment), short-lived and reversible, therefore the impact of anchoring on the shape of the seabed should be considered insignificant.

Emergencies

In case of a failure of the connection infrastructure and the need to replace damaged sections of cables, the bottom may be altered.

As the remedial works will be very local in extent and insignificant to the overall character of the bed at the scale of the whole Project area, this impact should be considered insignificant.

Summary of the assessment of the significance of the adverse impact of the planned Project on the formation of the seabed during the operational phase:

Type of impact and its severity	
Neutral	**(0)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the DDA	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(10) insignificant**

In total, the sum of the impact weights identified for the operational phase of the planned ECI was 10, which means that the impact on the seabed formation will be insignificant.

9.2. IMPACT ON GEOLOGICAL STRUCTURE, BOTTOM SEDIMENTS AND ACCESS TO RAW MATERIALS AND DEPOSITS

This chapter analyses the potential impact of the proposed Project on bottom sediments and geological structure and access to raw materials and deposits during the construction and operational phases.

Six cables will be laid in the ECI corridor for a total length of approximately 314 km:

- MFW Bałtyk II - 2 cable lines of approx. 60 km each,
- MFW Bałtyk III - 2 cable lines of approx. 67 km each,

- The connector - 2 lines of approx. 30 km each.

9.2.1. Construction phase

The following methods may be used during the laying of the buried/buried cable in the seabed: soil thawing (water jetting) and mechanical cutting (mechanical cutting). The coastal zone crossing will be carried out using the HDD method with a length of no more than 1.5 km, up to the exit beyond the last revetment (the drilling will reach an isobath of about 10 m), with the land section of the drilling not shorter than 120 m. Optionally, in the event that the trenchless clearance is shorter and exits before the last revetment, a deeper subsea trench will be excavated in the subsea section (as specified in the POM Plan - a minimum of 3 m below the interrevolutionary depression) - for a maximum length of 800 m.

After crossing the foreshore zone, further along the route, the maximum depth of excavation will be up to about 1.5 m, except for the 9-kilometer section running through the route of the TSS Slupsk Shoal, where it will reach about 2.5 m.

Bottom sediments and geological structure

The construction of the planned Project will be associated with the disturbance of bottom sediments and shallow geological structure, as well as local changes in the physical and chemical properties of the sediments due to:

- bottom preparation and burial/burial of cables;
- the use of alternative means of securing cables in areas where obstacles such as stonework and boulder clusters will not be avoided;
- deposition of sedimentary material stirred up and mobilized during cable burial/burial works;
- anchoring of vessels;
- implementation of trenchless passage through the coastal zone;

optional storage of excavated material

Bottom sediments and geological structure

The construction of the proposed Project will be associated with the disturbance of the bottom sediments and shallow geological structure and a local change in the physico-chemical properties of the sediments due to:

- the preparation of the bottom and plunge/burial cable,
- the use of alternative cable protection methods in places where it will not be possible to avoid obstacles such as stonewalls and clusters of boulders,
- the deposition of sedimentary material stirred up and mobilised during the plunge/burial of cables,
- anchoring of vessels,
- the implementation of a trenchless crossing of the coastal zone,
- optionally, storage of excavated material

Preparation of bottom and trench for cable

The works will disturb sediments of different origin and structure, due to the varying depth structure and lithology layout within the ECI corridor. The sediments will be disturbed to a depth of approx. 1.5 m on most of the route, except for the section of 9 km passing through the TSS Ławica Słupska, where the depth will reach up to about 2.5 m, and the reef zone for HDD trenchless passage, where it will be necessary to perform a deeper subsea excavation in the coastal zone to the exit behind the last reef, where on a section of up to about 800 m, the excavation will reach a depth of up to about 5 m. They will be moved, their structure and physico-chemical properties will be altered (e.g. by mixing of sediments with different lithologies, remobilisation of nutrients and contaminants), and subsequently they will be lifted (resuspension) and dispersed in the form of suspended matter in the water, which will be re-deposited at the bottom once the works have terminated.

The level of disturbance to the sediment structure will depend on the cable plunge/burial method used and the type of sediment. (table 9.1).[357] As a result of the blur (erosion) and/or hydration

[357] *BEER 2008*

(fluidisation), physical properties of the sediments, such as moisture content, density, porosity, permeability or plasticity (in the case of cohesive sediments) will be changed.

Table 9.1. *Level of sediment disturbance depending on the used cable laying method and the type of sediments*

Method of the cable burial		Level of sediment disturbance vs. type of sediment Scale from 1 (low) to 10 (high)			
		sands	**muds**	**gravels**	**clay**
Ploughing		1	1	1	1
Ploughing with water jetting		2	3	2	2
Water jetting	Hydration (fluidisation)	2	2	N/A	N/A
	Erosion (blurring)	3	4	3	3
Mechanical cutting		3	4	3	3

Level of disturbance: 1 = low, 10 = high, N/A = not applicable

Source: BEER 2008

The lowest level of disturbance, and therefore the least amount of sediment that will pass into the water table, is characterised by the ploughing method. In the casemechanical cutting, using cutting equipment, the destruction of the structure is - at level of 3 (4 for muddy sediments), and the amount of sediment re-suspended is small and depends on the size of the cut trench. For sediment water jetting method, the level of disturbance/destruction of the sediment structure is comparable to mechanical cutting, but the amount of sediment entering the water is higher. The amount of re-suspension will depend on the pressure/velocity of the jet and the type and degree of cohesion of the sediment (degree of cohesion between grains in the sediment).[358]

The sediment erosion (blurring) or hydration (fluidisation) can occur during sediment water jetting. Erosion occurs when the pressure of the water jets is increased. Then the velocity of the water flowing over the sediment surface increases and the sediment particles are washed away, resuspended and transported out of the excavation area. This process takes place in less cohesive sediments. In contrast, hydration (fluidisation) of the sediment occurs when the lower pressure water jets are used and applies to cohesive sediments. As a result of fluidisation, part of the sediment passes into the water. In the case of cohesive and hard clays, disintegration into lumps and larger clumps can occur, making fluidisation more difficult. In such cases, dredging systems are used in parallel with the water jetting to deepen the cable, allowing the lumps to be removed from the trench. The amount of sediment that will pass into the water table is small. The sediment in the water is carried over various distances.[359]

The final amount of sediment particles that will pass into the water will depend on the content of the individual fractions in the sediment and their degree of cohesion, and the distance over which the particles will be transported will depend on the hydrodynamic conditions, including the velocity of the currents in the water.

The planned Project will result in seabed intervention works over a total area of approximately 0.46 km², which represents 0.26% of the planned Project corridor (assuming a total of 6 cables with a total length of approximately 314 km). If additional excavations are carried out in the shallow coastal zone, the area of interference will increase by about 0.064 km², giving a total of 0.53 km², which is 0.30% of the area of the corridor of the planned Project.

During the construction work associated with the laying of the 6 cables, about 400,000 m3 of excavated material will be stirred up, resulting in about 700,000 Mg of sediment, assuming an average volumetric density of 1.75 g/cm³ (i.e., 1,750 kg/m³) and just over 570,000 Mg of sediment dry weight (assuming an average sediment moisture content of about 17%).

[358] *BEER 2008*
[359] *BEER 2008*

Table 9.2. *Amount of sediment stirred up during cable burial assuming HDD trenchless passage exit behind last revetment*

Parameters	Connection infrastructure					
	MFW BII		MFW BIII		Connector	Total
Length of cables in the offshore section with HDD section for one cable [km]	60		67		30	157
Length of cables in marine section with HDD section for two cables [km]	120		134		60	314,0
Length of excavation in the offshore part without HDD section (1200 m) [km]	58,8		65,8		30	154,6
Length of excavation in the offshore section without HDD section (1200 m) for two cables [km]	117,6		131,6		60	309,2
Maximum depth of excavation [m]	1,5	2,5	1,5	2,5	1,5	-
Length of sections of a given depth of excavation for one cable [km]	49,8	9	56,8	9	30	154,6
Sediment volume per m³ of excavation per m of cable [m³/m]	1,12	2,5	1,12	2,5	1,12	-
Total sediment volume for one cable [m³]	55776	22500	63616	22500	33600	197 992
Total sediment volume per cable section [m³]	78 276		86 116		33 600	197 992
Total sediment volume for two cables [m³]	156 552		172 232		67 200	395 984
Masa wzruszonego osadu [Mg]	273 966		301 406		117 600	692 972
Sucha masa wzruszonego osadu [Mg]	227 391,78		250 166,98		97 608	575 166,76

Source: In-house study

In the case of implementation of a shorter trenchless crossing and the need for deeper excavation to go beyond the last revetment, it should be noted that the total amount of shrugged off excavated material during the laying of the 6 cable lines will be slightly higher than indicated in Table 9.2.

Resuspension of sediments

Sediment resuspension was analysed for the water jetting method, as this causes turbidity during the works. For the other methods, sediment resuspension will be lower.

When laying cables using the water jetting method, it is assumed that between approximately 10 and 30% of the excavated material may pass into the water. These values depend on the type of bottom-building sediment. Two cable laying speeds are also assumed: 250 and 350 m of cable per hour.

The analysis of suspended solids spreading during the execution of the aforementioned works, carried out for the purposes of this Report (Volume IV, Attachment 2b.), has shown that the greatest resuspension (approx. 35%) is to be expected in the sections of the route where cohesive sediments, with a high content of silty and clay fractions, are present in the deep structure (figure 9.3., figure 9.4.), i.e. :

- within the connection of MFW Bałtyk II: 32-31 km, 29-28 km, 24-23 km, 19-13 km, 8-7 km, 3-0 km, 18 BII-14 BII km, 10 BII-0 BII km,
- within the connection of MFW Bałtyk III: 32-31 km, 29-28 km, 24-23 km, 19-13 km, 8-7 km, 3-0 km, 24 BIII-9 BIII, 3 BIII-0 BIII,
- within the connector between MFW Bałtyk II and MFW Bałtyk III: the western part.

These sections represent approx. 44% of the length of the entire ECI route. On the remaining part of the route, which is made up of non-cohesive (mainly sandy) sediments, approximately 20% of the excavated material will pass into the water.

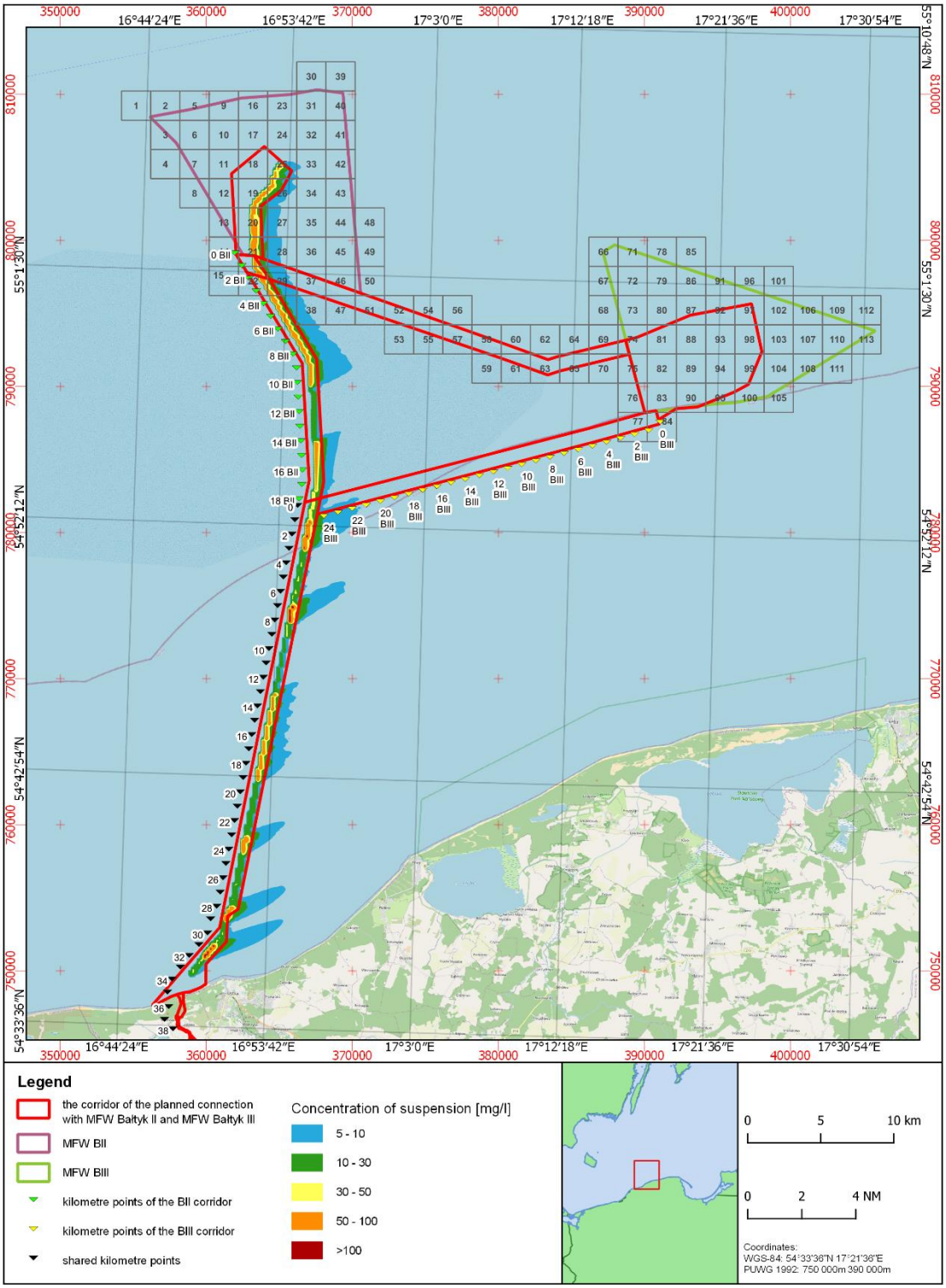


Figure 9.3. Maximal *concentration of suspended solids in the whole column of waterduring laying one cable line from: MFW Bałtyk II, at a working speed of 250 m/h.*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

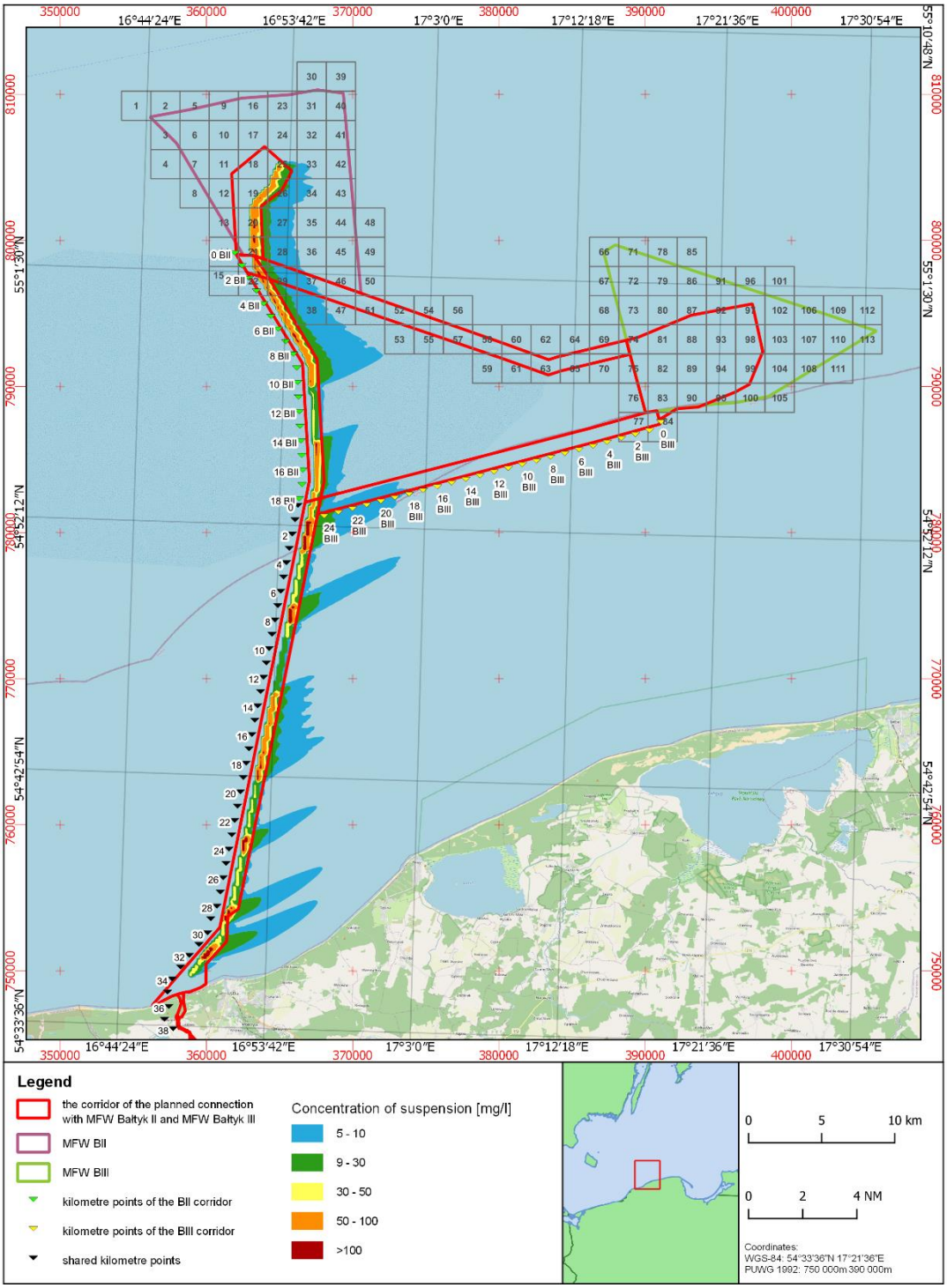


***Figure 9.4. Maximal** concentration of suspended solids in the whole water column during laying one cable line from: MFW Bałtyk II, at a working speed of 350 m/h.*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

In order to estimate the amount of resuspension, the lithology of the sediments within the trenches was taken into account (by analysing the core samples taken from the ECI corridor - Volume III. Attachment 1.2) and the ECI corridor was divided into cohesive and non-cohesive sections. Taking into account the above-mentioned conditions, during laying 4 cables (plus 2 connector cables) are expected to be resuspended approx. 121 692.78 Mg of dry sludge (table 9.3).

Table 9.3. *Amount of sediment to be re-suspended during works of burying/burying of cables, assuming trenchless HDD crossing HDD trenchless passage exits behind the last revetment*

Parameters	Connection infrastructure		
	IP (cohesion) sections	IP sections (non-cohesive)	Total
Length of excavation [km]	138	171,2	309,2
Dry weight of resuspended sediment [Mg].	256 704,44	318 462,32	575 166,76
Amount of resuspended sediment [%]	35	10	-
Dry weight of resuspended sediment [Mg].	89 846,55	31 846,23	121 692,78

Source: In-house study

In the case of implementation of a shorter trenchless passage and the need for deeper excavation to the exit behind the last revetment, taking into account the lithological nature of the sub-bank section (the presence of sandy sediments - non-cohesive formations) and the assumed amount of sediment that can pass into the water depth (10%), it should be concluded that the total amount of excavated material in the resuspension during the laying of the 4 cable lines (plus 2 connector cables) will be slightly greater than that given in the table 9.3.

Range of turbidity

Based on the results of the suspended solids spread modeling carried out (Volume IV, Appendix 2b), it can be assumed that, depending on the properties of the bottom sediments, the maximum range of water turbidity will be from about 1 km to about 8 km, with suspended solids concentrations mostly not exceeding 10 mg/l. Water turbidity with a concentration of more than 30 mg/l will only occur in the immediate vicinity of the pit. For sections built from non-cohesive sediments, the maximum range of turbidity in the water tone at both 250 m/h and 350 m/h will be up to about 1 km. For cohesive sections, the ranges will be larger, reaching up to about 5 km for the V250 scenario to about 8 km for the V350 scenario, with a maximum near the seashore (due to shallower depths) and in the Slupsk Shoal TSS area, where the excavation will be deeper.

Suspended solids concentrations will be comparable to those during heavy storm events. During storm conditions in the area of the planned Project, the natural instantaneous suspended solids concentration in the water can range from tens to hundreds of mg/l, and after the storm has subsided, after several hours, the suspended solids concentration decreases to pre-storm values[360] .

The maximum turbidity time at which the concentration of suspended solids at individual points along the route exceeds the background limit, taken for modeling purposes as 5 mg/l[361], will vary depending on the amount of sediment released into the bed and the direction of the route. For sections of the route running in the west-east direction (part of route BIII and the connector), the turbidity time will be slightly longer than for sections of the route running north-south, which is due to the spreading of suspended solids along the trench route during the works, in accordance with the prevailing direction of winds from the western sector. For sandy sections, the maximum turbidity time will not exceed 4 h, while for cohesive sections, enriched in silty and clay fractions, it will average up to 10 h, with a maximum of 16 h, at several points along the ECI route. The shortest turbidity time for both cohesive and non-cohesive sections will occur along the ECI route from the mfw Bałtyk II(figure 9.5, figure 9.6).

[360] *Source: Modelling of suspended solids (Volume IV, Attachment 2)*
[361] *przy czym wartość ta może się naturalnie zmieniać od kilu do kilkuset mg/l*

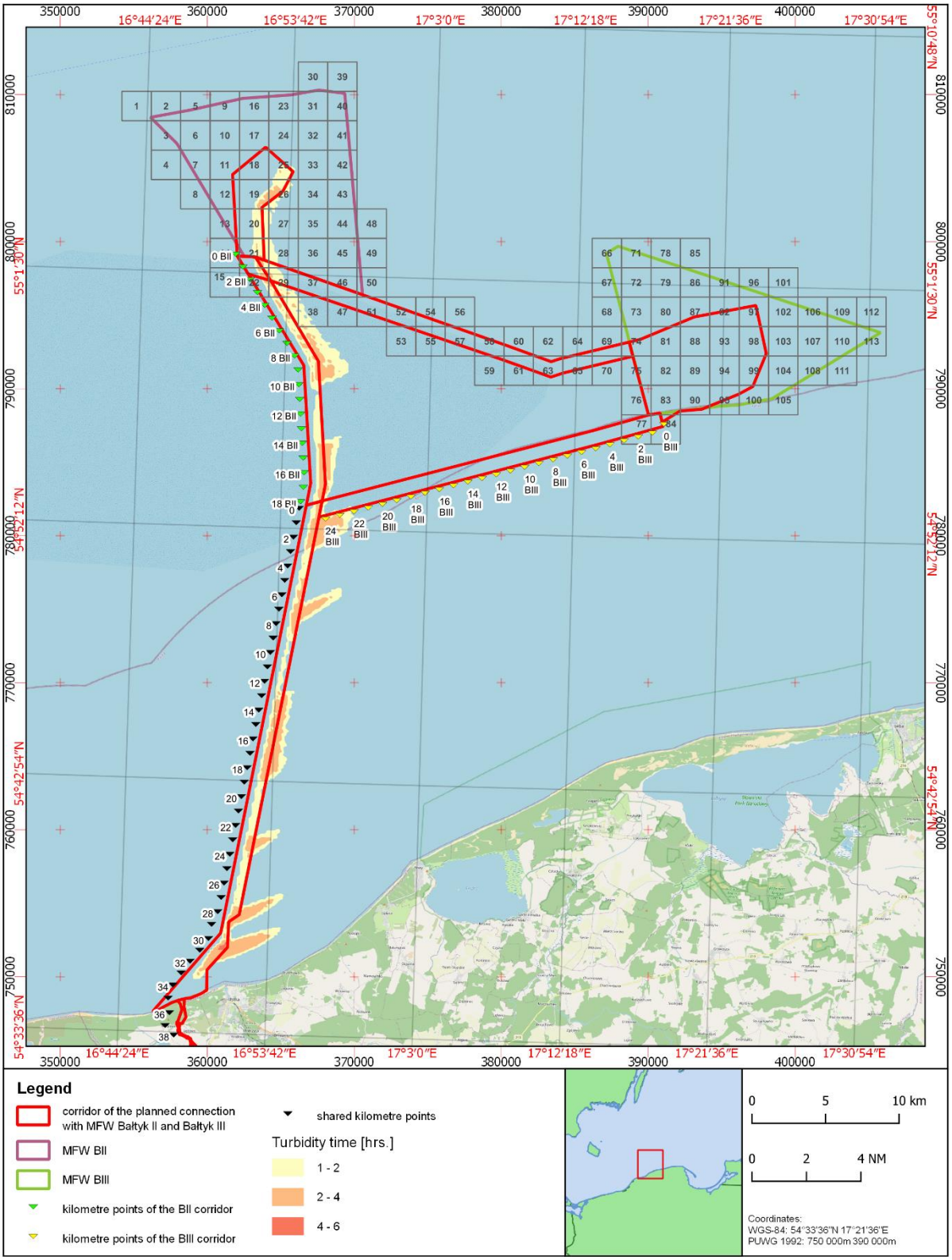


Figure 9.5. *Total water turbidity time during laying one cable line from MFW Bałtyk II, at a work speed of 250 m/h.*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

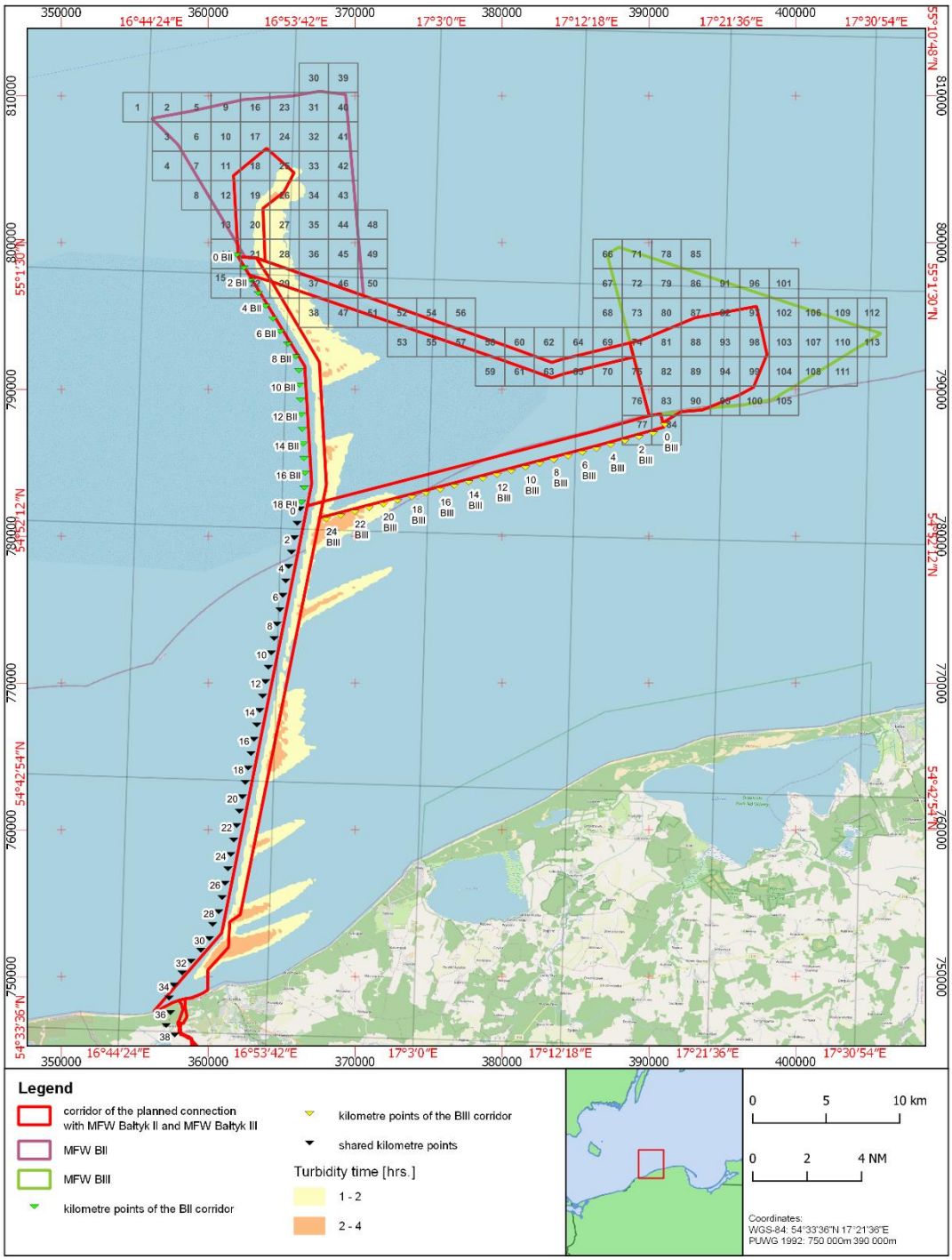


Figure 9.6. *Total time of water turbidity during laying one cable line from MFW Bałtyk II, at a working speed of 350 m/h.*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

Bearing in mind that the cables will not be laid at the same time (probably one after the other), the level of turbidity in the water during the burial of one cable will be much lower. In addition, taking into account the time of turbidity, the cloud of suspended matter will move as the work progresses and the concentration of suspended matter in the water, in the areas where the cable is buried, will gradually decrease.

Upon completion of the works, a deposition of suspended solids on the bottom with a maximum thickness of 1 mm will occur in an area that can be a maximum for one cable line:

- MFW Bałtyk II - approx. 27.43 km²,
- MFW Bałtyk III - approx. 42.86 km²

- the connector - approx. 22.17 km².

More information on suspended solids deposition is provided in Subchapter 9.1.1.

Remobilisation of heavy metals, nutrients and pollutants

The agitation (disturbance) of bottom sediments, associated with, i.a., bottom preparation and cable burial, favours the passage of pollutants from the sediments to the water[362,363], such as: heavy metals, PAHs, PCBs and biogenic elements - nitrogen and phosphorus. The process of sediment agitation increases the oxygenation of the sediment and, due to the release of various compounds into the water, reduces the amount of pollutants, thus improving sediment quality. Better oxygenation of the sediment can reduce (limit) the passage of phosphorus from the sediment, as this process occurs under anaerobic conditions.[364] In the case of cable burial, the method that will result in the greatest uplift of the bottom sediments is the water jetting method.

Concentrations of heavy metals in surface sediments from the ECI area, i.e. Pb, Cu, Zn, Ni, Cr, in bound and labile form, occur at very low levels, while for As, Cd and Hg - at trace levels, generally below the lower limit of quantification. The concentrations of both nutrients - N and P and contaminants PAHs and PCBs - are typical for sandy sediments of the southern Baltic and do not deviate from the literature data on the content of these compounds in surficial bottom sediments of the southern Baltic. During the construction works, the chemical properties of the bottom-building sediments will be altered, including their oxygenation and quality improvement. At the same time, labile forms of metals, biogenes and pollutants will migrate into the water, which, due to low concentration levels, will not adversely affect water quality in the area of the planned Project.

Taking into account the content of labile forms of metals, nutrients and pollutants in the bottom sediment within the planned Project, as well as the total volume of sediment that will be stirred up due to cable burial/burial, the amount of emissions of the above-mentioned substances to the water body that may occur due to the laying of 6 cables with a total length of 314 km was estimated, taking into account the exit of the HDD trenchless passage beyond the last revetment (table 9.4).

Table 9.4. *Amount of heavy metals, nutrients and pollutants released from sediment during plunge/burying cables*

Parameters	Connection infrastructure				Annual riverine load to the Baltic Sea*
	MFW BII (2 lines)	MFW BIII (2 lines)	Connector (2 lines)	Total (6 lines)	
Content of heavy metals, nutrients and pollutants					
Sediment dry weight [Mg]	446,382.3	499,253.3	226,590	1,172 535.6	-
Pb [kg].	799.4	894.6	479.9	2,173.9	1,700 – 24,000
Cu [kg]	421.9	472.1	253.3	1,147.3	47,700 – 100,000
Zn [kg].	1,776.5	1,987.9	1,066.4	4,830.8	61,900
Ni [kg].	359.7	402.6	215.9	978.2	46,100 – 687,000
Cr [kg].	297.6	333.0	178.6	809.2	3,800
As [kg]	Concentration in the ECI sediment at trace levels, below the lower limit of quantification				n.a.
Hg [kg].	Concentration in the ECI sediment at trace levels, below the lower limit of quantification				100 – 2,100
Cd [kg].	Concentration in the ECI sediment at trace levels, below the lower limit of quantification				500 – 2,300
P [kg].	119,764.9	134,022.6	71,891.3	325,678.8	4,810,000 – 9,500,000
N [kg].	256,552.7	287,094.7	154,001.0	697,648.4	89,720,000 – 150,000,000
PAHs [kg].	37.7	42.2	22.7	102.6	n.a.
PCB [kg].	0.4	0.5	0.3	1.2	260,000

Source: In-house study

** data from: Environmental Impact Report on the Connection Infrastructure of the Offshore Wind Farm Baltica B-2 and B-3*

[362] *Bojakowska 2001*
[363] *Uścinowicz Sz.(ed.) 2011*
[364] *Alloway and Ayres 1999*

A comparison of the estimated remobilisation results of the individual compounds shows that the total load of heavy metals, nutrients and pollutants will be negligible compared to the annual load contributed by the rivers. Considering the fact that each cable line will be laid separately, the actual one-time amount of sediment stirred up will be much smaller, and therefore much lower concentrations of released substances occur (table 9.4.).

Considering the overall impact on the seabed sediments during the preparation and plunge/buryingof the cable (i.e. disturbance, alteration of the structure, change of physical and chemical properties, resuspension, dispersion, redeposition) and the small area of direct intervention in the seabed (of approximately 0.46 km², which represents 0.26% of the total area of the corridor of the planned Project for the shorter trenchless passage and deeper excavation to the exit beyond the last revetment - the bottom interference is about 0.53 km², which is 0.3% of the total area of the corridor), it should be concluded that the impact will be **insignificant**.

Use of alternative cable protection methods

In locations where the ability to bury/plunge the cable using water jetting or mechanical cutting technologies will be limited, considerated is to lay the cable on the bottom and secure it. Considered are two methods, i.e. stone dumping or concrete mattress covering. These locations include: fields of boulders, pebbles, gravels or very hard seabed, where excavation will be impracticable or uneconomical, and areas with high mobility of bottom sediments where high water dynamics may lead to cable exposure.

As a result of the above-mentioned methods, changes to the seabed level will occur. The degree of this change will depend directly on the structure of the seabed. In areas where the seabed is made up of medium to fine-grained sediments, the sensitivity to structure change will be much greater and the change more noticeable than in areas where pebbles and boulders are present.

The sites for the alternative methods will be identified after geotechnical investigations and the design of the cable route. It is worth mentioning, however, that at these locations, both the extent and scale of the resuspension of bottom sediments and remobilisation of heavy metals, nutrients and pollutants described in the earlier sections will be significantly reduced.

Given the local extent of the impact, which is directly limited to areas where cable burial technology will not be possible, the changes to the structure of the bottom sediments in relation to the nature of the surrounding bed, which includes stonework and isolated boulders throughout the route, should be considered insignificant.

Anchoring of vessels

During the preparation and construction phase, depressions in the seabed will occur at the berths of vessels installing components of the connection infrastructure. These disturbances will be local - point-like (up to a maximum depth of 3 m - depending on the type of sediment), short-lived and reversible, so the impact of anchoring on the seabed should be considered **insignificant**.

Trenchless crossing of the coastal zone

The crossing through the coastal zone of the planned connections from MFW Bałtyk II and MFW Bałtyk III will be made using a trenchless HDD method.

The drilling will be carried out to a maximum depth of approx. 50 m below the seabed level, passing through Pleistocene sediments represented by glacial till, water-glacial sands and clays, silts and stagnant sands. Along the drilling route, the sediments will be disturbed and the continuity of the lithologically distinct layers will be broken. The drilling work is likely to be organized on land.

Given the local extent of the impact, limited directly to the drilling route, and its short-term nature, it should be considered insignificant.

Optionally, the shore zone crossing will be made by HDD method with deeper excavation, which will be decided at the stage of construction project preparation. Based on the available bathymetric profiles in the area of km 237 - in accordance with the shore kilometer according to the UM, a minimum drill length of about 400 m from the shore to the isobath of about 6 m and an excavation of up to about 5 m deep,

in a strip of bottom up to 20 m wide, was assumed for the analyses in this Report. It was assumed that this could involve a section for a maximum distance of up to about 800 m - up to the exit beyond the last revetment (Figure 9.7).

It is tentatively assumed that the excavation will be prepared in two stages. In the first, the bottom will be dredged to a depth of about 3 m using a small dredge. In the second stage, a strip of bottom 1.5 m wide will be excavated in the previously prepared trench to a depth of about 2 m, in which the cable will be buried/buried using the method of soil thawing - jetting.

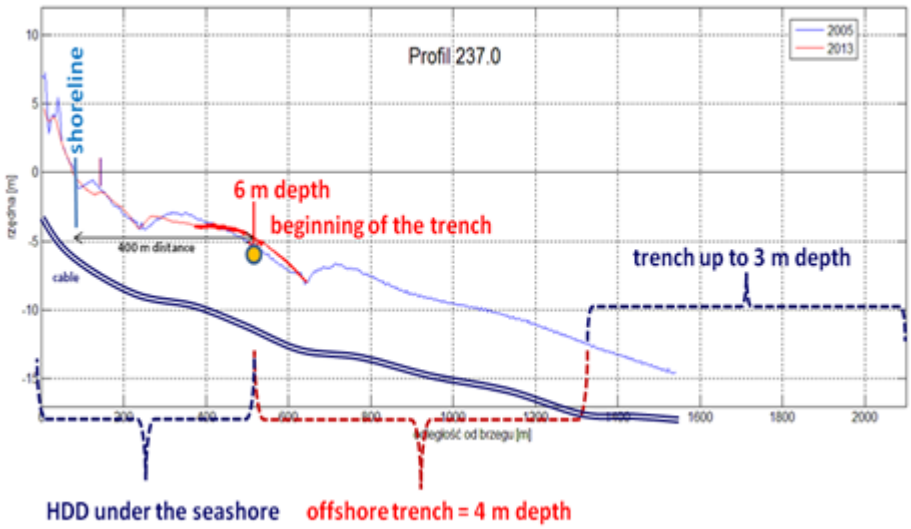


Figure 9.7 *Illustrative sketch of the location of the ECI power cable in Variant 1 - HDD and excavation to a depth of 4 m against bathymetric data in Profile of km 237.0*

Source: Modelling of suspended solids (Volume IV, Attachment 2)

Storage of excavated material

If a shorter trenchless passage is implemented and deeper excavation is required for a short section of up to 800 m, a small dredger (maximum payload up to about 2 500 m³) will be used. If it becomes necessary to deposit the dredged material from the bottom dredging, this will take place within the ECI corridor in the form of small piles at a depth of 10-12 m (between 32 and 30 km of the ECI corridor), east of the MFW Bałtyk II cable lines and/or east of the MFW Bałtyk III cable lines. The maximum assumed area for the storage of excavation spoils for the 4 cables will cover a bottom area of about 0.1 km², which is only 0.06% of the area of the corridor of the planned Project.

As a result of the work carried out, local sediment disturbance will occur in the area of dredged material disposal. The dumped spoil with different lithological characteristics will mix with the parent material lying on the bottom. The impact will be local and limited directly to the discharge site.

The chemical properties of the dredged material will be altered in the course of dredged material storage, as in the case of sediment shrugging during the cable burial/burial stage. At the same time, labile forms of metals, biogenes and pollutants will pass into the water, which, due to low concentration levels, will not adversely affect its quality in the area of the planned Project. Taking into account the dredge's maximum capacity, the volume of a single discharge will not exceed 2 500 m³ of sludge, which, in terms of dry weight of sludge, will amount to 3 631.25 Mg. With respect to the amount of dredged material and the volume of metal, nutrient and pollutant emissions that will be generated during the cable burial/dredging construction activities, during a single discharge of dredged material, the concentrations of the aforementioned released substances will be negligible. Therefore, the impact should be considered insignificant

Storage of excavated material will cause short-term turbidity of the water tone, and the resulting suspension will spread to neighboring areas according to the current field. The resulting turbidity will be

limited to the region and duration of the work. [365] [366] In the case of dredged material discharge at a depth of about 12 m, the deposition velocities of grains of fine and very fine sands reach up to 1.7 cm-s^{-1}. Considering the extent of spoil deposition, it will depend on the speed of currents. When working in the spring-summer period (current velocity of about 10 cm-s^{-1}), the maximum range of sediment deposition will be up to about 200 m, while in the autumn-winter period (current velocity of about 30 cm-s^{-1}) it will be up to about 600 m [367].

Taking into account the above estimates and:

- the assumed storage of excavated material at a depth of about 10-12 m within the boundaries of the ECI corridor,
- the lithological nature of the excavated material in the area of the analyzed deeper excavation (fine and very fine-grained sands),
- the size of a single sediment discharge with a volume of up to about 2 500 m³,

excavated material should be expected to fall to the bottom in a very short time, leaving a short-lived, slight turbidity of the water tone. The range of maximum spreading of the dredged material will be within the ECI corridor. Considering the above, this impact should be considered insignificant.

Summing up the total impacts that will occur during the potential storage of dredged material (i.e., sediment disturbance, change of physical and chemical properties, resuspension and re-deposition) and the small area of direct interference with the bottom limited to the discharge site, it should be concluded that they will be insignificant.

Access to raw materials and deposits

No documented mineral deposits or mineral extraction sites (mines) have been identified in or near the corridor designated for the planned Project.

The planned Project passes through prospective areas of crumb stone No. II and IV. In addition, in the zone closer to the shore, at the depth of 15-25 m, both on the eastern and western side of the ECI, three perspective areas of sands for shoreline recharge, i.e. Ustka 1, Ustka 2 and Ustka 3 (figure 9.8.).

The construction of the planned Project will result in local interference with prospective deposits due to:

- the bottom preparation and the cable plunge/burying,
- deposition of sedimentary material stirred up and mobilised during plunge/burying ofthe cables.

Access to crumb materials (sands and sand and gravel) will be temporarily restricted, and the surface will be occupied during the course of the works involving the sea bottom preparation, the cable laying and plunge/burying.

During the route cleaning phase (a strip about 5 m wide for each cable), the seabed intervention area will amount to 40.4 km² for field II and 10.58 km² for field IV, representing 0.01% and 0.06% of the total prospective area respectively. During the cable plunge/burying phase (1.5 m wide trench), the area of seabed intervention will be much smaller, amounting to 0.12 km² for Field II and 0.17 km² for Field IV, representing 0.003% and 0.017% of the total area of the prospective area, respectively.

Taking into account the scale of the Project in the area where the crumb stone materials occur, this impact should be considered insignificant.

During the bottom cleaning and the cable plunge/burying, sedimentary material will be stirred up, mobilised, and transported in suspension to adjacent areas of the bottom. Within the range of the

[365] *Trzeciak A., Brodzicka P., Chojnacka M., Elżanowska M., Fabrykiewicz R., Kaczmarczyk-Guzik A., Mazurek-Hajduk M., 2016, Raport o oddziaływaniu na środowisko pt. „Rozbudowa toru podejściowego z powiększeniem jego szerokości i głębokości technicznej wraz z wykonaniem obrotnicy o średnicy 750 m" w ramach modernizacji toru podejściowego do Portu Północnego., Transprojekt Gdański Sp. z o.o.*

[366] *Boniecka H., Cylkowska H., Dubrawski R., Gajecka A., Wandzel T., 2008, Raport o oddziaływaniu na środowisko pt. „Usuwanie do morza urobku z pogłębiania akwenów związanych z budową falochronu osłonowego i portu zewnętrznego w Świnoujściu", Instytut Morski w Gdańsku Zakład Hydrotechniki Morskiej*

[367] *Boniecka H., Cylkowska H., Dubrawski R., Gajecka A., Wandzel T., 2008, Raport o oddziaływaniu na środowisko pt. „Usuwanie do morza urobku z pogłębiania akwenów związanych z budową falochronu osłonowego i portu zewnętrznego w Świnoujściu", Instytut Morski w Gdańsku Zakład Hydrotechniki Morskiej*

suspension cloud will be the prospective areas of crumb stone materials (fields II and IV) figure 9.8, figure 9.9.

The thickness of the sediment layer that will be deposited after burial of a single cable will be small and in most areas will not exceed ..0.5 mm, apart from the trench where approximately to 1 mm of sediment will be deposited (figure 9.8, figure 9.9).

Given the deposited thickness of the sediment layer, it will not restrict access to the aforementioned areas. Furthermore, it will not impair their quality or their exploitation value. Therefore, the impact should be considered insignificant.

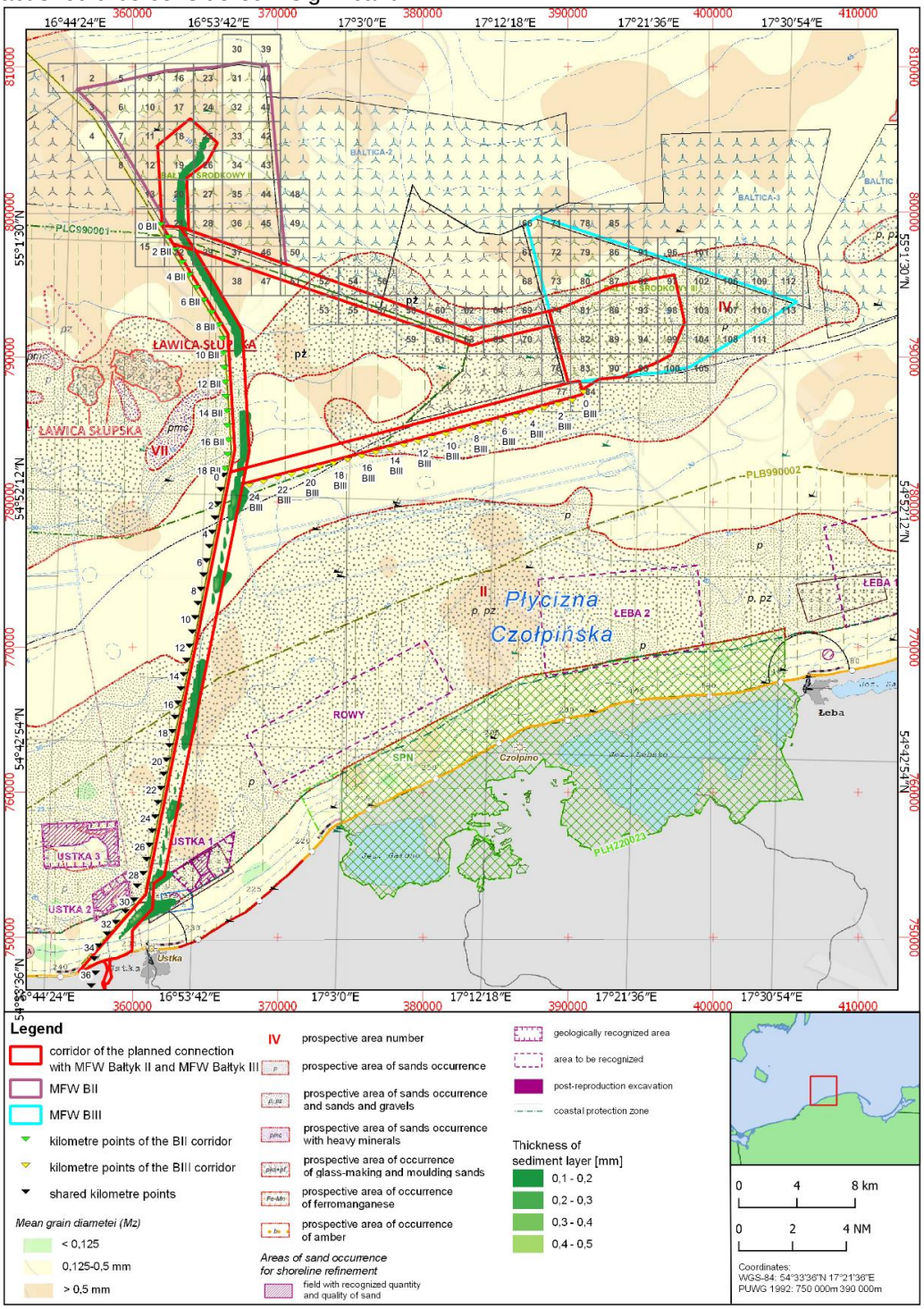


Figure 9.8. *Thickness of the deposited layer of sediments in fields of crumb raw materials No. II during laying one cable line from MFW Bałtyk II, at a cable laying speed of 250 m/h*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

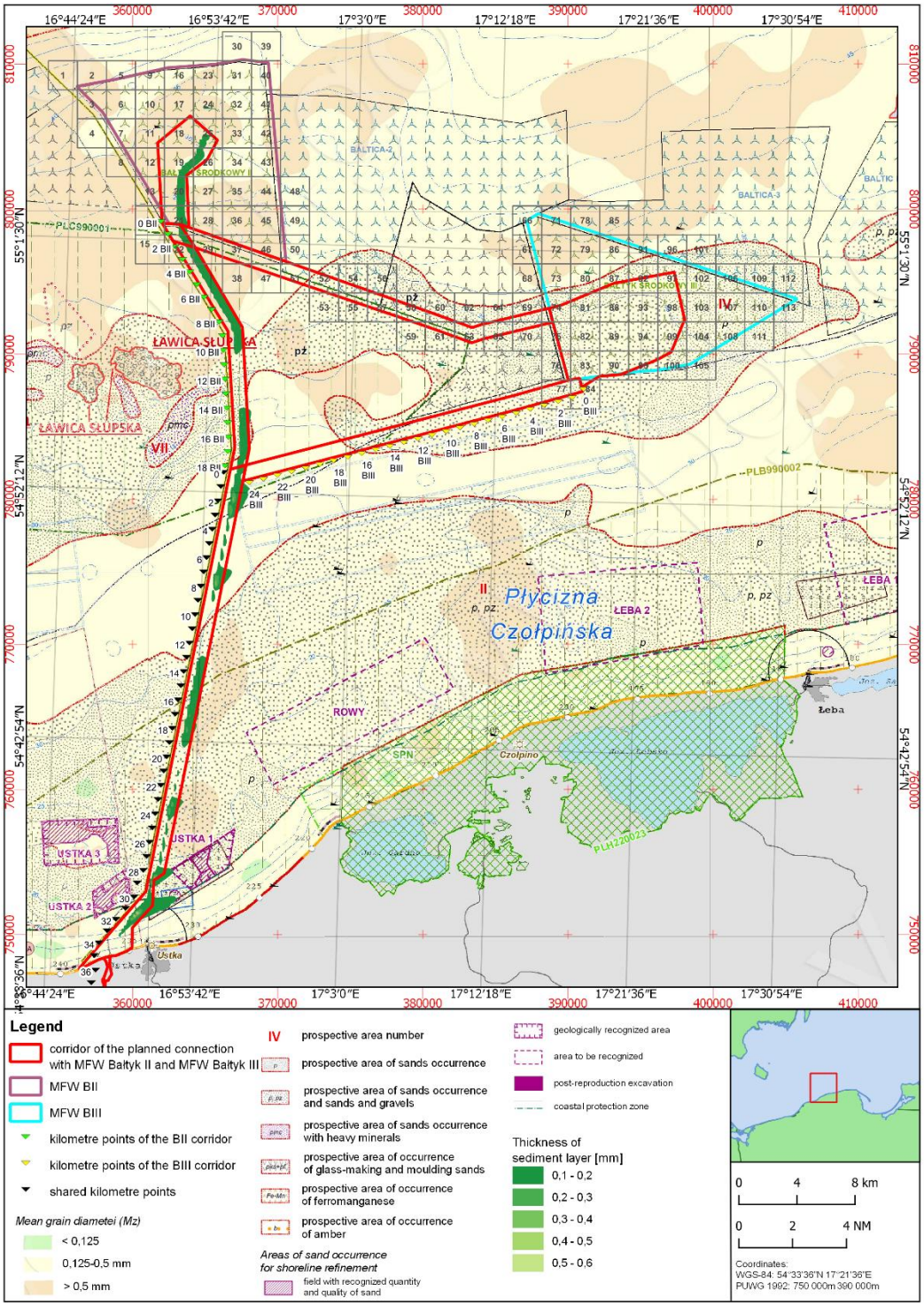


Figure 9.9. *Thickness of the deposited layer of sediments in fields of crumb raw materials No. II during laying one cable line from MFW Bałtyk II, at a cable laying speed of 350 m/h.*

Source: based on suspended solids modelling report (Volume IV, Attachment 2b)

Summary of construction phase assessment on geological structure, bottom sediments and access to raw materials:

When analysing the impact of the planned Project on the seabed sediments, geological structure and access to raw materials and deposits, the following aspects were taken into account: preparation of the seabed and excavation for the cable laying and burying/burrowing, possibility of applying alternative methods of cable protection, deposition of sediment material stirred up and mobilised during the

construction works, anchoring of vessels, execution of trenchless crossing through the coastal zone and optional storage of excavated material. Based, inter alia, on the performed modelling, it was concluded that in most cases the scale of this impact will be small (within the corridor boundaries), and that the impact will be insignificant.

Summary of the assessment of the significance of the adverse impact of the planned Project on geological structure, bottom sediments and access to raw materials and deposits during the **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Fixed	**(3)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(11) insignificant**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **11**, meaning that the **impact on the geological structure, bottom sediments and access to raw materials will be insignificant**.

9.2.2. Operation phase

Bottom sediments and geological structure

The operation of the planned Project will be associated with an increase in the temperature of the bottom sediments in the immediate vicinity of the cables due to heat emissions generated by the cables during the transmission of power from the offshore wind farms. The level of temperature emitted will depend on the operational output - temperatures will be higher at maximum electricity production.

A local bottom interference may also be associated with possible damage to the cable and the need for repair, but in practice such situations do not occur.

Impact on the temperature of the bottom sediments

The bottom sediments in the area of the planned Project will be heated, both due to seasonal changes in water temperature and as a result of heat emission from the cables.

Over the course of the year, the temperature of the bottom waters in the Baltic Sea varies over a wide range. The highest values reaching up to 18ºC are recorded in summer, the lowest values of 2ºC, in winter, at the beginning of the year. Seasonal temperature variations are observed in the vertical profile of the sediments and can extend to depths of 3-5 m below the bottom surface. This seasonality is marked at a depth of 20 cm below the bottom surface. The temperature here varies by ±0.4ºC (0.8 ºC).[368]

The transmission of power through power cables will be associated with the emission of heat. At the maximum load on the cable, the temperature at the centre of the cable is a maximum of 46ºC[369], while the temperature outside the cable is lower. The average load values of cables vary between 60 and 80% of the maximum value, so the temperature of the conductors and the amount of heat emitted into the environment will change.

If the cable is buried to an assumed depth of approx. 1 m to maximum 4 m, sediment will be heated only in the immediate vicinity of the cable. As you move away from it, the temperature will decrease. When the cable is buried to a depth of approx. 1-1.5 m, a slight increase in temperature of approx. 2ºC in the near-surface layer of sediments (at a depth of approx. 20 cm from the bottom surface) occurs. This layer of sediments is particularly sensitive due to the infauna living there. The temperature of the sediment will be effectively reduced to the seawater's temperature due to the close contact with

[368] *Müller et al. 2016*
[369] *Worzyk 2009*

seawater, which has a high convection coefficient and good thermal conductivity, and bottom water flows with an average velocity of 0.1 m/s.

If alternative methods of cable laying are required (e.g. covering with mattress or stone dumping), there will be no excessive heating of the sediment surface. As with burying the cable, the temperature of the conductor will be reduced to that of seawater.

In summary, the impact of the heat emitted by the cables on the bottom sediments will be long-term and permanent, but very local, limited to the immediate vicinity of the cable. The temperature of the seabed sediment in the near-surface bottom layer, which is the most sensitive because of the benthic organisms that live there, will be determined primarily by seasonal changes in water temperature. Therefore, this impact is to be considered **insignificant**.

Impact on the geochemical profile of bottom sediments

The heat emission of the cables, and the consequent slight increase in the temperature of the sediments surrounding the cable, can affect the dynamics of geochemical processes and the availability of elements in the vertical profile of the seabed. Laboratory studies in which the temperature of the sediments varied between 15-35ºC showed that as the temperature increases, chemical reactions are accelerated and metals (including Zn, Cu, Pb, Cr, Cd) are released from the sediments into the bottom water.[370]

According to the above information, heating of the bottom sediments will reach a maximum of a few degrees Celsius, while the content of heavy metals in the sediment is low or trace: the content of Pb, Cu, Zn, Ni, Cr occurs at a very low level, and in the case of As, Cd and Hg - at trace levels, generally below the lower limit of quantification. Concentrations of both nutrients - N and P, as well as contaminants - PAHs and PCBs, are typical for sandy sediments of the southern Baltic and do not deviate from literature data on the content of these compounds in surface bottom sediments of the southern Baltic.

In the vertical profile of the Baltic Sea bottom sediments, a significantly higher level of heavy metals is visible between 2 and 14 cm below the bottom surface.[371][372] Below this depth, metal concentrations decrease markedly. Similarly, the concentrations of PCBs and PAHs are elevated in the sediment layer to a depth of about 15 cm. Below this depth the content of these compounds clearly decreases.[373]

Bearing in mind that during excavation work prior to cable operation:

- disturbance of the deep structure of the sediment will occur, which promotes the remobilisation of pollutants and nutrients into the water table and their oxygenation,
- the concentration of re-deposited (post-completion) contaminants and chemical compounds in the near-surface sediment layer (up to 15 cm) will occur,

and taking into account:

- the minimum burial depth of the cable – approx. 1 m,
- the non-significant effect of cable temperature at a depth of 20 cm below the bottom surface, where concentrations of pollutants and nutrients are highest,

it should be concluded that the potential effect of temperature on the release of heavy metals and contaminants from the sediment to the water will be **negligible/minimal**.

Cable damage

In case of failure of the connection infrastructure and the necessity to replace damaged cable sections, the structure of the bottom sediments in the area of the cable damage may be altered. As the repair works will be very local and, at the scale of the whole Project area, insignificant for the bottom sediments (already altered during the construction phase at the ECI location), this impact should be considered **insignificant**.

[370] *Haiyan Li et al. 2013*
[371] *Uścinowicz Sz.(ed.) 2011*
[372] *Shahabi-Ghahfarokhi et al. 2021*
[373] *Uścinowicz Sz.(ed.) 2011*

Access to raw materials and deposits

The planned Project passes through two prospective deposits of sand and sand and gravel. As such, the laying of the 4 cables at the bottom will prevent access and potential exploitation at the ECI location.

In view of the bottom occupation in the ECI area, taking into account the bottom area above the cables (approx. 1.5 m), the distance between the lines for the same connection (approx. 25 m) and between the lines of two different connections (approx. 50 m), together with a buffer zone of approx. 25 m from the external cable lines, an area of 3.04 km² within field II and 4.04 km² within field IV, representing 0.08% and 0.04% of their total area respectively, will be excluded from the area of potential crumb deposits.

Given the small area occupied by the ECI cables within the crumb raw material fields II and IV, this impact should be considered **insignificant**.

Summary of the assessment of the significance of the adverse impact of the planned project on the geological structure, bottom sediments and access to raw materials and deposits during the **operational phase**:

Type of impact and its severity	
Neutral	**(0)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(10) insignificant**

In total, the sum of the impact weights identified for the operational phase of the planned ECI was **10,** meaning that **impact on the geological structure, bottom sediments and access to raw materials will be insignificant**.

9.3. IMPACT ON WATER QUALITY AND ENVIRONMENTAL GOALS SET FOR SEA WATERS

This chapter analyses the potential impact of the planned Project during the construction and operation stages on water parameters, including temperature, salinity, pH and hydrochemical parameters. In addition, an analysis was made of the impact of the ECI on the state of the marine environment in accordance with the MSFD of the waters in relation to the characteristics of the marine environment (D1-D10) and the environmental objectives for achieving good environmental status of waters contained in the Regulation of the Minister of Infrastructure of 25 February 2021 on the adoption of a set of updated environmental objectives for marine waters (Dz.U.2021.569) (see Chapter 7.3), and the impact on the overall status and environmental objectives of the coastal waters CW6001WB3 Polskich wód przybrzeżnych Basenu Bornholmskiego, established in accordance with the WFD.

The potential impacts of the planned Project on water quality and environmental conditions relate primarily to the **construction phase** and are associated with:

- necessary interference with the seabed causing agitation of bottom sediments and increased suspended solids in the water during construction activities related to cable burial/burial and possible storage of excavated material, if a shorter trenchless passage is implemented and deeper excavations are made in the coastal zone;
- remobilization of possible bottom sediment contaminants (e.g., nutrients, metals);
- destruction or disturbance of habitats of marine organisms;
- periodic underwater noise emissions from ships and equipment necessary for laying cable lines

During **the operation phase**, impacts on water quality and status will primarily be related to cable operation which causes heat emissions. In addition, in terms of impacts on marine organisms, if alternative methods of cable protection i.e. stone burial or concrete mattresses are used, there will be

limited opportunities to bury the cable using either de-burring or mechanical cutting techniques (e.g. fields of boulders, pebbles, gravels or a very hard seabed where excavation would be impracticable or uneconomical), habitat modification may occur (reef creation).

A summary of potential impacts on marine waters is presented in the table below (table 9.5).

Table 9.5. *Potential impacts of the Project on marine water quality parameters*

Parameter		Construction phase	Exploitation phase
Temperature		no imp.	możliwy wpływ
Salinity		no imp.	no imp.
Ph Reaction		no imp.	no imp.
Hydrochemical parameters	Suspended solids level	możliwy wpływ	no imp.
	Content of biogenic substance (nitrogen, phosphorus) and harmful substances (e.g. PBC, heavy metals, PAHs)	możliwy wpływ	no imp.
Parameters for assessing the state of the marine environment in accordance with the MSFD	D1-biodiversity, D3-commercially exploited fish and invertebrate species, D4-food chains, D5-eutrophication, D6-seabed integrity, D8-pollutants and pollution effects, D9-harmful substances in fish and seafood, D10-trash in the marine environment	możliwy wpływ	możliwy wpływ
Quality elements for the classification of the ecological state of JCWP	Biological elements	możliwy wpływ	możliwy wpływ
	Hydromorphological elements	możliwy wpływ	możliwy wpływ
	Ecological status/potential	możliwy wpływ	możliwy wpływ
	Chemical status	możliwy wpływ	możliwy wpływ
	General condition	możliwy wpływ	możliwy wpływ

no imp. – no impact

Source: own elaboration

Water quality could also be affected by potential releases of hazardous substances and waste as a result of emergencies, but due to the very low probability of occurrence of emergencies (analysed in more detail in section 14.1.), they were considered **insignificant - negligible**.

The impacts of the construction and operation stages are presented below for those parameters that may be affected by the planned Project, i.e. no salinity and pH.

9.3.1. Impact on physical and chemical parameters of water

Temperature

Potential impacts of the planned Project on water temperature may only occur during the **operational stage**, during which heating of sediments and bottom waters may occur as a result of heat emissions from the cables.

The analysis of thermal effects (Section 9.10) has shown that there will be no heating of the bottom waters, either when the cables are buried at a depth of approx. 1 to approx. 4 m or when the cables are laid on the bottom surface and covered with a stone bed or concrete mattress. Considering the intensive cooling effect of the cable by the seawater and the water flows near the bottom, which also reduce the temperature of the cable, it must be concluded that there will be no change in the temperature of the bottom waters. Therefore, the impact is to be considered negligible.

Level of suspended solids

During the cable plunge/burying phase (trenching), there will be agitation and mobilisation of bottom sediments and their resuspension. An analysis of the suspended matter spreading (Volume IV, Appendix 2b), showed that the highest turbidity is to be expected in areas where the bottom is composed

of cohesive sediments with a high content of silty and clay fractions. These sections represent ca. 44% of the length of the entire ECI route (Section 9.2.2.).

Based on the results of the suspended matter flow modelling, where the most unfavourable hydro-meteorological conditions were assumed (Volume IV, Appendix 2), it may be assumed that depending on the properties of the bottom sediments, the maximum range of water turbidity will be from approximately 1 km to 8 kilometres, with a suspended matter concentration generally not exceeding 10 mg/l. Water turbidity of more than 30 mg/l will occur in the immediate vicinity of the excavation (maximum range up to about 500 m). The highest concentrations are to be expected at the work site, i.e. in the trench axis, primarily in the cohesive sections. The maximum turbidity time will not exceed 16 hours.

Turbidity in the water depths generated during construction activities will be comparable to that during heavy storm events. During storm conditions, in the area of the proposed Project, the natural instantaneous suspended solids concentration in the water depths can range from tens to hundreds of mg/l, and after the storm has subsided, after a few hours or so, the suspended solids concentration decreases to pre-storm values[374].

Turbidity of the water tone may also occur as a result of the storage of dredged material from excavation in the shallow coastal zone if a shorter trenchless passage is implemented. The resulting suspended solids will spread to neighboring areas according to the current field. Turbidity of the water tone will be limited to the region and duration of the work. Given the lithological nature of the dredged material (fine and very fine-grained sands) and the size of a single sediment discharge with a volume of up to about 2 500 m³, the sediment will sink to the bottom in a very short time, leaving a short-lived, slight turbidity of the water tone. The range of maximum spreading of dredged material will be within the ECI corridor.

Therefore, the impact of suspended solids generated during construction activities on water quality will be direct, short-term (up to a maximum of oneday), reversible, supralocal in extent, and the magnitude of concentrations and duration will be similar to naturally occurring conditions during storm events. Therefore, this impact should be considered insignificant.

Biogenic and harmful content

Agitation (disturbance) of the bottom sediments, associated among other things with bottom preparation and cable burial/plunge, favours the transfer of pollutants from the sediments to the water depths, such as heavy metals, PAHs, PCBs and biogenic elements - nitrogen and phosphorus (section 9.2.2.).

Concentrations of heavy metals in surface sediments from the ECI area, i.e. Pb, Cu, Zn, Ni, Cr, in bound and mobile form occur at very low levels, while for As, Cd and Hg - at trace levels, generally below the lower limit of quantification. Concentration values of both nutrients - N and P, as well as PAH and PCB contaminants are typical of sandy sediments of the southern Baltic and do not deviate from literature data on the content of these compounds in surface bottom sediments of the southern Baltic.

Given the above, the passage of labile forms of metals, nutrients and pollutants into the water will not adversely affect water quality during construction activities. Therefore, the impact should be considered **insignificant**.

9.3.2. Impact on the state of the marine environment of the construction and operation phase under the MSFD

The analysis of the impact of the planned Project on the state of the marine water environment was performed with reference to the current assessment of the state of marine waters (by basins), based on the results of research of biological and physicochemical elements of waters, obtained within the framework of the PMŚ. The water status of two water bodies was considered, i.e.: 36 Open waters of the Bornholm Basin and 38 Polish coastal waters of the Bornholm Basin, within the boundaries of which the planned Project is located (location against the basins is included in Chapter 2, figure 2.1).

[374] *Source: Suspension spread modeling (Tom IV, Zał.2b)*

The assessment of the status of the marine environment in subbasins 36 and 38 (table 9.6) shows that in the waters of subbasin 36 good status was achieved in the features D1 biodiversity (for zooplankton), D6 seabed integrity and D9 harmful substances in fish and seafood - heavy metals; in the waters of subbasin 38 good status was achieved in the features D8 pollutants and pollution effects - radionuclides and D9 harmful substances in fish and seafood - heavy metals. In the remaining features, good environmental status has not been achieved or has not been assessed. So far, for marine waters, no overall assessment of water status has been made.

Table 9.6. *Assessment of the state of the marine environment in 2020. GES - good environmental status, nieGES - good environmental status not achieved, - no assessment*

Lp	Subakwen	Name of Subakwen	D1/D4				D3	D6	D5	D8				D9		D10
			Fishes	Zooplankton	macrozoobenthos	chlorophyll a				radionuclides	Heavy metals	TZO	Micronucleus test	Heav metals	TZO	
1.	36	Open waters of the Bornholm Basin	nieGES	GES	nieGES	nieGES	nieGES	GES	nieGES	nieGES	nieGES	nieGES	nieGES	GES	nieGES	-
2.	38	Polish coastal waters of the Bornholm Basin	-	-	nieGES	-	-	nieGES	nieGES	GES	nieGES	-	-	GES	nieGES	nieGES

D1- Biodiversity, D3- Commercially exploited fish and invertebrate species, D4- Food chains, D5- Eutrophication, D6- Seabed integrity, D8- Contaminants and pollution effects, D9- Harmful substances in fish and seafood, D10- Litter in the marine environment

Source: Assessment of the state of the environment of Polish Baltic marine areas on the basis of monitoring data from 2020 against the background of the decade 2010-2019, GIOŚ, 2021.

The assessment of the impact of the planned Project was made under the assumption of "no deterioration" of the current condition of the waters, in relation to the assumed environmental objectives with targeted measures for achieving good environmental status in the marine environment. The current set of environmental objectives for marine waters was adopted by the Regulation of the Minister of Infrastructure of 25 February 2021 on the adoption of an update of the set of environmental objectives for marine waters (O. J..2021.569).

In the table below, with the individual environmental objectives assigned to the respective features, the potential impact of the planned Project, both in the construction and operational stages, is analysed (table 9.7).

Table 9.7. *Assessment of the impact on the environmental targets set for individual marine water status features*

No.	Feature	Environmental objective	Construction phase	Operation phase
I.	***Status features***		***Impact assesment***	***Impact assesment***
1.	D1 - Biodiversity is maintained. The quality and occurrence of habitats and the distribution and diversity of species correspond to the prevailing physiographic, geographic and climatic conditions of the Baltic Sea region.	Reducing or maintaining anthropogenic pressure at a level that ensures the maintenance of natural habitats, including in fisheries, in which the natural biodiversity of the biotic elements present is maintained as well as habitat protection within Natura 2000 protected areas is ensured.	- the maintenance of natural habitats (also in the Natura 2000 site Ławica Słupska PLC990001) may be disturbed during construction works, during which the seabed will be directly interfered with and habitats, mainly phyto and macrozoobenthos will be disturbed/destroyed - this will be a direct, medium-term, reversible impact of local character - within the boundaries of the ECI corridor (Chapter 9.4.1, Chapter 9.4.2.) - benthic habitats will recover within a maximum of 2 years and the level of biodiversity will be maintained by the presence of the same species in the Project area **- It is worth adding that the most valuable habitats of** the Ławica Słupska Natura 2000 site **are located outside the site of direct interference with the seabed** **- impact will not cause deterioration of water status in terms of biodiversity**	- not applicable
2.	D4 - Occurrence of elements of the marine food chain in numbers and diversity at levels that ensure species diversity and maintain full reproductive capacity.	Reducing the impact of human activities to a level that allows the ecosystem to reach a state where all elements of the marine trophic chain exhibit a natural and stable level of abundance and diversity, and where the productivity of the biotic components guarantees the proper functioning of the trophic network.	- temporary disruption of the trophic chain may occur as a result of localised destruction of benthic habitats - this impact will be direct, medium-term, reversible, of local character - within the ECI corridor (chap.9.4.1, chap.9.4.2.) - the benthic habitats will recover within a maximum of 2 years and the levels of abundance and biodiversity will be maintained by the presence of the same species in the Project area	- not applicable

No.	Feature	Environmental objective	Construction phase	Operation phase
			- impact will not cause deterioration of water status in terms of trophic chain disturbance	
II.	***Features of pressure***			
3.	D2 - Maintain alien species introduced into marine ecosystems as a result of human activities at a level that does not cause negative changes to those ecosystems.	Reducing , by taking appropriate action, the spread of alien species introduced into the environment as a result of human activities to ensure that alien species occur at levels that do not disturb the structure and functioning of the ecosystem, in particular for specific groups of species, areas particularly vulnerable to introduction and general habitat types.	- not applicable	- the use of alternative methods of cable protection in the form of stone chippings or concrete mattresses may provide an additional substratecan create habitat (reef effect), potentially favouring the appearance of alien species - the above-mentioned methods will be applied, inter alia, in areas of boulder fields, stonewalls (which cannot be avoided), so that the used bedding or mattresses will not differ in substrate quality from the parent substrate - this impact will be very local, limited to the locations of application of the above methods (chap.9.4.1., chap.9.4.2.). - the new substrate will be colonised by native species - typical of stony bottoms, which are very abundant in the ECI area, therefore the likelihood of alien species appearing is minimal and the impact should be considered insignificant. **- the impact will not cause deterioration of water status in terms of introduction of alien species**
4.	D3 - Maintain populations of all commercially exploited fish and shellfish within safe biological limits and distribute populations of	The aim is to maintain commercially exploited fish and shellfish populations within safe biological limits consistent with natural conditions by ensuring that all commercially exploited fish stocks are exploited at or below the maximum sustainable yield level ensuring that all commercially exploited fish are within safe biological limits, and by reducing or maintaining the exploitation of fish stocks at a level that ensures that their full reproductive capacity and full range of ages and individual sizes are maintained.	- during the construction works there will be no reduction or deterioration of the commercially exploited fish population in the area of the planned Project - in connection with the construction works, there will be a temporary reduction in the exploitation of fish	- there will be no reduction or deterioration of the commercially exploited fish population in the area of the planned Project during the exploitation stage - due to the establishment of a protection zone for the line by the Director of the Maritime Office in

No.	Feature	Environmental objective	Construction phase	Operation phase
	these fish and shellfish by age and abundance, indicative of its good condition.		within the 8 fishing squares through which it runs planned Project, - the impact will be local (within the boundaries of the ECI corridor) and of short duration - it will cease immediately after the completion of the works, therefore the impact should be considered insignificant - the area of the planned Project is of minor importance as a fishery for key species of economic importance (Chapter 9.11) - spawning grounds of economically important fish in the area are unlikely to occur - the impact will not cause deterioration of water status in terms of maintenance of commercially exploited fish populations	Gdynia cable, there will be a reduction in the use of bottom fishing gear in the area of the ECI location - this will be a permanent impact, of a local character and will not cause disturbance to commercially exploited fish populations, thus the impact should be considered insignificant - the area of the planned Project is of minor importance as a fishery for major commercially important species (Chapter 9.11) - the impact will not cause deterioration of water status in terms of maintenance of commercially exploited fish populations
5.	D5 - Minimised human-induced eutrophication, in particular its adverse effects such as biodiversitya loss, ecosystem degradation, harmful algal blooms and oxygen deficiency in lower water bodies.	Maintaining the inflow of annual nitrogen and phosphorus loads into the Baltic Sea by rivers and as atmospheric deposition below the maximum inflow values (MAI) established under the regional arrangement (HELCOM), which will allow a reduction of nutrient concentrations in the sea to levels not exceeding acceptable threshold values, which are in accordance with the recommendations of existing national and European Union legislation and guarantee the achievement or maintenance of good environmental status and do not cause adverse effects in the form of excessive algal growth, elevated concentrations of chlorophyll "a" in the water column, decreased transparency of seawater and oxygenation levels in the bottom waters, which consequently promote the proper development of pelagic and benthic habitats.	- not applicable	- not applicable
6.	D6 - Maintain the integrity of the seabed at a level that ensures that the structure and function of benthic ecosystems are protected and not	Reducing cumulative pressure on the seabed to a level that allows benthic habitats to function at near-natural levels.	- benthic ecosystems will be adversely affected during construction works, which will involve direct interference with the seabed and disturbance/destruction of habitats, mainly phyto and macrozoobenthos - it will be a direct, medium-term, reversible impact of local character -	- not applicable

No.	Feature	Environmental objective		Construction phase	Operation phase
	adversely affected in particular.			within the limits of the ECI corridor (chap. 9.4.1, chap.9.4.2.) - benthic habitats will recover within a maximum of 2 years and the level of biodiversity will be maintained by the presence of the same species in the Project area **- the impact will not cause deterioration of water status in terms of benthic ecosystem services**	
7.	D7 - Permanent change in hydrographical conditions that does not adversely effects marine ecosystems.	Criterion D7C1 (secondary): The spatial extent and distribution of permanent changes in hydrographical conditions (e.g. changes in wave activity, currents, salinity or temperature) of the seabed and water column associated in particular with the physical loss of the natural seabed.	Reducing pressures associated with permanent changes in hydrographic conditions.	- during the construction works there will be no changes in hydrographical conditions (including changes in wave and current activity) - hydrodynamics in the coastal zone will not be disturbed due to the planned trenchless passage using HDD technology (Chapter 9.1.), - Optionally, if a shorter trenchless passage is implemented and the bottom needs to be deepened in the shallow coastal zone for deeper excavation, there may be a short-term change in wave-current conditions due to modification of the bottom relief; however, given the dynamics of the area, the bottom should be expected to return to its original state before the cable was buried/submerged in a fairly short time - this impact will be local and short-lived, so it should be considered insignificant; **- the impact will not cause deterioration of water status in terms of hydrographic conditions**	- in case of application of alternative methods of cable protection in the form of surcharges or mattresses, local modification of currents in the nearest vicinity of the applied methods is possible - the impact will be very local, limited to the places of occurrence of the aforementioned objects and will not pose any threat to the coastal zone (Chapter 9.1.2.) - due to heat emission from the cables, there will be an increase in temperature only below the bottom surface - a local temperature increase of up to 20 cm below the bottom surface by up to 2ºC is possible; - for cables laid on the bottom, there will be no temperature change in the water column (Chap.9.10) - taking into account the above, these impacts are to be considered insignificant - impacts will not cause deterioration of water status in terms of the change of hydrographic conditions
8.		Criterion D7C2 (secondary):	Reducing cumulative pressures on habitats.	- not applicable	- not applicable

No.	Feature	Environmental objective		Construction phase	Operation phase
		Spatial extent of each benthic habitats types adversely affected (physical and hydrographic characteristics and associated biological communities) due to permanent alteration of hydrographical **con ditions**.			
9.	D8 - Maintaining concentrations of pollutants at levels that do not cause marine pollution.	Criterion D8C1 (primary): Within coastal and territorial waters and outside territorial waters, concentrations of pollutants do not exceed specified threshold values.	Reducing or maintaining at current levels inputs of pollutants from marine sources, including the application of measures to minimise releases of pollutants resulting from acute events, and land-based inputs into the marine environment in order to achieve or maintain concentrations of pollutants in biotic and abiotic components of the marine ecosystem at levels not exceeding acceptable threshold values, below which the likelihood of adverse effects of hazardous substances on marine organisms is minimal and which comply with the recommendations of applicable national and international legal instruments and which ensure that good environmental status is achieved or maintained.	- during the construction works the sediments will be disturbed and moved, thus remobilising labile forms of metals, nutrients and pollutants present in them - due to very low concentrations of the above-mentioned substances in sediments, released to the water-depth will not adversely affect water quality (Chapter 9.2.), therefore the impact should be considered insignificant **- the impact will not cause deterioration of water status in terms of pollution from marine sources**	- not applicable
10.		Criterion D8C2 (secondary): Species health and habitat condition (such as species composition of these habitats and relative abundance in long-term contaminated locations) have not been adversely affected due to contaminants, including through	Areas selected as vulnerable to long-term exposure to pollutants: the effects of pollutants on marine biota at different levels: molecular, cellular, tissue, organ, organism, individual, population including cumulative and synergistic effects are at a level that guarantees the correct functioning of organisms including the maintenance of normal physiological functions and thus guarantees the maintenance of the correct species structure and habitat range.	- not applicable	- not applicable

No.	Feature	Environmental objective		Construction phase	Operation phase
		cumulative and synergistic effects.			
11.		Criterion D8C3 (primary): the spatial extent and duration of significant acute pollution with polluting substances as defined in Article 2(2) of Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005 on ship-source pollution and on the introduction of penalties, including criminal penalties, for pollution offences (OJ L 255, 30.09.2005, p. 11, as amended), including oil and similar constituents, is minimised.	Polish sea areas defined by national borders: The occurrence of pollution emergencies involving pollutants as defined in Article 2(2) of Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005 on ship-source pollution and the introduction of penalties, including criminal penalties, for pollution offences, including oil and similar constituents, is reduced to a minimum through the implementation of appropriate measures at operational level and security systems.	- substances may be released during construction work pollutants as a result of: incidents at sea (collision, contact, grounding), oil spills, release of municipal waste or domestic sewage, release of biocidal substances, release of hazardous substances, - the probability of the occurrence of the above-mentioned events is extremely low, therefore the effects of the occurrence of the above-mentioned accidents are assessed as negligible - insignificant (section 14.1.) - in the event of a potential occurrence of the above mentioned events, appropriate measures will be implemented at the operational and protection system level in order to neutralise the pollution as soon as possible - the impact will not cause deterioration of water status in terms of pollution of the marine environment	- not applicable
		Criterion D8C4 (secondary): Negative effects of significant pollution of an acute nature on species health and habitat condition (such as their species composition and relative abundance) are minimised and, where possible, eliminated.	The impact of pollutants from releases resulting from acute events on the structure of species (listed in Table 1 of Part II of the Annex to Commission Decision 2017/848) and extent of habitats (listed in Table 2 in Part II in the Annex to Commission Decision 2017/848), is reduced to a minimum by implementing measures and safeguards to eliminate the occurrence of contamination of an emergency nature.	- as above **- the impact will not cause deterioration of water status in terms of pollution and its impact on species structure**	- not applicable
12.	Feature D9 - Maintain levels of	Reducing or maintaining at current levels the input of pollutants from various marine and terrestrial sources entering the marine environment in		- during the construction works the sediments will be disturbed and	- not applicable

No.	Feature	Environmental objective		Construction phase	Operation phase
	contaminants in fish and shellfish intended for human consumption, not exceeding the levels specified in standards or regulations for levels of these substances.	order to achieve or maintain concentrations of pollutants in fish and seafood intended for human consumption at levels not exceeding limit values that comply with the standards and recommendations of existing national and European Union legislation and that guarantee the safety of consumption and the achievement or maintenance of good environmental status.		moved, thus remobilising labile forms of metals, nutrients and pollutants present in them - due to very low concentrations of the above-mentioned substances in sediments, released to the water-depth will not adversely affect water quality (Chapter 9.2.), therefore the impact should be considered insignificant **- the impact will not cause deterioration of water status in terms of pollution of living organisms**	
13.	Feature 10 - Maintain waste characteristics and quantities at a level that does not cause harm to the marine, transitional and coastal water environment.	Reduce the amount of newly emerging and deposited solid waste in the marine environment, from a variety of terrestrial and marine sources, to levels that guarantee the proper functioning of the ecosystem, taking into account the natural resilience of the ecosystem, or to eliminate newly emerging waste altogether.		- waste generated during the construction stage will be collected and disposed of by specialised companies authorised to conduct this type of activity (Chapter 10.14) - there will be no pollution of the marine environment with waste - the impact will not cause deterioration of the condition of waters in the context of waste pollution	- not applicable
14.	Feature 11 - Maintain energy inputs, including undersea noise, at levels that do not adversely affect the marine environment.	Criterion D11C1 (primary): Spatial distribution, temporal range and levels of impulse sound in water associated with human activities do not reach levels that adversely affect marine animal populations.	Reducing the pressures associated with the temporal and spatial occurrence of impulse sounds in the sea associated with human activities, above levels that adversely affect marine animal populations.	- no impulsive noise will be generated during construction works - the impact will not cause deterioration of water status in terms of impulsive noise pollution	- not applicable
15.		Criterion D11C2 (primary): The spatial distribution, temporal range and levels of of continuous low-frequency sounds in the water associated with human activities do not reach levels that cause	Reducing the pressures associated with the temporal and spatial occurrence of continuous low-frequency sounds in the sea associated with human activities, above levels that adversely affect marine animal populations.	- continuous noise will be generated during the construction phase - the highest noise levels will be generated by a large cable plant (192 dB re µPa at a distance of 1m from the source). - noise levels generated during installation of the ECI will not	- not applicable

No.	Feature	Environmental objective		Construction phase	Operation phase
		adverse effects on marine animal populations.		significantly impact noise levels in the area of the planned Project (highest noise levels recorded in the Bornholm Basin areas - 140 dB re 1µPa and above) - noise levels generated during construction will have a moderate impact on fish (ch.9.4.3.) and mammals (ch.9.4.4.) and will be potentially negative, direct, simple and short term - will cease immediately after construction is completed **- impact will not cause deterioration of water status in terms of continuous noise pollution**	

Source: own elaboration on the basis of the Regulation of the Minister of Infrastructure of 25 February 2021 on the adoption of an updated set of environmental objectives for marine waters (Journal of Laws 2021, item 569)

The impacts of the planned Project on the current condition of the waters defined by individual marine ecosystem features (D1-D10), both during construction and operation, will be insignificant. The moderate to medium-term impacts (features D1 and D2) will be very local (related to the location of direct seabed intervention works) and reversible. Destroyed benthic habitats will be restored within approximately 2 years of the completion of the works and the presence of the same benthic habitats in the ECI area will allow recolonisation and restoration of the habitat structure to the state prior to the Project.

In view of the above, it should be concluded that there will be no deterioration of the current water status of the Bornholm Basin Sub-areas 36 Open Waters and 38 Polish Coastal Waters of the Bornholm Basin during either the construction or operational phase. Therefore these impacts should be considered **insignificant**.

9.3.3. Impact on WFD environmental objectives for coastal waters

The analysis of the impact of the planned Project on the overall status and environmental objectives of the coastal waters, established in accordance with the WFD, has been performed with reference to the most recent monitoring results, based on the results of biological, hydromorphological and physicochemical elements of the waters, obtained as part of the monitoring of the Chief Inspectorate of Environmental Protection (according to the classification in effect as of January 1, 2022).

The water levels of two water bodies within the JCWP Polskie wody przybrzeżne Basenu Bornholmskiego, within which the planned Project is located, were taken into account and is unlikely to interfere with CW20001WB2 Polish coastal waters of the Gotland Basin, as only a small portion of the IP corridor enters this coastal water body (figure 9.10.).

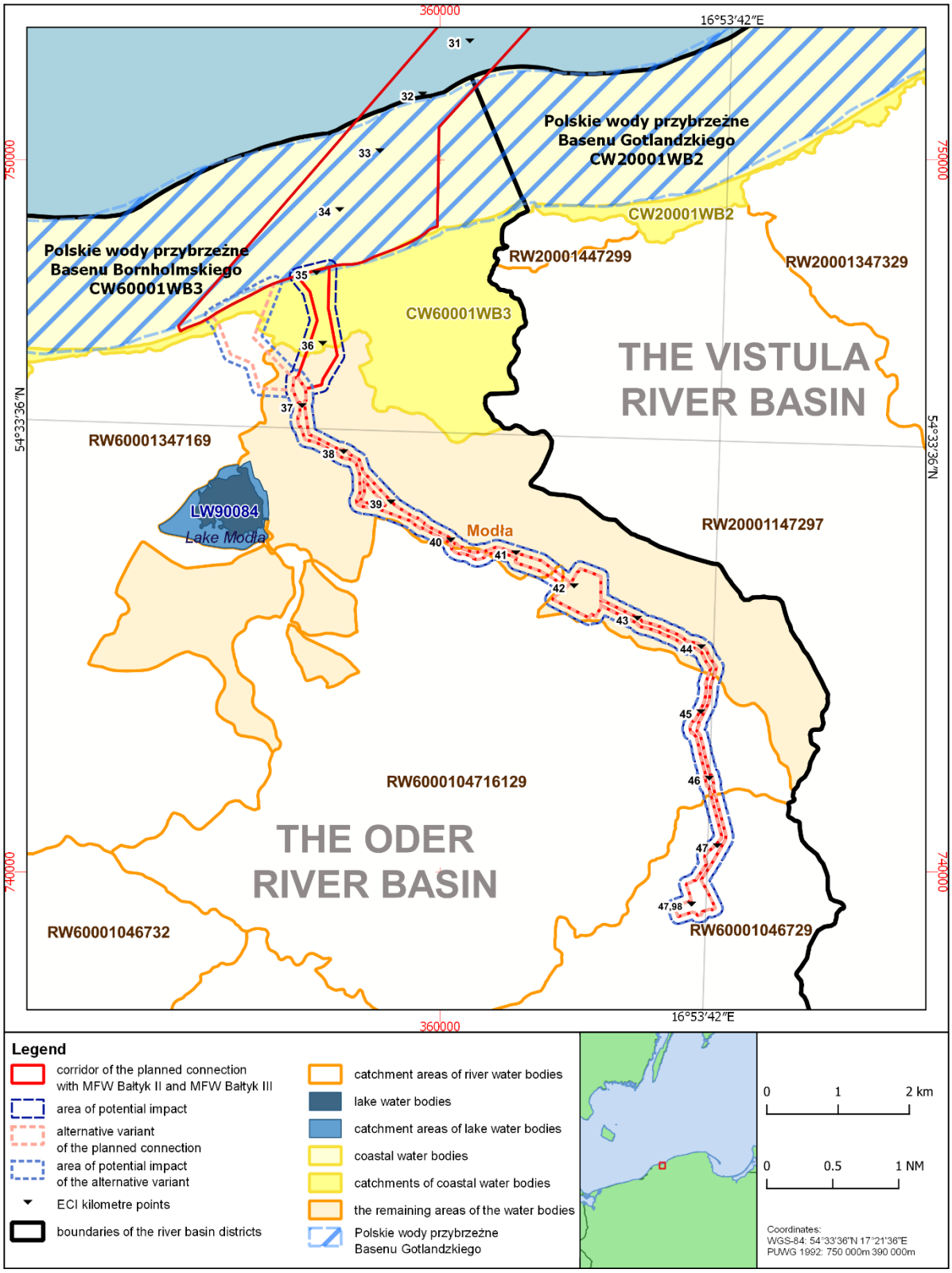


Figure 9.10. *Planned Project in the catchment areas of coastal and surface water bodies*

Source: own elaboration based on IIaPGW https://apgw.gov.pl/pl/III-cykl-materialy-do-pobrania

The coastal waters within the JCWP CW60001WB3 Polskie wody przybrzeżne Basenu Bornholmskiegoare characterized by poor overall condition. The ecological potential status is poor, and the chemical status is below good (table 9.8).

Table 9.8. *Assessment of the status of the water body Rowy - Jarosławiec Zachód based on monitoring results 375*

Name	JCWP CODE	Status JCWP	2017-2021						JCPW environmental goal for 2022-2027	
			Biological elements	Morphological elements	Physico-chemical elements	Ecological status/potential	Chemical status	General condition	Ecological status/potential	Chemical status
			Class	Class	Class					
Polskie wody przybrzeżne Basenu Bornholmskiego	CW60001WB3	NAT	V	I	>II	poor	below good	bad	moderate	good

NAT- natural water body; I - very good/maximum potential, II - good status/potential, III - moderate status/potential, IV - poor status/potential, V - poor status/potential

Source: own elaboration based on https://wody.gios.gov.pl/pjwp/publication/COAST_WATERS/108

[375] *https://wody.gios.gov.pl/pjwp/publication/COAST_WATERS/108*

The environmental objective for the JCWP *CW60001WB3 Polskie wody przybrzeżne Basenu Bornholmskiego* is to achieve moderate ecological status and good chemical status. In the context of the Natura 2000 protected area Przybrzeżne wody Bałtyku PLB990002 located within the JCWP, the main objective is to maintain or restore the proper status of the objects of protection, i.e. wintering and migratory bird species: razorbill - *Alca torda*, black guillemot - *Cepphus grylle*, long-tailed duck - *Clangula hyemalis*, herring gull - *Larus argentatus*, velvet scoter - *Melanitta fusca*, common scoter - *Melanitta nigra*.

Therefore, the assessment of the impact of the planned Project was made with the assumption of "no deterioration" of the current state of the waters, with respect to quality elements for the classification of the ecological status of the water body. In addition, the impact of the ECI on the objectives for the Natura 2000 protected area Przybrzeżne wody Bałtyku PLB990002 was assessed.

In the table below, next to the individual quality elements for the classification of the ecological status of the watercourse, the potential impact of the planned Project, both in the construction and operation stages, is analysed (table 9.9.).

Impact on the objectives of the Polskie wody przybrzeżne Baseny Bornholmskiego JCWP for the Przybrzeżne Wody Bałtyku protected area Natura 2000

Due to the poor general condition of the coastal waters of the JCWP Polskie wody przybrzeżne Basenu Bornholmskiego, for the Natura 2000 protected area PLB990002 Przybrzeżne Wody Bałtyku, the objectives related to the maintenance or restoration of the proper status of the objects of protection - species of wintering and migratory birds were determined: razorbill - *Alca torda*, black guillemot - *Cepphus grylle*, long-tailed duck - *Clangula hyemalis*, herring gull - *Larus argentatus*, velvet scoter - *Melanitta fusca*, common scoter - *Melanitta nigra*.

Of the aforementioned birds, species such as razorbill, black guillemot, European herring gull and velvet scoter are scarce in the area of the planned ECI, in the range of JCWP Polskie wody przybrzeżne Basenu Bornholmskiego. The proportion of each does not exceed 0.1% in the seabird grouping. In addition, no common scoters and long-tailed ducks are found here - despite its clear dominance in the species composition of avifauna occurring in the area of the planned Project (Chapter 9.5.). Therefore, both the construction and operation of the planned Project will not impact the above mentioned species and their associated targets. Due to the small scale of habitat interference in the Przybrzeżne Wody Bałtyku PLB990002 area, located within the boundaries of the JCWP Polskie wody przybrzeżne Basenu Bornholmskiego and the proximity of water bodies with an abundant food base, this impact should be considered **insignificant.**

Table 9.9. *Assessment of impacts on specific quality elements of the CW60001WB3 Polskie wody przybrzeżne Basenu Bornholmskiego JCWP water body*

Quality elements for the classification of the ecological status of the waterbody		**Current assessment of water status**	**Construction stage**	**Operation stage**
Biological elements	- composition, abundance and biomass of phytoplankton, - composition and abundance of other aquatic flora (macroalgae and angiosperms), - composition and abundance of benthic macro-invertebrates	Class V (poor condition)	- construction works on the area of approx. 0.04 km², to a maximum of 0.1 km² (if a shorter trenchless passage is implemented and deeper excavations are made) there will be direct interference with the bottom and habitat disturbance/destruction, exclusively of macrozoobenthos (no macroalgae found). - This will be a direct, medium-term, reversible, local impact within the ECI corridor (Section 9.4.2). - the benthic habitats will recover within a maximum of 2 years and it will be possible to maintain their structure and abundance due to the presence of the same species in the Project area - in view of the scale of the seabed intervention works and the possibility of habitat restoration the impact should be regarded as insignificant **- the impact will not cause a deterioration of the condition of the biological elements of the waters**	- due to heat emission from the cables there will be an increase in temperature below the bottom surface - a local temperature rise of up to 20 cm below the bottom surface of up to 2ºC is possible, which may affect benthic organisms - taking into account the depth at which most of the infauna species living in the POM live (up to approx. 10 cm) and the decrease of temperature with the distance from the cable, it should be concluded that the impact of temperature on macrozoobenthos will be insignificant (Chapter 9.4.2., Chapter 9.10.) **- the impact will not cause deterioration of biological water elements**
Hydromorphological elements	Morphological conditions: - depth variability, - structure and composition of the substrate.	Class I (very good condition)	- in the course of cable laying works, the surface and bottom structure will be disturbed - in the case of disturbance of the bottom structure in the coastal zone (reef zone) - formed at the stage of implementation of deeper excavations - to go beyond the last reef, taking into account the dynamics of the area (the action of waves and currents), it is expected that the bottom will return to its original state before the cable was buried in a short time (within a few days to weeks) (section 9.1.1.), - despite the interference with the deep structure of the seabed, there will be no change in composition of the subsoil, only mixing of sediments of different lithology - the impact will be of local character and will be limited to the area of excavation (1.5 m wide strip for one cable line); optionally on a short stretch - with a width of 20 m)(Chapter 9.2.) - taking into account the scale of the seabed intervention works, the above mentioned impacts should be considered insignificant **- the impact will not cause deterioration of hydromorphological elements of waters**	- in the case of alternative methods of cable protection in the form of surcharges or mattresses, local changes in the structure and composition of the substrate are possible - due to the fact that the above-mentioned methods will be applied, among others, in areas of boulders, stones (which cannot be avoided), they will not deviate in quality from the parent substrate. - the impact will be very local, limited to the places of occurrence of the aforementioned objects (Chapter 9.1.2.) and therefore it should be regarded as insignificant **- the impact will not cause deterioration of hydromorphological elements of waters**
	Other: - tidal regime, - direction of prevailing currents,		- there will be no changes in hydrodynamic conditions (including changes in wave and current activity) during construction works	- in the case of applying alternative methods of cable protection in the form of surcharges or mattresses, local modification of currents in the immediate vicinity of the applied methods

	- exposure to waves		- hydrodynamic conditions in the coastal zone will not be disturbed due to the planned trenchless passage using HDD technology (Section 9.1.1.) **- the impact will not cause deterioration of hydromorphological elements of waters**	is possible - the impact will be very local, limited to the places of occurrence of the aforementioned objects (Chapter 9.1.2.), and therefore it should be regarded as insignificant **- the impact will not cause deterioration of hydromorphological elements of waters**
Physico-chemical elements	General: - transparency, - thermal conditions, - oxygen conditions, - salinity, - acidification, - nutrients	Class > II (good condition)	- construction works will result in turbidity of the water table and change of water transparency - the maximum range of water turbidity will be from approximately 1 km to 8 kilometres from the works, the maximum concentration (30 mg/l) will occur in the trench immediate surroundings , the maximum duration of turbidity will not exceed 4 hours, - the impact will be direct, short-term, reversible, cross-local and the magnitude of the concentrations will be similar to naturally occurring storm conditions and therefore the impact should be considered insignificant (Chapter 9.2.) - During the construction works the sediments will be disturbed and moved, and thus the nutrients - nitrogen and phosphorus - present in them will be remobilised, - the concentration values of nutrients in the sediments of the ECI area are typical for the sandy sediments of the southern Baltic Sea and the amount of nutrients that will be released (after laying of the 6 cable lines) to the water depths as a result of remobilisation will be much smaller compared to the annual load of N and P carried with rivers to the Baltic Sea (Chapter 9.2.1.) - therefore the impact should be regarded as insignificant **- the impact will not cause deterioration of the status of physicochemical elements of waters**	- not applicable
	Substances particularly harmful to the aquatic environment: - specific synthetic and non-synthetic pollutants (Formaldehyde fluorides, volatile phenols, petroleum hydrocarbons, free cyanides, bound cyanides; elements: As, Ba, B, hexavalent Cr, total Cr, Zn, Cu, Al, Mo, Se, Ag, Tl, Ti, V, Sb, Be, Co)		- during construction works there may be a release of pollutants as a result of: events at sea (collision, contact, grounding), oil spills, release of municipal waste or domestic sewage, ingress of biocidal substances, release of hazardous substances, - the probability of the occurrence of the above-mentioned events is extremely low, therefore the effects of the occurrence of the above-mentioned accidents are assessed as negligible - negligible (Chapter 14.1.) - in the event of a potential occurrence of the above-mentioned events, appropriate measures will be implemented at operational and safety system level to neutralise the contamination as soon as possible - during the construction works the sediments will be disturbed and agitated, thus remobilising the contaminants present in them: heavy metals, PAHs, PCBs,	- not applicable

			- concentrations of heavy metals in surface sediments from the ECI area, i.e. Pb, Cu, Zn, Ni, Cr, in bound and mobile form are at a very low level, while in the case of As - at the trace level, generally below the lower limit of quantification, the concentration values of PAHs and PCBs are typical for the sandy sediments of the southern Baltic, and the amount that will be released into the water depths as a result of remobilization will be much smaller compared to the annual load of the above substances carried with rivers into the Baltic Sea (Chapter 9.2.) - therefore the impact should be regarded as insignificant - **the impact will not cause deterioration of the status of physicochemical elements of waters**	
Ecological status/potential	Classified on the basis of aggregated measurement data obtained from physico-chemical, biological and hydromorphological elements at a representative sampling point within the framework of diagnostic monitoring or operational monitoring	poor	Due to the insignificant impacts of the planned Project during the construction stage, **there will be no deterioration of the ecological status/potential of the waters**	Due to the insignificant impacts of the planned Project during the operation phase, **there will be no deterioration of the ecological status/potential of the waters**
Chemical status	Classified on the basis of concentrations of specific synthetic pollutants, using acute and chronic toxicity data, both for taxa specific to the surface water type and for other taxa of aquatic organisms for which data are available, in particular for algae and macrophytes, fish and daphnia and organisms representative of saline waters	Below good	Due to the insignificant impacts of the planned Project during the operation stage**, there will be no deterioration in the chemical status of the waters**	Due to the insignificant impacts of the planned Project during the operation phase, **there will be no deterioration in the chemical status of the waters**
General condition	Classified on the basis of chemical status and ecological status/potential	bad	Due to the insignificant impacts of the planned Project during the construction phase, **there will be no deterioration of the overall water status**	Due to the insignificant impacts of the planned Project during the operation phase, **there will be no deterioration of the overall water status**

Source: based on: OJ. 2017 item 1566 - Regulation of the Minister of Infrastructure of 25 June 2021 on the classification of ecological status, ecological potential and chemical status and the method of classifying the status of surface water bodies, as well as environmental quality standards for priority substances - with annexes

As a result, there will be no deterioration in the current overall status of JCWP Polskie wody przybrzeżne Basenu Bornholmskiego, thus both the construction and operation of the Project will not affect the achievement of objectives aimed at maintaining or restoring the proper conservation status of coastal waters.

9.3.4. Overall summary of impact on water

Having analyzed the potential impact of the planned Project on marine waters, taking into account such aspects as: interference with the seabed causing agitation of bottom sediments and increasing the content of suspended solids in the water during construction work, related to clearing the area for laying and burying/plunging the cable lines, remobilization of possible contaminants of bottom sediments (e.g., biogens, metals), destruction or disturbance of habitats of marine organisms, periodic emission of underwater noise from ships and equipment necessary for laying cable lines, it was found that in most cases the scale of these impacts will be small, and the impacts will be insignificant. The planned Project will have no impact on either the status or the achievement of the environmental objectives for the open water areas of the Bornholm Basin, the Polish coastal waters of the Bornholm Basin, or the JCWP Polskie wody przybrzeżne Basenu Bornholmskiego water body. A summary of the assessment of the significance of impacts during the construction and operational phases is summarised in the tables below.

Construction phase

Summary of the assessment of the significance of the impacts of the planned Project on marine waters and environmental objectives - **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Straight	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was 10, meaning that **impacts on marine waters and environmental objectives will be insignificant**.

Operation phase

Summary of the assessment of the significance of the impacts of the planned Project on marine waters and environmental objectives - **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Straight	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(11) insignificant**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **11**, meaning that impacts on marine waters and environmental objectives **will be insignificant**

9.4. IMPACT ON WILDLIFE

This chapter analyses the potential impact of the planned Project on marine biotic resources during the construction and operational phases, with reference to the sensitivity of the identified species and their habitats in the ECI area. A list of potential impacts is presented in table 9.10.

Table 9.10. *Matrix of potential impacts of the planned Project during the construction and operation phases*

Project phase	Impact	Phytobenthos	Macrozoobenthos	Fish	Mammals	Birds	Sand hopper
Construction phase	increase in suspended solids concentration						*n.i.*
	disturbance of sediment structure/habitat destruction			*n.i.*	*n.i.*	*n.i.*	*n.i.*
	obstruction/restriction of feeding grounds/habitat change	*n.i.*	*n.i.*			*n.i.*	*n.i.*
	remobilisation contaminants from sediment					*n.i.*	*n.i.*
	exhaust gas emissions	*n.i.*	*n.i.*	*n.i.*	*n.i.*		*n.i.*
	noise and vibrations	*n.i.*	*n.i.*				*n.i.*
	increased vessel traffic (spatial blockage)	*n.i.*	*n.i.*				*n.i.*
Operation phase	habitat change	*n.i.*	*n.i.*		*n.i.*		*n.i.*
	reef effect (stone dumping/concrete mattress)			*n.i.*	*n.i.*	*n.i.*	*n.i.*
	exhaust gas emissions	*n.i.*	*n.i.*	*n.i.*	*n.i.*	*n.i.*	*n.i.*
	noise and vibrations	*n.i.*	*n.i.*			*n.i.*	*n.i.*
	electromagnetic field	*n.i.*				*n.i.*	*n.i.*
	heat	*n.i.*		*n.i.*	*n.i.*	*n.i.*	*n.i.*
	increased vessel traffic (spatial blockage)	*n.i.*	*n.i.*	*n.i.*		*n.i.*	*n.i.*

orange area - potential impact
n.i. - no impacts
Source: In-house study

During the construction phase, bottom preparation, cable laying followed by plunging/burial (and optionally with storage of excavated material) will disrupt the bottom structure and overlying sediments and thus destroy habitats, both phyto- and zoobenthic. During cable burial/plunge and optional spoil discharge, sediment re-suspension and remobilisation of contaminants will occur, potentially affecting water status and thus the living organisms that inhabit it. Changes in environmental conditions will entail periodic changes in the availability of food resources (hindering/restricting feeding grounds) and contribute to temporary habitat changes. Noise and exhaust emissions will occur during the works, and the vessels involved in the works will be a spatial barrier to the migration routes of birds and the migration routes of bi-environmental fish living in the coastal zone in the ECI area.

The operation phase will be related to electromagnetic field and heat emissions generated by the submarine cables. The use of alternative methods of cable protection - stone dumping or concrete mattresses - will contribute to the creation of new habitat – reefs. Backfilling and temporary destruction of benthic habitat will occur at the dredged material disposal site. Considered as a positive action as it can lead to an lost of existing habitats and the creation of new ones in their place artificially created reefs. Habitats destroyed during the construction phase will be successively restored and, due to the species abundance found around the ECI, it will take approximately 5-6 years for the habitat to settle

and reach near maturity, although the first signs of recolonisation of zoobenthos individuals will probably be visible within a few weeks or so, and the first macroalgae are expected as early as the first growing season.

The impact assessment for individual components of the marine environment is presented in chapters 9.4.1 - 9.4.6 of this Report. It was conducted in accordance with the methodology adopted for the purposes of the Report (Subchapter 1.4.).

The potential impact of the planned Project in terms of pollution of the marine environment (including abiotic and biotic components) arising at the stage of construction and operation is caused by:

- spillage of petroleum substances (e.g. spills as a result of refuelling, ship collisions),
- ingress of biocidal substances,
- release of municipal waste or domestic sewage,
- release of hazardous substances (chemical weapons),
- uncontrolled explosion.

Due to the very low probability of the event, the impact is to be considered insignificant - negligible (Subchapter 14.1.). Therefore, it has been disregarded in the assessment of impacts on individual biotic components of the marine environment.

9.4.1. Phytobenthos

This chapter analyses the potential impact of the planned Project on the phytobenthos during the construction and operational phases for species identified in the area of the planned Project, including protected species and species forming habitat for zoobenthos and fish.

The conducted surveys showed that macroalgae in the area of the planned Project mostly occur in residual form or as single, small specimens very sparsely distributed on the bottom (bottom macroalgae cover is < 1%, i.e. one to a few specimens along the ROV runway of min. 150 m).

The areas of highest conservation value within the corridor IC, due to the presence of rare and protected plants (Furcellaria lumbricalis and Ceramium diaphanum rosacea, as well as two other species rare in the Polish Maritime Areas: Coccotylus truncatus and Rhodomela confervoides) and the local high degree of macroalgae coverage of the bottom, are located only within the corridor designated for the construction of the connection of MFW Bałtyk II in the section from km 7BII to 12BII and in the rocky area from km 3.54BII to the shallowest part of the buffer zone of the MFW Bałtyk II area (squares 21 and 22). The most valuable vegetation communities are concentrated in three locations along the Bałtyk II ECI route, where coverage reaches 80-90%. Within the borders of the ECI corridor connecting the offshore wind farm MFW Bałtyk III with the shore, no valuable sites in terms of phytobenthos were found (figure 9.11). Therefore, the assessment only concerns the connection from the offshore wind farm MFW Bałtyk II, i.e. two cable lines.

In the context of phytobenthic habitats inventoried throughout Ławica Słupska, the planned corridor is characterized by inferior habitat parameters (sandy sediment, stones and boulders that do not form clusters), quantitative (biomass) and qualitative (taxonomic composition), in relation to the most valuable phytobenthic communities of Ławica Słupska (habitat 1170) - figure 9.11.

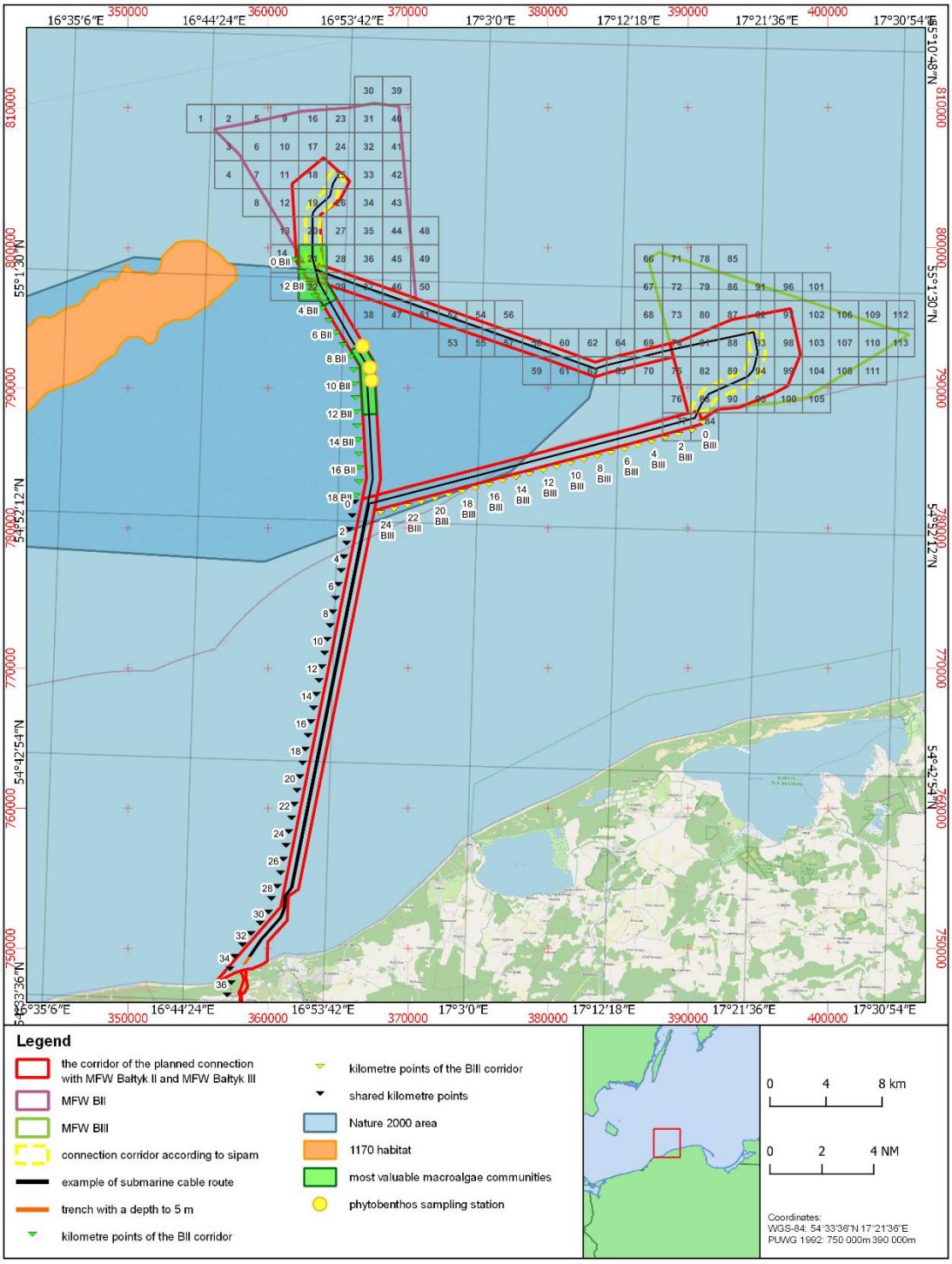


Figure 9.11. *Occurrence of macroalgae within the area of the planned Project on the background of the most valuable phytobenthos habitats of Ławica Słupska - i.e., habitat 1170*

Construction phase

Potential construction impacts of the proposed Project on phytobenthos will be related to:

- disturbance of sediment structure/habitat destruction,
- increase in suspended solids concentration,
- remobilisation of contaminants from sediment.

Disturbance of sediment structure/habitat destruction

During construction works associated with the bottom preparation and the cable burial/plunge, phytobenthos will be removed and, in connection with spoil deposition, backfilled. This may lead to a temporary reduction in biomass and temporarily affect the habitat and food base for invertebrates, fish and birds.

These changes will be most evident in the immediate area of the works, i.e. in the area of excavation (up to 1.5 m wide for each cable line), and to a lesser extent in the area where the bottom cleaning works will be carried out (a strip up to approximately 5 m wide for each cable line). The estimated area of the potential phytobenthos occurrence area in the ECI corridor is 11.43 km^2. The area of direct interference in the phytobenthos occurrence area during the bottom cleaning and burial/plunge works for the two cable lines (total interference zone of 10 m) will cover 0.09 km² of the bottom, which represents 0.79% of the valuable area of phytobenthos, thus occupying 0.08% of the area of the planned Project for the MFW Bałtyk II corridor (table 9.11.).

In the context of phytobenthic habitats inventoried in the area of Ławica Słupska[376], the area through which the planned ECI corridor runs is characterised by worse habitat parameters (sandy sediment, stones and boulders not forming clusters), quantitative parameters (biomass) and qualitative parameters (taxonomic composition), in relation to the most valuable phytobenthic communities of Ławica Słupska (habitat 1170) (table 9.11.).

Table 9.11. *Area of the seabed intervention works in areas of special value due to phytobenthos occurrence, within the corridor of the planned Project*

	Project area in the Bałtyk II corridor [km²].	**Area of phytobenthos occurrence in the corridor of MFW Bałtyk II [km²].**	**Area of phytobenthos occurrence in the corridor of MFW Bałtyk II [%].**
MFW Bałtyk II corridor covered by the Report	109.27	11.43	10.46
Area of the seabed intervention in an approx. 10 m wide strip (2 cables *5 m strip of the seabed)	2.39	0.09	0.08 (0.79% of the area favorable for phytobenthos)

Once the construction work is completed, the overgrowth of the stony bottom with phytobenthos may already start in the first growing season. However, the recovery of phytobenthos communities consisting of rare and protected species and/or those characterised by a high degree of the seabed cover by macroalgae will most probably take several years. However, this is possible due to the presence of the same species also in other areas of Ławica Słupska.

In summary, it can be concluded that in terms of disturbance of sediment structure and habitat destruction in relation to phytobenthos, this will be a direct, medium-term impact of the local extent and will be **moderate.**

Increase in suspended solids concentration

During construction work, due to sediment disturbance, organic matter, nutrients and pollutants accumulated in the sediment are released into the water column and will be transported away from the work site, following the prevailing direction of currents, and deposited on the bottom as a layer of several millimetres. The increase in suspended matter in the water column and its deposition has an impact on light penetration and consequently on primary production, among other things, in kelp.[377]

Macroalgae in the Project area occur at great depths (15-21 m), where light input is limited, and an increase in suspended solids may further deteriorate this condition. However, given the short-term (to approx.1 day), increased suspended matter content in the water and the coverage of the plants by a sediment layer not exceeding 1 mm, the survival and primary production of phytobenthos should not be

[376] *Michałek et al. 2020*
[377] *Riul et al. 2008*

affected. Therefore, it can be concluded that in the context of increased suspended solids concentration, in relation to phytobenthos, this will have a direct, short-term, localised and therefore insignificant impact.

Remobilisation of contaminants from sediment

During construction works, due to sediment disturbance, contaminants and nutrients accumulated in the sediment are released into the water column, leading to an increase in the concentrations of these compounds in the water. The change in environmental conditions may result in a decrease in the abundance/biomass of pollution-sensitive species (rare and protected species found in the ECI area) and an increase in the biomass of undesirable species.

As the concentrations of both heavy metals and other pollutants (including PAHs and PCBs) are at very low levels in the surface sediments of the planned Project, water quality will not worsen during construction works.

The impact associated with the release of pollutants and nutrients from the sediment into the water will be a direct, short-term, local and, therefore, **insignificant** impact.

Summary of the assessment of the impact on phytobenthos:

Summary of the assessment of the significance of the negative impact of the planned Project of MFW Bałtyk II on phytobenthos during the **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Medium-term	**(2)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
High	**(5)**
Impact classification	**(14) moderate**

The total sum of the impact weights identified for the construction phase of the planned ECI was **14**, meaning that the **impact on phytobenthos during the construction phase will be moderate**.

For the connection of MFW Bałtyk III and the connector, no impact was identified.

Operational phase

During the operation of the planned Project, when cables are buried in the bottom, the impact on phytobenthos will be neutral, as the existing habitat conditions will not change.

Negative impacts may only occur in small areas of the seabed where alternative methods of securing the cable in the form of stone surcharge or concrete mattresses are used; such methods are considered for hard bottom where it will not be possible to lay cables in the bottom.

Once a stone dumping has been created or a concrete mattress has been applied, colonisation of this new artificially created habitat by both primary and secondary producers will occur. Overgrowth of stony bottoms with phytobenthos can start as early as the first growing season. However, the restoration of phytobenthos communities, consisting of rare and protected species and/or characterised by a high degree of the seabed cover by macroalgae, will most probably take several years. However, this is possible due to the presence of such species in other areas of Ławica Słupska.

The impact associated with the creation of a stone dumping or the application of a concrete mattress in the bottom zone with a depth not exceeding < 25 m will be direct, local, long-term. In terms of the impact on phytobenthos, this effect should be considered local and insignificant.

Summary of the assessment of the significance of negative impacts of the planned MFW Bałtyk II Project on phytobenthos - **operational phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Medium-term	**(2)**

Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
High	**(1)**
Impact classification	**(10) insignificant**

In conclusion, the possibility of negative impacts on phytobenthos in operational phasein the bottom was not identified. Potential negative, insignificant impacts of the planned Project may only occur if alternative methods of cable protection are applied, which the Investor will implement only in case of the impossibility of bury the cable.

9.4.2. Macrozoobenthos

This chapter analyses the potential impact of the planned Project on the macrozoobenthos during the construction and operational phases, with reference to the species and benthic communities identified in the area of the planned Project, including species important for fish and birds.

Construction phase

The potential impact of the construction of the planned Project on macrozoobenthos will be related to:

- disturbance of sediment structure/habitat destruction in a strip of up to 20 m width for each cable line,
- an increase in suspended solids concentration,
- remobilisation of contaminants from sediments.

Disturbance of sediment structure/habitat destruction

During construction works associated with bottom preparation and cable plunge/burying, removal of benthic assemblages will occur and at the site of excavation.[378] Changes in benthic communities usually relate to species composition, in favour of opportunistic species, species richness, density, biomass, changes in trophic groups or productivity.[379][380]

The survival rate of burrowed animals depends, among other things, on the thickness of the layer or type of sediment, as well as on the animals' ability to move vertically in the sediment.[381] [382] [383] In laboratory studies, animals were found to be more active after burrowing. The Macoma balthica reached the speed of 0.37 - 3.89 cm-d^{-1} towards the surface, while *Mya arenaria* reached 8.0 cm-d^{-1}, and the bivalves were able to burrow from even under 30-40 cm of sediment. However, the survival rate of the buried animals was relatively low (not exceeding 33%) and depended on the species and the thickness of the sediment.[384] Studies have shown that mussels belonging to the epifauna, which attach themselves to the substrate with byssal threads and feed on suspended organic matter, have limited escape and are susceptible to be buried.[385] Large individuals of the mussel, *Mytilus edulis*[386], are able to burrow out from under a 3-4 cm layer of sediment by pulling themselves up on byssal threads. However, other studies have shown that only a few mussels are able to escape from under the sediment (<20% of the tested individuals), regardless of sediment type and burial time, and that the sediment layer from under which they were able to burrow was <2 cm.[387]

The destruction of the seabed by the creation of the trench will result in the loss of zoobenthos in these areas, and this may result in a temporary deterioration of feeding conditions and a reduction in the food base for fish and birds. These changes will be most evident in the immediate area of the works, i.e. in the area of the average 1.5 m wide excavation (to a maximum depth of 5 m), and to a lesser extent

[378] *Stronkhorst et al. 2003*
[379] *Newell et al. 1998*
[380] *Dannheim et al. 2019*
[381] *Essink 1999*
[382] *Powilleit et al. 2009*
[383] *Hutchison et al. 2016*
[384] *Powilleit et al. 2009*
[385] *Kranz 1974*
[386] *The current name of the species in the Baltic is Mytilus trossulus*
[387] *Hutchison et al. 2016*

in the area where the works will be carried out, including, inter alia, the cleaning of the bottom, the movement of equipment laying the cable and the placement of excavated material. Overall, the impact associated with bottom disturbance (a strip approximately 5 m wide for each cable), will affect less than 2.5% of the area of the bottom with a high biomass of benthic animals inhabiting both soft (>500 g-m^{-2}) and rocky (>1000 g-m^{-2}) bottoms (figure 9.12.), which are potential sites of particular favourable feeding for fish and birds. In total it will be approximately 0.23% of the bottom area of the ECI corridor (table 9.12.).

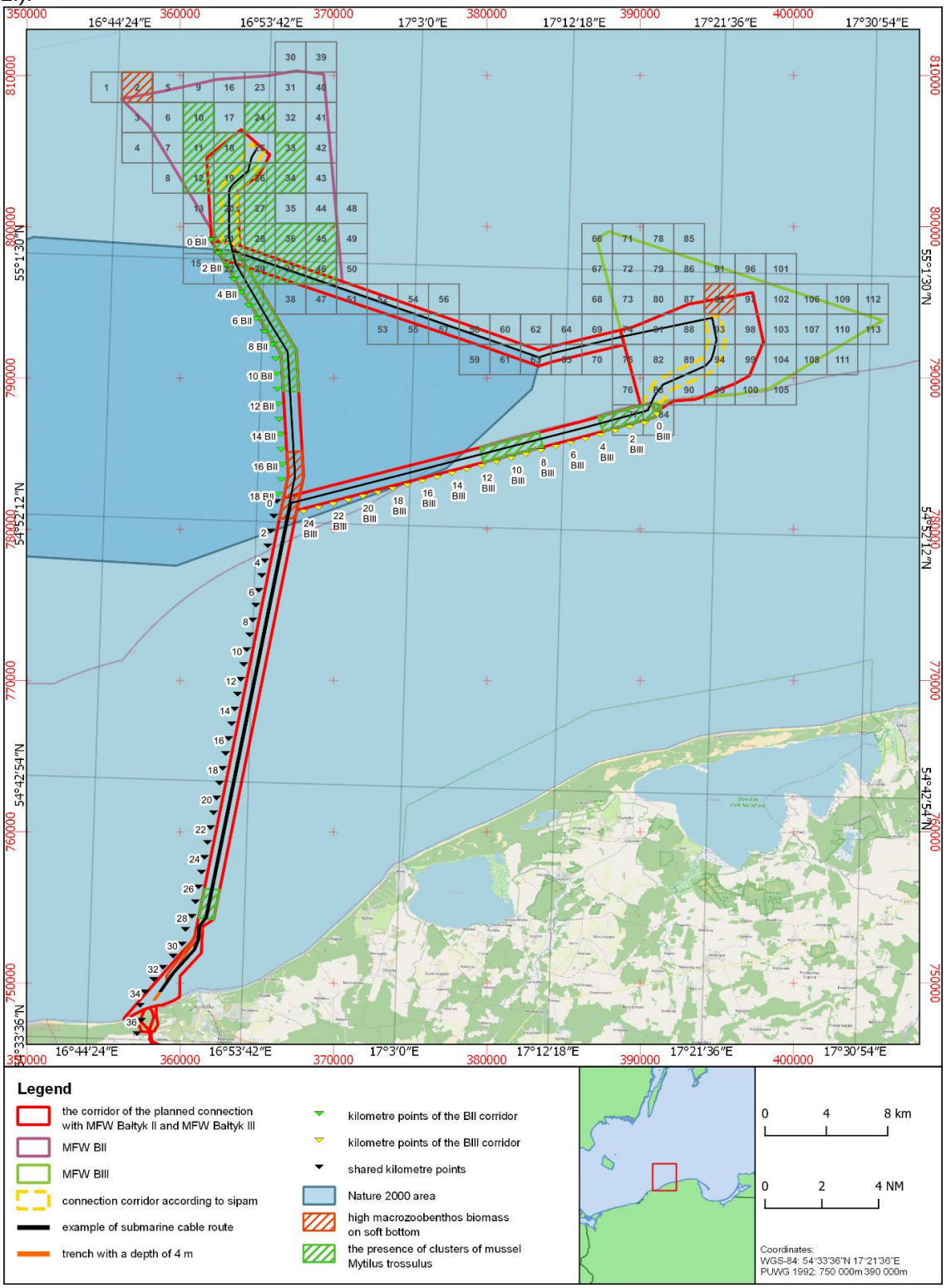


Figure 9.12. *Macrozoobenthos occurrence on soft and hard (rocky) seabed within the planned Project*

Table 9.12. *Seabed intervention works in areas of particular value due to high macrozoobenthos biomass on soft and groupings of mussels on the rocky bottoms, within the corridor of the planned Project*

		MFW Bałtyk II [km²]	MFW Bałtyk III [km²]	Connector between farms [km²]	Total area [km²]	Total area [%]
Area of the Project within the boundaries of the corridor under the ED application [km²].		73.03 + 36.24 (in the common part of the corridor)	35.71 + 36.24 (in the common part of the corridor)	29.65	174.63	100
Soft bottom	Area with high macrozoobenthos biomass (> 500 g-m^{-2}) [km²]	2.94 + 1.52 (in the common part of the corridor)	1.52 (in the common part of the corridor)	-	4.46	2.6
	Area of seabed intervention in a strip of approximately 40 m wide (2 cables* 20 m bottom strip), in an area of high macrozoobenthos biomass	0.04	0.016	-	0.06	0.03 (1.26% of the area of high macrozoobenthos biomass)
Hard rocky bottom	Area where clusters of mussels were observed	17.49 + 1.96 (in the common area of the corridor)	7.84 + 1.96 (in the common area of the corridor)	6.45	33.74	19.32
	Area of seabed intervention in a strip of approximately 40 m wide (2 cables*bottom strip 20 m), in an area of very high mussel biomass	0.19	0.1	0.07	0.36	0.2 (1.07% of area with high mussel biomass)

In the event that dredged material storage is required (if deeper excavation is necessary in the sub-bottom zone), the impact will be limited to the dredged material disposal site, i.e. an area of the bottom of approximately 0.1 km², located between 32 and 30 km of the ECI corridor, at a depth of 10-12 m, east of the MFW Bałtyk II cable lines and/or east of the MFW Bałtyk III cable lines. However, given that the planned discharge site is located outside valuable areas with high biomass of soft-bottom macrozoobenthos and mussel assemblages, dredged material disposal should not have a significant impact on the benthic organisms of this part of the bed.

After the construction phase, recolonisation of the area will occur, by animals living in neighbouring areas. Studies show the possibility of rapid recolonisation by opportunistic species, including polychaetes, thus causing a change in the species composition of benthic communities.[388] [389] Full recolonisation typically takes between 12 months and 4 years, and up to 5-10 years for benthic assemblages consisting of slow-growing species.[390] [391] In the ECI area, the size structure of the Baltic macoma *Macoma balthica* was dominated by large specimens, i.e. with shell lengths of 1 to 2 cm, with

[388] *Newell et al. 1998*
[389] *Coates et al. 2015*
[390] *Rosenberg 1976*
[391] *Newell et al. 1998*

a maximum length of 2.5 cm (Volume III, Attachment 1.5). In the Gdansk Bay area, the size of the Baltic macoma was similar and the age of the largest was determined to be around 10 years.[392]

The recovery of the assemblage depends, among other things, on the size of the area where the work is carried out, the condition of the benthic assemblages in the neighbouring area, the type of sediment and the season in which the work is carried out. The restoration of the structure and proper functioning of the benthic communities is determined by the restoration of their habitat.

Taking into account the limited possibility of movement of adult macrozoobenthos, the dispersal ability of pelagic larval forms of many species and the presence of macrofauna in the close vicinity of the Project, it may be concluded that the first recolonisation will probably take place within a few or several weeks after the completion of construction works. The restoration of the structure and function of the soft-bottom benthic communities can be expected several years after the completion of works.

This may be more rapid in the case of the bay mussel *Mytilus trossulus* assemblage. The bay mussel breeds mainly in spring and summer and the pelagic larvae settle to the bottom after a few weeks.[393] Experimental studies showed that already after 127 days, at a depth of 5 m, colonisation of suspended plates occurred and a benthic assemblage of several species dominated by the bay mussel *Mytilus trossulus* and the bay barnacle *Amphibalanus improvisus was* established.[394] In the ECI area, the size structure of *Mytilus trossulus* was dominated by individuals up to 2 cm in size, with a maximum shell length of 35 cm. Experiments conducted involvingropes in the Gdansk Bay showed that the mussels reach a length of 2 cm after about 2 years, with an annual growth rate of 3.0 to 6.7 mm per year.[395]

In summary, the destruction of habitats will be a direct, short-term, local impact, but the return to near baseline structure and function will be a long-term process. Therefore, the impact will be moderate.

Increase in suspended solids concentration

During the construction works and the disturbance of the sediment, organic matter, nutrients and pollutants accumulated in the sediment are released into the water column and will be transported away from the site in accordance with the prevailing direction of the currents and deposited on the bottom as a layer of several millimetres.

The suspended solids modelling analysis carried out for this Report (Volume IV, Attachment 2) showed that, depending on the type of sediment, the range of water turbidity during cable burial activities is from approximately 1 to 8 kilometres, with mostly suspended solids concentrations of less than 10 $mg\text{-}l^{-1}$. The range of water turbidity with a concentration of more than 30 $mg\text{-}l^{-1}$ does not exceed approximately 0.5 km. The elevated suspended solids concentration will persist in the water for no more than 1 day. During this time, there will be deposition of suspended solids, formed from the stirred up sediment. The maximum spatial extent of the deposition area will be marked at a distance of 2 to 5 km from the cable axis. The thickness of this layer after completion of the laying of one cable line, should not exceed 1 mm (on average about 0.1 – 0.2 mm). Therefore it can be concluded that the effect of an increase in the concentration of suspended solids and their slumping to the bottom will be short-lived and it will only occur during and shortly after the works.

The sediment layer of a few millimetres after all cables are buried/buried will not affect the infauna inhabiting the area of the planned Project. Animals living in the sediment are able to move both vertically and horizontally, and organic matter, both suspended in the water and falling to the bottom, is their food.

A greater impact can be expected on filter-feeding organisms such as the bay mussel *Mytilus trossulus* and the bay barnacle *Amphibalanus improvisus*. Sediments suspended in the water can deteriorate the quality of food, reduce the feeding rate, thus lowering the growth rate of filter-feeding

[392] *Wenne and Klusek 1985*
[393] *Dziubińska and Janas 2007*
[394] *Brzana and Janas 2016*
[395] *Sokołowski et al. 2022*

organisms.[396] In the case of the blue mussel *Mytilus edulis,* in the presence of a high suspended content, with less valuable food, it is able to increase nutrient uptake to some extent.[397]

A short-term increase in suspended solids and sediment cover of no more than 1.5 mm (for one cable line) is not expected to affect the survival and secondary production of macrozoobenthos, including the bay mussel *Mytilus trossulus*. The impact associated with the increase in suspended solids concentration will be - direct, short-term, local in extent and therefore **insignificant**.

Remobilisation of contaminants from sediment

Agitation (disturbance) of the bottom sediments, associated with, among other things, bottom preparation and cable burial/plunge, will promote the passage of contaminants from the sediments to the water, which may potentially impact the survival and secondary production of macrozoobenthos.

As the concentrations of both heavy metals and other pollutants (including PAHs and PCBs) in the surface sediments of the planned Project are at very low levels, there will be no deterioration in water quality during the construction works. Given the above, the survival and secondary production of macrozoobenthos will not be affected and therefore the impact should be considered insignificant.

Summary of the assessment of the significance of the adverse impact of the planned Project on macrozoobenthos during **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Medium-term	**(2)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(12) moderate**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **12,** meaning that the **impact on macrozoobenthos will be moderate**.

Operation phase

The following impact on macrozoobenthos may occur during operation of the planned Project and it is related to:

- a reef effect - the creation of new habitat due to the use of alternative methods to protect the cable in the form of stone dumpings or concrete mattresses,
- electromagnetic field emissions from cables,
- heat emissions from the cables.

Reef effect (new habitat – a stone dumping or concrete mattress)

The creation of a stone dumping or the use of a concrete mattress on a soft bottom will result in a change in habitat type and consequently a change in the benthic community. If these solutions are applied on a stony bottom, there will not be a change in habitat, but new unoccupied substrate will occur. In both cases, the new substrate will be colonised by species typical of stony bottoms. In the POM area, these are mainly the bay mussel *Mytilus trossulus* and the bay barnacle *Amphibalanus improvisus*. The species overgrowing the surfaces increase their complexity and contribute to the creation of living space for epifauna, above all crustaceans.[398] It is worth mentioning that assemblages developing on artificial structures may differ in terms of species composition, structure or biomass from assemblages inhabiting natural rocky bottoms.

In many environmental impact assessment reports, the creation of artificial reefs is regarded as a positive action, as it can lead to an increase in habitat and species diversity.[399] The density and

[396] *Widdows et al. 1979*
[397] *Bayne et al. 1993*
[398] *Wilhelmsson and Malm 2008*
[399] *Vaissière et al. 2014*

biomass of organisms feeding on suspended matter are higher on artificial reefs than on soft bottoms.[400] However, it is also noted that hard substrate may be unsuitable for some native fauna. This may favour an increase in opportunistic species (both native and non-native) and have unpredictable consequences for the ecosystem.[401] [402]

The impact associated with the creation of the artificial reef will be - direct, short-term, local in extent and therefore **insignificant**.

Electromagnetic field

The impact associated with the electromagnetic field generated by the ECI will only occur during the operational phase. Burying submarine cables in the seabed reduces the levels of magnetic fields and induced electric fields in seawater significantly (Subchapter 9.9). The magnetic field decreases rapidly with distance from the cable. Model tests show that for a cable buried 1 m deep, at the bottom surface just above the cable, the magnetic field reaches 7.85 μT (which is just over 6 times smaller than the Earth's magnetic field).[403] In contrast, at a distance of 4 m from the axis of such a cable in the horizontal direction, the electromagnetic field decreases by about 81%. If the cables are left on the surface of the bottom and covered with a stone dumping or mattress, the level of magnetic field reduction is lower and is comparable to that for a cable buried in the bottom at a depth of 2 m and at a distance of about 3 m from the cable axis - details of magnetic field emissions are given in Section 9.9.2.

The Earth's magnetic field influences the behaviour of certain groups of aquatic animals such as fish, bivalves and crustaceans.[404] Studies on the effects of electromagnetic fields on aquatic animals mainly concern fish, and to a much lesser extent invertebrates, and the results are inconclusive.[405] [406] Exposure of the Baltic Sea crustaceans (*Crangon crangon*, *Saduria entomon* and *Rhithropanopeus harrisii*) to a static magnetic field of 3.7 mT had no effect on their survival over a period of 1.5 to 3 weeks. In the case of the mussel *Mytilus edulis* exposed to such conditions for a period of 3 months, there was no effect on gonads or condition during the reproductive period.[407] In short-term experiments (<8 days) determining the effect of an electromagnetic field typical of areas in the vicinity of seabed cables (50 Hz, 1 mT), an increase in burrowing depth was observed in the polychaete worm *Hediste diversicolor*.[408] In contrast, no escape or approach to the field source was observed, and the amount of energy devoted by the polychaetes to production remained high.

For the alternating current (AC) cables planned for use in the ECI, the magnitude of the electromagnetic field is much lower than for the direct current (DC) cables of SwePol Link (OSPAR 2012), located in the vicinity of the planned Project. Studies carried out for the SwePol Link cable line before the cable was laid and one year after the work completion showed no major impact of the electromagnetic field on macrozoobenthos density and biomass[409]. The field values that will be generated for the HVAC will be much lower.

Taking into account the available modelling and literature studies on the impact of electromagnetic field generated by HVAC cables on benthic species and the magnitude of the electromagnetic field generated in the vicinity of the cables, it can be concluded that the magnitude of these emissions during the operational phase of the planned Project will have no impact on macrozoobenthos, so the impact can be assessed as **insignificant.**

Temperature

During the operational phase of the planned Project, heat will be emitted to the environment due to the transmission of power through the power cables. The maximum temperature of the external surface of the cables, during their maximum load, should not exceed 60°C (Subchapter 9.10). The

[400] *Wetzel et al. 2014*
[401] *Sheehy and Vik 2010*
[402] *Vaissière et al. 2014*
[403] *Tricast and Gill 2011*
[404] *Otremba et al. 2019*
[405] *Bochert, and Zettler 2004*
[406] *Gill et al. 2012*
[407] *Bochert, and Zettler 2004*
[408] *Jakubowska et al. 2019*
[409] *Andrulewicz et al. 2003*

temperature on the surface of the cable will depend on its location. A cable located directly on the bottom will have a significantly lower temperature, and at a distance of 6 cm the temperature is already equal to that of water (at 20°C).

Temperature affects, among others, physiological processes such as metabolic rate, nutrition, excretion, osmoregulation of marine animals.[410] The rate of physiological processes can increase with increasing temperature. However, there is an upper temperature limit above which reactions are reduced or inhibited. Among other things, an increase in temperature accelerates embryonic development in fish and marine invertebrates. The Baltic macoma *Macoma balthica* has been found to be negatively affected by rising temperatures. Among other things, a reduction in survival and reproduction of the bivalve was observed, as well as a deterioration in condition during milder winters.[411] [412] Importantly, even small changes in temperature (2^{o} C) had a negative effect on the bivalves.

Biochemical and/or physiological changes due to temperature changes in organisms inhabiting the water-sediment zone and living in the sediment can contribute to changes in the structure of benthic communities. Temperature can also indirectly affect sediment-associated organisms by influencing sediment biogeochemical processes, oxygen concentration and sediment-dwelling microbial communities. An increase in temperature further reduces the survival rate of benthic species under oxygen deficient conditions.[413]

Despite numerous reports in the literature in the context of the effects of temperature on different levels of biological organisation, there is still a lack of research on the effects of local temperature increases caused by submarine cables on macro- and microbenthic assemblages, and above all studies conducted *in situ*.[414]

Benthic organisms in the Baltic Sea experience seasonal temperature changes. Over the course of a year, the water temperature in the layer down to approximately 50-60 m varies over a wide range from about 2 to 18°C. In deeper layers, this range gradually decreases and maximum temperatures are delayed.[415] Benthic animals can also be affected by diurnal temperature changes, this applies, for example, to nektobenthic species or those making diurnal migrations in the water column. These species have a high tolerance to temperature changes. Seasonal temperature changes are observed in the vertical profile of the sediments and can extend to depths of 3-5 m below the bottom surface. This seasonality is marked at a depth of 20 cm below the bottom surface. Here, the temperature varies by ±0.4ºC (0.8 ºC). [416]

Assessing the change in sediment temperature at a depth of about 20 cm below the bottom surface is important for sediment-dwelling organisms. The infauna living in the POM mainly inhabit the layer down to about 10 cm, with a maximum depth of 30-35 cm.[417]

Model tests for the Baltic sediment for a cable buried at a depth of 1.5 m (Subchapter 9.10.) have shown that there will be no increase in sediment temperature above 2°C, directly above the buried cable at a depth of approximately 20 cm counting from the seabed surface. The same will be true at a cable burial depth of approximately 1 m. In areas of the seabed where the cable will be laid on the surface and covered with a mattress or stone surcharge, there will be no excessive heating, either of the seabed surface or of the created cable sheaths. Constant contact between the cable and the seawater will reduce the temperature of the cable to that of the seawater.

Given the narrow width of the corridors and the reduction in temperature with distance from the cable - the heat source, it must be concluded that the effect of temperature on the macrozoobenthos will be **negligible**.

[410] *Willmer et al. 2005*
[411] *Beukema et al. 2009*
[412] *Beukema 2021*
[413] *Vaquer-Sunyer and Duarte 2011*
[414] *Taormina et al. 2018*
[415] *Majewski 1987*
[416] *Müller et al. 2016*
[417] *Renz et al. 2018*

Summary of the assessment of the significance of the adverse impact of the planned Project on macrozoobenthos during the **operational phase**:

Type of impact and its severity	
Neutral	**(0)**
Indirect	**(1)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(10) insignificant**

In total, the sum of the impact weights identified for the operational phase of the planned ECI was **10**, meaning that the **impact on macrozoobenthos during the operational phase of the submarine cables will be insignificant**.

9.4.3. Ichthyofauna

This chapter analyses the potential impact of the planned Project on marine ichthyofauna during the construction and operational phases in relation to the sensitivity of the fish species identified around the planned Project, taking into account the habitats important for ichthyofauna.

The figure below (figure 9.13) shows the most valuable sections of the ECI corridor in terms of ichthyofauna resulting from the identified environmental conditions (Subchapter 7.4.3).

Construction phase

The potential impact of the construction phase of the planned Project on ichthyofauna will be related to the following factors:

- an increase in the concentration of suspended solids in water during the excavation of a cable trench.
- the remobilisation of potential contaminants in bottom sediments.
- noise and vibration from equipment and vessels conducting the works.
- the potential creation of a mechanical barrier along the migration route of bi-environmental fish.
- periodic habitat changes and a decrease in habitat quality.

The impact on individual fish species will vary depending on the sensitivity of specific life stages to the stressor. These relationships will be discussed below for selected economically important and protected fish species and groups inventoried in the Project area.

Increase in suspended solids concentration

The main factor affecting the ichthyofauna will be the disturbance of seabed sediments due to cable laying, and the associated temporary increased concentration of suspended matter in the water. Reactions of juvenile and adult fish to increasing concentrations of suspended solids include, in succession: avoidance of the zone, disorientation, impairment of respiratory function and, in extreme cases, mortality of individuals. In addition, an increase in suspended matter concentration may cause a deterioration of foraging conditions and a reduction in the food base for this group of fish (e.g. because of suspended matter covering the seabed and a reduction in the abundance of benthic organisms). In case of eggs, larvae and early juvenile stages, increased concentrations may cause of suspended matter often cause egg die-off and increased mortality of juveniles. In addition, the impact of suspended solids depends on the duration of exposure and other environmental factors, such as temperature and oxygen concentration in the water, as well as the pattern of sea currents affecting the rate and directions of spread and dispersal of suspended solids[418].

[418] *Chalcinska et al. 2015*

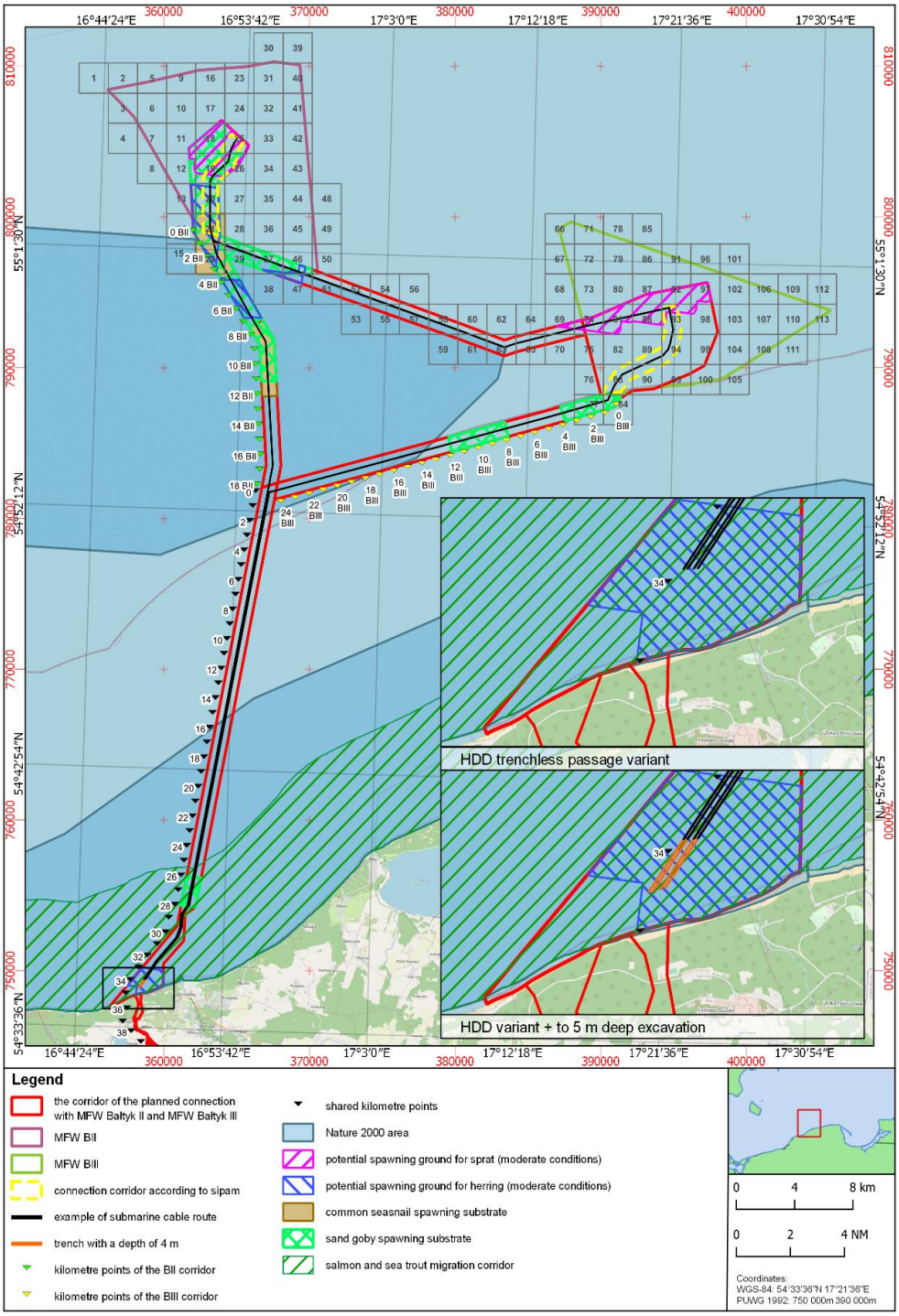


Figure 9.13. *Sections valuable for ichthyofauna in the ECI corridor*

Source: In-house study based on data from the Investor

Fish eggs and larvae are most sensitive to increased concentrations of suspended matter. The adherence of suspension particles to the eggs results in impaired respiration and removal of metabolites[419] [420] [421]. Suspension particles adhering to the eggs also have the effect of reducing their buoyancy, resulting in reduced survival rates and worsened condition of pelagic eggs. This causes the eggs to sink to deeper water or to the bottom, where there are less favourable development conditions. At a suspension concentration of 5 mg/l and an exposure time of 11 hours, a sinking of pelagic cod eggs was observed; an increase in suspension concentration and exposure time increases the rate of the

[419] *Chapman 1988*
[420] *Argent and Flebbe 1999*
[421] *Kiorbe et al. 1981*

sinking process.[422] For the early larval stages, values as low as a few milligrams/litre have a significant negative effect. At concentrations of 3 mg/l, the effect of the suspension on herring and cod larvae already caused an avoidance response. Literature data report increased mortality of the youngest yolk-sac larvae of the cod at suspension concentrations of 10 mg/l, in case of older larvae (after sac resorption) - mortality was lower.[423] Suspension was also observed to have an adverse effect on the feeding of herring larvae[424], which is also related to a reduction in the visibility of the food to the fish larvae when using their eyes.

Regarding adult fish, negative effects of increased concentrations of suspended solids are also observed. These include reduced mobility and reduced growth rates of fish[425]. Increased mortality due to gill plugging has also been observed.[426] The impact of suspension varies according to species and gill morphology - plankton-eating fish (e.g., herring and smelt) are particularly vulnerable.

In addition, a reduction in visibility due to a significant increase in suspension concentration may result in reduced feeding of adult fish. Mechanical damage to fish skin and physiological changes due to impaired gas exchange also occur.

A value >5 mg/l was used as the background exceedance threshold for suspended solids, while a value >30 mg/l was used as the limit for potential impact on ichthyofauna. This value is the most commonly stated concentration limit for suspended solids in Danish and German guidelines (for both breeding and recreational areas), but no such value is indicated in Polish regulations.[427]

As indicated in Subchapter 7.4.3, a total of 41 fish species were recorded as part of the inventories conducted in the Project area by the Investor and for the ECI of FEW Baltic II and the PMŚ surveys. 4 species of the commercially important marine fish were abundant: the cod, the flounder, the sprat and the herring. The plaice and the turbot were less abundant. The presence of 2 commercially valuable bi-environmental fish species breeding in freshwater was observed – the Atlantic salmon and the sea trout. Sandeel (sandeel, tobias) - species of lesser commercial importance, seasonally, intensively exploited in industrial fisheries - were also abundant in the ECI area. In addition, 4 species of fish under partial species protection in Poland were found (Journal of Laws 2016.2183): the sand goby (*Pomatoschistus minutus),* the common goby (*Pomatoschistus microps*), the common seasnail (*Liparis liparis*) and the straightnose pipefish (*Nerophis ophidion)*. All the listed keystone and protected species have moderate sensitivity to suspension impact as adult fish. The area of the ECI is not convenient spawning grounds for the cod and the sprat, species with typically pelagic eggs, very sensitive to increases in the suspended solids concentration. The analysed ECI runs through the area of Ławica Słupska, where there is adequate depth and suitable substrate for spawning of the common seasnail (macroalgae) and the sand goby (stones and empty shells of molluscs). The total length of the ECI within Ławica Słupska will be 48.85 km. These are sections running through an area of high value, of greater significance as a spawning ground for the listed protected species. In addition, potential spawning grounds for herring are around Ławica Słupska and in the coastal zone - the ECI runs through an area of moderate probability of spawning of this species on a total length of approx. 18 km. Another valuable area for ichthyofauna is a potential spawning ground of sprat (moderate probability of spawning of this species). This is in the northern part of the ECI, within the boundaries of MFW Bałtyk II and MFW Bałtyk III. The planned ECI runs through the area of potential sprat spawning grounds for a total length of approximately 9 km. The sections of the ECI running through the potential spawning grounds of the sand goby, the common seasnail, the herring and the sprat should also be considered as located in the area of occurrence of developmental stages of these fish species with increased sensitivity to suspended solids.

It is worth noting that ichthyofauna surveys, including ichthyoplankton, conducted between autumn 2017 and summer 208, in close proximity for another connection (within FEW Baltica II, about

[422] *Rönnbäck and Westerberg 1996*
[423] *Rönnbäck and Westerberg 1996*
[424] *Johnston and Wildish 1981*
[425] *Robertson et al. 2006*
[426] *Bruton 1985*
[427] *Report for the ECI of Baltic Power, 2021*

a few hundred metres east of the ECI of MFW Bałtyk II), indicate that: '*Taking into account the abundance of caught ichthyoplankton and the species found, it can be concluded with certainty that the area of the planned project is not a significant area for fish reproduction or feeding of their larval forms'*[428]

The sediment layer will be disturbed during the preparatory works and during the construction of the ECI, which involves the influx of suspended solids into the water. The sedimentation time of the suspended particles is determined by their size and specific gravity - it is faster for coarse sediments and slower for silt and clay. In addition, the occurrence of sea currents (especially in the superficial water layers in the area of the planned ECI) causes a faster dispersion of suspended matter, but increases the spreading range. Water movement in the bottom layer is much smaller (on average, more than two times smaller) than in the near-surface layer (0-4 m), so dispersion of suspended matter near the bottom occurs more slowly. Investigations of water velocity in the ECI area (Volume III, Attachment 1.4.) showed that average values do not exceed 0.3 m/s within the 10 and 15 m depth stations. The maximum velocity recorded was 1.46 m/s (in the surface layer). In the case of strong currents occurring during the works, a larger area of impact of falling particles is to be expected, but with a lower concentration.

Tests conducted during the laying of the SwePol Link cable showed that water turbidity was short-term and occurred locally, only in a small area. The cable burial technology used corresponded to the ploughing methodCI. The slurry was largely formed by the heavier fractions, which quickly sank to the bottom. The maximum turbidity during the laying of the SwePol Link cable in the shallows off the Stärnö peninsula was 11.7 NTU (Nephelometric Turbidity Unit). The highest turbidity was confined to the area under and around the dredge. At a distance of a few tens of metres, its value gradually decreased to background levels.[429]

At this stage, two methods of cable burial technology are being considered by the Investor for the Project:

- water jetting - preferred,
- mechanical cutting.

The extent to which the above technologies are applicable is determined by the geological conditions of the seabed. The mechanical cutting method will be used locally, in sections of hard, solid, or rocky seabed. Where the burial of the cable using the above-mentioned technology will be limited, the use of alternative cable protection methods will be considered, i.e.: stone dumping or concrete mattresses. The cables will be brought ashore from the sea using a trenchless method, so the amount of suspended solids released into coastal waters will be limited. For the modelling of suspended matter dispersion in the seabed (Volume IV, Attachment 2b), in accordance with the precautionary principle, the water jetting method was adopted as the method causing the largest inflow of suspended matter to waters from stirred up bottom sediments, considering two velocities of movement of the cable-laying vessel: 250 m/h and 350 m/h. In addition, the maximum adverse conditions, i.e., the maximum wave run-up at which submarine cable laying works can be safely carried out, were assumed.

Fine-grained sediments such as mud, silt, and clay, according to the modelling results, contribute to a significant increase of suspended particles in the water (up to 35% of the excavated material). The duration of suspended solids occurrence in the water for the ECI of MFW Bałtyk II and the section common for both farms (run with predominantly north-south direction), reaches up to 6 hours at a laying speed of v=250 m/h and 4 hours - at v=350 m/h, respectively. For the sections of the ECI of MFW Bałtyk III running in an east-west direction, the turbidity time is considerably longer (up to 15 hours at v=250 m/h and 16 hours at v=350 m/h), as the works are carried out along the route of the suspended matter spread. When works are conducted in sections with sandy and gravelly sediments, they generate amounts of suspended solids up to 10% of the excavated material, and turbidity times reach 3 hours for the V250 scenario and up to 4 hours for the V350 scenario.

The expected increase in suspended solids concentration in the water during the laying of a single cable is likely to be local and temporary, limited practically to the duration of the works, and to a maximum of a few tens of hours afterwards. The Project will be implemented in phases - for each of the

[428] *EIA Report FEW Baltic II Connection Infrastructure, August 2022 (Volume II Attachment 5)*
[429] *Westerberg et al. 2007*

cable lines, the estimated laying time will be 30-35 days (for the connector – 30 days for 2 cables), which translates into a total work period of approximately 170 days (six cables, laid one after the other). Therefore, the works will be repeated in the same area every month, so the impact of increased concentrations of suspended solids in the water will be intermittent and local, and not cumulative for subsequent cable lines.

It should be noted that the maximum indicated ranges occur in regions where fine-grained fractions dominate the sediment. The maximum extent of suspended matter spreading will occur in the bottom water layer, which could potentially affect demersal fish species (table 9.13). In contrast, the projected impact on migratory bi-environmental fish, which mainly use the middle and surface water layers, will therefore be less.

Table 9.13.*The extent of turbidity in water layers (bottom, middle and surface) at cable laying speeds of V250 and V 350 m/h (designations: K - cohesive (silts, clays, loams) NK - non-cohesive (mainly sands)*

		V250			**V350**		
	Concentrations	**BII**	**BIII**	**łącznik**	**BII**	**BIII**	**connector**
Maximum turbidity ranges (near the bottom)	do 5 mg/l	NK: to 1 km K: to 5 km	NK: to 1 km K: to 5 km + on the ECI section running in the direction of the W-E: NK: to 1 km K: do 2 km	NK: to 1 km K: to 4 km	NK: to 1 km K: to 8 km	NK: to 1 km K: to 8 km + on the ECI section running in the direction of the W-E: NK: to 1 km K: do 8 km	NK to 1 km K: to 7 km
	10-30 mg/l	NK: to 0,5 km K: to 1-2 km	NK: to 0,5 km K: to 1-2 km + on the ECI section running in the direction of the W-E: NK: w osi – to 0,5 km K: w osi – to 0,5 km	NK: to 0,5 km K: to 1-2 km	NK: to 0,5 km K: to 4 km	NK: to 0,5 km K: to 4 km	NK: to 0,5 km K: to 2 km
	>30 mg/l	in the axis – to 0,5 km	in the axis – do 0,5 km	in the axis – do 0,5 km	in the axis – do 0,5 km	in the axis – do 0,5 km	in the axis – do 0,5 km
Maximum extents in the middle layer - applies to cohesive soils	do 5 mg/l	to 5 km	to 5 km + on the ECI section running in the direction of the W-E:	to 3,5 km	to 8 km	to 8 km + on the ECI section running in the direction of the W-E:	to 7,5 km

			to 3,5 km			to 6,5 km	
	10-30 mg/l	to 2 km spot on route	in the axis – to 0,5 km	in the axis – to 0,5 km	to 4 km spot on route	in the axis – to 0,5 km	to 1,7 km
	>30 mg/l	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km
Maximum extents in the superficial layer - applies to cohesive soils	to 5 mg/l	to 4 km	to 4 km + on the ECI section running in the direction of the W-E: to 1,7 km	to 2,7 km	to 7 km	to 7 km + on the ECI section running in the direction of the W-E: to 4,7 km	to 4,7 km
	10-30 mg/l	to 1 km spot on route	in the axis – to 0,5 km	in the axis – do 0,5 km	to 3 km spot on route	in the axis – to 0,5 km	to 1,2 km
	>30 mg/l	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km	in the axis – to 0,5 km

Źródło: opracowanie własne

A value of 5 mg/l suspension concentration was taken as exceeding the background level and having an impact on early life stages of fish. With a cable laying speed of 350 m/h and 35% of the spoil entering the water (fine sediment), the maximum extent in the bottom layer was determined by the model to be: 8 km (ECI of Bałtyk II), 8 km (ECI of Bałtyk III) and 7 km (connecting section betweenfarms). Correspondingly, at a speed of 100 m/h and 20% of the dredged material entering the water (coarse sediments), these extents will be up to a maximum of 1 km.

However, for a suspended solids concentration of 30 mg/l (a value causing a potential impact on ichthyofauna), the maximum range of suspended solids spread in the bottom water layer, with a cable laying speed of 350 m/h and 35% of the dredged material entering the water (fine sediments), was determined in the model maximal as: 0.5 km (in the axis of the planned ECI corridor). Correspondingly, at a speed of 250 m/h and 10% of the dredged material entering the water (coarse sediments), also will not exceed 0.5 km . The area covered by this impact for the bottom layer at v=350 m/h was estimated in the model to be: 17.92 km^2 (ECI of Bałtyk II), 26.59 km^2 (ECI of Bałtyk III) and 13.39 km^2 (connector), while for the surface and middle layers, the floods will be (Table. 9.13 above).

Considering the modelling results of the suspended matter spreading in the middle of the water column and in the near-surface layer, it should be stated that the values of these concentrations are much lower, however, the extent remains comparable or even higher than for the bottom layer: e.g. for cable laying at a speed of 350 m/h and with 35% of the excavated material entering the water (fine sediments), the range for suspended matter concentration of 5 mg/l in the middle layer was determined in the model as: 8 km (ECI of Bałtyk II), 8 km (in the W-E direction up to 6.5 km) for ECI of Bałtyk III and 7.5 km (connector). For a concentration of above 30 mg/l and v=350 m/h, the range in the water depth for cohesive soils was determined in the model to be approximately 0.5 km. At cable laying speeds of 350 and 250 m/h, suspended solids concentration values above 30 mg/l occur in the water tone only within the ECI corridor (up to 0.5 km to the axis of the excavation). However, this is an important parameter for pelagic eggs and bi-environmental species particular migrating to spawn in the Słupia River, so as a minimization measure, there are temporary shutdowns of some works in the zone up to 4 Mm from the shore, where migration routes run.

The modelling results at 250 and 350 m/h for the surface layer show a slightly smaller extent of the turbidity zone 5-10 mg/l as for the middle layer. However, for concentrations > 30 mg/l, the values for the surface layer similarly fall within the limits of the ECI corridor (up to 0.5 km from the axis of the excavation).The modelling results relate to one cable line, however, according to the work schedule, the interval between the laying of subsequent lines will be approximately 30-35 days, ensuring no

cumulative impact related to the spread of suspended solids in the water, due to the limited duration of turbidity (up to a maximum of 16 hours).

Table 9.1. *Maximum area covered by water turbidity above 30 mg/l at a running speed of 350 m/h*

Subject	Potentially affected area [km^2].	
	Concentration of suspended solids >30 mg/l Bottom layer	Concentration of suspended solids >30 mg/l Middle and surface layer
ECI Bałtyk II	17.92	0
ECI Bałtyk III	26.59	0
ECI - Łącznik	13.39	0
ECI in the area of Ławica Słupska	23.85	0
ECI in the herring spawning area	3.95	0
ECI in the sprat spawning area	5.07	0
ECI in the area of potential denning grounds	3.77	0
ECI in the area of potential spawning grounds of the small goby	13.3	0

Source: In-house study

It should be emphasised that for areas of value for ichthyofauna (Ławica Słupska, potential herring spawning grounds, potential sprat spawning grounds) there is a clear variation in the area impacted by suspended solids > 30 mg/l in the bottom zone. For the area of Ławica Słupska, an area of 23.85 km^2 was obtained for suspended solids concentrations >30 mg/l; also the area of potential spawning grounds of small goby affected is quite significant - 13.3 km^2. On the other hand, the area of potential spawning grounds of herring, sprat and demersal subjected to the impact of suspended solids concentration >30 mg/l is small: from 3.77 to 5.07 km^2 (table 9.13).

The spatial extent of the impacted areas cited above will be determined by the pattern of winds and sea currents (spreading of suspended matter will occur in an easterly direction from the ECI route). Conducting the works under more favourable hydro-meteorological conditions, i.e., with lower wave and wind intensity, than the stress conditions assumed for modeling purposes, will result in a smaller impact area.

Another anticipated impact of suspended solids will be their deposition to the bottom. The thickness of the deposited layer will be of decisive importance. It may contribute to a deterioration of the incubation conditions for demersal eggs (laid on the bottom) and cause a decrease in the biomass of macroinvertebrates being the fish food base. It should be emphasised that according to the modelling results for a single cable line, the layer of suspended matter deposited on the bottom will not reach more than1.0 mmin the immediate vicinity of the cable laying area (up to 200 m from the route of the planned ECI). During the laying of a single cable, for the V250 and V350 scenarios, within sections made up of non-cohesive formations (sandy sediments), the sediment will deposit within the limits of the excavation, and its thickness will not exceed 1 mm. Within cohesive sections (clayey sediments, silty sediments, clays), where sediment resuspension will be greater, the spatial extent of the deposition area will be slightly larger and will be marked at a distance of 2 to 5 km from the cable axis, where up to about 0.1-0.2 mm of sediment will be deposited. It is estimated that with the occurrence of extreme hydro-meteorological conditions, under which work on the seabed can be carried out, the maximum possible area of deposition for one cable line can amount to:

- MFW Bałtyk II - approx. 27.43 km²,
- MFW Bałtyk III - approx. 42.86 km²,
- connector - approx. 22.17 km².

In view of the above, it should be assumed that the impact of suspended matter deposited on the seabed on the spawning grounds and fish food base will be local and insignificant. The modelling results are valid for one cable line, however, according to the works schedule, the interval between the laying of subsequent lines will be approximately 30-35 days, which will not cause cumulative impact of the deposition of the sediment layer on the bottom (due to very limited thickness of this layer). The time between laying successive cables will also allow the benthic organisms that are the food of the fish to adapt to the successively deposited small additional amounts of sediment on the bottom.

Considering the impact on the migration of bi-environmental fish (the Atlantic salmon, the sea trout), it should be noted that the amounts of suspended solids entering the water will be the highest near the bottom, while in the water and near the surface they will be much lower, which will limit the negative impact on these pelagic species. The threshold value for suspended solids' impact on fish adopted in the model (5 mg/l) is significantly lower than that found in rivers being migration routes for this group of species (typically up to 20 mg/l and higher), and will not affect adults of these species in the sea. Another accepted threshold value (> 30 mg/l) that may have some impact on bi-environmental species will be spatially limited and will occur only at the bottomover a total area of approximately 5.8 km^2. In the depths of water and inin the surface layersuch concentration values will not occur.. Therefore, no significant impact on bi-environmental species is expected from this factor.

It should also be pointed out that, optionally, in the case of implementation of a shorter trenchless passage and the need for deeper excavation to the exit beyond the last revetment, bottom dredging will be carried out in the excavation areas, and the resulting excavated material will be deposited between 30 and 32 km of the ECI route (see section 9.1). It is anticipated that the turbidity generated during the spoil storage stage will be limited to the site - the extent will not be greater than during the work using the sediment thawing method (jetting). If the works are carried out in spring and summer, the range of spreading of suspended solids in the area of deposition of dredged material on the bottom will be much smaller, due to lower hydrodynamic activity of the basin and lower velocities of sea currents. Taking into account the predicted dredge loading capacity of up to 2500 m^3, the planned one-time discharges will be small, so the magnitude of the impact will be insignificant in the context of the entire Project. According to the environmental valorization carried out, there are no important fish spawning areas or habitats with higher densities of benthic organisms at the dredged material deposition site and within the range of potential impact. However, the area is located in the migration corridor of bi-environmental fish, which could cause impacts related to additional inflow of suspended solids. Therefore, for the additional dredging works, as for the cable burial/dredging works, the same temporary exclusions are provided for the spawning migration period to protect the migration of bi-environmental ichthyofauna species.

To summarise the impact of suspended solids and deposition on ichthyofauna, including adults, juveniles, and spawning fish, it should be indicated that impact will occur during the construction phase along the entire section affected by the works, with medium intensity. Changes to the environment due to sediment redeposition will have a wide spatial extent, but the layer of sediment deposited will be insignificant. Considering the possibility of applying mitigation measures in areas of particular sensitivity - the impact has been assessed as **moderate**.

Remobilisation of contaminants from bottom sediments

The ingress of toxic chemicals into marine waters may occur because of resuspension of suspended solids from the seabed - if toxic substances are present in the bottom sediments. A significant environmental risk associated with the uplift of bottom sediments will only occur if the cable route passes through heavily contaminated areas.

A list of chemicals that need to be controlled when planning for seabed sediment interventions in different areas of the Baltic Sea has been identified by HELCOM.[430] These include heavy metals (cadmium, chromium, copper, lead, mercury, nickel, zinc, arsenic), chlorinated biphenyls, organochlorine and organophosphate pesticides, tributyltin (TBT) and its breakdown products, total petroleum hydrocarbons (TPH), polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), PCBs (congeners according to IUPAC 28, 52, 101, 118, 138, 153, 180), sum of PAH9 (anthracene, benzo[a]anthracene, benzo[ghi]perylene, benzo[a]pyrene).

Sensitivity of fish to toxicants varies and depends on species, sex, and life stage. It is the highest for spawning females, eggs and early larval stages, with egg die-off and hatchery losses occurring at elevated concentrations.[431,432]. Exposure of fish to toxic substances can induce morphological changes,

[430] *Lundberg et al. 2011*
[431] *Hansen et al. 1985*
[432] *Dethlefsen et al. 1986*

as observed in studies of the common seasnail, the flounder and the cod[433] in the North Sea, and the herring[434] in the Baltic Sea. Physiological changes and behavioural disturbances in fish are also observed. In the event of shipwrecks or collisions, spills of PAHs can be particularly damaging. For adult fish, the primary response to significant concentrations of harmful substitutions is to flee and avoid the contaminated area.

Overall, the sensitivity to toxic effects for key species of commercial importance (the cod, the flounder, the sprat and the herring) and inventoried protected species (the common seasnail, the sand goby, the common goby and the straightnose pipefish) was assessed as moderate.

According to literature data, mercury concentrations in the surficial sediment layer around the planned works are at low levels, and cadmium concentrations are at elevated levels.[435] However, investigations conducted by the Investor in the area of the planned ECI have shown low concentrations of cadmium in the sediments. Investigations of the content of polychlorinated biphenyls, organochlorine pesticides and heavy metals (copper, zinc, cadmium, lead, mercury) in sediments, carried out in 2010 at the POM, did not indicate the presence of the aforementioned substances in sediments in the area of the planned ECI in concentrations that could cause a negative biological effect.[436] Also, the results of studies on the concentration of heavy metals (copper, zinc, cadmium, lead, mercury) in sediment and flounder tissues from the area under consideration indicate a low level of accumulation of harmful substances in fish tissues.[437] The results of ΣDDT, HCB, PCDD/F tests performed in 2009 in sediments from the area of the planned MFW and ECI were also considered. They do not indicate that the concentrations of these substances may have a toxic effect on marine organisms.[438] The low concentrations of contaminants indicated in the literature are confirmed by the studies of bottom sediments conducted by the Investor (Volume III, Attachment 1.2.) discussed in Subchapter 7.2. None of the sediment samples tested in 2013-2014 exceeded the limit values for concentrations of metals and organic compounds. Based on the analysis, it can be concluded that the movement of bottom sediments within the water areas, the Project site and its impact extent will not result in the release of metals and organic compounds from the sediments in concentrations that could potentially affect the water status.

The impact associated with the release of pollutants and nutrients from the sediment into the water will be negative, direct, temporary, and local. This impact should be considered to be **insignificant**.

Impact of noise and vibration

Sensitivity of fish to noise intensity varies and depends on their anatomical conditions, such as the presence or absence of a swim bladder and its connection to the auditory organ. Their lifestyle, which differs between demersal and pelagic species, is also an important factor. Differences in response to noise levels also depend on the developmental stage - juvenile stages generally show less sensitivity than adult fish. Noise impact results in, among other things: mortality, permanent damage to body tissues, permanent and temporary loss of hearing capabilities, and changes in fish behaviour and acoustic masking.[439,440] According to the Sound Exposure Guidelines[441], there are specific sensitivity thresholds to noise associated with ship traffic and other fixed sound sources (such as the cable laying equipment) for these groups of fish (table 9.14).

Table 9.14. *Impact of noise from vessel traffic and other fixed sound sources on fish species groups and life stages*

[433] *Dethlefsen et al. 1986*
[434] *Lindén 1976*
[435] *Korpinen and Laamanen 2010*
[436] *Dąbrowska et al. 2013*
[437] *Polak-Juszczak 2013*
[438] *Szlinder-Richert et al. 2012*
[439] *Popper et al. 2014*
[440] *Mitson et al. 2003*
[441] *Popper et al. 2014*

Impact	Death or potentially fatal injuries	Reversible injuries	Temporary threshold shifts in hearing (TTS)	Masking effect on other sounds	Impact on fish behaviour
Fish group	**Distance from the sound (s - small, m - medium, l - large) and probability**				
Fish without swim bladder	(s) Low (m) Low (l) Low	(s) Low (m) Low (l) Low	(s) Moderate (m) Low (l) Low	(s) High (m) High (l) Moderate	(s) Moderate (m) Moderate (l) Low
Fish with a swim bladder not involved in hearing	(s) Low (s) Low (l) Low	(s) Low (m) Low (l) Low	(s) Moderate (m) Low (l) Low	(s) High (m) High (l) Moderate	(s) Moderate (m) Moderate (l) Low
Fish with a swim bladder involved in hearing	(s) Low (m) Low (l) Low	170 dB re 1 µPa */48 hrs.	158 dB re 1 µPa */12 hrs.	(s) High (m) High (l) High	(s) High (m) Moderate (l) Low
Fish eggs and larvae	(s) Low (m) Low (l) Low	(s) Low (m) Low (l) Low	(s) Moderate (m) Low (l) Low	(s) High (m) Moderate (l) Low	(s) Moderate (m) Moderate (l) Low

** sound pressure level*

Source: Popper et al. 2014

The main impact during the construction phase will be noise emissions from equipment and vessels used for the works. Considering the sensitivity of individual fish groups to increased noise levels, it can be assumed that the impact of this factor will be the greatest for fish with swim bladders: the cod, the herring, and the sprat, which are the most sensitive to sound. This is particularly true for the cod[442].The level of noise sensitivity of the Atlantic salmon and the sea trout is lower[443]. In contrast, demersal species without swim bladders such as the flounder, the plaice and the turbot, as well as protected species (the sand goby, the common goby, the common seasnail) are less sensitive to the noise impact - in this group, flatfish may be relatively more affected[444]. Fish larvae are slightly more resistant to noise[445] , but these life stages are not able to avoid noise sources effectively.

The intensity of sounds generated during cable installation is generally assessed to be above the hearing threshold of marine fish, but not above a level that triggers their behavioural response[446] . The average sound pressure occurring during cable laying activities (at a distance of 160 m) at the construction of the North Hoyle wind farm[447] was 123 dB. The noise generated during cable installation varied according to the structure and hardness of the bottom in the different construction areas. Since the North Hoyle site has a predominantly rocky and stony seabed, it should be assumed that the sound pressure values at the laying location of the planned ECI in the southern Baltic, where a sandy seabed predominates, will not be higher than those recorded during the cited studies.

The impact of underwater noise during construction will be related to both ship traffic and cable laying and plunge/burying equipment. This may vary depending on the adopted method of cable burial (water jetting of bottom sediments or mechanical cutting) as well as the hardness of the bottom. More noise may occur when burying cables in hard bottom substrate than in soft bottom substrate. Noise emissions from the construction of transmission infrastructure are indicated in the literature to be less harmful to fish compared to military activities or works using seismic or piling methods, but literature data is scarce[448,449]. However, it does not indicate a high risk of negative impacts of noise generated by such works on fish[450]. However, despite the lack of a clear impact of noise generated during cable laying on ichthyofauna, available literature studies recommend choosing the installation method and the period of the works that will ensure that the risk to fish is minimised.[451] This is particularly important in relation

[442] *Mueller-Blenkle et al. 2010*
[443] *Hawkins and Johnstone 1978*
[444] *Chapman and Sand 1974*
[445] *Popper et al. 2014*
[446] *Nedwell et al. 2003*
[447] *Nedwell et al. 2003*
[448] *OSPAR 2012*
[449] *Górski and Pawliczka 2019*
[450] *OSPAR 2008*
[451] *OSPAR 2012*

to the migration of bi-environmental fish, including the Atlantic salmon and the sea trout, which are valuable commercially exploited species.

In the case of the project under evaluation, the Investor assumes the use of sediment thinning and mechanical cutting to sink the cables to about 1.5 m below seabed level along most of the route, except for the 9-kilometer section running through the TSS Ławica Słupska route, where it will reach about 2.5 m. Optionally, where the trenchless passage is shorter and exits before the last revetment, a deeper undersea trench to a depth of about 5 m will be excavated on a section of the undersea for a maximum distance of about 800 m. If this technology is needed, the impact related to fish scaring will be comparable to that of the jetting method. It is estimated that the operation of dredge drives generates sound power levels of about 109 dB.

During the construction phase of the ECI, vessel traffic (including anchoring) and operation of equipment under water will be a source of noise levels. Noise emissions are mainly dependent on vessel size and propulsion type. The cable-laying vessels working on the ECI are large vessels, for which engine noise levels can reach 180-190 dB re 1 µPa at a distance of 1 m. In studies on the Baltic cod, the herring, and the sprat populations (the most sensitive to sound species of the main commercially exploited ones), a clear avoidance response to passing vessels by fish was observed[452]. These responses are dependent on the type of ship and the level of noise generated by its propulsion[453]. Also the depth of water and the material dominating the bottom affect the parameters of underwater noise generated by ship traffic[454].

Noise impacts from vessels working during the construction phase of the ECI will be local and temporary, and spatially limited to the ECI corridor and its immediate surroundings. Noise associated with cable laying will be limited due to the predominantly sandy bottom around the Project, allowing rapid burial of the cable and reducing noise. This noise will be cumulative with noise from vessels.

The impact associated with noise generated by units and equipment used during the construction phase for the entire duration of the works (estimated at 30-35 days for one cable line), will cover a total period of approximately 170 days. Optionally, if it is necessary to dig 4 deeper trenches (for 4 cable lines) in the shallow coastal zone (to go beyond the last revetment), additionally, it may increase the work time up to 8 days per cable. The intensity of noise impact for this phase has been determined to be medium and the significance of the impact has been determined to be **moderate**. Considering the salmon and the sea trout entering the Słupia River for spawning, the impact has been assessed to be potential **significant** if the works are conducted during the spawning migration period within a distance of 4 Mm from offshore. However, this impact can be eliminated by appropriate timing of selected works in the coastal zone - a detailed description of the excluded works and terms is described in Chapter 16.

Impact of a mechanical barrier on migration routes

The planned ECI crosses the spawning and feeding migration routes of commercially important fish species, which include the cod, the herring and the Atlantic salmon.[455]

During the construction phase, increased vessel traffic is expected due to works involving the laying and plunge/burying of the ECI cables as well as the optional cluster of excavated material. These works may periodically be an underwater physical barrier to fish migration. In addition, suspended matter lifted from the seabed will act as an additional physical barrier to fish movement during the works as they avoid areas of increased suspended matter concentration. The duration of suspended matter in the water, the rate at which it settles, and the extent of its spread will depend on the type of substrate at the site, the pattern of sea currents, and the technology chosen for the works. However, the barriers will be point-like (at the current location of the works), so migrating fish will be able to avoid the barrier. Nonetheless, it is possible that the works will have a negative impact (especially in the coastal zone, in autumn) on the spawning migration of the Atlantic salmon and the sea trout, especially for the population

[452] *Brehmer P., Sarré A., Guennégan Y., Guillard J. 2019. Vessel Avoidance Response: A Complex Tradeoff Between Fish Multisensory Integration and Environmental Variables. Reviews in Fisheries Science & Aquaculture 27 (3): 380-391*
[453] *Brehmer I in. 2019, De Robertis i Handegard 2013*
[454] *Jaśniewicz i in. 2016*
[455] *Netzel and Janusz 2005*

using the Słupia River as a breeding site[456]. This could be a potential negative impact on these species and given the conservation status of the Atlantic salmon in the Natura 2000 site Dolina Słupi PLH220052 (population rating B) - the impact has been assessed as **significant** for the salmon and the sea trout, mainly in terms of the undersea noise causing a scaring effect. However, this impact can be eliminated by the appropriate timing of selected works in the coastal zone, outside the spawning period of the salmon and the sea trout - a detailed description of the excluded works and terms is described in Chapter 16..

Impact of habitat alteration and reduction in habitat quality

Fish are sensitive to habitat degradation due to disturbance of bottom structure, reduced food availability (macroinvertebrates) and changes in top sediment granulation. The construction of the external connection infrastructure may adversely affect ichthyofauna, particularly in relation to spawning grounds.

The construction of the planned ECI will involve disturbance of seabed structure and habitats along the entire cable laying and plunge/burying route. The exception to this will be the section located in the coastal zone, where trenchless technology (HDD) will be used, which will not result in damage to seabed habitats. In the remaining part of the ECI corridor, a bottom zone of up to maximum approx. 5 m for each cable line will be affected. Overall, the area of impact of the planned ECI on the bottom will be approx. 1.55 km^2. This area represents 0.052% of the total area of the 8 fishing squares in which the sections of the planned ECI are located, and 0.003% of the area of the POM. In the event that the trenchless passage is shorter, a deeper trench will be excavated for a maximum distance of about 800 meters in the sub-basin section, which will slightly increase the area of interference with bottom habitats by 0.064 km^2.

The bottom cleaning method will involve pushing the top layer of bottom sediment to both sides, which involves the temporary removal of structures that provide habitat for fish and macroinvertebrates and the removal of macroalgae. The zones of deposition of pushed bottom material and equipment movement will also be subject to topsoil disturbance of similar extent. The excavation itself, resulting in deep disturbance of the bottom structure and complete removal of the organism assemblages, will be maximum approximately 1.5 m wide for each cable line. Excavation depth of outside the sand dunes areawill be 1.5 m (with the exception of the 9-km-long section running through the TSS Ławica Słupska, where the depth will be 2.5 m and the width 1.5 m). If it is necessary to excavate in the revetment zone (for a length of up to 800 m), the maximum depth will be about 5 m. There will be 2 cable lines for the connection from each MFW and the section connecting them, and 4 cable lines for the section common to both connections. This means that, assuming a maximum strip of bottom intervention (5 m), for the connection from MFW Bałtyk II, habitats with a total area of approx. 0.598 km^2 will be destroyed (including the direct excavation area of 0.180 km^2 and an additional interference zone of 0.418 km^2). For the connection with MFW Bałtyk III, this value will be 0.670 km^2 (including the direct excavation area of 0.20 km^2 and the additional interference zone of 0.470 km^2). In addition, it is envisaged that MFW Bałtyk II and MFW Bałtyk III will be connected by a separate connection consisting of 2 cable lines. This means destruction of habitats in a total area of 0.328 km^2 (including direct excavation area of 0.10 km^2 and an additional interference zone of 0.228 km^2). Therefore, the total area affected by the destruction of bottom habitats will be approximately 1.596 km^2. However, the significance of the estimated impact at the scale of the POM will be negligible (approximately 0.003% of the area of the POM).

It should be emphasised that particularly valuable habitats of ichthyofauna (including proper substrate for spawning of the common seasnail and the sand goby) and macroinvertebrates (constituting food base for fish) are in the area of Ławica Słupska, which is protected within the Natura 2000 network. For the MFW Bałtyk II connection, the seabed occupation in Natura 2000 Słupska Ławica site will amount to a total of 0.194 km^2 (including the direct excavation area of 0.058 km^2 and additional interference zone of 0.136 km^2), for the MFW Bałtyk III connection - these values will amount to a maximum of approx. 0.136 km^2 (respectively 0.041 km^2 and 0.095 km^2). In addition, a section of the projected connection between MFW Bałtyk II and MFW Bałtyk III runs along the border of the Natura

[456] *Bernaś et al. 2009*

2000 site in question, which may have a maximum impact on the seabed area of 0.212 km^2 (including the direct excavation area of 0.064 km^2 and additional interference zone of 0.148 km^2) in the boundary zone of the Natura 2000 site. This translates into a total loss of benthic habitats of higher conservation value in the Natura 2000 Ławica Słupska site of approximately 0.0542 km^2. This represents 0.07% of the area of the Natura 2000 Ławica Słupska site, and therefore the impact will be local, of a small spatial scale.

In addition, there are potential herring spawning areas (moderate spawning probability) along the route of the planned ECI (mainly in the northern part of Ławica Słupska and in the coastal zone - up to 3 km from the shore). The total area of these spawning grounds that will be temporarily destroyed is 0.135 km^2. In addition, it is possible to interfere with these spawning areas associated with the construction of a section of excavation in the revetment zone (length up to 800 m, the width of the excavation including the cleared bottom for one cable line - 20 m). The area of spawning grounds additionally occupied for this excavation will be 0.064 km^2. The planned ECI also crosses potential sprat spawning grounds (moderate spawning probability) located in the deep-water area in sections of the ECI located in the Bałtyk II and Bałtyk III farm areas of a total area of 0.107 km^2. Spawning disturbance to these species will, however, be local and insignificant at the scale of the Baltic Sea.

It should also be noted that relatively narrow strips of the bottom (maximum 4 × 5 m for two parallel connections and 4 cable lines) with disturbed structure will be subject to a rapid recolonisation by organisms inhabiting the intact bottom around them. This process may be slightly slowed down by covering the bottom in the vicinity of the laid ECI cables with a layer of sediment suspension of a thickness not exceeding 1.0 mm for a single cable line in the immediate vicinity of the laid cables, and reaching 0.1 mm further away from the cable lines. For the maximal speed of works v=350 m/h, the layer of 0.1-0.2 mm will cover the bottom surface: for OWF Bałtyk II - about 27.43 km², for OWF Bałtyk III - about 42.86 km², for the connector between OWF Bałtyk II and OWF Bałtyk III - about 22.17 km².

In summary, the area through which the planned ECI runs is not significantly distinguished from adjacent seabed habitats by the nature of the seabed or the composition of benthic organism communities and ichthyofauna[457,458]. During the construction of the ECI, there will be a periodic disturbance of habitat conditions, the abundance and the biomass of these groups. Regarding adult fish, impacts will be mainly limited to the effect of scaring, escapement and avoidance of disturbed habitats. For juvenile fish life stages (eggs, hatchlings) and macro-invertebrates, direct mortality may also occur during the works. Areas of potential spawning grounds for the herring and the sprat along the route of the planned ECI and areas in the coastal zone, where juveniles of these species congregate, are particularly vulnerable[459].

However, these changes will be short-term and reversible, as the nature of the substrate and habitat type do not change significantly. The cable lines will be backfilled with local material and the use of permanent protection elements (concrete mattresses, stone) will be limited to sections with particularly hard bottoms, thus also not significantly altering their structure. Particularly valuable sections along the route of the planned ECI include potential spawning grounds for herring and sprat, as well as breeding sites and habitats for protected fish species (dab and small goby) located mainly in the area of Ławica Słupska. Valuable macroinvertebrate habitats (including areas of soft bottom, where benthic biomass exceeds 500 g/m^2, and areas of rocky bottom, where mussel biomass exceeds 1,000 g/m^2) should also be identified as important for maintaining the food base of ichthyofauna. Due to the transformation of the bottom in narrow strips, it is anticipated that it will recolonise quickly and rebuild the macroinvertebrate assemblages that constitute the fish food base. Conducting the works in phases will reduce the accumulation of harmful impacts when laying more cables.

A reduction in habitat quality due to the construction of offshore transmission infrastructure may adversely affect both adult fish and their early stages (eggs, larvae, juveniles), which, under the influence of various factors (suspended solids, toxic substances, noise), may be stressed and, in extreme cases,

[457] *GIOŚ 2018*
[458] *HELCOM 2020*
[459] *Ramutkowski and Radtke 2015*

may suffer from increased mortality, leading to reduced reproductive success.[460] According to the literature, the work performed can, among other things, negatively affect reproductive success.[461,462,463,464]. A species particularly vulnerable to habitat alteration is the herring, which prefers shallow places with hard bottoms as spawning grounds[465,466]. Literature data indicates that disturbance of spawning grounds results in worse conditions for egg and fry development[467], therefore it is important to conduct work outside the spawning season and the development of the early life stages of the fish. Partial protection for herring spawning will be provided by the exclusion of some works in the zone up to 4 Mm from the shore (covering the herring spawning area) during the spring (March-Mid-April) as part of minimization. Structural changes also result in a temporary reduction of the food base, which for many fish species includes benthic organisms[468]. The time required to recolonise the transformed bottom area and rebuild the biomass of the macroinvertebrate assemblage varies depending on the type of original substrate and the fraction of deposited suspended matter. It is shorter for areas with sandy bottoms and usually does not exceed 3-6 months[469,470], but it can take up to 5 years in the case of a change in the nature of the substrate[471].

In the area of the planned ECI, the predominant bottom type is sandy, with a small proportion of hard bottom vegetation providing valuable habitat for, among others, species such as the protected seasnail and the sand goby. The ECI construction works (including changes to the nature of the bottom) will cover a relatively small area of this habitat type and will be temporary in nature. The predominantly sandy bottom areas provide habitat for flatfish and sandeel, which prefer this type of bottom due to their ability to burrow into it in case of danger.

The disturbance of the seabed structure during the plunge/burying of submarine cables results in the disturbance of the habitats of ichthyofauna and benthic organisms that provide food for many fish species. An analysis of the spatial variation of the area of the transformed seabed in the context of valuable habitats, fish spawning and feeding grounds is presented for the ECI construction phase. The effect of habitat transformation occurs both in the section directly altered by cable burial and in the area of the seabed covered by suspended matter raised during the works into the water In the case of the ECI, the layer of suspended matter settling to the bottom after burial of one cable line will not exceed 1 mm in the immediate vicinity of the excavation, while a layer of 0.1-0.2 mm is expected to be deposited over a larger area. This effect of potential negative impact of suspended solids may occur in the immediate vicinity of the burial sites of the ECI cables, especially when using a water jetting technology generating larger amounts of suspended solids (as assumed in the suspended solids spreading model used for the ECI in question). Therefore, the impact of the sediment layer deposited on the bottom will be negligible and will disappear within a short period of time after the completion of the works and will not occur during the operation phase.

However, the reduction in fish food base associated with the habitat disturbance will be local of negligible spatial scale, and the narrow strip of disturbed bottom will be recolonised relatively quickly, so the impact on ichthyofauna should be described as **negligible**. This is confirmed by the results of camera observations obtained for the operated SwePol Link cable, in which recolonisation of the bottom around the cable by benthic organisms and fish was recorded.

The reduction in habitat quality associated with the construction of offshore transmission infrastructure will occur during the construction phase, but the effects will also occur during the operational phase of the ECI until the disturbed marine habitats are restored. The impact associated

[460] *Knudsen et al. 1992*
[461] *ICES 1992, 2001*
[462] *Phua et al. 2004*
[463] *Posford Duvivier Environment i Hill 2001*
[464] *Birklund and Wijsman 2005*
[465] *Kiorboe et al. 1981*
[466] *Posford Duvivier Environment i Hill 2001*
[467] *Phua et al. 2004*
[468] *ICES 2001*
[469] *Newell et al. 1998*
[470] *Kenny and Rees 1994*
[471] *Zucco et al. 2006*

with habitat conversion will be a negative, direct, temporary, and local impact. Therefore, the significance of this impact for the construction phase has been determined to be **moderate**.

In summary, the impact of the planned Project on individual fish species will vary depending on their sensitivity to a given stressor (table 9.15.). The greatest impacts are expected during the construction phase, due to the increased sensitivity of fish to acoustic noise disturbance, as well as sediment movement and accompanying turbidity in the water.

Table 9.15. *Sensitivity of individual fish species found in the ECI area to potential impacts of the planned project.*

Impact / Species	Agitation of sediments	Water pollution	Acoustic interference	Creation of a spatial blockade	Habitat change
Sand goby	m	i	m	i	m
Seasnail	m	i	m	i	m
Sandeel	m	i	m	i	m
Cod	m	i	m	i	m
Plaice	m	i	m	i	m
Turbot	m	i	m	i	m
Flounder	m	i	m	i	m
Sprat	m	i	m	i	m
Herring	m	i	m	i	m
Tobias	m	i	m	i	m
Sea trout/Atlantic salmon	m	i	s	s	m
Straightnose pipefish	m	i	m	i	m

i – insignificant, m – moderate, s - significant

Summary of the assessment of the significance of the adverse impact of the planned Project on ichthyofauna during **construction phase**:

Type of impact and its severity		
Negative	**(1)**	
Direct	**(3)**	
Secondary	**(2)**	
Short-term	**(1)**	
Reversible/Reproducible	**(1)/(2)**	
Spatial extent of the impact		
Supra-local	**(3)**	
Sensitivity/vulnerability of the environment		
Average/Duża	**(3)/(5)**	
Impact classification	**(14) moderate**	**(17) significant**

The total sum of the impact weights identified for the construction phase of the planned ECI was **14**, which means that the impact on ichthyofauna for the construction phase will be **moderate**. The only **significant impact (17)** has been identified due to the possibility of a mechanical barrier (increased watercraft activity, underwater noise and water turbidity) in the shoreline zone, in the estuary area of Słupia river, during the period of trout and salmon spawning access. However, this impact can be eliminated by the appropriate timing of works in the coastal zone - a detailed description of the excluded works and terms is described in Chapter 16.

Operation phase

The potential impact of the operation of the planned Project on ichthyofauna will be related to the occurrence of permanent magnetic field emissions. Noise levels generated by the operated ECI can be described as negligible, as the cables will be buried in the bottom or covered with stone dumping or slabs.

The effects of electromagnetic fields on ichthyofauna are poorly recognised[472,473], and the results of studies of the response of individual species (e.g., eels) are inconclusive. The unit of measure for electric field strength is volts per metre [V/m], and the tesla [T] has been adopted as the unit of magnetic field.

The potential impact includes interference with the natural magnetic field caused by electromagnetic field emissions around transmission cables. This impact may result in disruption of orientation and subsequent rerouting of foraging and spawning migrations of fish. This is more commonly observed for sensitive species (so-called electro sensory species), which include the cod, the plaice, the eel, salmonids and sea and river lamprey[474,475,476,477,478]. Therefore, the potential impact can affect both marine and bi-environmental species that migrate between rivers, lakes and the sea.

The electric field may affect species of the herring family (Clupeidae) in the Baltic Sea, represented in the area by the herring and the sprat, and flat fish (Pleuronectidae), which includes the flounder, the plaice, and the turbot[479]. However, in an AC submarine cable, the primary electric field only exists inside the cable due to the insulation of the cable and its grounding, so it will not affect fish.

It was envisaged to use three-phase AC cables for energy transmission for the planned ECI. Due to the phase shifts of the currents in the individual conductors of the cable, this allows for an almost complete reduction in magnetic field emissions outside the cable.[480]

An increase in distance from the cable location results in a rapid decrease in the magnitude of the magnetic field. At a distance of about 1 metre, the field value is about 1 μT, while at a distance of about 10-13 m from the cable, the magnitude of the magnetic field drops below 0.01 μT. According to the assumed technical parameters, at 220 kV, the generated maximum field value will be up to 7.85 μT.

The detection threshold for magneto sensory organisms ranges from 0.01 μT to 0.05 μT for different species. This means that the magnitude of the electromagnetic field generated by the 220 kV cables of the planned ECI will be detected by these organisms from greater distances (up to several tens of metres in the bottom layer).

The literature[481] points to the possibility of behavioural changes in fish exposed to electromagnetic fields around cables. Depending on the species, these changes may include reactions of avoidance of the zone of influence or attraction of the fish towards the field source. In the case of flounder, a significant correlation between these phenomena and electromagnetic field strength was observed. Other authors have also indicated changes in fish behaviour related to electromagnetic field avoidance[482,483].

Sensitivity to EMF was assessed as low for most fish species found during the inventory and moderate for the flounder, the plaice, and the turbot.

For the planned ECI, it is envisaged to use multi-core, high-voltage alternating current (HVAC) submarine cables with an operating voltage of 220 kV for energy transmission. Previous studies

[472] *Gill 2005*
[473] *Öhman et al. 2007*
[474] *Gill and Taylor 2001*
[475] *Westerberg 2000*
[476] *Gill et al. 2005*
[477] *Rodmell and Johnson 2005*
[478] *Yano et al. 1997*
[479] *Fricke 2000*
[480] *OSPAR 2012*
[481] *Kjær et al. 2006*
[482] *Rodmell and Johnson 2005*
[483] *Westerberg 2000*

conducted in the Baltic Sea of an existing DC cable (SwePol Link) found that, at full load, the magnetic field generated around the cable was approximately 200 µT at a distance of 1 m[484]. Therefore, it was significantly higher than the predicted magnitude of the magnetic field that will potentially be generated by the planned ECI, which will use alternating current that generates a lower magnetic field than direct current, which is associated with a weaker fish response[485] [486]. The electric and magnetic field impacts of the planned ECI will be local and occur in the immediate vicinity of the ECI.

Literature data on the effects of magnetic fields on fish is limited.[487,488,489] Available information indicates that the magnitude of the electromagnetic field is lower for the alternating current (AC) cables that will be used in the planned ECI than for the direct current (DC) cables used in the existing SwePol Link transmission cable. Observations using cameras in the SwePol Link cable area have shown the presence of fish (including the cod) and invertebrates in its immediate vicinity and above the cable. This indicates that the magnetic field does not have a strong deterrent effect on aquatic organisms. However, literature studies have observed magnetic field and electric field effects on fish species showing greater sensitivity, which include the cod, the plaice, the eel, salmonids and sea and river lamprey[490,491,492]. Potential effects of magnetic fields may also occur for the herring and the sprat.[493]

An increase in distance from the cable location results in a rapid decrease in the magnitude of the magnetic field. At a distance of about 1 metre the field value is about 1 µT, with an alternating current of 100 A and a voltage of 145 kV[494]. In contrast, at a distance of about 10-13 m from the cable, the magnitude of the magnetic field drops below 0.01 µT. Both the variant proposed for implementation and the alternative variant, according to the technical parameters, assume a voltage of 220 kV. With these parameters, for a cable buried at a depth of 1 m, the maximum electromagnetic field generated will be up to 7.85 µT (which is more than 6 times smaller than the Earth's magnetic field, which is about 50 µT). At a distance of 10 m (horizontally) from the cable, the value drops to 0.22 µT near the bottom, and it will be 0.08 µT in the water depth (10 m above the bottom). When the cable is buried at a greater depth (the expected depth of laying of the cables of the planned ECI is 1.5 m on average), the electromagnetic field values above the bottom will be even lower.

Given the detection thresholds for magneto sensory organisms, the electromagnetic field generated by the 220 kV cables of the planned ECI will be detected by these organisms from greater distances (up to several tens of metres near the bottom). Regarding bi-environmental fish species such as the Atlantic salmon or the sea trout, the impact of the magnetic field on migration routes will be marginal, as these fish move through the water, usually at a considerable distance from the bottom.

Previous studies in the Baltic Sea for an existing 450 kV DC cable (SwePol Link) found that at full load, the magnetic field generated around the cable was approximately 200 µT at a distance of 1 m [495,496]. Therefore, it was significantly higher than the predicted magnitude of the magnetic field potentially generated by the ECI. This is related to the anticipated use of alternating current, which generates a lower magnetic field than direct current (used in the SwePol Link cable)[497,498], and a lower operating voltage (220 kV). Investigations of the magnetic field around the existing SwePol Link cable showed that at distances of 20 m and more, the changes in the magnetic field did not exceed the natural variations in the Earth's magnetic field[499]. Therefore, it can be expected that there will be no or weak fish responses to changes in the magnetic field around the planned ECI. The impact of the electric and magnetic fields

[484] *Westerberg et al. 2007*
[485] *Olsson et al. 2010*
[486] *OSPAR 2009*
[487] *Gill 2005*
[488] *Öhman et al. 2007*
[489] *Horns Rev Offshore Wind Farm Annual Status Report 2005*
[490] *Rodmell and Johnson 2005*
[491] *Gill and Taylor 2001*
[492] *Westerberg 2000*
[493] *Fricke 2000*
[494] *Olsson et al. 2010*
[495] *Olsson et al. 2010*
[496] *Westerberg et al. 2007*
[497] *Olsson et al. 2010*
[498] *OSPAR 2009*
[499] *Andrulewicz et al. 2003*

will be local and occur in the immediate vicinity of the ECI, without causing significant disturbance to the living conditions and migration of ichthyofauna.

Taking these conditions into account, the significance of the impact of electromagnetic fields on ichthyofauna during the operational phase has been assessed as **insignificant**.

Summary of the assessment of the significance of the adverse impact of the planned Project on ichthyofauna during the operational phase:

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(10) insignificant**

The total sum of the impact weights identified for the operation phase of the planned ECI was **10**, which means that the impact on ichthyofauna for the operation phase will be **insignificant.**

9.4.4. Marine mammals

This chapter analyses the potential impact of the proposed Project on marine mammals during the construction and operational phases in relation to the sensitivity of the species identified in the area of the proposed Project, taking into account their habitats and important foraging areas.

Visual survey of seals and porpoises and acoustic surveys of porpoise conducted in the analysed area in the years 2012-2017 and 2020-2021, aimed at determining the occurrence of marine mammals in the analysed area, revealed the incidental presence of grey seals (*Halichoerus grypus*), harbour seals and porpoises. Despite the identification of the area of the planned Project as not very important for the porpoise, in the nature documentation prepared for the protection plan of the area PLC990001 Słupska Ławica, it was proposed to include the porpoise in the SDF form with a D grade due to favourable feeding and breeding conditions (shallow water) and extreme threat of extinction. In addition, it was recommended that surveys be deepened in the next round of marine species and habitat monitoring under the PMŚ. This means that despite the sporadic occurrence of marine mammals in the area, it is necessary to analyse in detail the possible impact of the planned Project on them.

Construction phase

Potential construction impacts of the proposed Project on marine mammals will be related to the following factors:

- noise and vibration,
- increased vessel traffic (spatial blockage).
- increase in suspended solids concentration,
- obstruction/restriction of feeding grounds,
- remobilisation of contaminants from sludge.

Noise and vibration

When installing cables on the seabed, underwater noise emissions are unavoidable, resulting from, among other things: the operation of equipment and vessels[500] . The sounds emitted by ships are classified as so-called continuous noise and affect organisms primarily in the realm of behavioural changes and interference with communication between individuals. In general, there is as yet no clear indication that aquatic animals are affected by this noise other than locally, temporarily and slightly[501] , but this aspect is subject to intensive research. In the context of marine mammals, the most common effect of noise of lower to medium intensity is frightening/disturbance, as a result of which animals may

[500] *Górski et al. 2019*
[501] *Taormina et al. 2018*

leave zones of particular importance as feeding or breeding grounds. Underwater noise is particularly relevant in the context of harbour porpoises, as their conservation status requires the highest attention and their sensitivity to this factor and its effects is very high. The small number of available research results does not currently allow a clear indication of the levels from which it is possible to speak clearly of a threat to the species, referring to Baltic marine mammals at the population level.

Projected noise

During the construction phase of the IP, noise will be generated from the movement of smaller and larger vessels and from the operation of underwater equipment interfering with the seabed. The sound sources will travel along the route of the planned works, and due to operation both above and in the seabed, will extend to various locally occurring depths. Noise generated from the works will be detectable by marine mammals. It will also inevitably cause (depending on intensity) temporary scaring of fish, which may affect the temporary availability and/or abundance of food for marine mammals in the Project area.

According to a report by JASCO RESEARCH LTD[502] , noise emission values for the cable-laying vessel rank at 177 dB re 1µPa at a distance of 1m from the source, while for the accompanying workboat they rank at 156.9 dB re 1µPa at a distance of 1m from the source. As one moves away from the cable-laying vessel, noise levels decrease (to 130 dB, 120 dB and 110dB at distances of 0.38km, 3.03km and 13.95km respectively), supporting the case for no significant noise impacts associated with cable installation, on marine mammals.

According to the noise emission projections cited in Section 9.8 of this Report, the highest noise levels will be generated by a large cable-laying vessel (192 dB re µPa at a distance of 1m from the source).

Acoustic background

The area of the planned Project is characterised by medium underwater noise pressure on the marine environment. In terms of the impact of noise levels on mammals in the area of the planned MFW Bałtyk II and Bałtyk III, values for the broadband sound intensity level in the range 63 Hz - 10 kHz were indicated as being between 102 and 111 dB re 1µPa in the area of MFW BII and between 107 and 114 dB re 1µPa in the area of MFW BIII.

Recording of the *sound* pressure level (SPL - *sound pressure level*, expressed in water in dB with respect to 1µPa) of continuous sound is carried out in the POM as part of monitoring (GIOŚ) for frequency bands 63 Hz, 125 Hz and 2000 Hz in the 1/3 octave band, with respect to 1µPa, according to HELCOM guidelines. The results of underwater noise monitoring data collected from six locations covering the Polish economic zone in November and December 2018, divided into the Bornholm Basin, the eastern Gotland Basin, the Gdansk Basin and areas of the Polish coastal waters of the Gdansk Basin, indicated a high variability of noise levels depending on the location of measurements, confirming that maritime transport is a very important source of continuous noise in the POM. The highest noise levels were recorded in the Bornholm Basin and the eastern Gotland Basin (140 dB re 1µPa and above)[503] .

Noise generated during construction of the ECI will cause a local and short-term increase in background sound levels. Increased background levels at frequencies relevant to seals and porpoises can be caused mainly by smaller and faster moving vessels. However, compared to activities such as seismic surveys, military operations or piling construction activities, the maximum sound pressure levels associated with the installation or operation of the ECI can be characterised as low to moderate and will therefore not significantly affect existing noise levels in the area.

Auditory sensitivity of Baltic mammals

[502] *Meißner et al. 2006*
[503] *Draft: Update of the Programme for the Protection of Marine Waters, specialist version, Ministry of Infrastructure, https://chronmorze.eu/wp-content/uploads/2021/07/Projekt-aPOWM-20210629-v1.00.pdf.*

Marine mammals avoid underwater noise[504] by fleeing/ moving away from the source of the noise, which can alter the extent of preferred habitat. Previous research results indicate that noise avoidance by porpoises occurs within a few hundred metres to a few kilometres of the noise source[505] .

According to a study by Southall et al. (2007)[506] , the auditory sensitivity level for porpoise ranges from 0.2-180 kHz and for grey and common seals from 0.075-75 kHz. Audiograms presented by HELCOM are shown in figure 9.14 and figure 9.15.

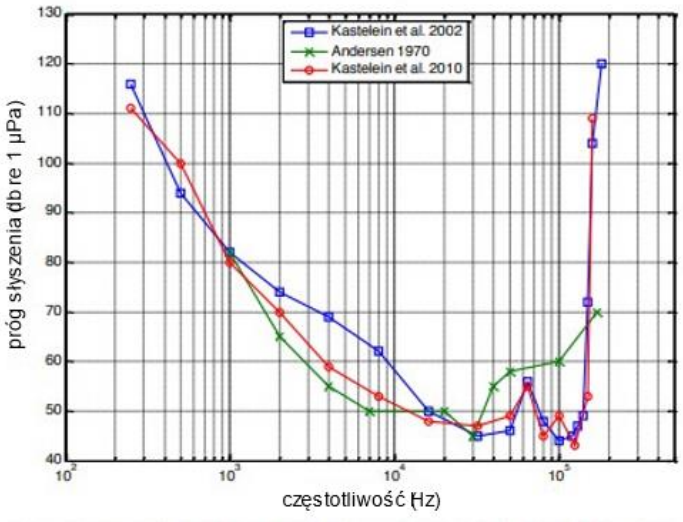


Figure 9.14. *Audiogram of a harbour porpoise*

Source: HELCOM 2019 Noise sensitivity of animals in the Baltic Sea. Baltic Sea Proceedings N° 167"

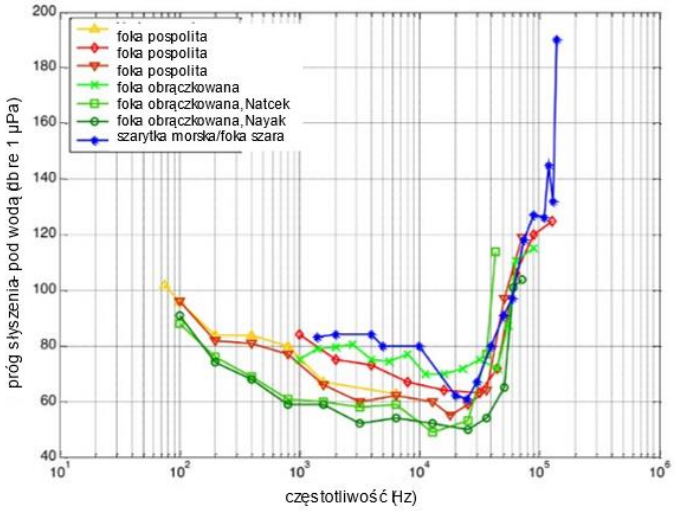


Figure 9.15. *Audiograms of common seal (orange line, red lines - from different studies), ringed seal (light green line and two dark green lines from 2 individuals of different sex and age - within one study), harbour seal (blue line).*

The grey seal audiogram is based on data acquired using the electrophysical method, the other audiograms were acquired using the behavioural method and are therefore not directly comparable.

Source: HELCOM 2019 Noise sensitivity of animals in the Baltic Sea. Baltic Sea Environment Proceedings N° 167"

Porpoises belong to a group of marine mammals capable of hearing the highest frequency ranges (*Very High-Frequency (VHF) cetaceans*[507]) and can generate ultrasound up to a frequency of about 180 kHz. The *clicks* for echolocation in porpoises oscillate around 130 kHz; similar clicks are also

[504] *Tyack 2008*
[505] *Olesiuk et al. 2002*
[506] Southall et al. 2007
[507] *Southall et al. 2019*

used for communication. The hearing sensitivity of porpoises is high. Porpoises can hear sounds in the frequency range between 16 kHz and 140 kHz (according to Southall et al. between 0.2-180 kHz), and the highest sensitivity of their hearing system occurs above 100 kHz (between 100 kHz and 140 kHz)[508]. As frequency increases, porpoises' auditory perception becomes more directional and echolocation more efficient.

Seals use sounds for communication mainly during the mating season, e.g. to mark territory by males, also underwater (common seal sounds: 250 Hz to about 1.4 kHz - most about 650 Hz, common seal sounds: 100 Hz-5 kHz, grey seal sounds - 100-3 kHz).

According to HELCOM[509], the noise sensitivity of harbour porpoises in the Baltic is higher during breeding and rearing of young (June and later). Common, grey and ringed seals are more sensitive, including sensitivity to masking (the phenomenon of interference with natural echolocation and other sounds used by the animals), during the breeding season (V-VII, II/III-IV, III/IV-V, respectively).

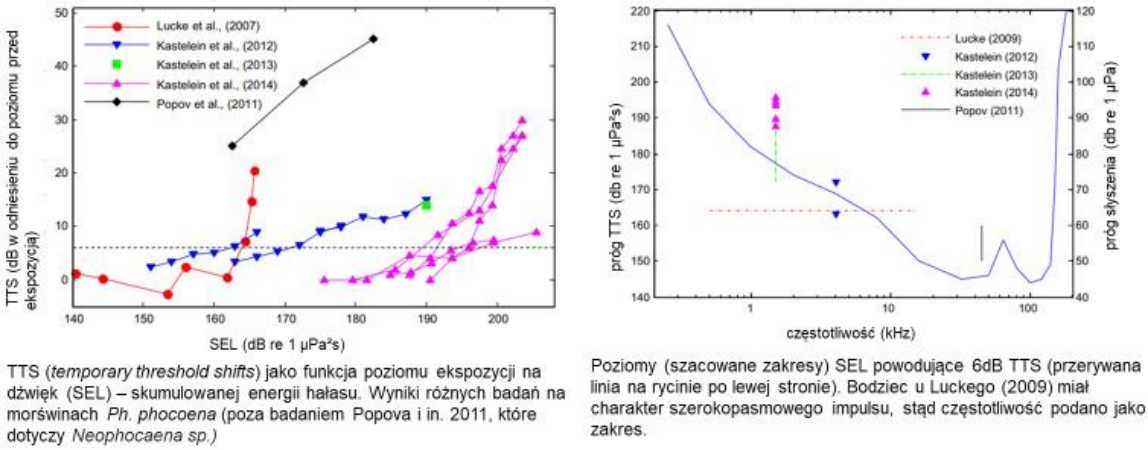
In a study by Southall et al. (2007) noise exposure levels for distress and injury were proposed, including TTS (temporary sound threshold shift) and PTS (permanent sound threshold shift)[510]. These levels are given in table 9.16. and are cross-referenced with data on planned noise emission levels during construction of the proposed Project.

Table 9.16. *Noise exposure levels causing distress and injury, including TTS and PTS in marine mammals, in relation to estimated noise levels generated during planned* ***ECI*** *construction*

Vulnerable species in the ECI area	**Criterion**	**Maximum predicted noise levels during ECI construction**				
		SPL level [dB re 1 µPa /SEL in dB re 1µPa^2][511]	**a small cable-laying vessel - at a distance of 1 m from the source SPL [dB re 1 µPa]**	**a large cable-laying vessel - at a distance of 1 m from the source SPL [dB re 1 µPa]**	**cable burial - 1 m from source SPL [dB re 1 µPa]**	**cable burial - 160 m from the source at a depth of 2 m SPL [dB re 1 µPa].**
porpoise	PTS threshold	SPL = 230/ SEL=215	152	192	178	123
seals (underwater)	PTS threshold	SPL =218/ SEL=203				
porpoise	TTS threshold	SPL =224/ SEL=183				
seals (underwater)	TTS threshold	SPL = 212/ SEL=171				
seals and porpoises	*disturbance* threshold triggering behavioural change, e.g. avoidance; (*disturbance*)	SPL - significant differences in test results SEL =160 (all mammals by Southall); SEL =145 (for porpoise by Lucke); SEL =171 (TTS threshold in seals by Southall)	152	192	178	123

Source: own elaboration based on Southall et al. 2007 and Lucke and Siebert 2009

[508] *Górski et al. 2019*
[509] *HELCOM 2019*
[510] *Temporary sound threshold shift (TTS) and permanent sound threshold shift (PTS), respectively*
[511] *Criteria: Southall et al. 2007 and Lucke and Siebert 2009*
SPL (sound pressure level - is the characteristic magnitude of a sound source) and SEL (exposure sound level/noise exposure level).



TTS (*temporary threshold shifts*) jako funkcja poziomu ekspozycji na dźwięk (SEL) – skumulowanej energii hałasu. Wyniki różnych badań na morświnach *Ph. phocoena* (poza badaniem Popova i in. 2011, które dotyczy *Neophocaena sp.)*

Poziomy (szacowane zakresy) SEL powodujące 6dB TTS (przerywana linia na rycinie po lewej stronie). Bodziec u Luckego (2009) miał charakter szerokopasmowego impulsu, stąd częstotliwość podano jako zakres.

Figure 9.16. *Noise levels resulting in TTS in harbour porpoise indicated in the five surveys.*

Source: Tougaard et al. 2015

The analysis of the estimated noise impact of the construction of the offshore cable connection on fish and marine mammals carried out for the ECI Beatrice Offshore Wind Farm by Subacoustech Environmental Ltd (2012) using the SPEAR model[512] , used the dB factor$_{ht}$ ($_{gat}$). The noise impact values estimated in the modelling were higher for mammals than for fish (due to the frequency component in sound; marine mammals are able to detect higher frequencies than fish). Noise-generating activities associated with the construction of connection infrastructure (excavation, dredging, cable laying and securing, vessel traffic) indicated that for harbour porpoise and common seal, the greatest noise impact is associated with bottom excavation activities (range causing 90 dB$_{ht}$ *(Phocoena phocoena*) up to 140 m from the source; range causing 75 dBht(Phocoena $_{phocoena}$) - 640 m from the source; table 9.17.).

Table 9.17. *Estimated range of noise impacts associated with ECI construction according to Nedwell et al. (2012) on harbour porpoise and common seal, measured in proposed dB$_{ht}$ (species).*

Activity	Species	90 dBht(gat)		75 dBht(gat)	
		Impact range (m)	sea area impacted (km² -hours)	Impact range (m)	sea area impacted (km² - hours)
cable laying	*Phocoena phocoena*	29	<1	220	4
	Phoca vitulina	2	<1	29	<1
trenching	*Phocoena phocoena*	140	1	640	31
	Phoca vitulina	12	<1	87	1
dredging	*Phocoena phocoena*	1	<1	9	<1
	Phoca vitulina	<1	<1	<1	<1
cable *protection*	*Phocoena phocoena*	99	1	550	23
	Phoca vitulina	17	<1	99	1
vessel noise	*Phocoena phocoena*	41	1	350	9
	Phoca vitulina	1	<1	43	1

Source: Nedwell et al. 2012

A schematic representation of the noise impact range of this activity is shown in figure 9.17.

[512] Nedwell et al. 2012

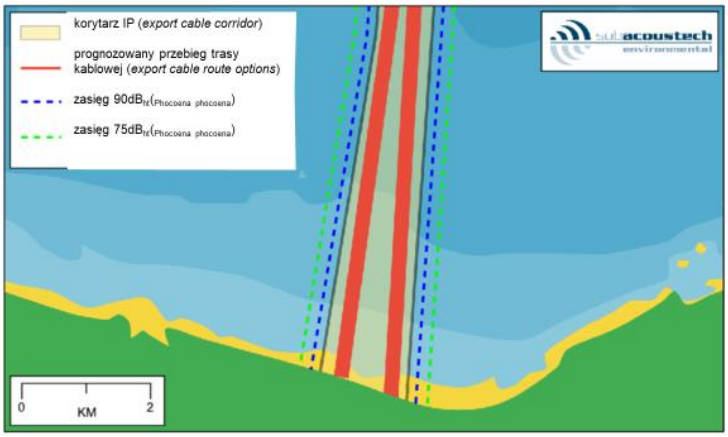


Figure 9.17. *Diagram of the 90 and 75 dBht(*$_{Phocoena\ phocoena}$*) ranges along the constructed ECI corridor in the Nedwell et al. study. (2012).*

Source: Nedwell et al. 2012

According to the modelling results[513] , assuming that the animal is moving at a typical speed for marine mammals during the noise avoidance response (approx. 1.5 m-s^{-1}), it is unlikely to be exposed to noise levels that pose a risk of hearing damage from any of the cable infrastructure construction activities. Assuming the most adverse conditions, where the animal remains motionless in relation to the sound source for the 24-hour period of the work being carried out, the hearing damage risk model works primarily against the seals (at 510m - when laying cables, 660m - when securing cables, 770m - when large vessels are moving). In practice, it is unlikely that an animal would passively remain at a such a distance from a source of continuous noise that can cause disturbance or stress, let alone risk to hearing.

Summary

The projected noise emissions associated with the construction of the planned ECI are not associated with a risk of hearing injury to marine mammals, although they may be high enough to cause them distress in close proximity. According to the schematic impact matrix presented by Taormina et al.[514] , the impact of underwater noise generated during the installation and decommissioning phase of the underwater cable lines by specialised vessels is associated with a level of impact on marine mammals identified as low (*low*), with a low level of uncertainty. The works will be of a temporary nature (movement of vessels carrying out the works) and will not significantly add to the existing noise background. The avoidance response occurring as a reaction to the noise generated, above the threshold of acceptance, will drive marine mammals away from the construction area, minimising the risk of major impacts, including PTS and TTS.

The infrequent sightings of marine mammals in the area indicate that any disturbance may be more likely to affect individuals. However, precautionary practice dictates that any activity that involves noise and potentially causes disturbance and/or harm to marine mammals (particularly harbour porpoises) should be mitigated as far as possible.

Once construction activities cease, acoustic conditions will be similar to those prior to the start of construction, allowing existing marine mammal species to use the area.

In summary, the impact of noise generated during construction will be potentially negative, direct, simple and short-term. Compared to noise levels achieved during construction of the MFW (e.g. piling), noise levels generated during installation of the ECI will be significantly lower and of a different nature (continuous noise rather than impulsive noise). Taking into account the existing acoustic background, they will not significantly affect noise levels in the area of the planned Project. Under the worst-case scenarios, the impact may result in disturbance and harassment of individual marine mammals at a distance of several hundred metres from the source, but due to the continuous (not

[513] *Nedwell et al. 2012*
[514] *Taormina et al. 2018*

impulsive) nature of the noise, as well as its intensity (according to the given predicted SPL values), there will be no risk of hearing damage to marine mammals. Given the extent of the impact of the proposed Project in terms of noise, which will be greater and the incomplete knowledge of the risks from noise pollution to marine mammals and their conservation status, this impact is considered to be **moderate.**

Increased vessel traffic (spatial blockade)

During the construction phase there will be movement of vessels (individually: cable-layers and optional dredgers - in case of deeper excavations in the coastal zone). The probability of collision of marine mammals with these vessels, although it exists and its potential effects are threatening to seals and porpoises, will not be higher than the probability of collision with other vessels moving in the vicinity of the planned IP.

In view of the sporadic occurrence of marine mammals to date (no significant relevance of the Project area in their context), the avoidance of noise, and the random nature of collisions, this impact should be considered **insignificant**.

Increase in suspended solids concentration

Work involving cable plunge/burying disturb the structure of the bottom sediments and spread them in the water depths, leading to an increase in the concentration of suspended solids. Thus, the turbidity of the seawater also increases. The results of the suspended solids spreading modelling carried out for the planned ECI (Volume IV, Appendix 2b) showed that the resulting turbidity in the water depth will be comparable to the suspended solids concentration found in the sea during strong storms. The maximum spatial extent of the suspended solids deposition area will be marked at a distance of 2 to 5 km from the cable axis, where up to about 0.1-0.2 mm of sediment will be deposited The duration of the resulting turbidity will not exceed several of hours.

Turbidity of the water tone may also occur as a result of the storage of dredged material from excavation in the shallow coastal zone if a shorter trenchless passage is implemented. The resulting suspended solids will spread to neighboring areas according to the current field. Turbidity of the water tone will be limited to the region and duration of the work. Given the lithological nature of the dredged material (fine and very fine-grained sands) and the size of a single sediment discharge with a volume of up to about 2 500 m³, the sediment will sink to the bottom in a very short time, leaving a short-lived, slight turbidity of the water tone. The range of maximum spreading of dredged material will be within the ECI corridor limits.

Both echolocating cetaceans and seals lacking this ability often inhabit murky and dark waters. Sight is not primary in the search for food and hunting activities; in seals, it is secondary to the sense of *vibrissae* in these activities. Pinnipeds, including the seal species found in the area of the planned Project, use these structures both as organs of direct tactile perception, able to distinguish the shape and size of objects, and as "tactile sonars"[515] . The fish, as they move, leave a disturbance ('path') in the form of tracks. This is detectable for up to several minutes[516] , and vibrissae allow seals to identify them. The sense of sight, adapted in seals to an aquatic-terrestrial lifestyle, loses its importance in situations of water turbidity (visual acuity decreases significantly and the visual function becomes at best supportive)[517] . Marine mammals, including seals, often reside in turbid waters, so the relevance of the effect of turbidity on the functioning of these animals is unlikely[518] . On the other hand, the residence of marine mammals in the area of increased suspended solids during the construction phase is highly unlikely as they avoid noise foci.

All species of marine mammals that have been shown to be present in the area of the planned ECI show low sensitivity to increased suspended sediment concentrations. Therefore, the impact of increased turbidity on mammals will be **insignificant**.

[515] *Hanke and Dehnhardt 2013*
[516] *Dehnhardt et al. 2001*
[517] *Todd et al. 2015*
[518] *ibid.*

Obstruction/restriction to feeding grounds

During the construction phase of the Project there will be a local disturbance of habitats that are potential feeding grounds for marine mammals. Resuspension and sedimentation will temporarily change the species and community situation of benthic and epibenthic organisms. Displacement of the bottom substrate and the macrofauna living within it will affect fish and downstream links of the trophic chain. Consequently, there may be localised changes in prey availability for marine mammals. These changes will be temporary, similarly, any reduction in the preference of marine mammals to select an area along the marine ECI as a foraging site will be temporary. If there is a reduction in the abundance of fish as food for marine mammals, these animals will move towards habitats with optimal food supply.

The impact of the construction phase of the Project that may involve a reduction in mammal food will be indirect, short-term and local. The overall benthic biomass will not change significantly (and there may even be a temporary increase in macrofaunal abundance due to mixing of bed substrate during digging). Above all, however, marine mammals are likely to avoid the ECI construction area due to noise and human presence, and the possible impact of depletion of the feeding base will be masked by the avoidance response of the construction area.

Marine mammals in such a situation are likely to forage less frequently or not at all in the area of the planned Project, choosing other locations. Re-consumption of food resources will be possible when the habitat returns to its pre-intervention state after the works are completed - recolonisation will occur within a relatively short time (up to several years in full).

Considering the above, the impact related to disturbance of sediment structure and habitat destruction on mammals can be considered **insignificant**.

Remobilisation of contaminants from sludge

As a result of sediment remobilisation, in addition to raising the level of suspended solids in the water table, various types of pollutants can be released.

Both the literature and the Investor's studies (Appendix 1.2 of Volume III of this Report and Chapter 7.2.) show low concentrations of contaminants in the surface layer of sediments in the area of the planned works, so there will be no deterioration of the chemical conditions of the habitat in case of their release. Therefore, it should be concluded that marine mammals **will not be affected by the** remobilisation of contaminants.

Summary of assessment of the significance of all adverse impacts of the planned Project on marine mammals - **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(13) moderate**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **13** which means that the impact on marine mammals for the construction phase will be **moderate.** It is worth noting that the assessment is based on the application of the precautionary principle, as detections of marine mammals in the area of the planned Project were sporadic.

Operation phase

Potential impacts of marine cable operations will result in permanent impacts in the form of magnetic field emissions. Periodic surveys (once every 5 years, with the first three reviews planned in the first, third and fifth year, following completion of construction) using seismic methods will be carried

out and will be a source of noise of short duration. In view of the sporadic occurrence of marine mammals in the area of the planned Project, this impact should be considered insignificant.

Magnetic field

The magnetic field generated by the connection infrastructure may affect magnetically sensitive animals, which among Baltic marine mammals include only porpoises. It is believed that they may react slightly to local changes in the magnetic field caused by the electromagnetic impact of cables placed in the seabed. However, sufficient knowledge of electromagnetic field sensitivity levels has so far been obtained for a small number of marine taxa, and in the context of marine mammals, possible dependencies on magnetic field effects are unknown.[519] Some authors suggest that cetaceans show sensitivity to the geomagnetic field in the ~ 60 nT range, and are therefore probably capable of detecting discrete field changes[520] . In summary, cetaceans and pinnipeds are among the groups that require further research in this aspect.

Appropriate technical solutions and the depth of cable laying make it possible to practically eliminate and neutralise the magnetic field on the surface of the cables. As indicated in section 9.9. of this report, at the bottom surface just above a cable buried at a depth of 1 m, the magnetic field reaches 7.85 μT. At a distance of 5 m above the bottom, in the vertical direction, the field value decreases by 95%, while in the horizontal direction, at a distance of 4 m from the cable axis, its value decreases by approximately 81%, reaching a value close to 0 at a distance of approximately 10 m from the cable axis.

Assuming the above, as well as the incidental and probably short-term presence of marine mammals in very close proximity to the cables, it should be concluded that the impact on marine mammals will be **negligible**.

Summary of assessment of the significance of all adverse impacts of the planned Project on marine mammals - **operational phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the DDA	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(11) insignificant**

In total, the sum of the impact weights identified for the operational phase of the planned ECI was **11** which means that the impact on marine mammals for the operational phase will be **insignificant**.

9.4.5. Sea birds

This chapter analyses the potential impact of the planned Project on seabirds during the construction and operational phases in relation to the sensitivity of the bird species identified in the area of the planned Project, taking into account important habitats for ornithofauna.

The most valuable sites for marine ornithofauna are associated with the northern parts of the connection corridors, i.e. where the ECI enters the Natura 2000 area PLC90001 Ławica Słupska.

Construction phase

The potential construction impact of the planned Project on seabirds will be related to:

- scaring away birds wintering and resting in the basin during migration periods because of increased ship traffic;
- - an increase in the concentration of suspended solids in the water depth associated with the necessary interference with the seabed of cable burial/burial and optionally during the storage of

[519] *Bilinski 2021*
[520] Gill et al. 2012

dredged material; noise emissions from vessels and equipment necessary for laying and plunge/burying the cable line;
- exhaust emissions from vessels engaged in construction works.

Disturbance of wintering and resting birds in the basin during migration periods as a result of increased ship traffic

Installation of transmission cables will result in scaring birds away from the area of the works. During surveys conducted by the Investor, the most numerous species of all recorded in marine areas in the vicinity of Ławica Słupska was the long-tailed duck, which is very sensitive to disturbance by boats and other human activities at sea.[521] Hence, it is estimated that presence of installation vessels will be the main impact in this area, resulting in the displacement of long-tailed ducks to other parts of the basin.

Construction works require the presence of various types of vessels that will disturb seabirds through physical presence, noise and light emissions. The first two factors should not have an impact on the routes of birds that do not use the area, but only fly over it. However, such an impact cannot be excluded at night, especially when vessels are heavily illuminated. Birds navigate during migration in relation to natural light sources such as stars and the sun. It has been observed that they also navigate towards lighthouses, oil derricks and other structures illuminated by artificial light at night.[522] . The phenomenon of birds being attracted to artificial light has been known since the 19th century and mainly involved lighthouses and spot-lit ships[523] causing collisions of birds with illuminated structures to be referred to as the 'lighthouse effect'.

The scale of the impact will depend on the number of vessels involved, their size, the method of lighting, the intensity of the light sources depending on the possibility of working after nightfall. If 1 cable vessel, 1 excavation vessel and 4 support vessels, optionally, a dredger (in the case of implementation of a shorter trenchless passage and the need for deeper excavations in the coastal zone), are planned to be involved in the laying of one cable line, the impact will be local.

The period during which installation works will take place is also important, as most seabird species, including the long-tailed duck, show very large differences in abundance between phenological periods. The period for migrating and wintering birds in the study area is from October to the end of April. Conducting works during this period may cause disturbance to birds. It is tentatively assumed that the laying and then plunge/burying will last approximately 6 months in total. The works will last approximately 30-35 days for one cable from MFW Bałtyk II and MFW Bałtyk III and approximately 25-30 days for laying the two cables of the connector between the farms. Optionally, if it is necessary to dig 4 deeper trenches (for 4 cable lines) in the shallow coastal zone (to go beyond the last revetment), additionally, it may increase the work time up to 8 days per cable.

The impact, according to the adopted methodology, has been determined to be negative, direct and simple. The effect of disturbance will be local, short-term, and reversible as the impact will cease immediately after construction and the increased ship traffic associated with construction works will not significantly differ from the standard traffic in the area. However, due to the particular importance of Ławica Słupska and its immediate surroundings, any additional disturbance may affect birds and therefore the sensitivity of this component has been assessed as high. Given the above, the impact is considered to be **moderate**.

Increase in suspended solids concentration

During the construction of the ECI, there will be an uplift of bottom sediments and an increase in the concentration of suspended solids in the water due to cable laying and plunge/burying. These factors may impact on the ability of the long-tailed duck and other resident birds to obtain food in the area of the works. Direct sediment agitation and resuspension will result in reduced water clarity.

Water turbidity may cause difficulties for birds using their eyes to hunt while foraging underwater. Based on the results of the suspended solids spread modelling prepared for this Report (Volume IV, Attachment 2b), it was estimated that the duration of water turbidity could be a maximum of

[521] *Schwemmer et al. 2011*
[522] *Wiese et al. 2001*
[523] *Allen 1880*

approximately 16 hours during the laying of one cable. Therefore, the resulting turbidity may result in a temporary impact on bird feeding areas and therefore possible movements of birds within the water basin. However, displacement of sea ducks is common as they exert a very strong influence on their prey populations.[524][525] It has been estimated[526] that long-tailed ducks in the western Gdansk Bay consume 6,350 tonnes of mussels per year. High bird numbers, particularly in Natura 2000 areas, may cause a decrease in mussel densities, which in turn may cause birds to move to other parts of the basin where food resources are bigger. Sea ducks can dive to depths of 40-60 m[527] [528] [529], but diving is an energetically costly activity, and diving time of benthophages increases with depths[530]. Therefore, forage in shallower, food-rich waters is most energetically viable for birds and only a decline in food resources forces them to move elsewhere within the water basin[531][532] .

The concentration of suspended solids and the extent of water turbidity will depend on several factors, including the direction of currents, wave action and the volume and fraction of disturbed sediment. Based on model calculations, the highest concentration of suspended solids will occur at the cable laying site. Under the most unfavourable conditions (cable-laying speed of 350 m cable per hour), the extent of turbidity may range from approximately 1 to approximately 8 km from the site, depending on the type of bottom sediments disturbed during the works. The greatest turbidity will occur directly offshore, in a section of the Natura 2000 site PLB990002 Przybrzeżne wody Bałtyckie, as well as in the eastern part of the Natura 2000 site PLC990001 Ławica Słupska. These areas, and especially Ławica Słupska, are important locations for bird concentrations during winter and migration.[533]

Sediment deposition associated with cable laying may affect benthic communities within and around the ECI area. A layer of uplifted sediment will be deposited on benthic organisms, which may interfere with their ability to exchange gas and take up nutrients. The predicted thickness of the sediment deposited after the completion of the works (for one cable line) will be up to a maximum of approx. 1.5 mm in the trench axis and less than 1 mm in the remaining area. Due to the small thickness of the sediment, there will be no reduction in benthic resources and therefore no impact on the food base of bird species present in the area, most notably the long-tailed duck. The impact on benthos and fish is predicted to be insignificant and will not disturb organisms being bird food.

Turbidity of the seabed may also occur as a result of depositing dredged material from excavation in the shallow coastal zone if a shorter trenchless passage is implemented. The dredged material is planned to be deposited in a bottom area of about 0.1 km², between km 32 and 30 of the ECI corridor, at a depth of 10-12 m, east of the MFW Bałtyk II cable lines and/or east of the MFW Bałtyk III cable lines. The slurry created during dredged material dumping will spread to neighboring areas, which may temporarily organise access to food. However, bearing in mind that the dredged material disposal site and the range of potential impact is outside the range of preferred feeding grounds, moreover, it occurs in an area where bird abundance is low, it will not affect the reduction of the food base of ornithofauna.

In conclusion, due to the complexity of natural processes and the need to consider many aspects of biology, both benthic organisms and seabirds, the impact has been determined to be negative, direct, and secondary. The impact on water transparency and benthic communities in the Project area will be local and short-term as it will cease upon completion of the works and will return to its original state after some time. It will be fully reversible - the process of recolonisation of benthic organisms and self-purification of waters will occur gradually, resulting in the restoration of the food base for, among others, the long-tailed duck. Therefore, this impact has been determined to be **insignificant**.

[524] *Guillemette et al. 1996*
[525] *Lewis et al. 2007*
[526] *Stempniewicz 1995*
[527] *Nilsson 1972*
[528] *Guillemette et al. 1996*
[529] *Lovvorn et al. 2003*
[530] *Stephenson 1994*
[531] *Meissner 2010*
[532] *Kirk et al. 2008*
[533] *Wilk et al. 2010*

Noise emissions

The presence and movement of vessels will be a major source of noise and a major cause of disturbance to seabirds in the area affected by the construction of the ECI.

This impact is much more significant for ichthyophages than for benthophages (long-tailed ducks), due to a potential, periodic and local reduction in fish density in the area of the works. However, the population of ichthyophages around the planned Project is extremely low and the proximity of neighbouring water basins, rich in ichthyofauna, is low.

Given the above, this impact has been determined to be negative, direct, and simple. The installation of the transmission cable will result in the disturbance of birds from the work area, with the laying of one cable in the seabed assumed to take approximately 30-35 days days for one cable. Optionally, if it is necessary to dig 4 deeper trenches (for 4 cable lines) in the shallow coastal zone (up to the exit beyond the last revetment), additionally, this may increase the work time to 8 days per cable. However, the scaring effect will be local, short-term, and reversible as the impact will cease immediately after construction and the noise generated by the Project will be no different from that generated by the numerous vessels sailing in the Baltic Sea, especially in the vicinity of the main fairway of the TSS Słupska Ławica, adjacent to the Natura 2000 site PLC990001 Słupska Ławica. Therefore, it should be considered that the impact will be **insignificant**.

Exhaust emissions from vessels

During the construction works, the number and type of emitters, i.e., the internal combustion engines powering the vessels, will not be significantly different from the emissions generated by vessels navigating on the water basin. The impact associated with increased emissions will be 462ecoloniz using modern vessels that meet current emission standards.

Atmospheric emissions of gases and particulates are not significant to bird populations, including the long-tailed duck, and therefore the impact has been assessed as neutral, direct and simple. Increased emissions will be local, short-term, and reversible as the impact will cease immediately after the construction completion. Therefore, the impact should be considered as **insignificant**.

Summary of the assessment of the impact on seabirds:

Summary of the assessment of the significance of the adverse impact of the planned Project on seabirds during the **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
High	**(5)**
Impact classification	**(15) moderate**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **15,** meaning that the impact on seabirds will be **moderate**, mainly due to the potential bird scaring during the migration and wintering period.

However, this impact can be significantly reduced or eliminated through appropriate timing for the installation works. It has been proposed that installation works, in the most valuable area for birds, i.e., on Ławica Słupska, will be carried out between May and the end of September, which eliminates the possibility of the impact on migrating and wintering birds. By adhering to these dates, the impact on birds can be considered **negligible**.

Operation phase

The potential impact of the operation of the proposed Project on seabirds will be related to:

- local change of habitats/feeding grounds.

Destruction of benthic communities during the construction phase will result in a temporary reduction in bird feeding grounds, primarily for long-tailed ducks.

The main food of these birds is mussels. Four species play the most significant role in the biomass structure in the Project area: the sand gaper (*Mya arenaria),* the Baltic macoma (*Macoma balthica),* the lagoon cockle *(Cerastoderma glaucum)* and the bay mussel (*Mytilus trossulus)*. While the diet of long-tailed ducks in the area of the planned Project is not known, given the food preferences of birds in the area of Cape Rozewie (the Baltic macoma and the sand gaper)[534] and in the area of the Gdańsk Bay (the Baltic macoma, the sand gaper, the lagoon cockle, the bay mussel)[535] it can be concluded that the species present in the area of the Project will form the basis of the diet of long-tailed ducks.

Restoration and ecolonization of benthic habitats will occur gradually over the life of the ECI, resulting in the restoration of the seabird food base.

During benthic habitat restoration, there may be both a restoration of the original species structure as well as changes caused by:

- physical factors (electromagnetic radiation, heat emission),
- biological factors (where alternatives to cable protection may be used, which may affect, for example, increased biodiversity or the appearance of invasive species).

In terms of physical factors, according to the analysis of the impact of the operation of submarine power cables on the thermal background, in areas of the seabed where the cables will be buried at a depth of approx. 1-5 m, there will be no heating of the near-surface sediment layer (up to 20 cm thickness from the seabed surface), which is important for benthos. Given the electromagnetic field generated by the cables, the magnitude of emissions will be so low as to have no impact on benthic organisms. Considering the above, there should be no changes in species structure because of heat and electromagnetic field emissions in benthic habitats.

Where alternative methods of cable laying may be used – i.e., the cable will be laid on the surface and protected with a mattress or stone dumping, artificial reefs for benthic organisms may be created, which may encourage an increase in the abundance of species, both native and non-native, increasing biodiversity and therefore the diversity of the food base for the long-tailed duck. At this stage of the project, the locations of alternative cable routing methods have not been identified. The final routing of the cable, including the choice of method, will be done once the geotechnical investigations of the bottom have been completed. The preferred method will be burial/pludge; only where the bottom is rocky over a larger area and it will not be possible to avoid it, the cable will be laid on the surface and protected with a stone dumping or mattress.

Accordingly, and based on information gathered from a literature search[536], given the scale of the Project, this impact has been determined to be neutral and indirect. The complexity of the biological and physical processes taking place, in relation to both benthic organisms and seabirds, means that this is a secondary impact. It will only be local and short-term. Due to the proximity of water areas with an abundant food base, the impact will be **insignificant**.

Summary of the assessment of the impact on seabirds:

Summary of the assessment of the significance of the adverse impact of the planned Project on seabirds during the **operational phase**:

Type of impact and its severity	
Neutral	**(0)**
Indirect	**(1)**
Secondary	**(2)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	

[534] *Meissner 2010*
[535] *Stempniewicz 1995*
[536] *Taormina et al. 2018*

Average	**(5)**
Impact classification	**(11) insignificant**

In total, the sum of the impact weights identified for the operational phase of the planned ECI was **11,** meaning that the impact on seabirds will be **insignificant.**

9.4.6. Sand hopper

As part of the planned Project, cables will be laid in the shoreline area using trenchless HDD technology.

Due to the lack of interference with the beach and dune area, it should be concluded that the planned Project, both during construction and operation, will have no impact on the sand hopper.

9.4.7. Summary of impacts on wildlife

The analysis of impacts on animate nature showed that the potential impacts of the planned Project only concern the construction phase, during which moderate impacts are expected on the biotic components of the marine environment, i.e. phytobenthos, macrozoobenthos, ichthyofauna, marine mammals and birds. In the case of ichthyofauna, the impact will also be significant, but only for bi-environmental fish.

The most onerous impact during the construction phase of the planned Project will be noise and vibration and an increase in suspended solids concentration, which will entail periodic changes within the habitats, especially in the context of ichthyofauna, where cumulative impacts (cumulative noise, increased vessel traffic, turbidity of the water depths) may occur due to works being carried out within the Atlantic salmon migration corridor. In the area of direct seabed intervention works, a total of 0.61 km² of macroalgae and macrozoobenthos habitats will be destroyed (including 0.094 km² for phytobenthos, 0.52 km² for macrozoobenthos(including 0.1 km2 during spoil storage - optional), which will be gradually restored after construction works are completed. During the operational phase, the impacts of the Project on all components of the marine environment have been classified as insignificant.

A summary of the assessment of potential impacts on the individual biotic components in the form of a matrix is presented in table 9.18. Green indicates insignificant impacts, orange indicates moderate impacts, red indicates significant impacts; GD indicates biennial fish.

Table 9.18. *Matrix for assessing the potential impacts of the planned Project during the construction and operational phases on the marine environment - Summary of the assessment (GD - bi-environmental species)*

Phases of the project	Impacts	Phytobenthos	Macrozoobenthos	Ichthyofauna	Ssaki	Ptaki	Zmieraczek plażowy
Construction phase	increase in suspended solids concentration						
	disturbance of sediment structure/habitat destruction						
	obstruction/reduction of feeding grounds/habitat alteration						
	remobilisation of contaminants from sediment						
	exhaust emissions						
	noise and vibration			GD			
	increased ship traffic (spatial blockage)			GD			
Operation phase	habitat alteration						
	reef effect (stone bed/concrete matting)						
	exhaust emissions						
	noise and vibration						

Phases of the project	Impacts	Phytobenthos	Macrozoobenthos	Ichthyofauna	Ssaki	Ptaki	Zmieraczek plażowy
	electromagnetic field						
	temperature						
	increased ship traffic (spatial blockage)						

Source: In-house study

9.5. IMPACT ON PROTECTED SITES (INCLUDING NATURA 2000), ECOLOGICAL CORRIDORS AND BIODIVERSITY

The planned Project implemented in the marine part will affect Natura 2000 sites:

- PLC990001 Ławica Słupska,
- PLB990002 Przybrzeżne wody Bałtyku,
- PLH220052 Dolina Słupi.

The offshore project will not affect other forms of nature conservation, as there are no valuable natural areas under legal protection (figure 7.48 from Chapter 7.5.).

9.5.1. Impact on Natura 2000 sites

A full Natura 2000 impact assessment, in accordance with the European Commission's guidance, has been carried out in Appendix 7 (Volume IV) of this Report. The main conclusions of the assessment are summarised below.

As the assessment did not identify the potential for significant adverse impacts on Natura 2000 sites that cannot be eliminated or minimised, the assessment was completed at Stage 2 Appropriate Assessment. However, minimising measures were formulated for two areas, which made it possible to eliminate or significantly reduce the possibility of negative impacts on habitats and species under protection in these areas.

PLC990001 Ławica Słupska

The project will be carried out within the boundaries of a Natura 2000 site, therefore the possibility of interference with fragments of protected habitats and habitats of wintering and migratory birds is anticipated, which may cause impacts during the construction phase, such as temporary fragmentation of habitats and deterioration of their quality as well as the scare.

Habitats

On the basis of the surveys carried out for the draft site protection plan, the boundaries of the two protected habitats: i.e. subsea sandbanks and rocky and stony seabed were delimited. Based on the maps provided and the corridor alignment of the planned subsea cables, it can be concluded that the planned project:

- does not interfere with habitat 1170 *Rocky and stony seabed, reefs (Skaliste i kamieniste dno morskie, rafy)* (figure 9.18)
- crosses a fragment of habitat 1110 *Offshore Sandbanks (Piaszczyste ławice podmorskie)* - only the connection with MFW Bałtyk II at a distance of approx. 2.3 km (from km 9BII m to km 12BII) - figure 7.48 in Chapter 7; therefore only for this habitat an impact assessment.

Therefore, a full assessment was performed only for habitat 1110 *Piaszczyste ławice podmorskie*.

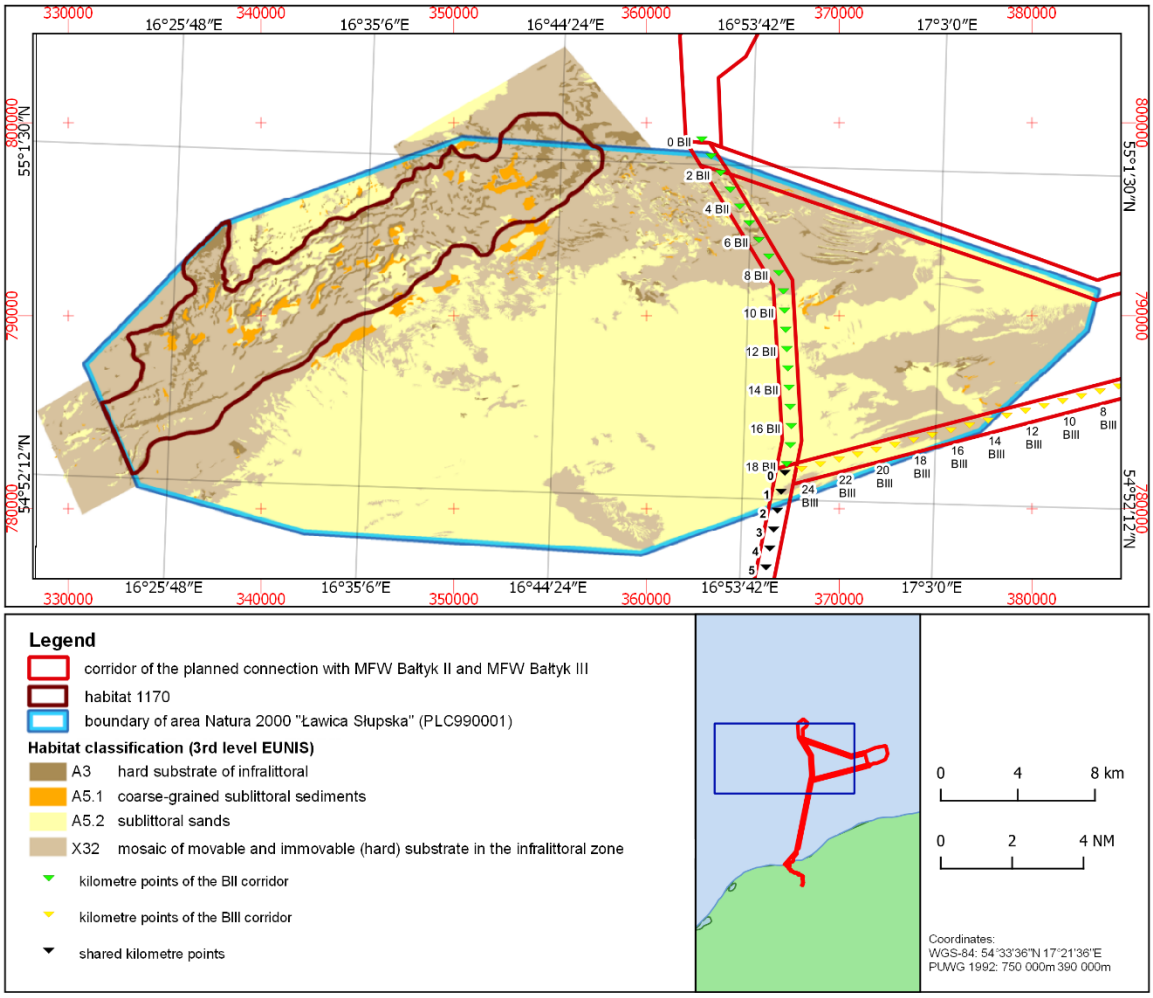


Figure 9.18. *Planned Project against habitat 1170 Rocky and stony seabed, reefs*

Source: own elaboration based on data for the draft of Ławica Słupska protection plan posted at http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

The analysed area at the same time provides important habitat for migratory and wintering birds that are the subject of protection in the area, i.e. for:

- black guillemot *Cepphus grylle,*
- velvet scoter *Melanitta fusca,*
- long-tailed duck *Clangula hyemalis*.

Black guillemot

In the draft Ławica Słupska Protection Plan, an analysis of the density and distribution of black guillemot in the area between 2013 and 2019 was carried out (figure 9.19).

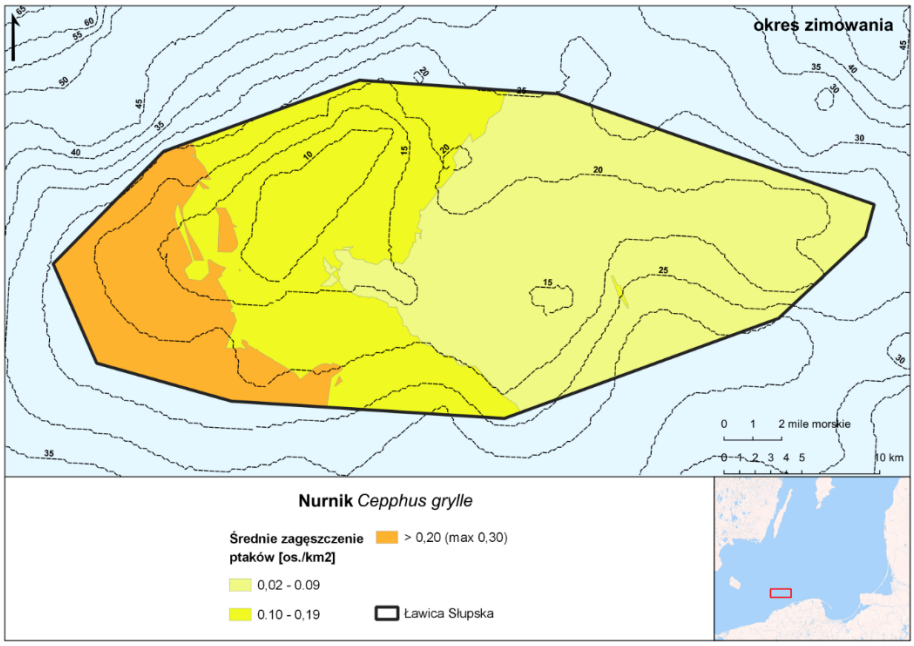


Figure 9.19. Distribution of black guillemot Cephus grylle in the area Ławica Słupska PLC990001 during wintering period

Source: Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

The analysis of the distribution of the black guillemot, indicates its presence mainly in the western part of the area of Ławica Słupska, i.e. outside the place where the planned Project will be implemented. Therefore the impact of the planned project is unlikely..

Urchins

The analysis of the density and distribution of urchins carried out as part of the work on the draft Ławica Słupska Protection Plan, 2013 - 2019 (figure 9.20). indicates that this species is also outside the area of the plannedECIfrom the Bałtyk II and Bałtyk III OWFs.

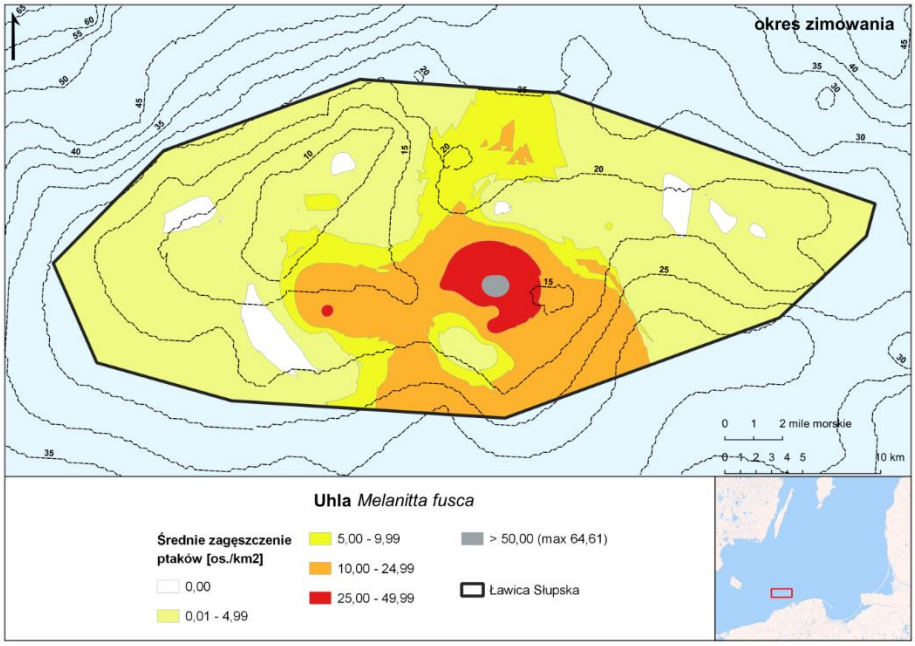


Figure 9.20. *Distribution of Melanitta fusca in area Ławica Słupska PLC990001 during wintering period*

Source: Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

Long-tailed duck

In the draft Plan for the protection of Slupsk Shoal, an analysis of the density and distribution of the icefish in the area in 2013 - 2019 was carried out (Figure 9.21). Its maximum values amounted to 553 s./km^2, and the average for the area was determined at 126.2 s./km^2. In contrast, during the 2012 - 2014 migration period, its maximum values were 285 os./km2, and the average for the area was 95.4 os./km^2. Based on the results of the interpolation, the total abundance of the area's long-tailed godwit was estimated at 101 148 – 231 180 individuals during the wintering period and 76 440 – 214 374 individuals during the migration period. The lower value characterizes the multi-year average, and the higher value characterizes the maximum abundance obtained[537].

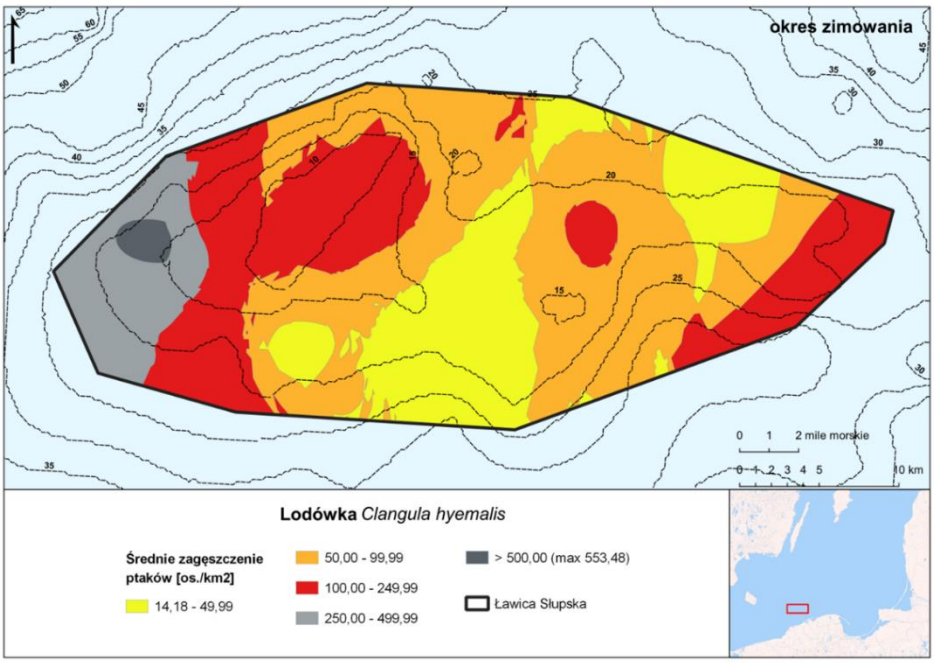


Figure 9.21. *Distribution of the long-tailed duck Clangula hyemalis in the area of the PLC990001 Ławica Słupska during the wintering season*

Higher densities of the refrigerator were also found in the area of the planned Project, which is also confirmed by the Investor's surveys conducted in 2012 - 2014. Therefore, a proper assessment was conducted for the refrigerator in the following section.

On the basis of the reconnaissance carried out, only two objects of protection that may be affected by the planned Project were subjected to a proper assessment:

- habitat 1110 Piaszczyste ławice podmorskie,
- long-tailed duck.

The small scale of interference with habitat 1110 (up to about 0.007% of the habitat area) and the fact that it will be a reversible and medium-term impact - it is assumed that the area will be recolonized by benthic organisms in about 2 years - allow the planned Project's impact on the environment to be considered insignificant. However, the condition for insignificant impact is the execution of the cable passage through the habitat using the method, that will not change the character of the bottom (for example jetting). In this section, protection of the cables by stone surcharge or concrete slabs should be ruled out, as this will permanently change the nature of the habitat in this section. The use of such protection is unlikely due to the sandy bottom; it should not be difficult to reach the safe depth of the cable recess.

[537] *Projekt planu ochrony Ławica Słupska zamieszczonych na stronie http://natura2000umsl.eu/o-projekcie/o-projekcie (materiały zamieszczone 26.03.2020 r.)*

The identified potential impacts of the planned Project on the lodge are related to the possibility of bird scaring and periodic depletion/disturbance of the food base associated with bottom interference. These impacts will be:

- local, i.e. affecting the immediate vicinity of the Project;
- short-term - their effects will be noticeable for a relatively short period after the completion of the works associated with the planned Project (recolonisation of benthic organisms is assumed to occur within 2 years);
- reversible - i.e. on its own, the receptor will be able to return to its original state

In addition, the proposed minimisation measures for wintering and migratory birds, i.e.:

- carrying out the works outside the birds' migration and wintering period, i.e. in the months from 1 May to 30 October, will allow to eliminate the impacts related to bird scaring;
- carrying out construction works with the use of modern vessels, equipped with internal combustion engines meeting modern emission standards.

will eliminate disturbance of birds and disturbance of the food base associated with water turbidity through appropriate timing of the works. Therefore, they will not result in an increase in bird mortality and deterioration of the conservation status of the species in the Natura 2000 site in question. As these impacts will be local and of short duration, they will not be cumulative with similar impacts in the POM.

In the case of habitat 1110 the impact was considered insignificant provided that alternative methods of cable protection i.e. stone erratics, concrete mattresses, etc. are not used along the habitat passage section.

The course of the cable corridor in the basins established in the POM Plan meets the condition included in the draft Conservation Plan of Ławica Słupska PLC990001 concerning the permission to lay submarine cables in the designated corridor [538]. Therefore, no impacts are expected in the integrity of the Ławica Słupska PLC990001 area. The planned Project is in accordance with the findings of the draft Plan of Protection of the area PLC990001 Ławica Słupska and the Plan POM.

In the context of coherence of the Natura 2000 network (the protection of seabird populations), the salient features of the Ławica Słupska PLC990001 area are:

- the location of these areas on the migration route of Eurasian seabird populations to their wintering sites;
- the availability of these areas for populations of wintering and resting birds during migration;
- suitable habitat conditions that make these areas attractive as wintering grounds or resting places during the autumn or spring migration of seabirds.

The Ławica Słupska area is located on the migration route of Eurasian seabird populations to their wintering sites. The distribution of birds on these sites and the abundance of birds is mainly due to the availability of food. Seabirds show a strong attachment to their wintering site and are reluctant to move longer distances[539, 540, 541]. This fact is also confirmed by migration studies of local birds wintering at nearby planned offshore wind farms. Radar surveys of migrating birds have shown that bird species wintering in this part of the Baltic Sea move in all directions without a clear pattern, indicating short flights to feeding grounds rather than long-distance movements. The highest number of recorded flights was documented in the strip between the Natura 2000 sites PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku[542].

In the context of maintaining coherence within the Natura 2000 network, it is particularly important to maintain the possibility of movement between areas of seabird populations, without threatening significant depletion of population status or significant energetic inputs that may affect the ecology and biology, including survival of individuals from these populations. The project characteristics

[538] *Michałek M., Mioskowska M., Kruk-Dowgiałło L. Prognoza oddziaływania na środowisko projektu planu zagospodarowania przestrzennego morskich wód wewnętrznych, morza terytorialnego i wyłącznej strefy ekonomicznej w skali 1: 200 000 Gdańsk. 2019, Wydawnictwa Wewnętrzne Instytutu Morskiego w Gdańsku, nr 7289*
[539] *Iverson and Esler D 2006*
[540] *Kirk et al. 2008*
[541] *Oppel et al. 2008*
[542] *Opioła et al. 2020*

do not envisage the construction of permanent structures protruding from the water that would act as a barrier to the long-tailed ducks as they migrate between feeding and/or resting areas during migration. In addition, it is recommended to carry out works within Natura 2000 site PLC990001 Ławica Słupska, that may frighten birds outside the period of migration and wintering of birds. Therefore, no impacts on the coherence of the Natura 2000 network are anticipated.

In conclusion, the possibility of negative impacts on the objects of conservation, on the integrity of the site and on the coherence of the Natura 2000 network has not been identified with the proposed minimization measures, including, first and foremost, the elimination of the possibility of conducting works in theECIcorridor during the period of migration and wintering of birds.

PLB990002 Przybrzeżne wody Bałtyku

The project will be carried out within the boundaries of a Natura 2000 site, therefore the possibility of interference with the habitat of wintering and migratory birds is analized, which may cause impacts during the construction phase, such as: temporary deterioration of the food base and crowding.

Based on the available PMŚ studies, data from other investors (BC-Wind, Baltic Power) and our own research, it can be concluded that no large groupings of birds are recorded in the analyzed area – figure belowe. Both individuals and their habitats occur in great dispersion in many places in this Natura 2000 area. Of the bird species that are the subject of protection within the PLB990002 Przybrzeżne wody Bałtycku area, long-tailed ducks were observed in the area covered by the planned Project in the greatest numbers. The remaining species occurred sparsely (single individuals): uhla, guillemot, razorbill, silvery gull and scoter.

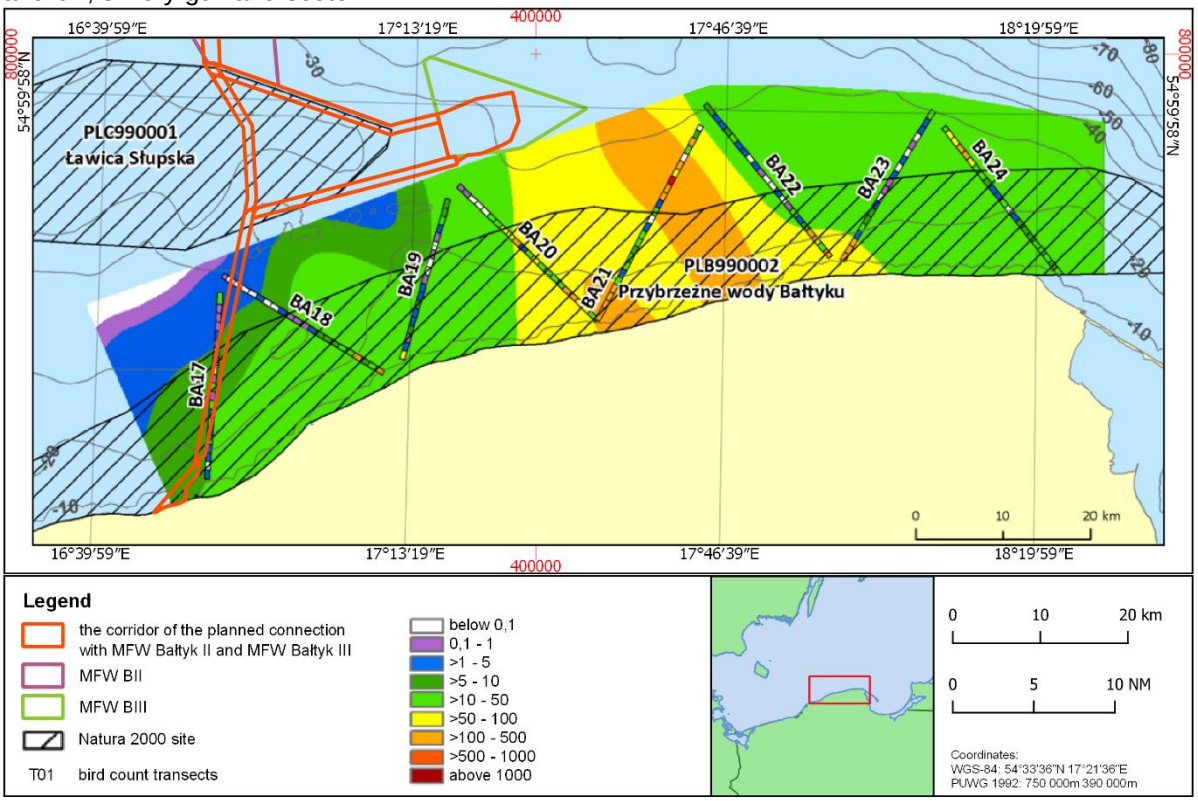


Figure 9.22. *ECI of OWF Bałtyk II and OWF Bałtyk III on the marine birds denticity during offshore surveys carried out in years 2018-2019 within Natura 2000 area Przybrzeżne wody Bałtyku for the purpose of the EIA Report for OWF Baltic Power*

Źródło: Raport o oddziaływaniu Infrastruktury Przyłączeniowej Morskiej Farmy Wiatrowej BALTIC POWER na środowiska, MEWO S.A., 2021

Impacts on the objects of protection of the PLB990002 Przybrzeżne wody Bałtycku area are considered insignificant, mainly due to the fact that the species of conservation concern are spread over a wide area and due to the nature of impacts caused by the planned Project, which will be local, short-term and reversible. The area of interference with the seabed in connection with the Planned Project

will cover 0.02% of the area of the PLB990002 Przybrzeżne wody Bałtycku area, and works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one cable, in case a deeper excavation is required for the trenchless passage.

With a view to reducing the impact of the construction phase as much as possible, minimization measures have been proposed that will apply to all species of conservation concern, i.e.:

- reduce the possibility of impact on the objects of protection (migratory and wintering birds) by increasing the intensification of the pace of work during the period when the number of birds in the Baltic coastal waters is the lowest, i.e. from May 1 to September 30;
- conducting construction work using modern vessels that meet modern noise emission standards.

The possibility of negative impacts on the conservation objects, on the integrity of the site and on the coherence of the Natura 2000 network has not been identified.

PLH220052 Dolina Słupi

The subject of protection in this area is, amongst others, the spawning population of Atlantic salmon *Salmo salar* and the river lamprey *Lampetra fluvialis*. In terms of ichthyofauna, there is a spawning migration route for Atlantic salmon, sea trout and the river lamprey in the coastal zone, approximately to 4 miles. These species use the River Słupia as a breeding ground, especially in autumn.

For ichthyofauna, negative effects of the works (especially in the coastal zone, in autumn) on spawning migration of Atlantic salmon and sea trout are possible, and in spring (March) for river lamprey especially for the population using the River Słupia as a breeding site. This could represent a potential negative impact on these species. [543]

Accordingly, a specific assessment was carried out in Volume IV, Annex 7 for Atlantic salmon *Salmo salar* and the river lamprey *Lampetra fluvialis.*

The planned project does not generate threats to the integrity of the Natura 2000 Dolina Słupi PLH220052 site or to the coherence of the network. The works will be carried out at a considerable distance from the site, and the only potential short-term and reversible impacts are related to the timing of cable laying in the coastal zone, i.e. up to 4 Mm from the shore.

The proposed minimisation measures

- carrying out works relating to cable laying in the coastal zone up to 4 Mm outside the spawning migration period in the months from 15 September to 15 November and from 1 March to 15 April,
- ichthyological supervision of the timing of the works, completely eliminate the possibility of disturbance to spawning migrations of Atlantic salmon entering the Słupia River.

In conclusion, the possibility of negative impacts on the objects of conservation (with the application of minimising measures), on the integrity of the site and on the coherence of the Natura 2000 network has not been identified.

Podsumowując, wszystkie potencjalne oddziaływania na obszary chronione dotyczą jedynie fazy budowy.

Summary of the assessment of impacts on Natura 2000 sites - construction phase:

Type of impact and its severity		
Negative	**(1)**	
Direct	**(3)**	
Simple/ secondary	**(1)/(2)**	
Short-term	**(1)**	
Reversible/ replicable	**(1)/(2)**	
Spatial extent of the impact		
Local/sub-local	**(2)/(3)**	
Sensitivity/vulnerability of the environment		
High	**(5)**	
Klasyfikacja oddziaływania	**(14) moderate**	**(17) significant**

[543] *Bernaś i in. 2009*

The total sum of the impact weights determined for the construction phase of the planned ECI was **14**, which means that the impact on Natura 2000 site Słupska Ławica and Przybrzeżne wody Bałtyku was considered moderate. For Natura 200 Dolina Słupi the sum of weights was **17** i.e. the impact was considered significant.

These impacts can be minimised or eliminated by appropriate timing of the works as discussed in Chapter 16. Impacts have been reduced to insignificant or will not occur at all (in the case of the Dolina Słupi).

9.5.2. Impact on ecological corridors

In the South Baltic, where the ECI is planned, no concept or documentation defining ecological corridors has been developed, and the applicable planning document, the POM Plan, does not depict ecological corridors in the sea. Nevertheless, the area of the planned Project serves many animal species, including ichthyofauna and birds, as a place for migration in search of spawning grounds and wintering.

For birds, the planned Project passes through the Natura 2000 sites PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku, which are on the migration route of Eurasian seabird populations to their wintering grounds. In addition, these areas provide resting places for populations of wintering birds and seabirds during autumn or spring migration. The highest number of recorded flights was documented in the belt between the Natura 2000 sites PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku.[544]

The area PLC990001 Ławica Słupska plays an important function in maintaining the continuity of ecological corridors in the European and global dimension. During winter it hosts at least 1% of the migratory route of the following species: the long-tailed duck, the black guillemot and the velvet scoter, as well as wetland birds in concentrations of over 20,000 individuals. The majority of bird migration takes place in the NE-SW direction.[545]

In terms of ichthyofauna, there is a spawning migration route for the Atlantic salmon and the sea trout in the coastal zone, approximately 4 miles offshore. These species use the Słupia River as a breeding ground, especially in autumn (Subchapter 9.4.3.).

Construction phase

Considering above-mentioned issues, during the construction phase of the planned Project, there may be disruption to the accessibility/obstruction of major migration routes due to:

- increased vessel traffic (barrier effect),
- underwater noise noise ,
- an increase in the concentration of suspended solids during bottom plunge/burying cables (and optional spoil storage).

Movement of vessels (barrier effect) During the construction phase, increased vessel traffic is expected due to works including bottom preparation and the ECI cable laying and plunge/burying. These works may be an underwater physical barrier to both fish and bird migration. However, these barriers will be spotty (at the location of the current works), so migrating fish and birds will be able to avoid it.

In case of ichthyofauna, negative effects of the works (especially in the coastal zone, in autumn) on the spawning migration of the Atlantic salmon and the sea trout are possible, especially with regard to the population using the Słupia River as a breeding site. This could potentially negatively impact these species.

For migrating and wintering birds, the period when they are most numerous in the Project area is from October to the end of April. Conducting works at this time may cause disturbance to birds.

Given the above, this impact has been determined to be negative, direct and simple. The effect of disturbance, both to fish and birds, will be local, short-term and reversible as the impact will cease immediately after the construction and the increased ship traffic associated with construction works will not be significantly different from the standard traffic in the area. However, due to the importance of

[544] *Opioła et al. 2020*
[545] *Opioła et al. 2020*

Ławica Słupska and its coastal waters, which are used for migration purposes, and the Słupia River into which the sea trout and the salmon spawn, the impact has been assessed to be moderate.

Noise emissions

The presence and movement of vessels will be a source of noise and a cause of fish and seabird fright and disturbance in the area affected by the construction of the Connection Infrastructure.

In terms of birds, the impact is more significant for ichthyophages than for benthophages (long-tailed ducks), whose population in the area of the planned Project is small. The effect of disturbance will be local, short-term and reversible as the impact will cease immediately after the construction and the noise generated by the Project will not be different from that generated by numerous vessels sailing in the Baltic Sea, especially in the vicinity of the main fairway of TSS Ławica Słupska, adjacent to the Natura 2000 site PLC990001 Ławica Słupska. Therefore, the impact should be considered insignificant.

For ichthyofauna, effects are expected on species that are the most sensitive to sound. A high level of sensitivity and hence a clear avoidance response is found in the cod, the herring and the sprat. Compared to the aforementioned species, the sensitivity of bi-environmental fish (the Atlantic salmon and the sea trout) is slightly lower, but similar behavioral responses are to be expected. Noise effects from units operating during the construction phase of the ECI will be local and temporary in nature, and spatially restricted to the ECI corridor and its immediate vicinity. The intensity of the noise impact for this phase has been determined to be medium and the significance of the impact has been determined to be moderate.

Increase in suspended solids concentration during bottom preparation and cable laying

During the stage of excavation, the bottom sediments will be stirred up and mobilised. Suspended sediments in the water depths will act as an additional physical barrier mainly to the movement of fish, as they avoid areas with increased concentrations of suspended matter. However, these barriers will be spotty (at the current location of works), so migrating fish will be able to avoid it. Nevertheless, there are possible negative effects of the works (especially in the coastal zone, in autumn) on the spawning migration of the Atlantic salmon and the sea trout, especially for the population using the Słupia River as a breeding ground.[546] However, considering the amounts of suspended solids entering the waters, they will be highest at the bottom, while in the water depths and near the surface they will be much lower, which will limit the negative impact on these pelagic species. The threshold for the impact of suspended solids on fish (5 mg/l) adopted in the suspended solids model (Volume IV, Attachment 2b) is significantly lower than that found in rivers that are migration routes for this group of species (typically up to 20 mg/l and above) and will not affect adults of these species in the sea. The next adopted threshold value (> 30 mg/l) that may have some impact on bi-environmental species will be limited to the immediate vicinity of the works being carried out and will only occur in the bottom layer Therefore, this factor is not expected to have a significant impact on bi-environmental species. Therefore, the impact of suspended solids on migration routes should be considered insignificant.

Summary of the assessment of the significance of all adverse impacts of the planned Project on accessibility/obstruction of main migration routes during the construction phase:

Type of impact and its severity		
Negative	**(1)**	
Direct	**(3)**	
Simple/ secondary	**(1)/(2)**	
Short-term	**(1)**	
Reversible/ replicable	**(1)/(2)**	
Spatial extent of the impact		
Local/sub-local	**(2)/(3)**	
Sensitivity/vulnerability of the environment		
High	**(5)**	
Impact classification	**(14) moderate**	**(17) significant**

[546] *Bernaś et al. 2009*

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **14,** which means that the impact on the accessibility of the main migration routes will be **moderate**, mainly due to the potential for bird scaring during the migration and wintering period. In the case of the migration corridor of bi-environmental fish entering the River Słupia for spawning, the sum of weights was **17,** i.e. the impact was considered significant.

The measure eliminating the impact of the planned Project on the permeability of migration corridors, both for birds and ichthyofauna, will be to conduct construction works outside the periods of migration and wintering of seabirds (from October to the end of April) in Ławica Słupska area and spawning migration of bi-environmental species, which for the Atlantic salmon and the sea trout is the autumn period - from 15 September to 15 November. This period, according to the *Regulation of the Minister of Maritime Economy and Inland Navigation of 21 August 2019 on the dimensions and protection periods of marine organisms and detailed conditions for commercial fishing* (Journal of Laws 2019.1701) and the *Regulation of the Minister of Agriculture and Rural Development of 6 July 2015 on the dimensions and periods of protection of marine organisms caught in recreational fishing and the detailed manner and conditions for the exercise of recreational fishing* (Journal of Laws 2021.2056 consolidated text).. Compliance with these deadlines will result in that the impact on birds and fish can be considered **insignificant**.

Operation phase

During the operational phase of the ECI, the extent and the significance of effects on migratory routes will be considerably smaller compared to the construction phase. Possible disturbances may occur due to the magnetic field generated by the cables and they will only affect ichthyofauna.

For the planned ECI, the magnitude of the magnetic field emitted for a cable buried at a depth of 1 m will be about 7.85 μT (which is more than 6 times lower than the Earth's magnetic field, which is about 50 μT). At a distance of 5 m above the bottom, in the vertical direction, the field value decreases by 95%, while in the horizontal direction, at a distance of 4 m from the cable axis, its value decreases by about 81%, reaching a value close to 0 at a distance of about 10 m from the cable axis. When the cable is buried at a greater depth, the field values above the bottom will be even lower.

Presence of cables will cause field emissions, which could result in disrupted orientation and subsequent rerouting of spawning fish. The potential impact of the magnetic field will primarily affect magneto sensory organisms. The detection threshold, depending on the species, ranges from 0.01 μT to 0.05 μT, which means that the magnitude of the magnetic field generated by the planned ECI cables will be detected by these organisms from greater distances, even up to several tens of metres in the bottom layer. For bi-environmental fish, i.e., the Atlantic salmon and the sea trout, the sensitivity to magnetic fields has been assessed as moderate (Subchapter 9.4.3.).

Given the magnitude of the emitted magnetic field of the planned ECI, the impact will be local and will occur in the immediate vicinity of the cables. Regarding bi-environmental fish species (the Atlantic salmon, the sea trout), which move in the water depths, usually a considerable distance from the bottom, the impact of the magnetic field on migration routes will be marginal.

Taking into account the above, it should be considered that the magnetic field generated by the cables will not cause interference with the migration of bi-environmental fish, and therefore the impact should be considered **insignificant**.

Summary of the assessment of the impact on the accessibility/obviousness of major migration routes

Summary of the assessment of the significance of all negative impacts of the planned Project on the main migration routes during **operational phase**:

Type of impact and its severity	
Neutral	**(0)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	

Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(10) insignificant**

In total, the sum of the impact weights identified for the **operational phase** of the planned ECI was **10,** meaning that the impact on the main migration routes will be **insignificant**.

9.5.3. Assessment of the impact on biodiversity

The corridor designated for the planned Project crosses Natura 2000 protected sites PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku is characterised by moderate value and, only in some places, high value (Subchapter 7.4.7), by passing the most valuable fragments of the seabed in the POM area.

The research on the marine environment conducted by the Investor in the area of the planned Project confirmed the uniqueness of the above-mentioned areas, moreover it showed spatial differentiation of the value of species and habitats.

Particularly noteworthy are the ECI sections running through the Ławica Słupska area (Natura 2000 site - PLC990001 Ławica Słupska) (figure 9.23), where biodiversity, especially in the context of ichthyofauna, is relatively high compared to the POM, which is supported by the more diverse habitat conditions present in the area. The inventory showed the presence of 4 demersal fish species under partial species protection in Poland (Journal of Laws 2016, item 2183): the sand goby (*Pomatoschistus minutus)*, the common goby (*Pomatoschistus microps)*, the seasnail (*Liparis liparis*) and the straightnose pipefish (*Nerophis ophidion)*. In addition, there are rare, strictly protected plant species, i.e.: red algae *Furcellaria lumbricalis* and *Ceramium diaphanum,* two other species rare in the Polish Maritime Areas: *Coccotylus truncatus and Rhodomela confervoide,* as well as a higher number of macrozoobenthos taxa in comparison to other areas of the POM, including the occurrence of a rare crustacean species *Eurydice pulchra,* included in the Red List of Threatened Species in the Baltic Sea, which, apart from Ławica Słupska, was recorded only in the vicinity of Klif Orłowski (cliff). Particularly noteworthy are areas of high zoobenthic biomass as potential feeding grounds for fish and/or benthos-feeding birds, e.g. the long-tailed duck and the scoter. Four species stand out in the composition of bivalves, playing the most important role in the biomass structure: three sediment-burrowing species: *Mya arenaria, Macoma balthica, Cerastoderma glaucum,* and the hard-bottom mussel *Mytilus trossulus*.

The sections of the ECI located in the Natura 2000 site - PLB990002 Przybrzeżne Wody Bałtyku (figure 9.23.) - cross the migration corridor of bi-environmental fish of the Atlantic salmon and the sea trout, species using the Słupia River as a breeding ground. In the shoreline zone, there are mussel habitats on the bottom, providing substrate for spawning of the sand goby, a protected species, and food for fish and birds. In addition, there are potential spawning grounds for the herring (with moderate habitat parameters)[547]. A unique species that lives on the beach in the shoreline area, attesting to its naturalness and high conservation value, is the beach sandhopper *Talitrus saltator*. It is under partial protection in accordance with the Regulation of the Minister of the Environment of 16 December 2016 on the protection of animal species (Journal of Laws 2016, item 2183) and listed on the Red List of Threatened Species in the Baltic Sea as a Data Deficient but also suspected endangered species (category: DD).[548]

Equally important in terms of conservation values are the sections of the ECI running beyond the borders of the aforementioned protected areas, i.e. section km 0BIII-4BIII and 8BIII-12BIII of MFW Bałtyk III and within the offshore fields of MFW Bałtyk II and MFW Bałtyk III (figure 9.23). The highest conservation values are observed in the area of MFW Bałtyk II, whose bottom substrate in the form of boulders and sand and pebbles is conducive to the existence and colonisation of benthic organisms, which provide an abundant food base for fish, which in turn are conducive to the birds occurring in these areas, especially the long-tailed duck, which by far dominates the group of wintering birds. In addition, the area is a potential spawning ground for the herring (in the southern part of the field) and the sprat

[547] *surveys conducted by the Investors in the area do not confirm the presence of spawning grounds*
[548] *HELCOM, 2013 HELCOM Red List of Baltic Sea species in danger of becoming extinct. Balt. Sea Environ. Proc. No. 140.*

(in the northern part of the field) with moderate habitat conditions, and the bottom conditions are suitable for spawning of the seasnail (in the southern part of the field).

Slightly less valuable, but equally important, are potential sprat spawning grounds (moderate habitat conditions), located in the northern part of the MFW Bałtyk III field. The high mussel biomass present here, similarly to the section km 0BIII-4BIII and 8BIII-12BIII of MFW Bałtyk III, provides substrate for spawning of the sand goby - a protected species.

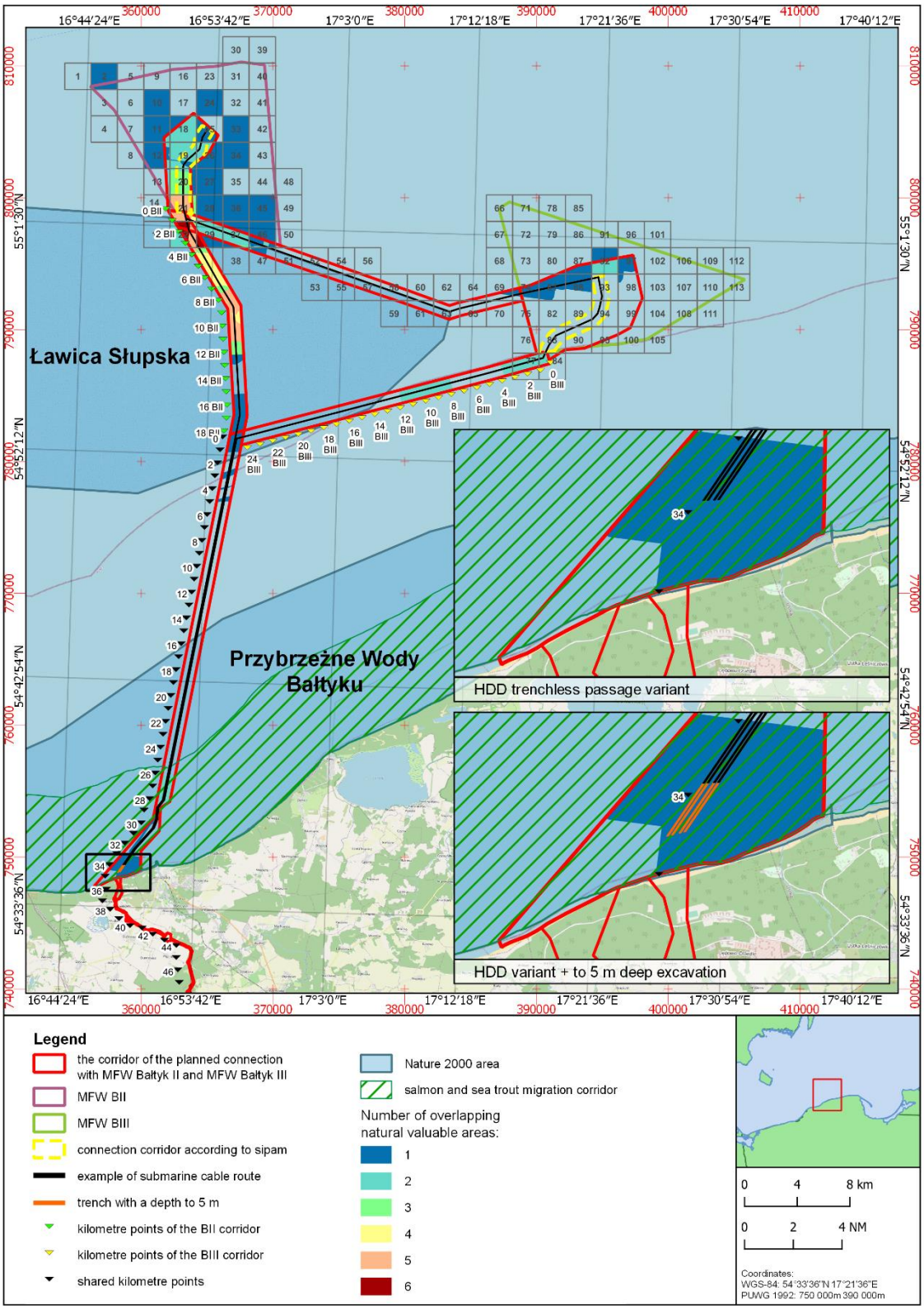


Figure 9.23. *Natural assets in the area of the planned Project*

Source: In-house study

Construction phase

The impact of the construction phase of the planned Project on biodiversity will be a composite of all effects identified for the individual biotic components of the marine environment (Subchapter 9.4.1. - 9.4.6.), and will be primarily related to:

- direct seabed intervention works associated with: cleaning of the seabed, plunge/burying, laying of cable lines and optional use of alternative methods of cable protection in the form of stone dumping and concrete mattresses (where there will be limited opportunities for cable burial using water jetting, ploughing or mechanical cutting techniques) - causing the disturbance of the sediment structure/habitat destruction and increasing the quantities of suspended solids in the water, therefore causing the remobilisation of contaminants,
- increased vessel traffic and underwater noise emissions due to works involving the laying of cable lines.

The most negative impact of the planned Project that may affect biodiversity is the destruction of benthic habitats, including phyto- and macrozoobenthos. This impact will be particularly significant in areas of greatest conservation value in terms of species diversity, abundance, biomass, and presence of rare/protected species. The remaining effects will be local, short-term and reversible as they will cease immediately after construction.

Phytobenthos habitats will be removed completely during the construction works (only along the route of the planned connection of MFW Bałtyk II), in a bottom area of approx. 0.094 km² and macrozoobenthos habitats along the route of the planned Project, in a bottom area of approx. 0.42 km² (including approx. 0.06 km² of soft bottom habitats and approx. 0.36 km² of hard bottom habitats). During the optionally contemplated placement of dredged material, there will be burial of macrozoobenthos habitat on the soft bottom in a 0.1 km² bottom area. This will have a direct, negative, medium-term and reversible impact. Habitats will be restored and re-colonisation of the bottom and restoration of habitat structure and function will be possible due to the presence of the same species in areas adjacent to the ECI.

For phytobenthos, the recovery of the communities may begin after the construction works, already in the first growing season. However, the return to their original state will most likely take several years in case of communities consisting of rare and protected species and/or characterised by a high degree of macroalgal bottom cover.

For zoobnthic habitats, the first recolonisation is likely to take place within a few or several weeks after the construction works. Taking into account the limited mobility of adult macrozoobenthos and the dispersal ability of pelagic larval forms of many species, recovery of the structure and function of soft-bottom benthic communities may be expected within several years of the cessation of works. This may be quicker in case of the hard bottom and the mussel assemblage *Mytilus trossulus*, which breeds mainly in spring and summer and the pelagic larvae settle on the bottom after a few weeks. After only about four months, bottom colonisation can occur and benthic communities dominated by mussels and barnacles can form. A similar size structure of mussels prior to the Project will be reached approximately 2 years after the cessation of the works, after the first breeding season in spring and summer.

In view of the above, the impact on biodiversity in the context of the benthos is considered to be **moderate**. However, it is worth emphasising that the seabed intervention works will not lead to the total elimination of valuable and protected species occurring in the area of the Project, as they are present in the areas adjacent to the ECI and, thanks to them, it will be possible to restore the phyto- and zoobenthos habitats destroyed during the construction works. In case of other biotic components, the impact will be **insignificant**.

Summary of assessment of the significance of adverse impacts of the planned Project on biodiversity during the **construction phase:**

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**

Medium-term	**(2)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(12) moderate**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was **12**, meaning that the **impact on biodiversity will be moderate**.

To a small extent, effects on benthic organisms can be minimised during the design phase, when the cables will be routed in detail. At this stage, it can be recommended to avoid, as far as possible, vegetation-covered bottoms. In addition, the valuable boulder seabed covered with mussel colonies will also be avoided as far as possible. Where it is not possible to avoid large and dense boulder clusters, the cables will be laid on the surface and covered with stone dumping or concrete slabs, which significantly reduces interference with the bottom and associated effects on the benthos. This means that at the design stage, solutions may be prejudged that will result in smaller effects than predicted in this Report.

Operation phase

The impact of the operation phase of the planned Project on biodiversity has been assessed as **negligible**. This is because the only permanent impacts on the marine environment relate to emissions of:

- magnetic fields,
- heat,

whose impact on living organisms was assessed in the preceding chapters on individual components of animate nature as **negligible**.

9.6. IMPACT ON UNDERWATER CULTURAL HERITAGE

Within the boundaries of the ECI corridor of the planned Project, there is no protected site or water body established under the regulations on the protection and care of historical monuments.

According to the opinion of the Pomeranian Voivodeship Conservator of Historical Monuments and the Director of the National Maritime Museum in Gdańsk (Volume IV, Appendix 8) (Chapter 7.6.), there are no cultural heritage objects in the area of the planned Project from the offshore substation to the place where the subsea drilling is planned. Therefore, this impact during both the construction and operational phases should be considered negligible.

However, due to the possibility of encountering archaeological monuments located in deeper seabed structures, it is necessary to proceed in accordance with the provision of Article 32 (1)(1-3) and (10) of the Act of 23 July 2003 on the protection and care of historical monuments. Pursuant to the provision to the aforementioned Act, when an object likely to have cultural value is encountered, one should:

- stop all works which may damage or destroy the discovered object,
- secure the object and the place of its discovery using available means,
- immediately notify the Pomeranian Voivodeship Conservator of Monuments, the Director of the Maritime Office in Gdynia and the Director of the National Maritime Museum in Gdańsk of the entire situation.

Upon completion of the inspection of the objects lying on the seabed, the Voivodeship Conservator of Monuments will decide:

- to continue the interrupted works, if the object is not a monument,
- to continue the interrupted works, if the discovered object is a monument, and the continuation of the works will not lead to its destruction or damage
- on further stopping the works and carrying out, at the expense of the organisational unit financing these works, archaeological research to the necessary extent.

Upon completion of the archaeological research, the provincial conservator of monuments issues a decision allowing the continuation of the interrupted works.

9.7. IMPACT ON CLIMATIC CONDITIONS AND AIR QUALITY

The planned ECI is a necessary element for the commissioning of MFW BII and BIII. Through the ECI of the planned Project, electricity will be supplied to the National Electricity System. It is estimated that indirectly the planned Project will contribute to the reduction of about 4.5 to 8 million tons of CO_2 per year. The above will contribute to reducing the effect of deepening climate change. Thus, the primary impact of the planned Project on the climate should be considered as positive.

ECI of MFW BII and BIII will not be a source of permanent emissions of pollutants into the atmosphere and will not deepen the effect of progressive climate change.

9.7.1. Construction phase

During the construction phase, the only source of exhaust gas emissions into the air will be the internal combustion engines of vessels and equipment used to lay and plunge/burying cables and optionally dredging. The internal combustion engines of the vessels will be a source of exhaust gas emissions, in particular: nitrogen oxides (NO_x), among which nitrogen dioxide (NO_2) predominates, sulfur oxides (SO_x), with sulfur dioxide (SO_2) predominating, carbon oxides and Non-Methane Volatile Organic Compounds (NMVOCs), hydrocarbons and dust. The volume and spectrum of exhaust emissions will depend primarily on the number and size of vessels involved, as well as their temporal and spatial involvement. The quality of the emitted exhaust gas will be determined by the quality of the fuel used by the vessels. The estimated maximum daily exhaust emissions produced by the combustion of diesel fuel by small vessels engaged in 10h/day work and medium and large vessels engaged in 24h/day work are shown in table 9.19. Recommendations for the standards and quality criteria of fuels used by ships are regulated by the MARPOL Convention and the directive of the European Parliament and the EU Council (sulfur directive).

Table 9.19. *Estimated maximum daily emissions from diesel fuel combustion by small vessels engaged in 10h/day operation and medium and large vessels engaged in 24h/day operation.*

No.	Substance	Emission factor [g*kg $^{-1}$ of fuel]	Emission volume [g*kg $^{-1}$ of fuel]		
			Vessels		
			Small	Merdium	Large
1.	Nitrogen oxides (NO_x)	32,629	65,26	1174,64	3915,48
2.	Non-methane Volatile Organic Compounds (NVOCs)	3,377	6,75	121,57	405,24
3.	Carbon monoxide (CO)	10,774	21,55	387,86	1292,88
4.	Total dust (TSP), including up to 100% of PM10 and PM2.5 dust	2,104	4,21	75,74	252,48
5.	Sulfur dioxide (SO_2)	0,020	0,04	0,72	2,40
6.	Aliphatic hydrocarbons (HC al.)	2,195	4,39	79,02	263,40
7.	Aromatic hydrocarbons (HC ar)	1,182	2,36	42,55	141,84

Source: Report on the environmental impact of the project of the Offshore Baltica B-2 and B-3 Connection Infrastructure.

The consumption of 12,000 Mg of fuel by the vessels results in the emission of more than 40,000 Mg of CO_2, 700 Mg of SO_2, 1,200 Mg of NO_x and 90 Mg of dust.

As part of the implementation of the planned Project, the target is to lay 4 cable lines (2 cable lines for MFW Bałtyk II, 2 cable lines for MFW Bałtyk III). Each of the cable lines is planned to be laid separately. In order to lay one cable line, it is planned to engage 1 cable laying vessel (large vessel), 1 earthwork vessel (large vessel) and 4 support vessels (small vessels). In the case of implementation of a shorter HDD trenchless passage, which will require deeper excavations (to go beyond the last revetment), a small dredger is planned to be used for the above work.

To power the aforementioned vessels, diesel fuel will be used, meeting the criteria and quality standards indicated in the MARPOL Convention and the directive of the European Parliament and the EU Council (sulfur directive). It is estimated that during 24-hour operation the cable vessel will consume about 25 Mg of fuel, the extraction vessel about 17 Mg of fuel, and the auxiliary vessels about 10 Mg of fuel. The estimated total time for installation work at sea is about 35 days each for laying one cable line. If a shorter HDD trenchless passage is implemented and deeper excavation is required, the work time may increase to about 8 days per cable.go HDD trenchless passage and deeper excavation is required, the work time may increase to about 8 days per cable. Based on the data described above, it is estimated that during the construction phase, to lay the 4 cable lines, the ships involved in the installation work will consume a total of about 7,280 Mg of fuel, and the emissions from its combustion are not expected to exceed 24 500 Mg of CO_2, 450 Mg of SO_2, 750 Mg of NO_X and 55 Mg of dust.

In connection with the Project, cable lines connecting MFW BII and MFW BIII are also planned to be constructed at a later stage. As part of this stage, two cable lines are planned to be constructed. The planned cable laying technology remains analogous to that described above, i.e. the cable lines will be laid separately with the involvement of 1 cable laying vessel (large vessel), 1 excavation vessel (large vessel) and 4 support vessels (small vessels). It is estimated that the laying of 2 cable lines connecting MFW BII and MFW BIII will take about 30 days. Based on the above-described data, it is estimated that during the above-described installation works, the vessels will collectively consume about 1,820 Mg of fuel, and emissions from its combustion should not exceed 6 100 Mg of CO_2, 110 Mg of SO_2, 185 Mg of NO_X and 145 Mg of dust.

Summary of assessment of climate and air quality impacts:

Summary of the assessment of the significance of atmospheric emissions impact on climate and air quality - **construction phase**:

Type of impact and its severity	
Neutral	**(0)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reproducible	**(2)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

In total, the sum of the weights of the impacts of air emissions during the construction phase of the planned of the planned ECI was **10**, which means **that climate and air quality impacts will be insignificant**.

9.7.2. Operation phase

The planned Project will not be a source of CO_2 emissions into the atmosphere and will not deepen the effect of progressive climate change.

The planned Project is an important element in the process of reducing climate impact by enabling the transmission of "clean" renewable electricity from offshore wind farms, which is expected to lead to a reduction in fossil fuel consumption.

Therefore, the planned Project will only cause positive impacts on the state of the atmosphere and the climate during the operation phase. It will not cause negative impacts, as maintenance inspections, which involve the passage of a checking the state of burial and protection of cables, which is associated with the passage of the vessel and emissions from the engines, are planned to be carried out in the first, third and fifth year, and then performed once every 5 years or so, after the completion of the construction works.

Adaptation to climate change

Climate change adaptation is understood as such a way of planning, implementing, operating and decommissioning a Project that is adapted to the progressing climate change as well as does not increase the vulnerability of the environmental elements to climate change.

Considering the adaptation of the planned Project to climate change, the location of the Project and the technology of its execution have been taken into account.

In terms of adapting the connection infrastructure to climate change, it is important to consider climate factors related to extreme weather conditions, which may affect coastal marine erosion phenomena with increased strength due to increased storm days, sea level rise, and decreased ice days.

The area intended for the execution of the Project is located in the coastal zone, in the maritime areas and in the area of special flood hazard (within the technical zone). Hydrodynamic impacts, in particular: frequency of given wind directions and strength, frequency of storm surges, wave height, depth of wave impact on the seabed, directions and velocity of bottom currents, maximum ordinate of the water table, range of the flood hazard area are the main criteria that should be followed in the process of designing, execution, exploitation and decommissioning of the Project.

In accordance with the requirements of the POM Plan, in coastal zone, the connection infrastructure is planned to be laid at right angles to the shoreline, under the seabed, and if this is not possible for environmental or technological reasons, other permanent safeguards will be used to ensure navigational safety - at least 3 m below the average depression of the bottom between submarine sand bars.

As far as technically and economically feasible, the cables will be of the highest strength class, will meet the current standards, and will have technical approvals, which will be confirmed by appropriate documents allowing for their marketing and use in the construction industry. The cables will be made of materials resistant to mechanical damage, in particular to short circuits, including those caused by lightning occurring within the offshore wind farm.

Installation, maintenance and decommissioning works are planned to be performed only under favourable hydrometeorological conditions. The aforementioned works will be excluded from periods of heavy rains and storms, strong winds and, consequently, increased wave action.

9.8. IMPACT ON THE ACOUSTIC CLIMATE

The construction phase of the planned Project in the offshore part will be associated with the emission of continuous noise (including underwater noise), emitted by operating equipment and vessels. Impulse noise emissions are not expected to occur. The most common measure of noise in underwater acoustics is the sound pressure level, measured in decibels with respect to 1 micropascal (dB re 1 µPa).

The possibility of acoustic impacts is not expected during the operation phase.

9.8.1. Construction phase

During the construction phase, the main source of noise will be vessels and underwater vehicles used for bottom preparation and cable laying and plunge/burying and for dredging the bottom and storing the dredged material (optional). The noise level generated by the above-mentioned vessels will be similar to that generated by other vessels and boats, i.e.: recreational boats, fishing vessels, tugboats and container ships, commonly occurring in marine areas. [549]

As part of the implementation of the planned Project, it is planned to lay 6 cable lines (2 cable lines for MFW Bałtyk II, each with a length of 60 km, 2 cable lines for MFW Bałtyk III - each with a length of 67 km, at a later stage - 2 cable lines connecting MFW Bałtyk II and MFW Bałtyk III - each with a length of 30 km). Each of the cable lines is planned to be laid separately. To lay a single cable line, it is planned to engage 1 CLV, 1 excavation vessel and 4 support vessels. It is estimated that the laying of

[549] *OSPAR 2008*

a single cable line will take about 30 days. For the connector between MFW BII and MFW BIII, 2 lines will be laid in about 30 days. In the case of implementation of a shorter HDD trenchless passage, which will require deeper excavations (to go beyond the last revetment), the work time may increase to about 8 days per cable. A small dredger is then planned to be used for the aforementioned work.

For vessels, expect noise levels in the range of 152 dB re 1 µPa at a distance of 1 m from the source for a small vessel to 192 dB re 1 µPa at a distance of 1 m from the source for a large vessel, such as a cable laying vessel.

In the case of dredging operations involving deeper excavation in the coastal zone and storage of dredged material, the noise generated by the dredger will not exceed 110 dB.[550]

When cables are buried into the seabed, noise (sound pressure) levels reach 178 dB re 1 µPa at a distance of 1 m from the source. At a distance of 160 m from the trench site, at a depth of 2 m, sound pressure levels drop to 123 dB re 1 µPa. The noise emitted during the work is variable and depends on the physical properties of the seabed in which the cable is buried.[551]

In sections of the ECI route where the use of cable burial technology will be limited and cable protection will be made, for example, in the form of stone embankment, noise emissions are also to be expected. The noise level generated during stone laying is within the limits of the acoustic background level of vessels and does not contribute to its increase. [552]

Considering the above, the noise level generated during construction activities will range from 152 to 192 dB re 1 µPa at a distance of 1 m from the source and will exceed the 108 dB threshold level for continuous noise for Polish marine areas.

The range of impact on the acoustic background will be limited in time to the period of cable laying work and in space, as a result of noise attenuation by water. In addition, it will depend on the physical properties of the seabed in which the cable will be buried. [553]

Taking into account the increasing intensity of ship traffic in the area of the Project, and thus the significant pressure of underwater noise on the marine environment (see Chapter 6.1.2.), taking into account the number of vessels used for ECI construction and the level of noise generated by them, it should be considered that the impact on the acoustic background will be negative, short-term and local.

Periodic changes in noise levels that will occur during the construction phase of the planned Project will affect marine organisms, especially fish and mammals, and the magnitude and extent of impacts will be dictated by the noise sensitivity thresholds of individual species. The assessment of noise impacts on living organisms is included in this Report in sections: 9.4.3 - impact on ichthyofauna, 9.4.4 - impact on mammals, and 9.4.5 - impact on birds.

Summary of assessment of impacts on acoustic background:

Summary of assessment of the significance of negative impacts of the planned Project on the acoustic background - **construction phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

[550] *Trzeciak A., Brodzicka P., Chojnacka M., Elżanowska M., Fabrykiewicz R., Kaczmarczyk-Guzik A., Mazurek-Hajduk M., 2016, Raport o oddziaływaniu na środowisko pt. „Rozbudowa toru podejściowego z powiększeniem jego szerokości i głębokości technicznej wraz z wykonaniem obrotnicy o średnicy 750 m" w ramach modernizacji toru podejściowego do Portu Północnego., Transprojekt Gdański Sp. z o.o.*
[551] *Nedwell i in. 2003*
[552] *Nedwell i Howell 2004*
[553] *Nedwell i in. 2003*

In total, the sum of the impact weights determined for the construction phase of the planned ECI was **10**, which means that **the impact on the acoustic background will be insignificant**.

9.8.2. Operation phase

During the operation phase of the planned Project, the source of noise will be vessels used for technical inspections. The state of burial/securing of the cable inspections will be carried out by the Investor using seismoacoustic methods, in the first, third and fifth years, and every five years thereafter, after completion of the construction work.It is planned to use catamarans (medium-sized vessels) for the aforementioned purpose. Considering the above, both the intensity of ship traffic and the level of noise generated will be sporadic, short-term and reversible. The impact has been assessed as insignificant.

Summary of assessment of background noise impacts:

Summary of the assessment of the significance of negative impacts of the planned project on the acoustic background - **operation phase**:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

In total, the sum of the impact weights determined for the construction phase of the planned ECI was **10**, which means that **the impact on the acoustic background will be insignificant**.

9.9. ELECTROMAGNETIC FIELDS

9.9.1. Construction phase

No impact.

9.9.2. Operation phase

The potential impact of the planned Project in terms of electromagnetic fields will be associated with the presence and operation of multi-core submarine cables of the highest voltage alternating current (HVAC) technology with an operating voltage of 220 kV.

Power cables will generate electromagnetic fields. Due to the shielding of the electric component of the field (E) by the conductive sheaths of the cable, they will be the source of only the magnetic component (M) of the electromagnetic field (figure 9.24.).

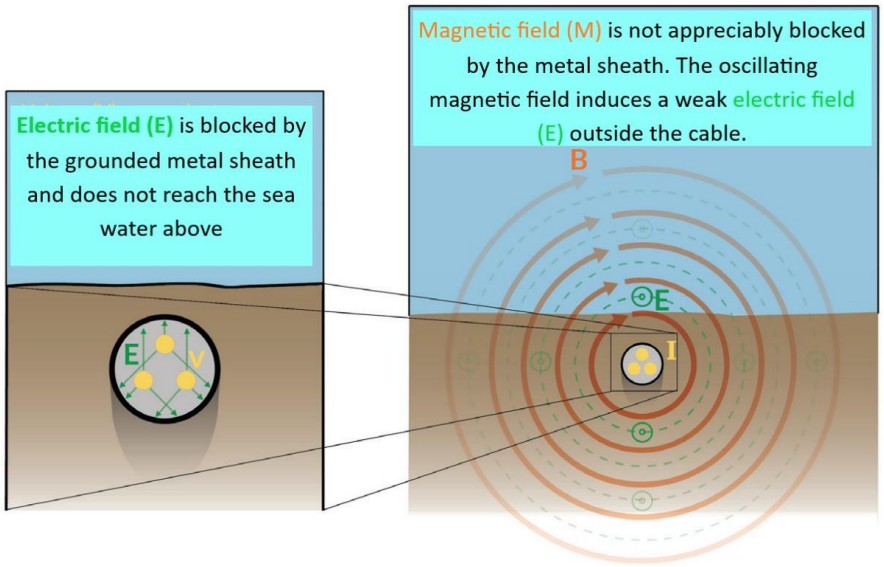


Figure 9.24. *Electric and magnetic fields generated in a power cable*

Source: ENVIRONMENTAL STUDIES 2020, Electromagnetic-Fields-Offshore-Wind-Facilities.pdf

The oscillating magnetic field induces a weak electric field (iE) outside the cable, but its values near the cable are negligible, on the order of a few $\mu V \cdot m^{-1}$. [554] [555] The values of the magnetic component depend on the load on the cable path, i.e. the current flowing through the cable and the depth of its burial in the sediment.

Magnetic fields from submarine power cables decrease rapidly with distance from the cable. Burying cables in the seabed significantly reduces the levels of magnetic fields and induced electric fields (iE) in seawater (figure 9.25.). Laying cables at a depth of 2 m reduces the magnetic field on the bottom surface by about four times. If the cables are covered with a stone embankment or mattress, the level of magnetic field reduction is less and is comparable to that for a cable buried in the bottom at a distance of about 3 m from the cable axis. [556]

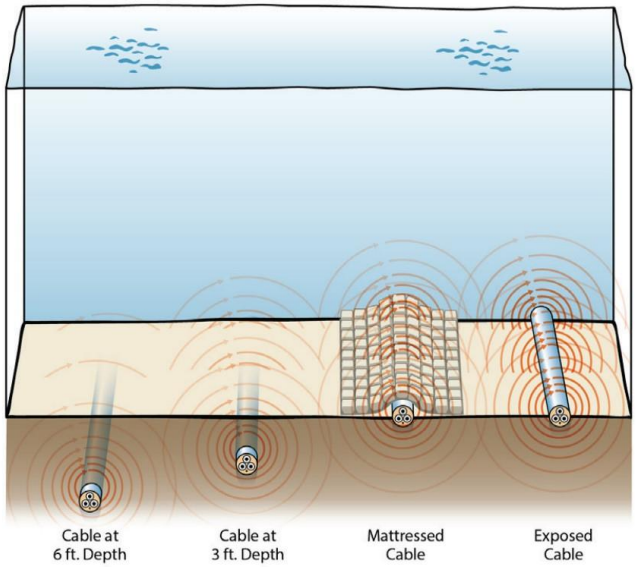


Figure 9.25. *Magnetic field range at different levels of cable burial.*

Source: ENVIRONMENTAL STUDIES 2020, Electromagnetic-Fields-Offshore-Wind-Facilities.pdf

[554] *ENVIRONMENTAL STUDIES 2020*
[555] *Copping et al. 2016*
[556] *ENVIRONMENTAL STUDIES 2020*

Model studies of the magnetic field generated by AC cables (figure 9.26.), taking into account the characteristics (intensity, voltage) of 24 submarine cables showed that in most cases the field intensity depends directly on the voltage in the cables (from 33 to 345 kV). Other factors affecting the magnitude of this field are the depth of burial and the distance between cables. The magnetic field reaches its highest values just above the cable and decreases rapidly with increasing distance from the cable axis (figure 9.26.), both vertically and horizontally. In layouts where current is supplied along two cables at least a few meters apart, a bimodal peak in the magnetic field was observed. [557]

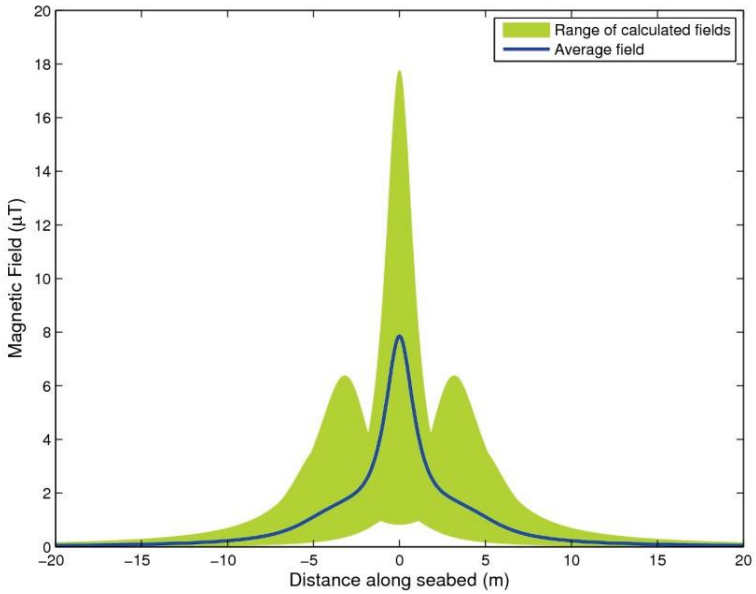


Figure 9.26. *Modeled average and range of magnetic field strength at the seafloor surface over AC cables buried in the bottom.*

Source: Tricast i Gill 2011

Analyzing the variation of magnetic field values, the study shows that at the bottom surface just above the cable buried at a depth of 1 m, the magnetic field reaches 7.85 μT (it is slightly more than 6 times smaller than the Earth's magnetic field, which is about 50 μT). At a distance of 5 m above the bottom, in the vertical direction, the value of the field decreases by 95%, while in the horizontal direction, at a distance of 4 m from the cable axis, its value decreases by about 81% (table 9.20., figure 9.27).

Table 9.20. *Averaged values of magnetic field (μT) as a function of distance from the bottom surface and from a cable buried in a depth of 1 m (based on modeling)*

Distance above the bottom [m]	**Magnetic field [μT]**		
	Horizontal distance from the cable [m]		
	0	**4**	**10**
0	7,85	1,47	0,22
5	0,35	0,29	0,14
10	0,13	0,12	0,08

Source: Tricast i Gill 2011

[557] *Tricast and Gill 2011*

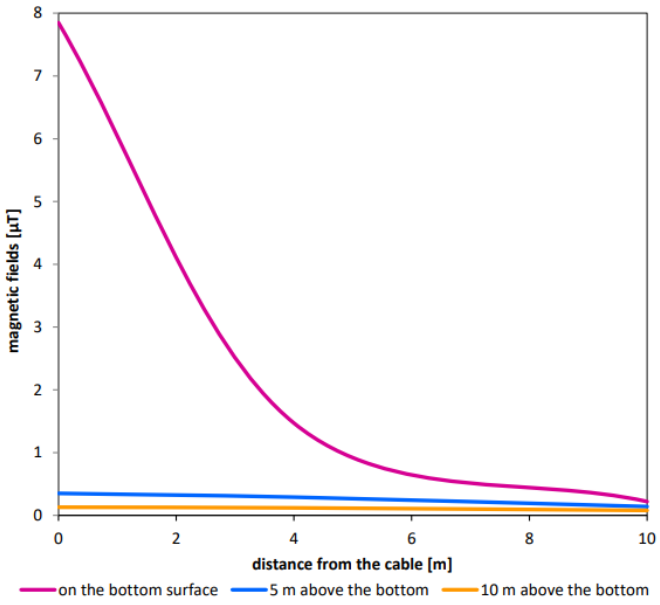


Figure 9.27. Averaged values of magnetic field (µT) as a function of distance from the bottom surface and from a cable buried 1 m deep (based on modeling)

Source: own compilation based on Tricast and Gill 2011

Currently, there are no unambiguously defined standards in Polish legislation setting the acceptable values of magnetic field in the marine environment. Taking into account the values of the electromagnetic field generated by the HVAC cables considered in the model studies and in the literature, and its spatial variability, it should be concluded that the volume of emissions generated during the operation phase of the planned Project will **not affect the abiotic elements of the marine environment**, and with a minimum distance between cables of 25 m, there will be no accumulation of the values of these fields. The magnetic field emitted by the cables will be much smaller than the Earth's magnetic field, so **the impact can be assessed as insignificant**.

Summary of the assessment of the significance of the impact of the planned Project on abiotic elements of the marine environment, including the natural magnetic field - **operational phase**:

Type of impact and its severity	
Neutral	**(0)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

In total, the sum of the weights of impacts related to the laying of cables on the bottom was **10**, which means that the impact of the planned Project on abiotic elements of the marine environment, including the natural magnetic field, will be insignificant.

Regardless of the detected low levels of magnetic field emissions generated by the ECI cables, an assessment was made of the sensitivity of marine organisms to changes in the values of this field. The generated electromagnetic field may affect the behavior of some species of marine organisms that use the Earth's magnetic field for navigation. The potential impact of the field may occur if the value of the emitted field coincides with or exceeds the threshold value of a given species.

An assessment of the impact on living organisms is included in the chapters of this Report on impacts on elements of animate nature in terms of macrozoobenthos, ichthyofauna (anadromous fish) and mammals.

9.10. THERMAL EFFECTS

9.10.1. Construction phase

No impact.

9.10.2. Operation phase

The operation phase of the planned Project, due to the transmission of power through the power cables, will be associated with the emission of heat into the environment.

As a result of this emission, there will be a temperature change in the vertical profile of the bottom sediments, which may result in:

- changes in the geochemical profile of the bottom sediments,
- changes in the structure of benthic communities.

Given what has been reported so far in scientific publications and in reports on the operation of submarine cables, there is still a deficiency of *in situ* sediment temperature measurements at cable sites. Therefore, this chapter presents the current state of knowledge on heat emission in sediment resulting from the presence of a cable, based on experimental and modelling studies, with a particular focus on thermal modelling conducted for different bottom sediments found in the Baltic Sea. The main focus is on temperature changes in the near-surface layer of sediments down to a depth of approximately 20 cm, where the POM infauna live (most species down to a depth of approximately 10 cm, individuals up to a maximum of 30-35 cm).[558]

The magnitude of emissions that have been determined from the above-mentioned sources has been used to assess the impact on the geochemical profile of the sediments and the benthic organisms living there, and their impact is described in Subchapter 9.2.2 and 9.4.2 of this Report, respectively.

Cable temperature

Depending on the construction of the cables and the used insulation materials, the temperature limit of the working conductor of the cables can be 90ºC. Considering the thickness of the insulation material and other reinforcing and sealing layers, the maximum temperature of the external surface of the cables is much lower and does not exceed 60ºC during their maximum load.[559]

The temperature increase in the conductor is gradual. The graph below shows the change in temperature of the cable and seabed as a function of distance from the centre of the cable (figure 9.28). The x-axis shows the distances from the cable, where Rc is the radius of the conductor, the section between Rc and Ra is the thickness of the insulation and 'seafloor' is the position of the seabed surface. Curve 1 shows the initial condition where both the cable and the seabed are at the same temperature (5ºC). Subsequent curves 2-4 show the temperature distribution in the cable as a function of the working conductor's reached temperature, until the maximum permissible load on the cable is reached and the temperature reaches 90ºC - curve 5. At the maximum load on the cable, the temperature on the surface of the cable is 44ºC lower than in the centre of the cable, with a maximum of 46ºC.[560]

[558] *Renz et al. 2018*
[559] *Müller et al. 2016*
[560] *Worzyk 2009*

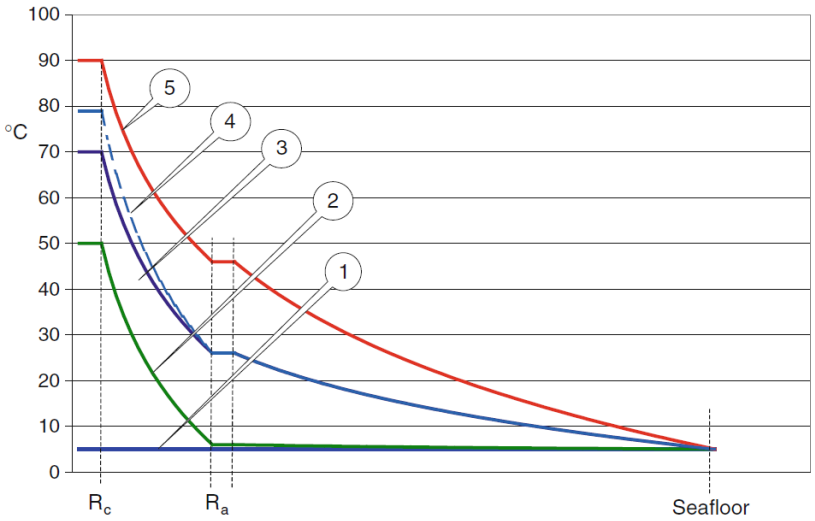


Figure 9.28. *Variation of cable and seabed temperature as a function of distance from the centre of the cable*

Source: Worzyk 2009

As the average load values of the cables exporting power from offshore wind farms vary between 60% and 80% of the maximum value, the temperature of the working conductors will change and thus the amount of heat emitted into the environment will, too.

Experimental and laboratory studies have shown that the amount of heat emission depends on:

- the method of cable laying, and depth of burial[561] ,
- bottom sediment properties (permeability, porosity, thermal conductivity/resistivity[562], temperature distribution of sediment in the vertical profile, thermal diffusivity of sediment[563]),
- marine environmental conditions (water temperature, speed of water movement over the bottom).[564]

Method of cable laying and depth of burial

Experimental tests considering 3 ways of laying cables (in pipes, buried in the seabed at a depth of 2 m, laid directly on the seabed), with identical loads showed that, depending on the way the cable was laid, the temperature inside the cable and on its surface was much lower for a cable buried in the seabed at a depth of 2 m and significantly lower for a cable laid directly on the seabed. This demonstrates the important influence of seawater as a 'cooling' medium, which, due to its high convection coefficient and good thermal conductivity, effectively lowers the temperature of the conductor. For a cable lying directly on the bottom, its temperature is equalized with that of the water already at a distance of 6 cm (the temperature adopted for the experiment is 20ºC) (figure 9.29.) [565]

[561] *Zhang et al. 2020*
[562] *Emeana et al. 2016*
[563] *Müller et al. 2016*
[564] *Zhang et al. 2020*
[565] *Zhang et al. 2020*

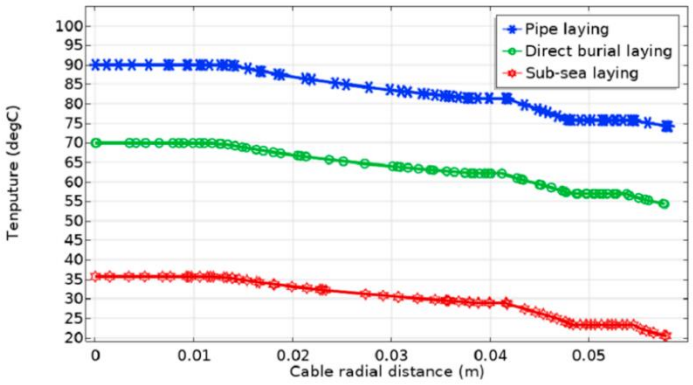


Figure 9.29. *Temperature distribution in a 3-core 220 kV cable laid in pipes (blue), in the seabed at a depth of 2 m (green) and directly on the seabed (red), assuming a uniform constant load of 926.3 A, water temperature 20ºC*

Source: Zhang et al. 2020

For safety reasons (risk of damage to the cables by vessels, including fishing vessels), the Project does not assume that the unprotected cables will be laid directly on the seabed. The consideration of such a solution for the planned Project is theoretical, but gives a good picture of the heat exchange mechanisms between the marine cable and its environment, and provides good comparative material.

For a cable laid below the seabed surface, the depth of burial is important. Tests assuming a constant load and constant thermal conductivity of the bottom sediments have shown that cables lying shallower have a lower temperature. The temperature at a distance of 6 cm from the surface of a cable buried at a depth of 40 cm is about 7ºC and 11ºC lower, compared to a cable buried at a depth of 1 m and 1.6 m respectively (figure 9.30.). Once again, this demonstrates the presence of a cooling effect by seawater. This effect is particularly evident in the sediment layer to a depth of 1 m.[566]

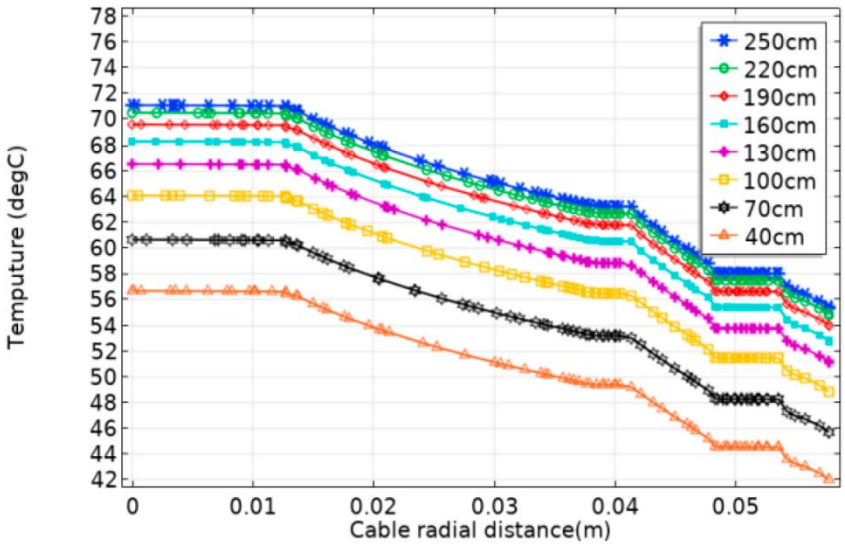


Figure 9.30. *Effect of the depth of the cable burial in the seabed on its temperature. The horizontal axis is the distance from the centre of the cable to its outer layer*

Source: Zhang et al. 2020

The submarine cables of the planned Project will be laid at a depth of approximately 1 m to approximately 5 m. The target depth of the individual cable sections will be determined at the construction design stage, after performing a risk analysis and recognising the detailed parameters of the seabed sediments, and will be selected to limit thermal effects while maintaining a high degree of

[566] *Zhang et al. 2020*

safety for marine users and the implemented ECI. Regardless of the depth of foundation of the cables, the magnitude of their thermal effects will be no greater than presented in this Report.

Bottom sediment properties

Laboratory tests using sediments of different permeabilities at a given cable surface temperature (buried at a depth of approximately 1 m) showed a significant relationship between the permeability of the sediments and the magnitude of the heat flux, and the type of mechanism for transferring this heat.

In case of low-permeability sediments (e.g. coarse-grained silt) above the cable (with a temperature of 60ºC), a temperature rise of approx. 5ºC above the ambient temperature occurs in the near-surface layer of sediments at a depth of approx. 20 cm below the bottom surface. The extent of the thermal plume is small and, due to the low conductivity of the sediments, it is concentrated around the cable. For sediments with medium permeability (e.g. fine-grained sands), at a depth of 20 cm below the bottom surface, the sediment temperature increases by 20ºC above the ambient temperature, and the thermal plume outlines a 120 cm wide strip. For highly conductive sediments (e.g., very coarse sands), for a cable with a temperature of 18ºC, the temperature in the near-surface layer is 10-12ºC above ambient, and the elevated heat flux is concentrated above the cable, in a narrow band about 40 cm wide (figure 9.31). [567]

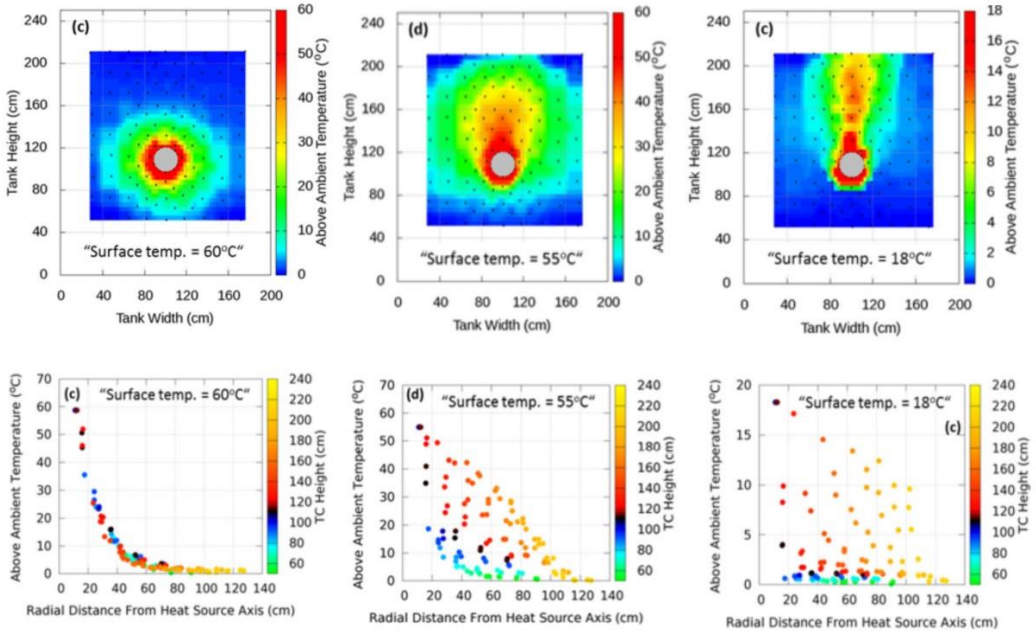


Figure 9.31. *Temperature distribution in sediments with different permeabilities and different temperatures on the cable surface*

C - low permeability (1.41 × 10^{-13} m²), cable surface temperature 60ºC; d - medium permeability (5.0 × 10^{-13} m²), cable surface temperature 55ºC; c - high permeability (1.49 × 10^{-9} m²); cable surface temperature 18ºC with the corresponding extent of the thermal plume over the cable (scatter of TC values).

Source: Emeana et al. 2016 C - changed

Studies have shown that sediment permeability is the overriding parameter controlling the heat transfer mechanism, which can occur in the form of conduction or convection (figure 9.32). The transition from conduction to convection occurs when the permeability increases from 10^{-11} to 10^{-10} m². [568]

[567] *Emeana et al. 2016*
[568] *Emeana et al. 2016*

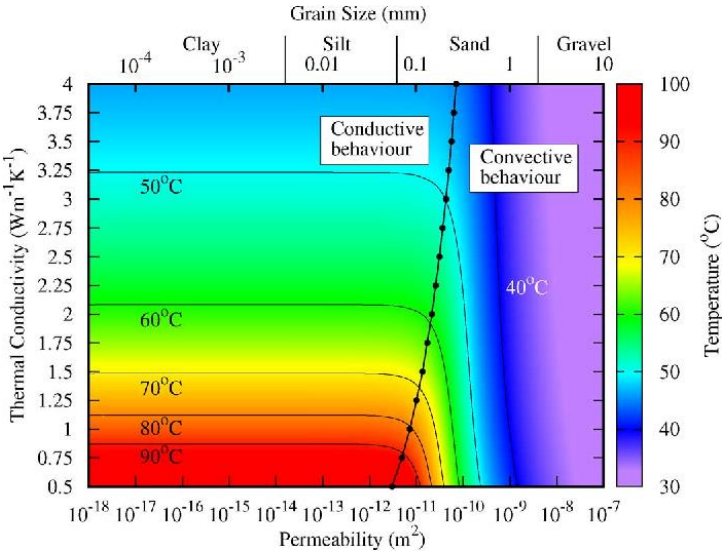


Figure 9.32. *Heat transfer mechanisms in relation to bottom sediment permeability.*

Source: Hughes et al. 2015

The above mechanisms are reflected in the different patterns of heat fluxes, i.e., symmetrical for low and medium permeability sediments, propagating radially from the heat source, and asymmetrical for high permeability sediments, representing an area of elevated temperature concentrated in a narrow band directly above the cable, which will determine the spatial extent of thermal impacts on the marine environment.

Marine environment conditions

Another parameter that affects the operating temperature of the cable and thus the environment is the **water temperature and its movement**. An analysis of the variation in seawater temperature, with different ways of laying the cable for the same load, showed that as the water temperature decreases, the temperature of the cable, and thus its effect on the surroundings, also decreases (figure 9.33.)[569]. According to the calculations, for an an example cable lying on the bottom, a reduction in water temperature of 27ºC reduced the temperature on its surface by more than 30ºC, while for a cable buried 2 m below the bottom, the temperature decreased by 8.5ºC (figure 9.33).

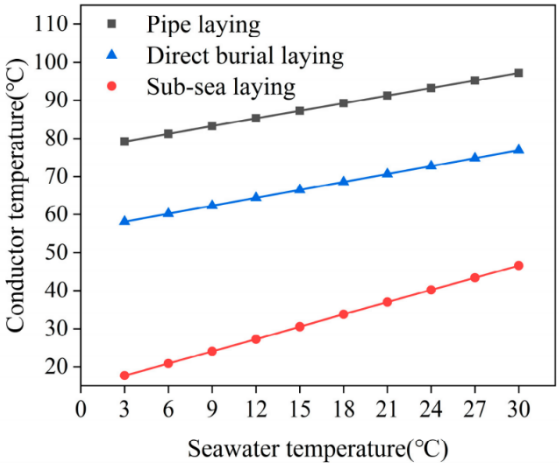


Figure 9.33. *Temperature variation of the working conductor of an offshore cable as a function of seawater temperature for three different cable laying methods.*

Source: Zhang et al. 2020

[569] *Zhang et al. 2020*

An analysis of the effect of seawater movement on the temperature of the cables also showed a decrease in temperature at the surface of the cables when bottom currents occur. In the model, the velocity of the bottom currents was assumed to be between 0 and 1 m/s for the three cable laying methods, which corresponds to the velocities found in the natural environment.[570] Regardless of the laying method, the cable temperature decreased with increasing seawater velocity. The biggest changes occurred in the low velocity range, while there was small or no change with further increases in current velocity (above 0.005 m/s).[571]

The most significant temperature drops were recorded for the cable lying directly on the bottom (initial temperature 79.98ºC). Even at a low flow rate of 0.0001 m/s, there was a drop in the cable's operating temperature of more than 30ºC, while an increase in flow rate to 0.005 m/s reduced the temperature by almost half. Compared to a cable buried 2 m below the bottom (initial temperature 76.52ºC) at a flow rate of 0.0001 m/s, the temperature dropped by 6.25ºC, and, at 0.005 m/s and above, the cable temperature stabilised at 69.95ºC. In the case of the cable laid in the pipe, the temperature decrease with increasing water velocity was the smallest, with a maximum temperature decrease of 5.6ºC.[572]

In summary, the magnitude of heat emission and its spatial extent depends on the marine environment conditions and the characteristics of the cable. Some simplifications have been made in the laboratory and experimental studies by the way of assuming, among other things, a constant seabed temperature (boundary condition) at the location of the cable foundation in the seabed, or a homogeneous thermal conductivity of the bottom sediments throughout the vertical profile, during the experiments. In reality, seabed sediments are heterogeneous, and their thermal properties change with depth. The temperature of the sediments is governed by the seasonal variability of the seawater. In addition, there is water movement at the bottom in the form of bottom currents, which is significant for the temperature of the cable, and thus also the surrounding sediments.

Influence of cable temperature on sediment thermal conditions in the Baltic Sea

Due to the multitude of factors influencing heat emission during cable operation as described above, assessment of the impact, i.e., the magnitude of emission and its spatial extent, requires recognition of environmental parameters of the Baltic Sea, such as water and sediment temperature and its seasonal variation, thermal conductivity of sediments and hydrodynamics of the basin, especially the occurrence of water movement in the bottom layers. The analysis focused primarily on temperature changes in the near-surface sediment layer to a depth of about 20 cm, where the POM infauna live (most species to a depth of about 10 cm, individuals to a maximum of 30-35 cm).[573] The main driving force for the temperature distribution of marine sediments in the Baltic Sea is their seasonal heating and cooling by seawater. Throughout the year, the temperature of the bottom water varies over a wide range. The highest values of up to 18ºC are recorded in summer, the lowest values of 2ºC, in winter, at the beginning of the year (figure 9.34).[574]

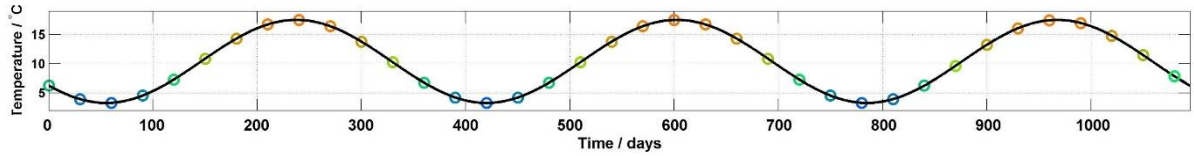


Figure 9.34. *Seasonal variation in bottom water temperature in the Baltic Sea for 3 years*
Source: Müller et al. 2016 - changed

[570] *Melchers and Jeffrey 2004*
[571] *Zhang et al. 2020*
[572] *Zhang et al. 2020*
[573] *Renz et al. 2018*
[574] *Müller et al. 2016*

Seasonal temperature changes are recorded in the vertical profile of the sediments and can extend to depths of 3-5 m below the bottom surface. The figure below (figure 9.35) shows the thermal profiles of sediments from three different locations in the Baltic Sea, during the summer season (June 2011), where, as the waters warm up, the temperature in the upper layers of the sediments increases up to more than 12 degrees, while in the lower layers the temperature is a few degrees lower, and its values correspond to the temperatures during the winter season. However, despite the same bottom water temperature, the thermal profiles of the sediments are not the same. This is indicative of their different thermal properties, i.e., thermal conductivity and thermal diffusivity, resulting, for example, from the different geological structure of the bottom and lithology of the Baltic Sea bottom sediments. The first profile represents sediments with low conductivity and diffusivity in the upper part, higher in the lower part. The second represents the opposite situation to the first one, while the third shows uniform values throughout the vertical profile, at relatively high levels.

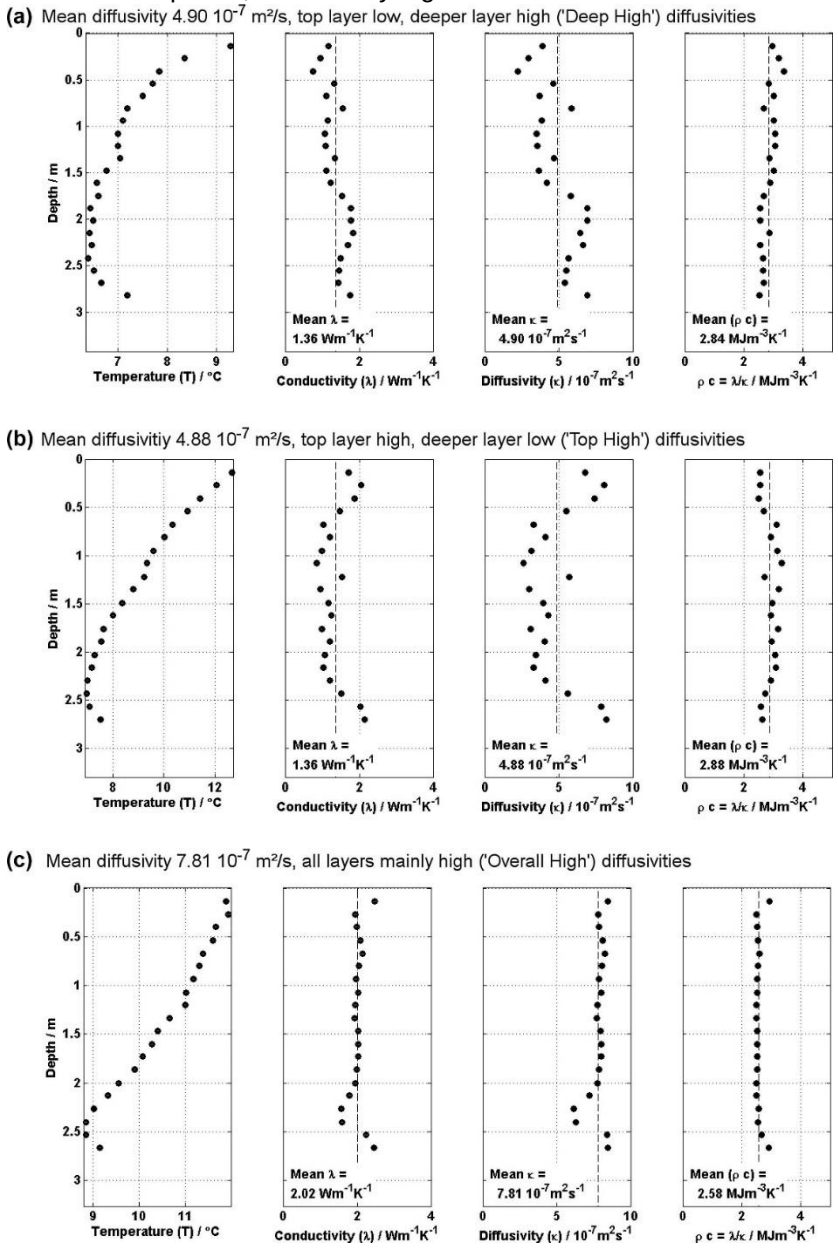


Figure 9.35. *Variability of sediment thermal parameters with depth measured at three sites in the Baltic Sea. Variation of conductivity and diffusivity with depth: (a) low values in the upper first metre, (b) high values in the upper 0.5 m and low values below, (c) generally high values; last column - ρc - volumetric heat capacity (typical value for marine sediments 2.5-3.0 MJ m^{-3}K^{-1})*

Source: Müller et al. 2016

Considering the variability of conductivity and sediment diffusivity with depth, forcing from seasonal changes in seawater temperature recorded at 20 cm depth results in temperature changes in the range of ±0.4ºC(0.8ºC) (figure 9.36), under natural conditions without an additional heat source. Thus, submarine power cables can be seen as an overlapping second-order source.[575]

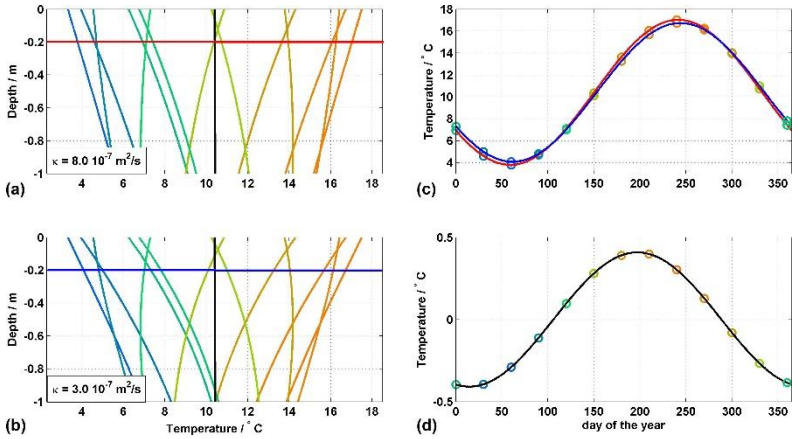


Figure 9.36. *Changes in seasonal temperature in sediments: a) for maximum diffusivities, b) minimum diffusivities, c) seasonal temperature at 20 cm depth for high (red line) and low (blue line) diffusivities, d) temperature differences due to seasonal forcing over the year.*

Source: Müller et al. 2016 - changed

Modelling for different thermal profiles of the Baltic Sea sediments for a cable buried 1.5 m below the bottom surface, assuming constant power losses on the cable of 50 W/m throughout the year and taking into account seasonal variation in water temperature, showed that the temperature increase in the near-surface bottom layer, at a depth of 20 cm, depends on the thermal diffusivity profile of the sediments. As the conductivity of the sediments increases, the temperature of the cable decreases due to increased heat fluxes towards the bottom.[576]

An analysis of heat emission for different Baltic Sea bottom sediment profiles showed that:

- if the sediment profile has a constant diffusivity at a fairly low level of 3.4 x 10^{-7} $m^2 \cdot s^{-1}$, at a depth of approx. 20 cm below the bottom surface, the temperature will rise to approx. 2ºC above the ambient temperature, but only in the last quarter of the year, when the sediment temperature is highest during the year due to the sub-heating of water and sediment during the summer. During the rest of the period, the temperature increase will not exceed 2ºC,
- if diffusivity and conductivity values are high in the lower layers of the profile, at a depth of approx. 20 cm below the bottom surface, temperature will rise to approx. 1.5ºC above the ambient temperature, but only in the last quarter of the year, when the sediment temperature is highest during the year due to heating of the water and sediment during the summer. During the rest of the period, temperature differences will not exceed 1.5ºC,
- if diffusivity and conductivity are high throughout the vertical profile of the sediment, the temperature of both the cable and the sediment will be much lower than in other cases. Temperature differences at a depth of 20 cm settle at seasonal variations of 1ºC.[577]

An analysis of a more realistic cable work scenario with annual power losses of 0 to 100 W/m, assuming higher conductivity and diffusivity in the upper sediment layers, showed that the cable temperature reaches approximately 40ºC for most of the year, and that the temperature difference at 20 cm below the bottom surface reaches below 1.2ºC for most of the year.[578]

In summary, modelling studies for a cable buried at a depth of 1.5 m, relating to real conditions prevailing in the sediments and bottom waters of the Baltic Sea, showed that at a depth of 20 cm below

[575] *Müller et al. 2016*
[576] *Müller et al. 2016*
[577] *Müller et al. 2016*
[578] *Müller et al. 2016*

the bottom surface, a temperature increase of up to 2ºC will occur, but only for constant low diffusivity throughout the vertical profile of the sediments, and only at the end of the annual cable cycle. The results are close to the temperature values measured under natural conditions, but for cables buried slightly shallower. Bottom sediment temperature measurements for submarine cables (132 kV AC cables) of the Nysted wind farm (location - western Baltic Sea), laid at a depth of 1 m below the bottom level, showed that the maximum temperature rise at a depth of 20 cm was 1.4ºC above ambient temperature.[579]

In view of the above test results, and additionally taking into account the intensive cooling effect of seawater on the cable and the water flows, which also reduces the cable temperature, it should be concluded that in the case of the planned Project, where the minimum depth of burial will reach approx. 1 m and the average velocity of water flows at the bottom reaches 0.1 m/s[580], the temperature increase will not exceed 2ºC in the near-surface layer of sediments at a depth of 20 cm. Where the cable is buried deeper (up to about 5 m), the temperature increase in the layer under consideration will be considerably lower.

In areas of the seabed where alternative methods of cable protection, i.e., concrete mattress or stone dumping, are used, there will be no excessive heating, either of the seabed surface or of the stone dumping or mattresses. The constant contact of the cable with seawater with its high convection coefficient and good thermal conductivity, and the aforementioned water flows near the bottom, will effectively reduce the temperature of the conductor to that of seawater.

In summary, the thermal impact of the operational phase can be considered to be permanent, reversible and limited to the immediate vicinity of the cable. The impact is considered to be insignificant.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(11) Non-significant**

9.11 IMPACT ON MATERIAL ASSETS

There are no material assets in the area of the planned Project.

Sites of cultural value may be potentially located in the area of the planned Project. The potential impact of the planned Project on these sites is described in Subchapter 9.6 of this Report.

The SwePol Link cable line is located at a distance of approx. 72 m from the boundary of the planned Project extent. Wind turbines MFW BII and MFW BIII will be located in the vicinity of the cable line of the planned Project (figure 9.37).

[579] *Meißner et al. 2006*
[580] *Ostrowski et al. 2018*

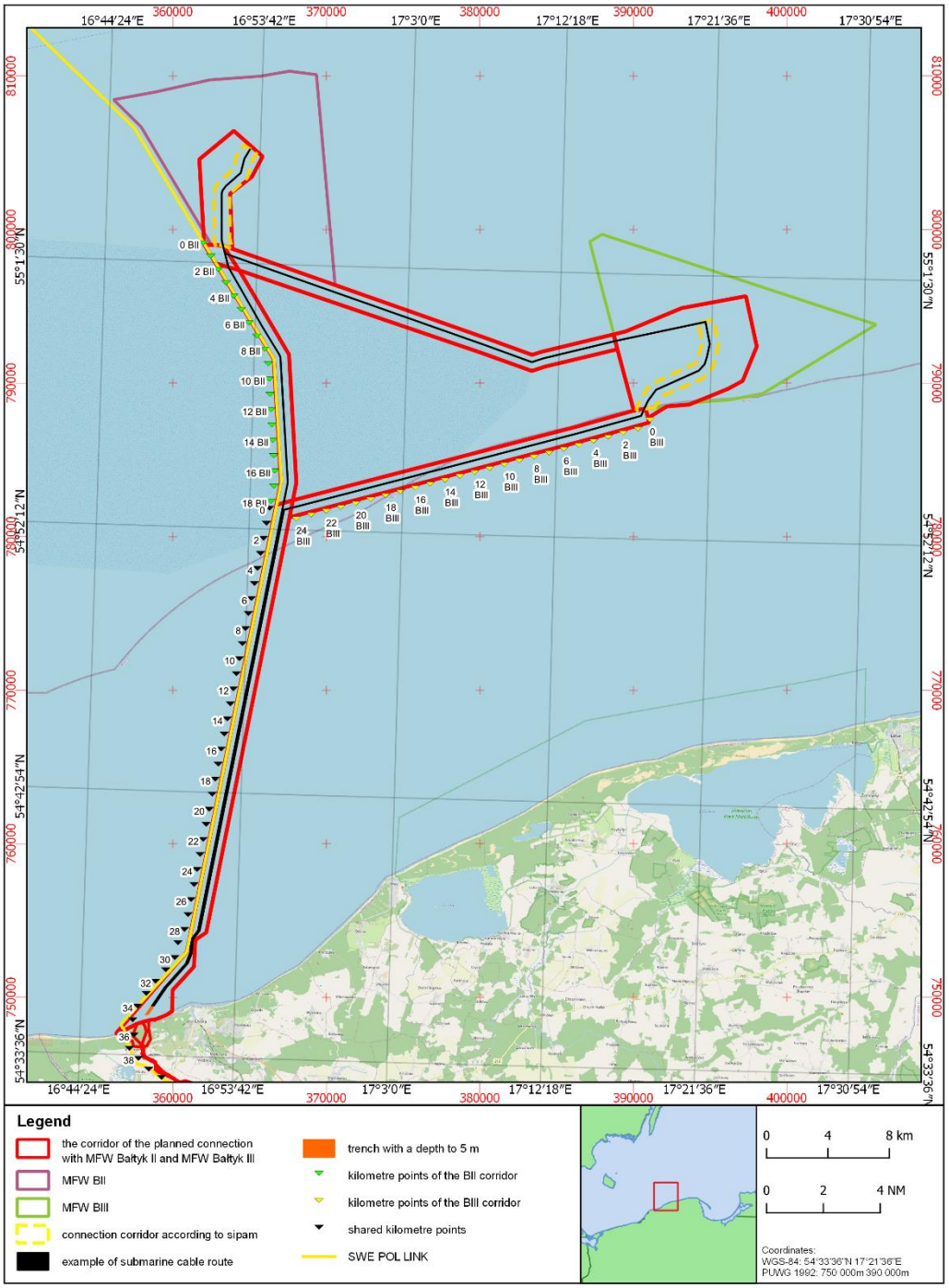


Figure 9.37. *Location of the planned Project in respect of SwePol cable line route*

Source: In-house study

The potential impact of the planned Project on the above-mentioned material assets may include soil dilution/destabilisation in the vicinity of the wind turbine structures or exposure of the cable line caused by installation earthworks. Other potential effects are of an incidental nature and are described in Chapter 14 of this Report.

The SwePol Link cable line is out of reach of the interference of installation vessels on the bottom.

The route of the cable line of the planned Project will be designed at a safe distance from the planned location of the wind turbines, also out of the range of interference of the installation vessels in the bottom.

Accordingly, no impacts of the planned Project on material assets are anticipated.

Summary of the assessment of the impact on material assets:

As no impact of the planned Project on material assets is anticipated, an impact assessment summary has been waived.

9.12. IMPACT ON THE FISHERY USE OF WATER AREAS

The analysis of the catch data in the fishing quadrants where the planned ECI is located showed that the share of the total catch (reported in catch weight) in the 8 analysed quadrants (BL5, BL6, BL7, BL8, BM7, BM8, BN7 and BN8) in the 123 fishing quadrants in the POM was low and amounted to 1.05% in 2018-2019, and decreased slightly to 0.92% in the following years 2020-2021. The total value of catches reported in kg in 2019, 2020 and 2021 represented 0.64%, 0.41% and 0.47% of the total value of catches of the Polish Baltic fleet, respectively. This means that the share of catch value in the fishing quadrants in question was about 2 times lower than the share of catch weight in relation to the POM data. Fishing productivity in the analysed area was also low - the average value for all analysed fishing quadrants in 2018-2021 was 189 kg/km^2, which is 4.6% of the average value for the POM from 2014-2019.

A total of 3,648 Atlantic salmon and sea trout were caught in the fishing quadrants in question in 2018-2019, which accounted for approximately 5.7% of the total salmonid catch in the POM (reported in individuals). On the other hand, a total of 2,116 fish were caught in the fishing quadrants in question between 2020 and 2021, which accounted for about 6.2% of the total salmonid catch in the POM (reported in individuals). The contribution of the fishing quadrants in question to the salmonid catch in the POM is therefore about 6 times higher than the total catch reported in kg. The cited data indicates that the fishing quadrants where the planned ECI will be located are not important fisheries for species caught in bulk (reported in catch weight). On the other hand, it is an area of more significance for salmonid fishing, and this applies, for the whole analysed period, mainly to the fishing quadrant BL5 located in the coastal zone, in the area of the mouth of the Słupia River, and to a smaller extent also to the neighbouring quadrant BL6 to the north (in 2018-2019). Slightly higher catches of salmonids were also recorded in fishing quadrants BM8 and BN8 in 2020-2021.

In general, there is a high intensity of fishing vessel traffic in the Ustka area, which is related to the approach of vessels to the harbour. At a length of approximately 10.5 km, the ECI crosses an area with a significant number of passing vessels (>100 per year). Further away from the shore, vessel traffic disperses towards the east and west, and the frequency of passage in the ECI area decreases significantly. The analysis of fishing vessel traffic shows that the area covering fishing quadrants BL5, BL6 and BL7 is the most sensitive. Potential fishing locations are located on both sides of the ECI corridor, with the most numerous vessel locations found approximately 6 Mm (11 km) from shore.

9.12.1. Construction phase

The potential impact of the planned ECI on fisheries relates mainly to the construction phase and will be associated with restrictions on fishing vessel movements in the vicinity of the cable installation units. This will be a local (within the boundaries of the environmental decision) and short-term impact. The largest percentage of the area affected by the application for an environmental decision relates to fishing quadrant BM7 (14.9%). This means that a maximum of 497pprox.. 15% of the fishing quadrant in question will be restricted for fishing and fishing vessel traffic. A smaller share of the area will apply to quadrants BL8 and BL5 (8.2% and 7.1% respectively), while for quadrants BL7 and BN7 the share will be 6.0% and 5.3%, respectively. For the remaining quadrants it will be less than 5%. Taking into account the relatively short time of the construction and occupation of only a small part of the area at any given time during the works, the impact on fisheries during the construction phase in the quadrats in question should be described as negligible. The largest % of the bottom area impacted by the planned ECI also applies to fishing quadrant BM7 (1.62 km^2, 0.41% of the quadrant area), in the

remaining quadrants this value will be smaller and in four of them – will not exceed 0.1% of the area. Overall, the area of impact of the planned ECI on the seabed will be 1.55 km^2, which represents 0.052% of the total area of the 8 fishing quadrants in which the sections of the planned ECI are located, and 0.003% of the area of the POM plan.

In the case of implementation of a shorter trenchless passage and deeper excavation to the exit beyond the last revetment, as well as storage of dredged material from the aforementioned excavation, the values are slightly higher, and the area of total interference will be 1.71 km2 (including 0.1 km2 for storage of dredged material), which is 0.058% of the total area of the 8 fishing quadrants. The difference in bottom occupation is due to the larger interference area only in quadrant BL5. This indicates a negligible impact of the planned Project on ichthyofauna food resources and populations of commercially exploited fish species.

Summary of the assessment of the significance of the adverse impact of the planned Project on fisheries during the construction phase:

Impact type and severity	
Negative	(1)
Direct	(3)
Simple	(1)
Short-term	(1)
Reversible	(1)
Spatial extent of the impact	
Within the boundaries of the ED	(1)
Environmental sensitivity/vulnerability	
Average	(3)
Impact classification	(11) insignificant

In total, the sum of the impact weights identified for the construction phase of the planned ECI was 11, meaning that the impact on fisheries will be insignificant. The moderate environmental sensitivity is due to the greater importance of the area in question for salmonid fishing, which may be disturbed during the works.

9.12.2. Operation phase

During the operation phase, it is envisaged that a protection zone for the cable lines will be established by the Director of the Maritime Office in Gdynia. This will restrict the use of bottom fishing gear in the area of the location of this ECI. This will be a permanent, local impact.

Taking into account the insignificance of the study area as a fishery for the main economically important species, the indicated impact on fisheries will be negligible. On the other hand, special attention should be given to the problem of protection of bi-environmental species of salmonids, which constitute a significant component of commercial fishing in the area. With regard to salmonid fishing, the direct impact of the Project will only occur during the construction phase due to restrictions on vessel movements and fishing opportunities in the vicinity of the vessels installing the cables. Anticipated restrictions on the use of bottom fishing gear in the vicinity of the ECI site during the operational phase will not affect salmonid fisheries, as these are predominantly caught in pelagic gear (anchored set gillnets and drifting longlines). After the ECI is decommissioned, fishing restrictions may be withdrawn if the cables are removed from the bottom during the decommissioning phase.

Summary of the assessment of the significance of the adverse impact of the planned Project on fisheries during the operation phase:

Impact type and severity	
Neutral	**(0)**
Direct	**(1)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(2)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Environmental sensitivity/vulnerability	
Low	**(1)**
Impact classification	**(9) insignificant**

The total sum of impact weights identified for the operational phase of the planned ECI was **9**. However, despite the long-term nature of the impacts associated with fishing restrictions on bottom gears, the significance of the impact on fisheries in the area will be low as the area is not a significant fishery. This impact is reversible as the fishing restrictions can be withdrawn once the cables are removed from the seabed during the decommissioning phase of the Project. Therefore, the cumulative impact on fisheries for the operational phase will be negligible.

9.13. IMPACT ON MARITIME TRANSPORT AND SHIPPING

The planned Project is associated with a slight increase in vessel traffic during the construction phase of the Project. The operation phase will not result in an increase in ship traffic – inspections the state of burial/securing of cables are planned once every 5 years, with the first three inspections scheduled in the first, third and fifth year after completion of construction. An important determinant of the construction phase is the necessity to cross one of the most important traffic routes in the Baltic Sea - the TSS Ławica Słupska. The location of the planned project in relation to the location of the TSS Ławica Słupska route is shown on the figure in Subchapter 6.1.2.

The use of vessels during the operation of the planned Project involves the risk of emergency situations of an incidental nature, such as collisions, encounters, and groundings. The risks and assessment of these situations are described in detail in Chapter 14.

9.13.1. Construction phase

During the construction phase of the planned Project, the most significant potential hazards to shipping and maritime transport are associated with works along the TSS Ławica Słupska route.

Anchoring of installation vessels may cause temporary difficulties in vessel traffic in the area of works, in particular in area B and D with the most intensive vessel traffic, i.e., area B - the area of TSS Ławica Słupska and area D - related to the operation of the port of Ustka (Subchapter 6.1.2).

In order to maintain safety, the entity responsible for implementation will, before the installation work begins, develop a navigational safety plan including:

- Preliminary schedule indicating the division of labour, areas of activity and covering:
  - construction operations,
  - the names of the vessels,
  - scheduled start and completion dates.
- For the vessels, their technical characteristics will be made available. Before each vessel is mobilised, a readiness audit will be carried out to verify the suitability and efficiency of the fleet and the documentation of the work. The audit will be carried out applying the requirements and guidelines of the Common Marine Inspection Documents (CMID) using IMCA inspection documents and the Common Marine Inspection Document database (eCMID). Vessels will be inspected for Health, Safety and Environment before and during mobilisation. A recognised organisation will conduct an independent Marine Warranty Survey on all construction vessels.
- Regarding the planning of maritime operations, the following documents will be presented:
  - an organisation chart,
  - an emergency response plan (ERP).
- Each offshore operation will include:
  - assembly procedures and analyses,
  - action-specific risk assessment (TBRA) processes,
  - a readiness review,
  - a simultaneous operations analysis (SIMOPS),
  - weather forecasting and decision support for offshore operations,
  - calibration of ship's equipment.
- For offshore operations, the following will be defined:
  - safety zones for specific areas, construction vessels (CLV) and support vessels, including barges and other craft with reduced manoeuvrability,
  - safety zones in the event of encountering a UXO or CWA,

- the use of patrol vessel or indirect monitoring,
- principles of information (e.g., Securite messages), direct monitoring (GV) and technical monitoring (e.g., CCTV, ARPA, AIS),
- the enforcement of violations of security restricted areas (e.g., use of individual messages addressed to offending units),
- ERP activation procedures,
- the principles of alert and information exchange with maritime administration and other operational services (SAR, Border Guard, Navy, BHMW).

The above measures ensure that cable laying is conducted safely within the TSS Ławica Słupska route. In addition, the works in this section will be conducted at the highest possible cable laying speed that the ground conditions will allow. It is tentatively assumed that the speed of cable laying will be no less than 200 m of cable laying per hour.

Summary of the assessment of effects of the Project on maritime transport and shipping during the construction phase:

Type of impact and its severity	
Neutral	**(0)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Classification of the impact	**(8) insignificant**

In total, the sum of the weights of the Project's impacts on transport and shipping during the construction phase was 8, which means that the impact will be insignificant.

9.13.2. Operation phase

According to the POM plan, in sub-areas: 16.201.I, 16.206.I, 45.201.I, 42.201.I, 42.206.I, 34.206.I, 29.206.I, 29.926.B, 28.206.I, 27.206.I, 27.915.B, 27.311.Ip, after the implementation of the Project, a safety zone will be designated in which anchoring will be prohibited - except anchoring for reasons of emergency and related to maintenance works, which will be conducted on average once every 5 years. The above will not pose a risk to existing and future vessel traffic in the Project area. The emergency anchoring exemption will not reduce the safety of navigation in the area.

Summary of the assessment of the significance of the impact of the Project on maritime transport and shipping during the operation phase:

Type of impact and its severity	
Neutral	**(0)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Classification of the impact	**(10) insignificant**

The impact of the operational phase has been assessed as insignificant.

9.14. IMPACT ON HUMAN LIFE AND HEALTH

The water basin in the Project area is used for fishing, shipping and maritime transport, as well as for tourism and recreational purposes. In addition, it is used by the Navy.

The impact on human life and health during the construction and operational phases of the planned Project will result from its impact on the water body development and use.

9.14.1. Construction phase

The construction of the cable lines will cause limited disruption to:

- fishing,
- vessels sailing along the TSS route and the usual route to and from the ports of Gdynia and Gdańsk,
- the Polish Navy,
- the public.

In the case of fishing during construction, in order to provide a protection zone during cable installation, sections of fishing squares will be excluded from fishing: BL5, BL6, BL7, BL8, BM7, BM8, BN7 i BN8.The direct area of interference of the Project within the 8 quadrants will represent a maximum of 1.71 km^2, which is only 0.058% of their total area. Considering the duration of the disturbance and the small area of exclusion (8 quadrats in relation to the 123 fishing quadrats in the POM) and the low fishery productivity of these quadrats compared to the POM (Subchapter 9.12), it should be concluded that the disturbance associated with the construction phase will be insignificant.

Vessels sailing the TSS route and the usual route to and from the ports of Gdynia and Gdansk will have to modify their sailing course during the construction phase due to the presence of vessels engaged in cable line construction, which may involve increased fuel consumption and/or increased sailing time. Taking into account the progressive nature of the works, the disruption will be minimal and the extent of the impact on shipping will be local and short-term.

The area of the Project runs through the fairways of the Polish Navy i.e., 0025, 0026, 0208, 0209 - located in basin 29.915.B and Zone No. 6, where military activities are being carried out (training ground P-20). During the construction works, there will be a temporary restriction of the use of these areas.

During the construction phase of the trenchless crossing, access to the coastal zone will be restricted. This zone, which is used by tourists for recreational purposes, may then be temporarily closed.

In summary, the difficulties described above will be direct, short-term, simple and reversible, as they will cease immediately after the construction phase. It is not anticipated that there will be any other impacts during the construction phase on the development and use of the water body and consequently on the population, health and living conditions of people. Therefore, this impact is to be considered as insignificant.

Summary of the assessment of the impact on human life and health:

Summary of the assessment of the significance of adverse impacts of the planned Project on human life and health during the construction phase:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Classification of the impact	**(9) insignificant**

In total, the sum of the impact weights identified for the construction phase of the planned ECI was 9, which means that the impact on human life and health will be insignificant.

9.14.2. Operation phase

During the operation phase, the impact on the use and development of the basin will result almost exclusively from the establishment of a safety zone for the cable lines by the Director of the Maritime Office in Gdynia, within which prohibitions and restrictions on use will be in place to protect the

submarine cables from damage or destruction. Of the existing uses of the basin, the safety zone will restrict fishing (bottom fishing) the most, as bottom fishing gear will most likely be banned within the safety zone.

An analysis of the catch data in the fishing squares where the planned ECI is located showed that the proportion of total commercial catches (reported in catch weight) in the 8 analysed quadrants (BL5, BL6, BL7, BL8, BM7, BM8, BN7 and BN8) (Subchapter 9.12) was low and the fishery productivity in the area was not significant. Given the above, the indicated impact on the fishery will be negligible.

During the operational phase, periodic inspections of the cable lines will be conducted, at least once every 5 years, with the first three inspections scheduled in the first, third and fifth year, following completion of construction. This type of work will normally involve a single vessel, and therefore impacts on navigation and other water basin forms of use are not anticipated.

No other impacts affecting the population, health and living conditions of people are expected to occur during the operational phase.

In view of the above, the impact should be considered as insignificant/ negligible.

Summary of the assessment of impacts on human life and health

As the impact of the planned Project on human life and health during the operational phase is insignificant/negligible, an impact assessment has been waived.

9.15. WASTE MANAGEMENT

The planned Project will generate waste at each of its stages. The predicted types and quantities of waste generated during the construction, operation and decommissioning phase are presented in the form of a table. Waste names and their codes are in accordance with the Regulation of the Minister of Climate of 2 January 2020 on waste catalogue (Journal of Laws 2020 item 10). At the current stage of work advancement, it is not possible to precisely determine types of generated waste and their quantities, therefore the table includes all theoretically possible types of waste and estimates their maximum expected quantities on the basis of information on the assumed technology and the longest assumed duration of onshore and offshore works.

9.15.1. Construction phase

At the stage of construction works it is expected that waste will be generated by vessels and installation equipment, as well as by the vessel crew. A summary of the maximum estimated amounts of waste generated during the construction phase of the offshore part of the planned Project is presented in table 9.21.

Table 9.21. *A summary of the maximum estimated amounts of waste generated during the construction phase of the offshore part of the planned Project*

Waste code (*hazardous waste)	**Type of waste**	**Estimated maximum quantity [Mg/year]**
13	**Used oils and and wastes of liquid fuels (excluding edible oils and oil groups 05, 12 and wastes of liquid fuels (excluding edible oils and oil groups 19)**	
13 01	**Used hydraulic oils**	
13 01 09*	Mineral-based chlorinated hydraulic oils	0,05
13 01 10*	Mineral based non-chlorinated hydraulic oils	0,05
13 01 11*	Synthetic hydraulic oils	0,05
13 02	**Used engine, gear and lubricating oils**	
13 02 04	Mineral-based chlorinated engine, gear and lubricating oils	0,05
13 02 05	Mineral-based non-chlorinated engine, gear and lubricating oils	0,05
13 02 06	Synthetic engine, gear and lubricating oils	0,05

Waste code (*hazardous waste)	**Type of waste**	**Estimated maximum quantity [Mg/year]**
13 02 07	Readily biodegradable engine, gear and lubricating oils	0,05
13 02 08	Other engine, gear and lubricating oils	0,05
13 04	**Bilge oils**	
13 04 03*	Bilge oils from ships	0,10
13 05	**Solids from oil/water separators**	
13 05 02	Sludges from oil/water separators	0,05
13 05 06*	Oil from oil/water separators	0,05
13 05 07*	Oily water from oil/water separators	0,05
13 07	**Wastes of liquid fuels**	
13 07 01*	Fuel oil and diesel	0,05
13 07 02*	Petrol	0,05
13 08	**Oil waste not included in other subgroups**	
13 08 80	Oily solid waste from ships	0,02
14	**Wastes of organic solvents, refrigerants and propellants (except group 07 and 08)**	
14 06	**Wastes of organic solvents, refrigerants and propellants in foam or aerosols**	
14 06 02*	Other halogenated solvents and solvent mixtures	0,05
14 06 03*	Other solvents and solvent mixtures	0,05
15	**Packaging waste, absorbents, filter materials, wiping cloths and protective clothing not included in other groups**	
15 01	**Packaging waste (including separately collected municipal packaging waste)**	
15 01 01	Paper and cardboard packaging	0,20
15 01 02	Plastic packaging	0,20
15 01 03	Wooden packaging	0,20
15 01 04	Metallic packaging	0,20
15 01 05	Composite packaging	0,20
15 01 06	Mixed packaging	0,20
15 01 07	Glass packaging	0,10
15 01 09	Textile packaging	0,10
15 02	**Absorbents, filter materials, wiping cloths and protective clothing**	
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	0,10
15 02 03*	Absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	0,10
16	**Wastes not included in other groups**	
16 06	**Batteries and accumulators**	
16 06 01*	Lead batteries and accumulators	0,10
16 06 02*	Ni-Cd batteries and accumulators	0,10
16 06 04	Alkaline batteries (except 16 06 03)	0,10
16 06 05	Other batteries and accumulators	0,10
16 81	**Wastes arising from accidents and incidents**	
16 81 01*	Wastes having hazardous properties	0,001
16 81 02	Wastes other than those mentioned in 16 81 01	0,001

Waste code (*hazardous waste)	Type of waste	Estimated maximum quantity [Mg/year]
19	**Wastes from waste management facilities, from wastewater treatment plants and from the preparation of water intended for human consumption and water for industrial use**	
19 08	**Wastes from wastewater treatment plants not included in other groups**	
19 08 05	Sludges from treatment of urban waste water	1
20	**Municipal waste including separately collected fractions**	
20 01	**Municipal waste separated and separately collected (except 15 01)**	
20 01 01	Paper and cardboard	0,10
20 01 02	Glass	0,10
20 01 08	Biodegradable kitchen and canteen waste	0,20
20 01 29*	Detergents containing dangerous substances	0,10
20 01 30	Detergents other than those mentioned in 20 01 29	0,20
20 01 33*	Batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries	0,01
20 01 34	Batteries and accumulators other than those mentioned in 20 01 33	0,01
20 01 35*	Discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components	0,05
20 01 36	Discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	0,05
20 03	**Other municipal waste**	
20 03 01	Mixed municipal waste	0,10

Source: In-house study

The generated waste will be stored on vessels, in accordance with the marine pollution prevention plan in use on each vessel, drawn up in accordance with the requirements of the Law on Prevention of Marine Pollution from Ships of March 16, 1995 (Journal of Laws 2020.1955, as amended).

Collection of waste from vessels will take place at harbors. Waste will be handed over to authorized entities in accordance with the port plan for managing waste and cargo residues from ships.

9.15.2. Operation phase

During operation, waste will be generated only by vessels during inspections, which are planned on average once every 5 years, with the first three inspections scheduled in the first, third and fifth year, following completion of construction. These will be typical ship waste, mainly municipal solid waste. These will be negligible amounts of waste per year.

9.16. IMPACT DURING DECOMMISSIONING

Two decommissioning methods are assumed - decommissioning by inactivation and leaving the External Connection Infrastructure in the seabed/ground (the Investor's preferred method) and decommissioning by complete dismantling of the ECI (cutting the cables into sections and pulling them on board of the CLV).

If the cables are left in the seabed, no impacts on biotic and abiotic elements of the marine environment are expected. In the case of dismantling, the impact and its significance will be, in most cases, identical to those identified for the construction phase, since the assumed scope of the dismantling works is very similar to the construction works.

A final decision on the method of decommissioning the Project will be made after the operation of the External Connection Infrastructure has been completed.

10. IDENTIFICATION OF IMPACT OF THE INVESTOR'S VARIANT ON THE TERRESTRIAL ENVIRONMENT

The Investor's variant are (figure 10.1):

- eastern variant of ECI landfall using HDD guided drilling or HDD guided drilling combined with sea trench,
- underground 220 kV cable line,
- ONS onshore substations,
- 400 kV underground cable line.

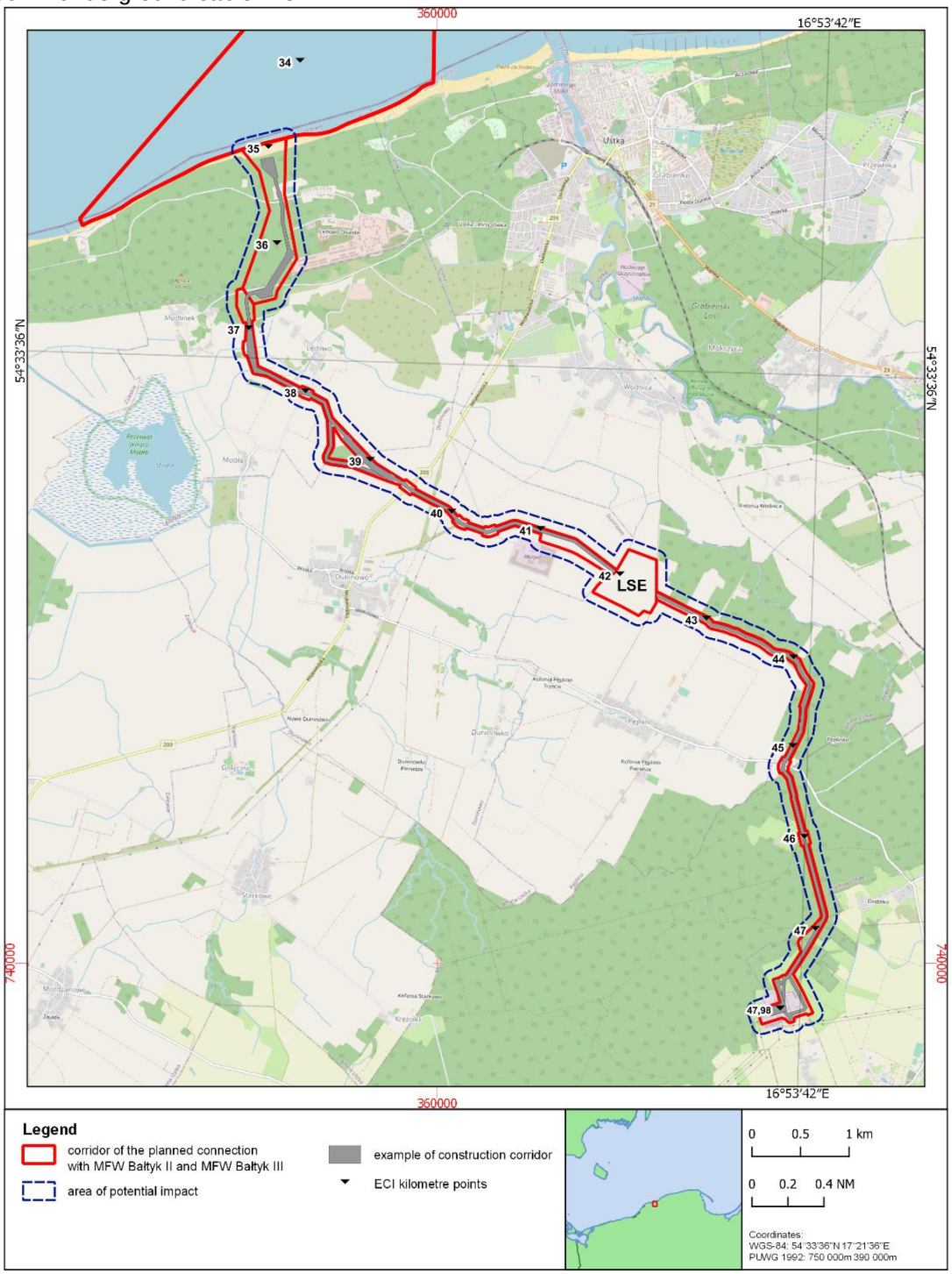


Figure 10.1. *Planned Project in the Investor's variant*

Source: In-house study

10.1. IMPACT ON THE LAND SURFACE

The route of the planned Project is characterized by considerable variation in terrain. At the point where the cables are brought ashore between 236.5 and 238.5 km of the shore (according to the kilometerage of the Maritime Office), the beach is from about 30 to about 60 m wide.

Immediately behind the beach is a strip of spit overlain by a strip of coastal dunes, the so-called Lędowskie Wydmy rising in places to 40.4 m above sea level. The hinterland is a flat foreland area of flat moraine upland with an elevation of about 5 m above sea level. Then the moraine upland begins to take shape, the elevation of which reaches about 36.6 m above sea level in the area of the PSE S.A. substation. Słupsk Wierzbięcino.

This chapter examines the potential impact of the planned Project on land surface, with reference to the impact on the landform - the shoreline and the dune belt, during the construction, operation and decommissioning phases.

10.1.1. Construction phase

Coastal and dune zone

During the construction phase, the shoreline within the planned Project corridor, extending between 235.0 and 238.75 km of the coastline, and a strip of dunes behind it, will be within the area of the potential impact of the Project.

The construction of the planned Project will be associated with periodic landform changes in the shoreline and dune zone due to:

- the execution of the HDD launch pit,
- levelling works for the construction facilities in the cable landfall area,
- the construction of cable chambers.

The cables will be brought ashore by a trenchless method, using HDD method or HDD method combined with offshore trenching (Subchapter 3.2.2.). The cables will come ashore at approximately 160 m from the shoreline, just outside the construction corridor boundary (Subchapter 3.2.1). As the construction works are likely to take place partly within this corridor (a small fragment of the anthropogenically transformed area (Photo 3.1), and it cannot be used for purposes other than shore maintenance, the Investor will apply to the Director of the Maritime Office in Gdynia for conditions of use of this area[581].

The area of the construction site for the HDD cable landfall will be approximately 0.85 ha. The planned location of the HDD launch pit includes an area that is partly de-soiled and paved due to the functioning of the fortification complex of the 9th Permanent Artillery Battery Ustka - Lędowo (9BAS) in this area. In this aspect, preparation of the HDD launch pit will require removal of concrete elements (figure 3.1.) and cutting out of trees/shrubs in this area. The source of water for drilling and for social and domestic needs will be cisterns or existing water pipelines.

The planned Project will involve the construction of four cable chambers (concrete rectangular objects with a side length of a few metres at most and a depth of about 2 m). The cable chambers will be located just at the base of the main dune embankment (the so-called Lędowskie Wydmy). In the places of their foundation, a levelling of the area of maximum 800 m^2 will be carried out. This is a partially paved area, so the levelling will be minor in extent. Excess soil will be managed within the service strip. Preparation of the construction site by levelling the ground and removing vegetation may trigger aeolian processes. The formation of the dunes may be disturbed during the construction works, and the degree of this interference will depend on how the cable chamber foundation works are conducted. Therefore, vehicle and machinery traffic should be eliminated in the area north of the planned cable chambers. Also, pipelines (e.g., for water intake/discharge) should not be laid through the dune zone. It should be noted that the construction works will be conducted in a partially transformed area sheltered by forest complexes (Photo 3.1), which provide a wind barrier and limit aeolian processes. The potential impact

[581] *In the case of the protection zone, the restrictions resulting from its establishment are not indicated.*

of the construction phase, due to the location near the seashore and dunes, has been assessed as moderate.

The structure of the shore will not be disturbed to an extent that would adversely alter its function because of the trenchless technology. Therefore, the impact of the construction phase on the shore (i.e., within approximately 160 m of the shoreline) will not occur.

With the application of the proposed solutions related to prohibition of any interference in the areas north of the landfall of the cable lines (including prohibition of movement of vehicles and construction machinery on the dunes, laying of pipelines, etc.) it is predicted that the impact of the construction phase on the dune will be insignificantly negative, indirect, secondary, short-term, reversible and within the limits of the Environmental Decision. It is important to ensure the appropriate condition of the vegetation overgrowing the surface of the dune during the restoration of the site. If neglected, aeolian processes may be triggered and consequently elements of the planned Project may be buried or exposed in places.

Cable route and ONS substations

The main impact of the construction phase on the land surface and relief, outside the seashore zone, will be related to:

- the excavation of the open trenches necessary for the laying of the cable lines and the entry and exit chambers in the sections to be traversed by trenchless methods (roads, local railway line, wetlands or environmentally valuable areas),
- the construction of temporary access roads along the axis of the planned cable tracks and manoeuvring yards and a permanent access road to the ONS,
- land levelling for onshore substations (ONSs).

The construction of the underground cable line will involve the temporary occupation of land for a construction corridor, approx. 30-32 m wide (including necessary extensions e.g. for trenchless crossings and extensions in the vicinity of landfall cables), which will be related to the construction work. In this strip, a trench will be excavated with a depth of approx. 3 m and a width of approx. 10 m. It is also permissible to excavate deeper trenches due to crossings with underground infrastructure and to excavate narrower (several) trenches as dictated by the phasing of the works. This applies, for example, to the 400 kV line where there are 2 tracks at a distance of 5 m. It is planned to lay 12 cable lines including fibre optic cables: 4 tracks, 3 cables per track for 220 kV lines and 2 tracks of 3 cables for 400 kV lines. There will be a complete transformation of the topsoil and the land relief.

At the location of the planned smaller trenchless crossings (road, watercourse, and local railway line crossings), the width of the land occupation will be up to approximately 50-100 m and extensions in the vicinity of the offshore and onshore cable connection due to the need for launching and exit chambers.

It is assumed that the execution of a approx. 1 km section of the route (open excavation) will take approximately 12 weeks. Excavation works will be conducted on an approx. 11 km section of the underground cable line route, i.e., approx. 80% of the connection route.

During the construction works, soil from excavations will be stored at a suitable distance on the edge of the ditches, within the limits of the construction corridor. The soil will be stored in such a way as not to disturb the water relations on the neighbouring plots and not to adversely affect the transformation of the natural landform. The excavated soil will be divided into topsoil (organic) and the remaining soil. This will be covered with plastic sheeting to prevent it from becoming weedy. Then, after appropriate cleaning (removal of larger stones and plastics), it will be used to backfill the excavations with an appropriate compaction ratio. The surplus soil (approx. 19,000 m^3) resulting from the backfilling of the excavation with technical infrastructure and the sand and cement mixture will be transported to a designated storage area. The sand and cement mixture used to fill the immediate vicinity of the cables is a non-toxic material and will not adversely affect the ground.

Any surplus earth masses will be managed in accordance with the Waste Act of 14 December 2012 (Journal of Laws 2022.699, consolidated text, as amended) and the Regulation of the Minister of the Environment of 10 November 2015 on the list of types of waste that individuals or organisational

units that are not entrepreneurs may subject to recovery for their own needs, and the permitted methods of their recovery (Journal of Laws 2016.93).

The impact of the construction phase on the land surface and relief associated with the excavation will be negative, direct, simple, short-term, reversible, and their spatial extent will be limited to the boundaries of the Environmental Decision. The impact can be characterised as insignificant.

As part of the planned Project, crossings, using trenchless methods, will be made through areas that are valuable in terms of nature and difficult to cross with an open excavation (e.g., Struga Lędowska, a provincial road, a local railway line). The deepest trenchless drilling up to 25 m below sea level is planned for the cable crossing under the area of the Naval Centre in Ustka, around approx. 36.3 km of the ECI corridor and when crossing wetlands in the vicinity of the 39 km ECI corridor. The size of the launching and exit chambers depends on the specific ground conditions, length of drilling, equipment used, etc. Estimated dimensions are approximately 3 x 5 m. In the case of HDD method implementation for the seashore crossing, military land crossing and near PSE station, the size of the chambers may be larger. In some cases, where the HDD method will be performed from the ground level, the chambers will not be implemented. Once the trenches adjacent to the entry and exit points have been drilled and uncovered, the pipe ends will be laid at the required underground level.

The total length of the trenchless crossing sections proposed in the preliminary design phase is approximately 1.47 km. The target length of the sections will be determined after geotechnical investigations conducted during the construction design phase. Where a trenchless crossing is planned, the current landform will be preserved, while interference with the ground surface will only concern the preparation of the entry and exit chambers. The impact of the construction phase on the ground surface and relief associated with the drilling, including the entry and exit chambers, will be negative, direct, simple, short-term, reversible, and their spatial extent will be within the boundaries of the Environmental Decision. Therefore, the impact can be insignificant.

The temporary access roads with a length of approximately 13 km and a width of approximately 6 m will also be realised in the construction corridor. Upon completion of the construction works, the area designated for the temporary roads will be restored to their original state. Part of these roads (i.e., approx. 2 km) will be used as permanent access roads. The temporary roads will be paved with aggregate or prefabricated slabs. The choice of material for the construction will be adapted to the type of substrate and the loads of the machinery that will move on them. In addition, the location of manoeuvring areas for turning vehicles is envisaged in places where passage will not be possible due to the shape and development of the land.

The impact of the construction phase on the land surface and relief associated with the construction of the temporary access roads will be negative, direct, simple, short-term, reversible/permanent (for roads that will be used during the operational phase), and their spatial extent will be within the boundaries of the Environmental Decision.

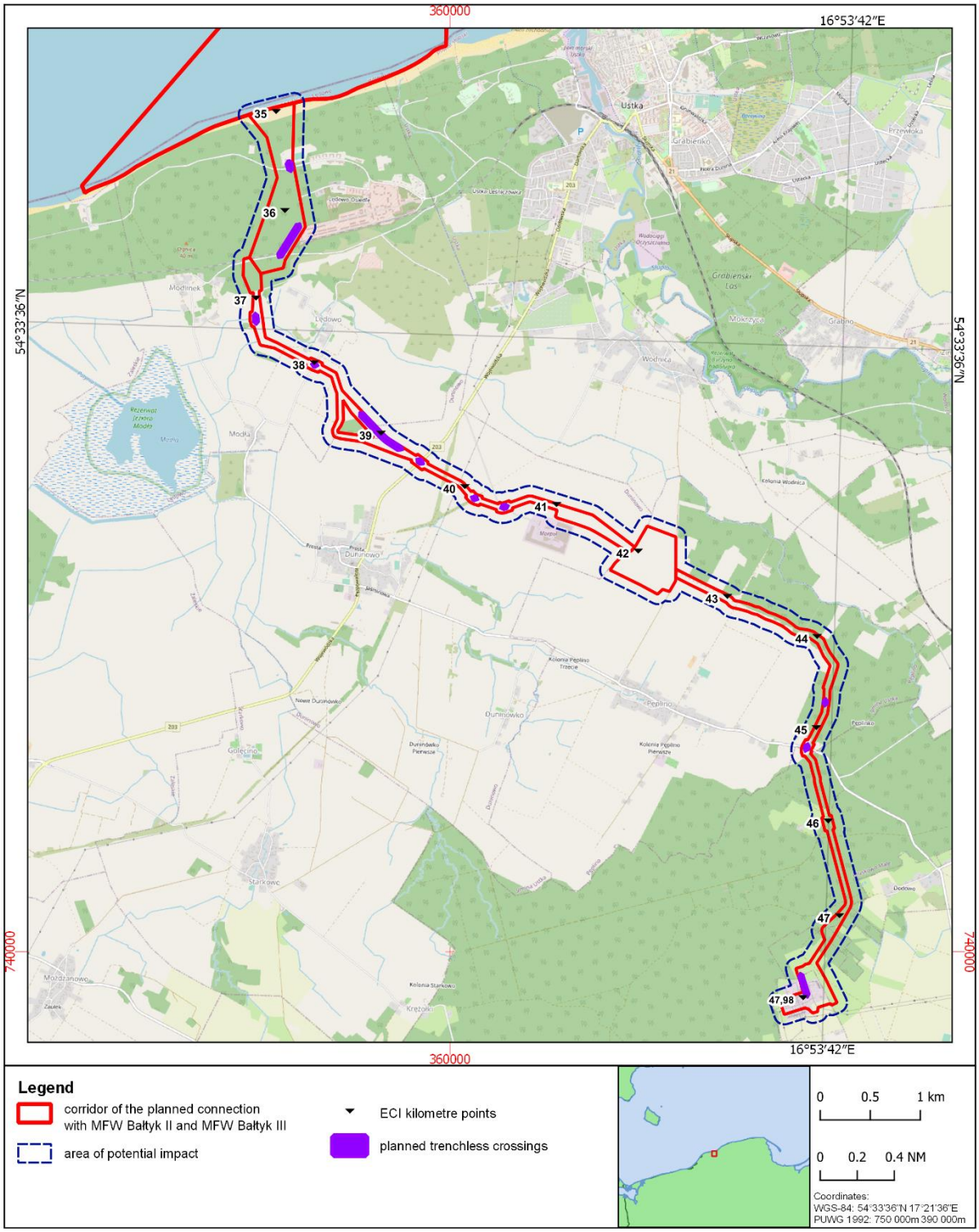


Figure 10.2. *Sections of trenchless crossings along the ECI route from MFW Bałtyk II and MFW Bałtyk III proposed in the preliminary design phase*

Source: In-house study based on the Investor's data (Onshore civil construction & cable installation study, 05 2022)

Construction facilities will be located at the planned onshore substations (ONSs) in the Pęplin area and around the cable landfall. The construction facilities will be equipped with portable sanitary facilities with leak-proof tanks, systematically emptied by specialised companies, and any spills will be neutralised with oil neutralising agents; workers will be trained to use such agents.

The development of the planned Project will require levelling of the substation site (ONS). The soil will be used within the ONS area, and any excess will be handed over to specialist companies for development in accordance with current legislation. The area of the two ONS substations will be in total

of approximately 16 ha. The land for the planned substation is moderately undulating, with elevations ranging from approximately 21.25 m above sea level in the south-eastern part to 17.5 m above sea level in the northern part.

The impact of the construction phase on the land surface and relief associated with the levelling of land for the ONS stations will be negative, direct, simple, short-term, permanent, and their spatial extent will be within the boundaries of the Environmental Decision. The impact can be insignificant.

In summary: the planned Project will involve the temporary conversion and occupation of land for the construction of the underground cable line, cable chambers, and the permanent conversion of the ONS substation area, the construction facilities, access roads and manoeuvring yards. As the maximum depth of excavation along the majority of the route of the underground cable line (approx. 11 km) will not exceed several metres, and the planned cable chambers and the manoeuvring area are small in size and they are planned in an already transformed area, the construction of the planned Project will have a moderate impact on changes to the ground surface, and the levelling works will have minor extent.

The potential impact may also include contamination of open excavations with grease, oil, etc. In the event of incidental contamination of the ground surface, the Contractor shall replace the soil and dispose of the contaminated soil as hazardous waste.

As a result of the impact assessment of the implementation of the Project (construction phase), it can be concluded that the impact on the shore zone due to the use of trenchless technology will be neutral.

A summary of the assessment of the significance of the negative impact of the planned Project on the land surface and relief during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
High	**(5)**
Impact classification	**(12) moderate**

The moderate assessment is influenced by the presence of a dune in close proximity to the planned construction works at the cable landfall. The dune is characterised by high sensitivity; it is a highly vulnerable ecosystem. The impact on the dune has been assesse as negative, indirect, secondary, short-term, reversible and within the limits of the Environmental Decision. The impact can be significantly reduced by prohibiting the movement of construction vehicles and machinery on the dunes north of the cable landfall and ensuring that the vegetation growing on the surface of the dune is in good condition after the construction phase.

10.1.2. Operational phase

At the stage of exploitation of the planned Project, no impact which may adversely affect the ground surface and the relief of the terrain is anticipated, also in the zone of the shore and the dune belt.

10.2. Impact on Geological Structure and Deposits

Along the route of the ECI, there are weak-bearing soils, which include dune and aeolian sands, peats, peats on sands, peat silts, and valley bottom silts and sands. These soils can make it difficult to carry out earthworks with heavy construction equipment. They account for about 24% of the length of the land connection and occur along the entire route of the connection.

According to the maps of concessions for exploration, prospecting and extraction of minerals from deposits, the planned Project in the onshore part is located outside the concession areas. There are no mineral deposits or mining areas within the boundaries of the planned Project and in the area of potential impact.

10.2.1. Construction phase

During the construction of the planned Project, the works will not affect the geology, the surface formations, and will be related to:

- the excavation of open trenches for the laying of power cables and cable ducts, as well as launching and exit chambers in the sections planned to be crossed using trenchless methods,
- levelling works for substations (ONSs), cable chambers, access roads.

It is assumed that the maximum depth of excavation for the construction of the underground cable line will not exceed 3 m. In particularly justified cases, this depth may be greater. Excavation will be conducted along an approx. 11 km section of the cable line route, i.e., approx. 80% of the connection route, and the cables will be laid in approx. 1 km long excavation sections. The maintenance time for a single section of excavation will be approximately 12 weeks.

The foundation of the cable chambers at the cable landfall (4 perpendicular-shaped objectswith a side length of a maximum of a few metres) is planned in excavations with a depth of approx. 2 m, which will then be backfilled, and any excess soil will be managed within the construction corridor.

According to the detailed geological map (1:50,000), the planned ECI corridor passes through a mosaic of post-glacial sands and clays as well as weak soils (of a poor bearing capacity), such as dune and aeolian sands, peats, peats on sands, peat silts and silts, and sands of valley bottoms. These are present at approximately 24% of the length of the onshore route and occur locally along its entire route (figure 8.6 subchapter 8.2).

Trenchless methods will be used (with a maximum drilling depth of 5 m. below ground level) in case of areas with a high-water table or poorly drained areas that are difficult to cross by open excavation. The locations of the tentatively planned trenchless crossings are shown in figure 10.1. The total length of the trenchless crossing sections proposed in the preliminary design phase is approximately 1.47 km. The target length of the sections will be determined following geotechnical investigations at the construction design stage. Trenchless methods will be preferred where possible to avoid weak soils and wetlands. Thus, the construction of the planned Project along most of the route will only affect the near-surface layers and its impact will not affect the deeper geological layers. Only in the case of the cable crossing under the grounds of the Ustka Naval Centre, around 36.3 km, it is envisaged that trenchless drilling operations may extend up to 25 m below the surface. The general picture of the geological structure of the area shows (Subchapter 8.2) that glacial sands or glacial till lie beneath the aeolian sands in the dunes. These are poorly permeable sediments that provide good insulation against potential contamination of the deeper geological layers. Furthermore, due to the small cross-sections of the casing pipes, the scale of interference with the deeper geological layers will not be significant.

The impact will be negative, direct, simple, short-term, reversible, and their spatial extent will be within the boundaries of the Environmental Decision. It should be taken into account that if the appropriate technological regime is not maintained, contamination of the ground and deeper sedimentary layers (indirectly or directly also water contamination) with fuel spills from construction machinery may occur. However, with proper protection of the worksite and proper organisation of the work, the probability of such an event can be considered to be low.

Construction facilities will be in the area of the planned substations (ONS) in the area of Pęplin and the cable landfall. The construction facilities will be equipped with portable sanitary facilities with leak-proof tanks, systematically emptied by specialised companies, and any spills will be neutralised with oil neutralising agents; workers will be trained to use such agents.

Due to the need for access to the construction site of the planned Project, the use of existing roads and the construction of new roads is planned. The construction of approximately 13 km of

temporary roads is planned along the axis of the planned cable tracks. This will not affect the geological structure. In addition, the Investor is planning to use the existing road infrastructure.

The degree of the impact described above depends on the sensitivity of the area determined by the type of surface formations. Dune areas and areas with high groundwater table are the most sensitive to impact of the construction phase of the planned Project.

The most valuable dune area with aeolian sands (34.9-36.6 km of the ECI corridor, along a section of approx. 1.7 km) susceptible to wind erosion and infiltration of pollutants, e.g., oil spills, is the area of Lędowskie Wydmy. Directional drilling is planned in this section, which excludes the risk of disturbing surface formations and minimises the risk of infiltration of contaminants. In the dune area, it is planned to locate a construction site for the landfall of the cables, cable chambers, a construction site, and a manoeuvring area. Geologically sensitive areas for contaminant infiltration, due to the high groundwater table, are peats (37 km), peats on sands (38.5, 44 km), peat silts (42, 45.5, 47 km) and valley bottom silts and sands (47 km). These soils can make earthworks with heavy construction equipment difficult. They occur on approximately 24% of the length of the land connection. The Investor's plans to use trenchless methods in areas that are valuable in terms of nature and difficult to cross with open excavation, as well as due to the presence of watercourses and other natural obstacles, which will significantly reduce the impact on surface formations.

The rest of the planned route of the underground cable line and ONS substation runs through areas made up of glacial sands and glacial till, which are more resistant than the aeolian sands on the dunes and formations with a high groundwater table.

In the light of the analysis of the geological conditions of the underground cable line, cable chambers, access roads and onshore substation, the planned Project does not pose a threat to the geological structure.

As a result of the impact assessment of the implementation of the planned Project (construction phase), it can be concluded that the impact on geological formations will be negative, direct, simple, short-term, and reversible, and their spatial extent will be within the boundaries of the Environmental Decision.

The assessment of the significance of the adverse impact of the planned Project on the geological structure during the construction phase is presented below:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(11) insignificant**

The sum of the significance weights of the negative impact is 11, so the impact during the construction phase on the geological structure has been assessed to be insignificant. Only when passing the cables under the military area, in an area of approx. 36.2 km, it is anticipated that drilling down to 25 m below ground level may result in disturbance of the system of sedimentary layers and involve a risk of contamination of deeper sedimentary layers in the event of an accident. With proper site protection and work organisation, the likelihood of such an event is low.

10.2.2. Operational phase

During the operation phase of the planned Project, no impact that may adversely affect the geological structure is anticipated.

Raw materials and deposits

The planned Project on the onshore part is located outside the concession areas and there are no mineral deposits or mining areas. No prospective areas of useful minerals have been either identified.

The northern part of the planned Project is in zone 'C' of the health resort protection. The execution of the planned Project in all phases (construction, operation, and decommissioning) will not interfere with the assumed objectives of the zone 'C' therapeutic function in accordance with the Resolution No. XVII.176.2012 of the Ustka Municipality Council of 30 March 2012 on the adoption of the Statute of the Ustka health resort.

The planned Project is located more than 2.8 km from the nearest deposit and therefore no impact of the construction, operation and decommissioning phases on the deposits and accessibility to the mineral deposits is expected.

10.3. IMPACT ON SOILS

The route of the planned Project passes through agricultural areas. They occupy about 41.7% of the area. The dominant soil types are brown soils (leached, acid, proper), which occupy approx. 40.84% of the area. There is also a large share of podzolic soils (about 17.21%) and arenosols, which account for about 14.36%. About 11.65% is occupied by soils within closed and forested areas, for which there is no data. The smallest area along the route of the planned project is occupied by hydrogenic soils (about 3.02%) and muds (about 0.14%).

Hydrogenic soils of the silty, peaty and mucky type (about 3.02%). They have low resistance to disturbance of the soil profile, the balance of soil-water relations and pollution. Soils with low resistance to pollution and sensitive to wind erosion are also arenosols. In addition, an important aspect is the occurrence of fertile soils of the following types: black earths and soils and attention to agricultural soils of the good wheat complex of bonitation class II, IIIa and IIIb and potential limitations of cultivation, occurring primarily at the stage of construction of the planned Project.

10.3.1. Construction phase

The predicted impacts on soils during the construction phase will be related to:

- open excavation and levelling work (disturbance of soil profile),
- traffic of heavy construction and installation equipment (soil compaction),
- dewatering of excavations (disruption of hydrological conditions),
- preparation of launching and exit chambers for trenchless crossings (disturbance of soil profile and hydrological conditions),
- occupation of land for the construction of the ONS, access roads, and construction yards.

In addition, the impact will be related to aeolian erosion and potential contamination of soils with grease, oil, etc.

The construction of the planned Project will involve the temporary occupation of land for:

- the exit of the cable lines on land (an area of approximately 0.85 ha),
- underground cable line, where the construction corridor will be approx. 32 m wide over approx. 11 km (widened locally to approx. 50-100 m and extensions in the vicinity of the marine/land cable connection).

In addition, there will be permanent surface occupation:

- approx. 16 ha for the planned two ONS substations (one to serve the power output from MFW Bałtyk II and the other from MFW Bałtyk III); the construction facilities for the entire onshore linear section will also be organised at this site,
- approx. 1 ha for the access road to both stations.

In a section of approx. 11 km, i.e., approx. 80% of the route, the land will be transformed within the construction corridor with a width of up to approx. 32 m, (locally enlarged in the area of trenchless crossings and extensions in the area of cable landfall), of which approx. 10 m will be excavated with an open trench approx. 3 m deep[582]. This will be an area where the soil profile will be permanently disturbed. In addition, a temporary road of a width of 6 m (figure 10.3) will be constructed within the construction corridor. The remaining area within the construction corridor (approx. 16 m wide) is a potential reserve

[582] *In particularly justified cases, this depth may be greater*

area for the excavation spoil storage area and a reserve area for a future connection from MFW Bałtyk I, which is not the subject of this Report. After closure of the excavation and decommissioning of the access road, the area will be restored to its original state and further use of agricultural areas will be possible.

Despite the restoration of the soil profile, a periodic deterioration in the productivity of agricultural and forestry soils as their mixing with bedrock, drying out or wetting may occur during the storage of the excavated material. As a result of natural succession and natural soil-forming processes, the soil should return to its pre-development state within a few years.

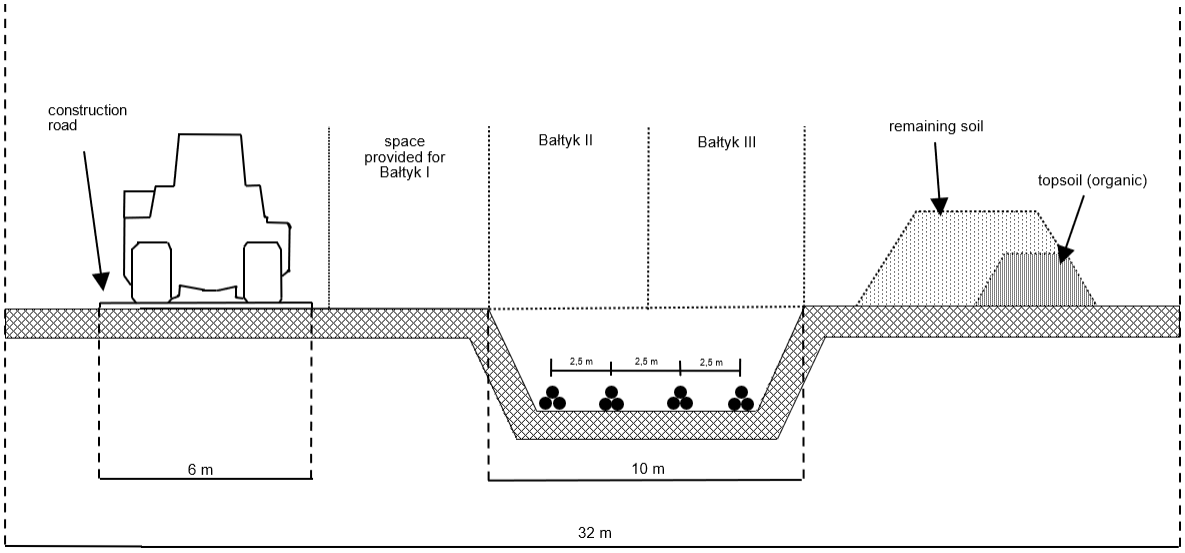


Figure 10.3. *Example diagram of construction corridor for construction of underground cables from MFW Bałtyk II and MFW Bałtyk III*

Source: In-house study based on the Investor's data Onshore civil constructiom & cable installation study, 05 2022

The earthworks technology assumes that the excavation spoil will be divided into a fertile layer (humus) and a residual layer (bedrock). To protect the humus heaps, they will be temporarily covered with plastic sheeting (to prevent weeds). Then, once the excavation has been closed and the soil profile restored, the humus, after having been cleaned in advance, will be spread with the appropriate compaction ratio. This is an important measure in view of the need to restore the original productivity of the soil and the possibility of its agricultural use again.

Due to the adopted technology i.e., filling the soil in the immediate vicinity of the cable bundle with a mixture of cement and sand (figure 10.4) there will bea surplus of soil, which is provisionally estimated at approx. 19,000 m^3. The cable and its protective elements, as well as the sand and cement mixture in the immediate vicinity of the cables, are non-toxic and chemically neutral and pose no risk to the earth and water environment, including soils.

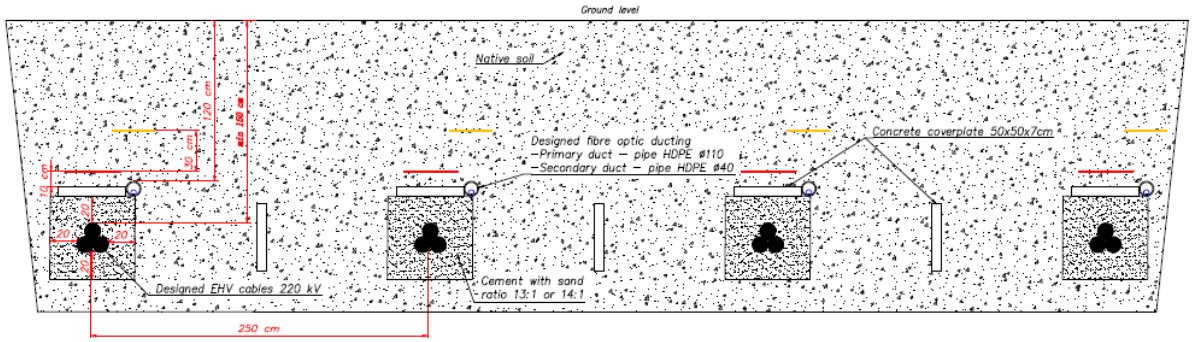


Figure 10.4. *Example of cross-section through an open trench for cable lines from MFW Bałtyk II and MFW Bałtyk III*

Source: Investor data: Onshore civil construction & cable installation study, 05 2022

Surplus earth masses will be transported to a designated storage site. In accordance with Article 2 p. 3 of the Act of 14 December 2012 on waste (Journal of Laws 2022.699, as amended), uncontaminated soil and other naturally occurring materials excavated during construction works are not treated as waste, provided that the material will be used for construction purposes in its natural state in the area where it was excavated. Other types of earth mass are treated as waste and are managed on the basis of the Act on waste and the provisions of the Regulation of the Minister of the Environment of 10 November 2015 on the list of types of waste that individuals or organisational units that are not entrepreneurs may subject to recovery for their own purposes and the permitted methods of their recovery (Journal of Laws 2016.93). Soil that will not be managed at the construction site will be handed over to entities with appropriate waste management permits or transferred to individuals in accordance with the Regulation of the Minister of the Environment of 10 November 2015 on the list of types of waste that individuals or organisational units that are not entrepreneurs may subject to recovery for their own needs, and permissible methods of their recovery.

In the construction corridor (in the place where a temporary technological road will be laid and excavated material will be stored periodically) and in the place of temporary access roads, construction and manoeuvring yards, soil compaction and disturbance of soil profile permeability will occur locally. The degree of the impact on soils depends on their sensitivity to:

- density,
- changes in hydrographic conditions,
- aeolian erosion,
- contamination.

In the northern part of the planned Project, there are podzolic soils (area 35 and 37 km of the ECI corridor), which are among the poorest (in terms of trophic) mineral soils with a fully developed profile. In the area where they are found, cable chambers, construction, and manoeuvring yards (associated with the landfall of the cables from the sea), access roads and excavations will be located. Periodic disturbance of the soil profile and hydrological conditions, as well as soil compaction will occur. The intervention around the HDD launching chamber will last approximately 1 year (+ 2 months for the site preparation). However, it should be emphasised that the terrain in this area is already transformed and partly hardened due to the functioning of the 9th Battery of Fixed Artillery Ustka - Lędowo (fortification complex) here. It is assumed that the execution of a approx. 1 km section of the route (in an open excavation) will take approximately 12 weeks.

Podsolic soils are particularly sensitive to wind erosion. This susceptibility depends on the degree of soil formation and structure, as well as on the bedrock and organic matter content. The most sensitive soils are early-stage, loose-textured soils made up of single, unbound particles, i.e., arenosols (between km 35.5 and 36.5 of the ECI corridor) - see figure 8.9 in Subchapter 8.5. Open excavations, access roads and the HDD launching chamber under the military area (at approx. 36.2 km of the ECI corridor over approx. 365 m) are planned on these soils. The prolonged exposure to wind may result in depletion of these soils, but due to the surrounding forest (a less windy area), this impact, despite the long duration of the works at the cable landfall, should not be significant.

Arenosols are also soils that are particularly sensitive to contamination from grease and oil spills, and do not have the capacity to absorb hydrocarbons due to the low proportion of organic matter. Wetland soils are equally sensitive, due to the possibility of contaminants migrating with the water. Hydrogenic soils along the route of the planned Project are located in the area of wet meadows and the Struga Lędowska watercourse and riparian habitat (at km 37 and 39, respectively, of the ECI corridor) - see figure 8.9in Subchapter 8.5. Construction site spills occur most frequently because of the use of outdated equipment and refuelling of construction vehicles on site. These hazards can therefore be effectively minimised by using efficient and modern equipment and by refuelling construction machinery and equipment on paved surfaces.

The pumping of water in wetlands in connection with the excavation and HDD launching and exit chambers will lead to a temporary lowering of the water table in the close vicinity of the excavation, causing periodic drying of the soil layer and, in the case of hydrogenic soils, increased decay processes and plant death. This happens especially if the excavation is open for a long time. Wetlands revert to

their original state, particularly when native material has been used to backfill the excavation. The type of dewatering will be determined after analysis of the soil investigation results.

The route of the planned Project consists of land covered by brown soils, which occupy approx. 42.5% of the area and occur from km 37.5 to km 47 of the ECI corridor. Open excavations, access roads and ONS substations will be implemented in this area. The main impact will be related to soil profile disturbance and soil compaction.

Black earths occur sporadically along the route of the planned Project and, as fertile soils, are intensively used for agriculture. They occur in the southern part of the planned Project: in the area of planned ONSs and PSE S.A. Słupsk Wierzbięcino substations from 42 km of the ECI corridor to the end of the route, and in the area of km 39. The construction of the ONS will exclude the possibility of their further agricultural use.

The change in soil structure through compaction will be associated with the operation and movement of heavy construction equipment. Similar changes can be expected at the locations of construction backstops and manoeuvring yards. The construction equipment in use will, on the one hand, exert high pressure on soil surfaces, which may cause compaction of the topsoil, and on the other hand, may pose a potential threat of soil contamination due to equipment failure and leakage of hazardous substances from construction vehicles and machinery. Hydrogenic soils are particularly vulnerable to changes in soil structure through compaction. Soil compaction adversely affects extremely sensitive peat soils with a high content of organic material. The introduction of air (oxygen) into peat soils results in its mineralisation. Therefore, it is planned to locate the back-up facilities, as well as the construction of access roads, outside the area of hydrogenic soils. The primary construction site will be in the area planned for the construction of the ONS substation where brown and black earth soils occur. The planned construction background at the cable landfall is an area where podsolic soils and arenosols occur.

A summary of the significance of the adverse impact of the planned Project on soils during the construction phase is given below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Medium-term	**(2)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(13) moderate**

The sum of the significance weights of the predicted negative impact is 13, so the impact during the construction phase on soils for the route of the planned ECI has been assessed as moderate. The negative impact on soils during the construction phase will mainly relate to changes in soil structure, disturbance of the soil profile, change in hydrographic conditions, compaction and potential contamination, however the impact will be reversible - properly executed soil decomposition with the division into humus and bedrock together with proper restoration of the soil profile should not result in long-term reduction of soil fertility.

In summary: during the construction phase, the planned Project will be related to the temporary transformation of soils in the construction corridor with a width of approx. 32 m (widened to approximately 50-100 m and extensions in the vicinity of the marine/land cable) and in the location of construction facilities, the landfall of cables and the ONS construction site. The greatest impact will occur in relation to hydrogenic soils and arenosols, which are the most sensitive to changes associated with disturbance of the soil profile, alteration of hydrological conditions, soil compaction and potential contamination. Proceeding in accordance with the Earthmass Management Plan described above during the construction phase will allow for their agricultural reuse. The location of the planned Project on agricultural land, below the vegetation layer of the soil, will not result in a change to land use for non-agricultural purposes, or take the land out of production.

10.3.2. Operation phase

At the stage of exploitation of the planned Project, no impact that may adversely affect the soils along the route of the planned ECI is expected, as the operation of the underground cables is maintenance-free and does not require any interference with the soil. The implementation of the planned Project will not lead to a deterioration of soil structure and a decrease in agricultural production. As already mentioned, the location of the planned Project on agricultural land, below the vegetation layer of soil, will not result in a change of land use for non-agricultural purposes or in the exclusion of this land from production.

Thermal emissions to the ground due to the operation of the underground cable line will occur. Calculations of the thermal impact are presented in Attachment 6 in Volume IV of this EIA Report. The calculations show that the thermal impact of the cables introduces insignificant temperature changes at the ground surface in the area above the laid cables. The calculations were performed for a maximum load factor of 1, which assumes continuous transmission of maximum power through the designed cable lines. The actual thermal impact of the designed cable lines will be smaller, as the actual power generation of the wind farm is intricately linked to weather conditions (dependent on wind speed) and only reaches maximum generation in short periods during the year. In this context, the impact of the cables on the soils during the operational phase can be considered negligible.

The permanent conversion of soils will take place around the planned cable chambers, ONS substations and permanent access roads. The construction of the ONS will exclude the possibility of further agricultural use of the black earth and brown soils present here, of II, IIIa and III b valuation class.

Pursuant to Article 18(1) of the Act of 24 July 2015 on the preparation and implementation of strategic investments in transmission networks (Journal of Laws 2022.273 consolidated text), the provisions on the protection of agricultural and forest land do not apply to agricultural and forest land covered by the decision on the location of a strategic investment in transmission networks.

During the operational phase, the potential impact on soils will be negative, direct, simple, long-term, and permanent due to the occupation of the site for the ONS facilities.

A summary of the significance of the negative impact of the planned Project on soils during the operational phase for the ONS station is presented below.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Simple	**(1)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Law	**(3)**
Impact classification	**(13) moderate**

The sum of the significance weights of the negative impact is 13, so the impact during the operational phase on soils for the route of the planned ECI have been assessed as moderate. The negative impact on soils during the operational phase will relate to the permanent occupation of land for ONS substations up to a total area of 16 ha and the exclusion of high-quality soils from agricultural use.

10.4. Impact on Surface and Groundwater and Flood Risks

10.4.1. Surface Waters

Construction phase

The projected impact of the construction phase of the planned ECI on water resources will involve:

- crossing of watercourses: Struga Lędowska and Pogorzeliczka,

- crossing of ditches and other water facilities that periodically lead to water,
- dewatering of excavations prior to laying the cable line in a trench in areas with high groundwater levels (initially about 4 km of the route in the northern part of the ECI may require dewatering),
- levelling and hardening of the area.

Crossing of Struga Lędowska - trenchless crossing

Struga Lędowska (37.2 km of the ECI corridor). Potential the greatest threats to the aquatic environment along the ECI corridor will be associated with the crossing of the Struga Lędowska watercourse, whose waters flow into the Modła Lake, located approximately 900 m to the west of the planned Project's corridor boundary. The Modła Lake and the surrounding wetlands are protected as a nature reserve and constitute a special habitat protection Natura 2000 site Przymorskie Błota PLH220024 (Subchapter 8.6.1.). In this aspect, the assessment of the impact on surface water pays particular attention to the potential impact of all phases of the planned Project on the hydrology of the Modła Lake and the possibility of contamination of the water feeding the lake, which is located along the route of the planned Project (figure 10.5).

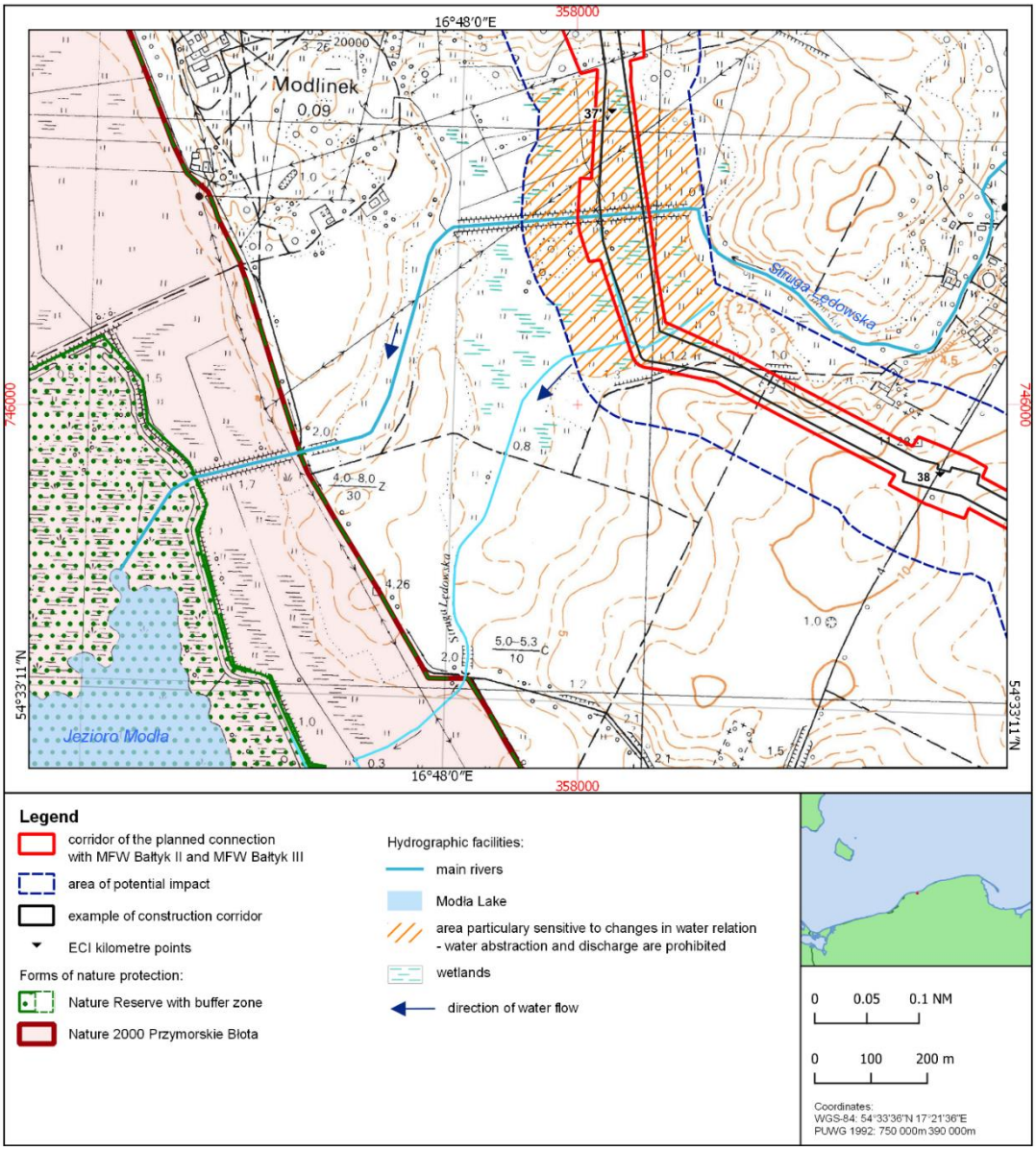


Figure 10.5. *Ecosystem of the Struga Lędowska watercourse and the Modła Lake*

Source: In-house study

The planned Project crosses the Struga Lędowska watercourse in the vicinity of the 37.2 km of the ECI corridor. At the location of the planned crossing, the watercourse is approximately 1.5 m wide and is regulated (embanked) with a slope approximately 1 m high on both sides (for photographic documentation of Struga Lędowska at the crossing location, see Chapter 6 in Site Inspection Card No. 8 and Subchapter 8.4). The ichthyofauna inventory in Struga Lędowska showed poor species composition and low fish abundance (8 pike and 18 tench were caught and stickleback was observed) (Volume III, Attachment 2). The site of the watercourse crossing is a local depression with an extensive complex of wet meadows. There are hydrogenic soils here, the presence of which determines the high groundwater table.

Due to the difficult conditions of the open excavation works, the crossing of Struga Lędowska has been planned using the HDD trenchless method, which means that both the river bed and the surrounding wetlands will not be disturbed over a length of approx. 75 m. This measure significantly minimises the potential impact of construction on this watercourse.

However, the construction of a trenchless passage will require the construction of a launching and receiving chamber at the beginning and end of the passage several meters deep. The parameters of the chambers (including depth) will be determined at the construction design stage. The construction of the chambers may involve the need to periodically pump out water during the drilling operation. This may lead to a temporary lowering of the water table in the immediate vicinity of the chambers, causing temporary drying of the soil profile. This is particularly the case if the excavation will be open for a long time. Wetlands return to their original state, especially if native material has been used for backfilling the excavation.

Following geotechnical investigations, the extension of the trenchless section and/or modify the technology may be necessary. The method of dewatering will be indicated after analysis of the soil investigation results at the construction project stage. To limit the risk of disturbing hydrological conditions, measures to minimise the lowering of the water table in the vicinity of the excavation, such as sheet piling and/or needlefilters are planned.

The execution of the trenchless passage requires a water supply for the drilling mud, so potential sources of water supply were analyzed by examining the available water resources in the area of the planned Project. The most abundant water supply is Lake Modla and the Struga Lêdowska stream flowing into it. The Modła Lake is particularly sensitive to changes in hydrological conditions and individual components of the hydrographic network, which may cause changes in water chemistry and consequently in fauna and flora species abundance and composition. Due to its protection status and sensitivity to changes in hydrological conditions, it is necessary to exclude the intake of water necessary for the drilling mud (in connection with the planned trenchless HDD passage) from Lake Modła and Struga Lędowska and the discharge of drilling mud, or water from dewatering the chambers, into this lake and the watercourses and ditches flowing into it, which the analyzed IP corridor crosses on the section from 36.9 km to 37.5 km of the IP corridor.

The construction equipment used may additionally pose a potential pollution risk due to equipment failure and leakage of hazardous substances from construction vehicles and machinery. In this aspect, care should be taken to ensure its condition and only technically sound equipment should be allowed to work.

In summary, it is expected that the impacts of the construction phase on the Struga Lêdowska River have been eliminated through the implementation of the trenchless crossing. The remaining impacts associated with the organization of the trenchless crossing in the vicinity of the watercourse bed will be local and short-lived and will not lead to a disturbance of the hydrological conditions of Lake Modla.. Soil and water contamination is unlikely and will be only related to the short-term construction phase of the underground cable lines. Furthermore, the application of the proposed solutions will reduce the possibility of the formation of a depression cone and drainage of the hydrogenic soils present here.

Crossing of Pogorzeliczka - trenchless crossing or open trench

Pogorzeliczka (44.7 km of the ECI corridor). Near km 44.7 of the ECI corridor, there is the Pogorzeliczka watercourse, up to 1.5 m wide, which flows into the Modła Lake (approximately 7 km from

the planned watercourse crossing point). This small watercourse will be crossed in the upper reaches. Photographic documentation from a site inspection conducted in May 2022 showed that there was no water in the watercourse - see Chapter 6 Site Inspection Card No. 20 and Subchapter 8.4. So, it must be considered that the nature of the watercourse has changed from permanent to intermittent due to climate change.

The watercourse is regulated at the site of the planned crossing. There are woodlands in the surrounding area. The Pogorzeliczka is likely to be crossed using the HDD method. The investor also allows crossing by open trench.

The impact of the construction phase on the Pogorzeliczka watercourse will be local and short-term.

Larger drainage ditches and roadside ditches will also be crossed using the HDD method.

The following figures show example cross sections of the crossing of underground 220 kV (figure 10.6) and 400 kV (figure 10.7) cable lines with a drainage ditch using the trenchless HDD method. The depth of the cable lines laid using the HDD method at intersections with watercourses will be determined at a later stage of the project.

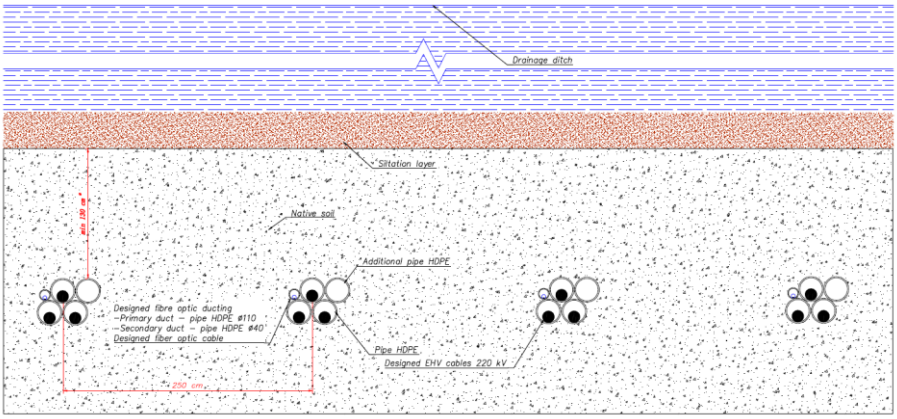


Figure 10.6. *Example cross-section of a crossing of a 220 kV underground cable line with a drainage ditch using HDD technology**

***** *The depth of the laid HDD cable lines at watercourse crossings will be determined at a later stage of the Project.*

Source: Final concept report[583]. C256-EP-Z-RS-00001-C02' developed in April 2022.

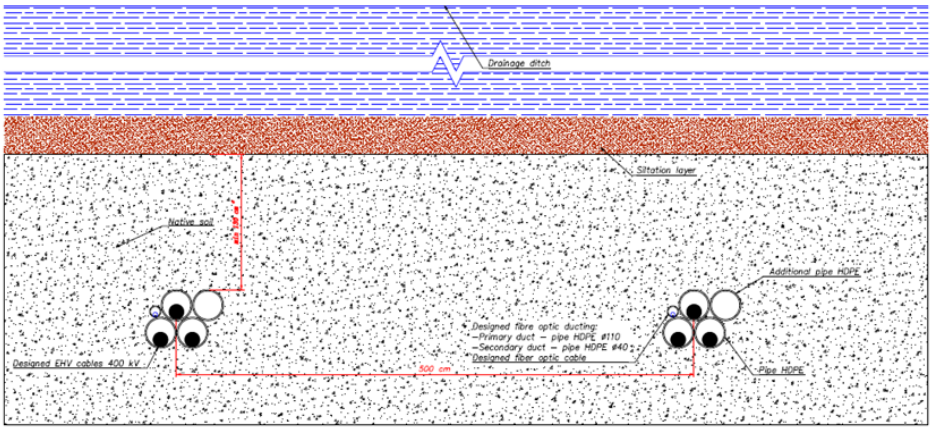


Figure 10.7. *Example cross-section of a crossing of a 400 kV underground cable line with a drainage ditch using HDD technology**

** The depth of the laid HDD cable lines at watercourse crossings will be determined at a later stage of the Project.*

Source: Final concept report[584] . C256-EP-Z-RS-00001-C02' developed in April 2022.

[583] *In the original: "Final Concept Reports of MFW Bałtyk III and MFW Bałtyk III Onshore civil construction & cable installation study".*

[584] *In the original: " Final Concept Reports of MFW Bałtyk III and MFW Bałtyk III Onshore civil construction & cable installation study".*

In the case of the HDD method and long directional drilling, the casing pipes will be filled with a mixture of sand and cement, which will improve the conditions for heat dissipation from the cables and prevent the penetration of water with contaminants, which could adversely affect the operation of the cables.

All details relating to the trenchless method of crossing watercourses will be agreed with the watercourse administrator at the stage of water permits.

Open trench crossing of drainage ditches

Some of the drainage ditches will be crossed using the open excavation method. The drainage ditches along the route of the planned Project are in various states of maintenance. They are of low value in terms of nature and will be crossed by open excavation, which may cause the local and short-term impact during the construction phase. The degree of impact will depend on the time of year and weather conditions and the amount of water in the ditches[585]. The potential impact will be related to temporary increases in suspended solids in the waters and interference with the riverbed.

The impact discussed above will be local and short-term.

All details relating to the method of any open excavation will be agreed with their administrator at the water permit stage.

Land levelling and changes in water infiltration

The realisation of the underground cable lines is associated with land levelling of maximal 16 ha around the cable chambers and the ONS substations. In addition, the construction of approximately 13 km of temporary roads paved with aggregate or prefabricated slabs and the permanent way to the ONS station is planned. The planned levelling will be local and will not contribute to changes in the infiltration of rainwater and snowmelt. Minor changes will occur because of the introduction of hardening of the land in hitherto forested areas, which will reduce the gravitational movement of surface water and rainwater in this area. The impact associated with the construction of temporary paved roads will be local and short-term. The roads will be demolished at the end of the construction phase and the site will be returned to its original condition. In the case of the levelling and hardening of the ONS substation site, the impact will be local and long-term.

Wastewater will also be generated during the construction phase from the toilets and facilities of those employed on site. Workers on site will use portable toilets, which will be installed around the works. The number of toilets will be adapted to the number of people employed.

During the implementation of the planned Project, the collection of wastewater or materials that may deteriorate water quality is not expected. During the construction phase, waste and wastewater will be managed in accordance with applicable regulations and standards. As a result, wastewater and waste will not pose a threat to surface water quality. During the construction phase, the potential impacts on surface water will be negative, direct, secondary, short-term, and reproducible, of local extent. Sensitivity due to the relation with the Modła Lake is high**:**

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Short-term	**(1)**
Reproducible	**(2)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
High	**(5)**
Impact classification	**(16) moderate**

The sum of the significance weights of the negative impacts is 16, so the impact during the construction phase on surface water for the route of the planned ECI has been assessed as moderate. The negative impact on surface water during the construction phase will relate to the crossing

[585] *During the site visit (19 May 2022), it was found that most of them were not running water*.

of watercourses and ditches, land levelling and hardening. Works in the Struga Lędowska area should be carried out using the proposed solutions: water intake for drilling fluid from the Modła Lake and discharge of water into this lake and adjacent watercourses, i.e., from 36.9 km to 37.5 km, is prohibited.

Operation phase

The operation phase of the planned Project is a maintenance-free process with regard to the underground cable line, limited to service and maintenance works, primarily at the cable connection points, i.e., the so-called couplers and cable chambers. In this aspect, the impact on surface water quality will be related to potential contamination due to accidental spills from machinery and vehicles in connection with maintenance works. The maintenance of the plant and equipment will be conducted using technically efficient equipment and with appropriate safeguards, in accordance with the legal regulations and the Investor's internal instructions.

Potential impacts on water will only affect the two planned onshore substations and their service.

Water and wastewater management

During the operation phase, the water demand of the LSE station for social and fire purposes will be small (about 0.3m^3/day). The source of water supply will probably be a water supply system.

During the operation of the planned Project, within the ONSs:

- rainwater,
- social and domestic wastewater

will be produced.

Rainwater from the ONS's paved areas will be collected and discharged to a receiving water body in accordance with the Water Act.

The operation of the ONS substation may be associated with emergency leakage of electro-insulating oils, electrolytes, foam extinguishing agents, generator fuel into the ground and leakage into surface water. To prevent potential failures, it is planned to equip transformers with oil pans associated with a rainwater treatment system (oil separation). For batteries, it is planned to use trays or cuvettes to catch the electrolyte in the event of leakage. In addition, the substation will be equipped with hand-held sorbent kits and agents for dealing with spilled and leaked hazardous substances, adapted to the size of the facility and the amount of apparatus containing such substances.

The social and domestic wastewater generated in the social building serving the planned ONS substations will be generated in small quantities (there will be a few people on the station at all times) and will be discharged to the sanitary sewer system or to a septic tank.

The operation phase will have no impact on surface waters, including the operation of the ONS substation under normal operating conditions (trouble-free operation) will not affect their quality.

In summary, the construction phase will have a minor impact on surface water through the introduction of paved surfaces (access road to the ONS and locations of offshore and onshore cable connections buildings within the ONS) and a reduction in rainwater infiltration at this location. This impact has been assessed as not significant:

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(9) insignificant**

10.4.2. Groundwater

Construction phase

Trench drainage

The cable lines will be laid in a dry excavation; therefore, dewatering will be required in areas where the groundwater level is above the ordinate of the bottom of the excavation. A detailed analysis of hydrogeological and hydrograhic conditions is presented in Subchapter 8.4 based on the Hydrogeological Map of Poland. Sheet Ustka (1:50,000). According to the performed characterisation, in the northern part of the planned Project (up to 38 km) groundwater occurs at the depth of about 2.5 m. Therefore, it was provisionally estimated that approx. 4 km of the route in the northern part of the ECI may require dewatering. In this case, pumps, needle-filters, or additional dewatering trenches will be used (Subchapter 3.2.3). The type of dewatering will be carefully analysed after the analysis of the ground investigation results at a later stage of the design work, where such sections will be selected based on information on groundwater levels, their nature and in relation with the design data. To reduce the risk of disturbing hydrological conditions, minimising measures in the form of sheet piling used at the point excavation locations for trenchless crossings are recommended.

Water from dewatering will be discharged off-site into existing drainage ditches (beyond 36.9 km to 37.5 km) according to the permit of their administrators and current legislation. Distribution of the water to adjacent areas may also be possible, which has a beneficial effect on groundwater, especially during dry periods. After completion of the construction work, the groundwater level in the excavation areas should level off within a few days. The spatial extent of the lowered groundwater level should not exceed a few metres from the excavation. Dewatering works will be conducted in advance until the individual, approximately 1 km long sections of the underground cable line have been laid and covered.

In the case of needle-filter drainage, the waters do not contain substantial amounts of suspended solids and can be discharged into receiving bodies (ditches, watercourses). If pumps are used, then the water will be cleaned of suspended solids.

Trenchless crossings are planned in areas that are difficult to cross by open excavation (watercourses, wetlands). The foundation of the ONS substation will not affect groundwater due to its depth in the area (10-15 m below sea level).

During the construction phase there is a risk of groundwater contamination, particularly with petroleum substances, associated with the use of vehicles and construction machinery. However, groundwater contamination is unlikely and will only be related to the short-term construction phase of the cable lines. Maintenance of construction and transport equipment in good construction condition and proper organisation of the works will reduce the likelihood of contamination entering groundwater.

Dewatering will be local, confined to small areas. The short duration of the works during excavation ensures that there will be no long-term changes to the aquatic environment due to any dewatering.

During the construction phase, the potential impact on groundwater will be negative, direct, secondary, short-term and reversible.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
High	**(5)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, so the impact during the construction phase on groundwater for the route of the planned ECI has been assessed as

moderate. The negative impact on groundwater during the construction phase will primarily relate to temporary trench dewatering.

Operation phase

The potential impact on groundwater, in particular groundwater and the first aquifer, may relate to contamination of the usable groundwater layer due to the inflow of pollutants (hydrocarbons, suspended solids) from equipment and machinery used during the maintenance of the installation of the connection infrastructure components, and rainwater and snowmelt infiltrating both along the underground cable lines, and from the area designated for the ONS substations. This impact will be reduced because of the planned provision of a drainage system at the ONS. In addition, the substation operation may be associated with emergency leakage of electro-insulating oils, electrolytes, foam extinguishing agents, generator fuel into the ground.

It is assumed that servicing and maintenance work on the installation and equipment will be conducted using technically sound equipment and with appropriate safeguards, in accordance with legislation and the Investor's internal instructions. This will minimise the risk of contamination of the usable groundwater level.

The Project, located at a depth of approximately 2 m, will not cause any changes to the groundwater environment. No groundwater abstraction activities that could cause a lowering of the groundwater table, of the usable aquifer, is planned. The impact will be local and short-term. Due to the scale and nature of the planned Project, there will be no impact on the GWBs during the operation phase. No threat to achievement of environmental objectives was identified either.

10.4.3. Impact on Surface and Groundwater Bodies

Surface water bodies

The planned Project is located in the Oder River basin area, for which the second update of the "Oder River Basin Management Plan" is in force as of February 24, 2023, adopted by the Decree of the Minister of Infrastructure of November 16, 2022 (Journal of Laws 2023.335.). The Plan sets environmental objectives for, among others, the coastal water body CW60001WB3 Polish coastal waters of the Bornholm Basin. The assessment of the impact of the planned Project on coastal waters is discussed in the marine section, i.e. in Section 9.3.3. The land section of the IP corridor will interfere (Figure 8.13 in Section 8.4.1):

- over a length of about 1.2 km into the direct catchment area of the sea CW60001WB3, where there are no hydrographic facilities and the cable exit to land will be made trenchless including the technical strip of the Maritime Office - it is concluded that there is no possibility of impacts;
- over a length of about 8.4 km in the so-called "other areas of the JCWP", where the IP will pass through Struga Lędowska flowing into Lake Modła - impacts are discussed below;
- for a length of about 1.8 km into the catchment area of JCWP RW6000104716129 Pogorzeliczka, where it crosses the Pogorzeliczka in its upper course - impacts are discussed below;
- for a length of about 1.8 km into the catchment area of JCWP RW60001746729 Moszczeniczka, where it does not cross the main watercourse or its tributaries - it is concluded that there is no possibility of impacts.

Struga Lędowska and Lake Modła

The construction of the planned Project will be carried out mainly within the boundaries of the "remaining areas of the JCWP", and the potential impacts will be related to the crossing of the largest watercourse along the route of the planned Project and the only one that conducts water continuously - i.e. Struga Lędowska flowing into Lake Modła. Since Struga Lędowska does not currently constitute a separate JCWP, the environmental objectives established for Lake Modła - i.e. JCWP No. LW90084 i.e. good ecological status and good chemical status - were adopted in this assessment. No deviations have been designated. For this JCWP, environmental objectives were set, including: preservation of the eutrophic lake ecosystem with its characteristic biotopes, biocoenoses and processes, in particular, populations and habitats of wetland bird species. For the Pas Pobrzeża na Zachód od Ustki protected landscape area, the set environmental objectives include, among others, the preservation of a distinctive landscape with diverse ecosystems, the preservation and protection of surface water ecosystems

(natural and artificial, flowing and standing, including oxbow lakes) together with a belt of surrounding vegetation, as well as the prevention of lowering of the groundwater table, particularly by limiting the construction of drainage facilities and drainage ditches. For the PLH220024 Przymorskie Błota Natura 2000 site, environmental objectives include maintaining a high degree of habitat hydration.

The planned trenchless crossing of the Struga Lędowska eliminates the possibility of negative impacts on the watercourse and on the watercourse bed. Due to the proximity of Lake Modla, which is particularly sensitive to changes in water relations and pollution, a minimizing measure is proposed in this Report by prohibiting the extraction and discharge of water to make drilling mud for the trenchless passage or for any other purpose. This applies to all watercourses flowing into Lake Modla along the section of the IP corridor from km 36.9 km to 37.5 (Figure 10.5). With the implementation of the proposed solutions, it is expected that the implementation of the planned Project will not jeopardize the possibility of achieving good ecological status and good chemical status of this water body, and will not jeopardize the achievement of objectives related to the protection of water-dependent habitats and species.

Pogorzeliczka

Pogorzeliczka will be crossed in the upper reaches at a distance of about 7 km from the mouth of Lake Modla - in this section it is an intermittent watercourse, as there was no water in the riverbed during a site visit in May 2022. The environmental objective for this JCWP W6000104716129 Pogorzeliczka is good ecological status and good chemical status, and achievement of this objective is considered to be at risk. The catchment area of the JCWP is an area sensitive to eutrophication caused by pollution from municipal sources, understood as enrichment of waters with nutrients, particularly nitrogen or phosphorus compounds. For this riverine water body, protected areas have been designated for the protection of habitats or species, for which the maintenance or improvement of their status is an important factor in their protection.

At the current stage, the crossing of the Pogorzeliczka River is planned using the HDD trenchless method. Both the implementation of the trenchless crossing and the optional open excavation during periods of low water levels or lack of water in the riverbed will not result in the possibility of impacts that would jeopardize the achievement of environmental objectives assigned to this water body. The impact of the construction phase on the Pogorzeliczka will be local and short-lived and will not jeopardize the possibility of achieving environmental objectives.

In conclusion, the implementation of the planned Project will not jeopardize the achievement of the environmental objectives set in the second update of the "Oder River Basin Management Plan," adopted by the Regulation of the Minister of Infrastructure dated November 16, 2022 (Journal of Laws 2023.335), which came into force on February 24, 2023. With proper execution of construction works, there will be no significant impact on the hydrographic network in the area. Other impacts typical of underground infrastructure implementation will not result in a significant impact on surface water.

Groundwater bodies

The planned Project will be implemented within the boundaries of GWB PLGW600010. A detailed characterisation of the GWB together with an assessment of their status is presented in Subchapter 8.4.2.

Within the boundaries of the GWB, in the sections potentially requiring dewatering, the impact will cease with the completion of the construction phase and the water will be discharged to the receiving water body, and construction dewatering poses no threat to the Quaternary aquifer or to the lower layers. This will be a short-term and reversible impact. During the implementation of the Project, the impact will be associated with dewatering and the risk of groundwater contamination from oil and grease from machinery and equipment used during construction.

In accordance with Article 59 of the Act of 20 July 2017. - Water Law (Journal of Laws 2021.2233, as amended) the environmental objective for groundwater bodies (GWB) is:

- preventing or reducing the entry of pollutants into them,
- preventing deterioration and improving their condition,
- protect and take corrective action and ensure a balance between abstraction and recharge of these waters to achieve good status.

According to the data sheet[586], the environmental objectives for PLGW600010 are good chemical and quantitative status and are not at risk of not being achieved.

Analysing the above-mentioned legal conditions, the state of groundwater, as well as taking into account the nature of the investment and the associated impact, it should be concluded that the project in question will not contribute to the failure to achieve the environmental objectives contained in *'*Odra River Basin Management Plan', adopted by the Regulation of the Minister of Infrastructure dated November 16, 2022 (Journal of Laws 2023.335.).

10.4.4. Flood Risk Areas

The planned Project in the coastal zone runs through an area of special flood hazard. Pursuant to Article 16(34) of the Water Law Act (Journal of Laws 2022.2625, consolidated text, as amended), the planned Project is located fragmentarily (figure 8.18).

- between the shoreline and the dyke or natural high shore into which the dyke has been incorporated, as well as the islands and lagoons referred to in Article 224 which constitute registered parcels,
- within the construction corridor.

The planned Project, in the coastal zone, is fragmentarily located within areas of special flood risk. The construction site for the cable landfall and cable chambers will be in these areas. The area is partially deforested and transformed in the 35 km area. The fortification complex of the 9th Fixed Battery Ustka - Lędowo is located here.

The erection of any buildings and the location of new developments in areas of special flood risk requires a water permit prior to a building permit.

In areas at risk of flooding during the construction phase, it is necessary to properly protect the site from contamination of water and land. The contractor will be responsible for properly securing the ground and water environment against the spillage of hazardous substances. The contractor shall use technically efficient equipment and construction machinery. In addition, the technical condition of the equipment used to conduct the construction work should be checked during the execution of the construction work in order to prevent the spillage of oils and lubricants.

The electricity connection (both underground cable lines and cable connection points) will be planned in such a way that water does not enter the protective pipes and that they are not silted up. The cable entry points into the protective tubes will be sealed, and the cables protected from damage.

Implementation of the planned Project will not increase the risk of flooding at any stage.

According to Article 77 (1) paragraph 3) of the Water Act, the collection of sewage, natural fertilisers, chemicals, as well as other materials that may contaminate the waters, and the conducting of waste processing and storage, are prohibited in areas of special flood risk.

Within the boundaries covered by the Flood Risk Management Plan for the Odra River Basin Area adopted by the Regulation of the Council of Ministers of 18 October 2016 (Journal of Laws 2016.1938) information on flood risks and hazards as well as measures to mitigate/eliminate them is presented, among others. The planned Project does not jeopardise the achievement of the objectives adopted in the aforementioned Plan.

10.5. IMPACT ON NATURE

10.5.1. Vegetation and habitats

The area of the ECI corridor is characterized by a strip pattern of natural habitats, typical for Pomerania, parallel to the sea shore. During the inventory in the Investor's option, the presence of 11 naturally valuable species of vascular plants were found, including 8 taxa under legal protection (chapter 8.5.1. table 8.6). In the Investor's variant, no plant species under strict protection were found.

[586] *http://karty.apgw.gov.pl:4200/api/v1/jcw/pdf?code=GW600010*

Apart from the valuable natural species of vascular plants, the biological inventory showed the presence of 13 species under partial protection of species of bryophytes. There are no species of bryophytes under strict protection. The area of the land corridor of the planned connection is characterized by the diversity of moss species typical for the forests of Gdańsk Pomerania. All moss species are common taxa.

The inventory showed the presence of 9 natural habitats within the Investor's option. They include: a strip of white dunes (habitat 2120), gray dunes (habitat 2130), mixed forests and coniferous forests on coastal dunes (habitat 2180), dry heathland (*Pohlio-Callunion*) (habitat 4030), small patches of acidic lowland beech (Luzulo-Fagenion) (habitat 9110), a vast patch of acid oak forests (Quercion robori- petraeae) (habitat 9190), small patches of dry heaths (Pohlio-Callunion) (habitat 4030), a patch of riparian oak-elm-ash forests (Ficario-Ulmetum), (habitat 91F0), three small patches of subatlantic oak-hornbeam forests (Stellario holosteae) Carpinetum betuli) (habitat 9160) and patches of fertile beech forests (Dentario glandulosae-Fagenion, Galio odorati-Fagenion) (habitat 9130) (Chapter 8.5.1. table 8.8). The condition and prospects for the protection of the abovementioned habitats are varied. Habitats are an important element of the biodiversity of Pomerania and the vegetation of the coastal zone of the southern Baltic Sea. The most important habitats in terms of biodiversity and floristic specificity are priority habitats, the ranges of which are wholly or mostly within the EU, which means that if they do not survive in the EU, they will disappear completely from the face of the earth, so Member States have to undertake appropriate protective measures. In the area of the inland corridor, the inventory of natural habitats showed the presence of the priority natural habitat 2130, gray coastal dunes. The main threat to the occurrence of this habitat is the introduction of trees and shrubs in order to stabilize the dune against abrasive processes and the increase in tourist use, as well as trampling and littering the patches. 11 patches of this habitat were identified in an unsatisfactory (U1) and bad (U2) condition.

Construction phase

The main impacts of the construction phase on the vegetation and natural habitats will be related to the temporary occupation of land for a 30-32 m wide construction corridor (locally enlarged in the area of trenchless crossings and extensions near the landfall of the cables), including the construction of temporary paved roads of approximately 13 km and permanent roads of approx. 1.5 km (to the offshore and onshore cable connection station and the LSE station). On a section of approx. 11 km, i.e. approx. 80% of the route, an open excavation will be made, its width will be approx. 10 m and depth approx. 3 m[587]. It will be the area where the surface layer of soil will be damaged and trees and bushes will be cut down.

In the areas of forest patches of natural habitats, i.e. mixed forests and coniferous forests on coastal dunes (habitat 2180), acid oak forests (habitat 9190), sub-atlantic oak-hornbeam forests (habitat 9160), acidic and fertile beech forests (habitats 9110 and 9130) and a narrow strip of dry heathland (habitat 4030) within the construction corridor, a part of the habitat patch will be destroyed due to the permanent removal of its biotic elements. The habitat of a riparian oak-elm-ash forest (91F0) in the area of 38.6 and 39.0 km will be bypassed using a trenchless passage from the east or an open trench from the west - see Chapter 6 of the Field Vision Card No. 11.

The construction phase is also related to the wear and tear of the topsoil on both sides of the planned excavation and the emission of noise and dust due to the movement of cars and construction machinery. The construction equipment used may additionally create a potential hazard through contamination caused by equipment failure and leakage of hazardous substances from vehicles and construction machinery. In this aspect, its condition should be ensured and only technically functional equipment should be allowed to work.

The vegetation and natural habitats occurring in most parts of the area, within the construction corridor, as well as the construction of an open excavation and the construction of the ONS station, are relatively resistant and easily regenerated (e.g. meadow and pasture habitats). In the case of arable

[587] *In particularly justified cases, this depth may be greater*

fields, the impact of works related to the planned project, in the face of annual agricultural work, will be practically negligible and imperceptible. After completing the work on agrocenoses, annual crops will be cultivated. Moreover, in the areas used for agriculture, the biodiversity of the area will be enriched locally, while in the meadows and pastures, regeneration of vegetation will take up to three growing seasons. Moreover, after the excavation of the trench, the damaged area will be covered with replacement vegetation, with a large share of anthropophytes and apophytes, the composition of which will depend on the habitats through which the trench will pass, as well as on such parameters as: water availability in the habitat, pollution, insolation (solar irradiance), thermal conditions, degree of disturbance of soil parameters and topography. Due to the construction of the ONS station, the agrocenoses occurring here will be completely destroyed.

The impacts of the construction phase on vegetation and natural habitats will also be related to the implementation of cable landings using the HDD technology, at a distance of approx. 160 m from the shoreline (Chapter 3.2.1). Due to the implementation of the trenchless passage, there will be no interference in the area of the most valuable natural habitats: white dunes (habitat 2120) and gray dunes (habitat 2130). The construction area for the cable landing/landfall using HDD technology will be approximately 0.85 ha. The planned location of the HDD passage starting chamber covers a fragment of habitat 2180. It is a partially deforested and hardened area due to the functioning of the fortification complex of the 9 Fixed Artillery Battery Ustka - Lędowo in this area. In this aspect, the preparation of the HDD exit starting chamber will require clearing concrete elements from the area and then cutting down trees.

In the place of the planned smaller trenchless crossings (crossing roads, watercourses and the local railway line), due to the HDD crossing within the construction corridor, part of the habitat patches will not be damaged due to the permanent removal of its biotic elements or the destruction by cars or construction machinery the top layer of the patches. The impact on biotic elements within the habitat strips will be practically insignificant, except for the starting and receiving chambers which will be located at appropriate distances from the habitat patches so as to minimize the risk of their negative impact. After the end of the construction phase, the area will be restored to its original condition.

The effects of the planned project's impact on species of vascular plants and mosses under protection will vary. For example: considering the prevalence of the partially protected sand sedge *Carex arenaria* as a common species in coastal dunes, inland dunes, sandy grasslands, as well as in coastal forests and forests, the destruction of part of the population through activities related to the construction phase will not adversely affect population resources of this species on a regional as well as supra-regional or national scale. In the case of legally protected species, but frequent and common in given habitats or in coastal ecosystems, e.g. black crowberry *Empetrum nigrum* or *Carex nigra* sand sedge, the area of the construction corridor will not adversely affect either local population resources or the condition of species on either side of the excavation. Other species of vascular plants within the construction corridor belong to rare taxa in the country and their sites will be destroyed. Minimizing measures should apply only to vascular plant species from the *Orchidaceae* families (rust-red helleborine, broadleaf helleborine, white honeysuckle), *Caprifoliaceae* (Pomeranian honeysuckle). Within the boundaries of theECIcorridor, species have also been inventoried protected *Ericaceae* (monoflowering pear, lesser pear, roundleaf pear) whose metaplantation is relatively easy, however, the species will not be damaged during construction work, as it is located within the boundaries of the technical belt of the Maritime Authority and no construction work will be carried out there. The above-mentioned taxa belong to species that tolerate transplantation relatively easily and adapt to a new place, provided that they are transplanted to identical or similar habitat patches. The best time for transplanting would be in late spring, right after the flowering of the aforementioned taxa.

Photo 10.1. *Broad-leaved helleborine Epipactis helleborine – species under partial protection*

Source: Nature Inventory, Volume III Appendix 2

Photo 10.2. *Protected Pomeranian honeysuckle Lonicera periclymenum in the undergrowth of acid oak (natural habitat code 9190)*

Source: Nature Inventory, Volume III Appendix 2

The impact on species of bryophytes will also be limited. Metaplantation is not used for species of bryophytes. The species of forest moss and sphagnum moss occurring in the area of the construction corridor are frequent and common species in the area of dry and humid forests along the entire Baltic coast, however, the impact related to the construction of the ECI should be as small as possible and limited to the movement of machines only on existing roads and a narrow strip directly adjacent to the excavation / drilling route. The construction equipment used may additionally pose a potential contamination risk due to equipment failure and leakage of hazardous substances from vehicles and construction machinery. In this aspect, its condition should be ensured and only technically functional equipment should be allowed to work.

After the end of the construction phase, the area will be restored to its original state, with the exception of the technological corridor, which will be permanently deforested. Agricultural land will be returned to its original state and will be used for agriculture.

The tables below (table 10.1, table 10.2, table 10.3) present the species of vascular plants, bryophytes and habitats potentially exposed to destruction as a result of the planned project. The table lists the species within the ECI corridor up to 60 m wide. However, the area directly related to construction works (technical / construction corridor) will be much narrower; its maximum width will be approx. 30-32 m to about 50-100 m and extensions in the vicinity of the offshore and onshore cable connection

Table 10.1. *Species of vascular plants exposed to potential destruction as a result of the planned Project in the Investor's option.*

No.	Approximate km of the ECI corridor	Species within the ECI corridor	Protection Status	Presence in the construction corridor	Impact type	Minimizing actions
1.	35 - 36,5	Black crowberry *Empetrum nigrum*	OCz	yes / FV	Destruction of species sites in connection with tree felling in the area of the landfall of cables and the implementation of excavations	Trenchless methods (in the area of about 36.3 km below the area of the Naval Center in Ustka)
2.	35	Coastal peas	no	no	HDD controlled drilling or HDD controlled drilling combined with offshore trench	
3.	35	Snowline wintergreen *Pyrola minor*	OCz	no	HDD controlled drilling or HDD controlled drilling combined with offshore trench	
4.	35	Sidebells wintergreen single-flowered *Moneses uniflora*	OCz	no	HDD controlled drilling or HDD controlled drilling combined with offshore trench	
5.	35 - 35,1	*Dark-red Helleborine Royal Helleborine*	OCz	yes / FV	HDD controlled drilling or HDD controlled drilling combined with offshore trench	
6.	47,6	Broad-leaved helleborine *Epipactis helleborine*	OCz	yes / FV i U1	Destruction of species in connection with the implementation of excavations and entry to the PSE station	Metaplantations
7.	42,5 - 47,1; 47,6	Lesser butterfly-orchid *Platanthera bifolia*	OCz	no	Destruction of the species sites in connection with the implementation of excavations and entry to the PSE station	Metaplantations
8.	46,5	Water-starwort *Callitriche hamulata*	no	yes / U1	Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained
9.	44,6	Vernal water-starwort *Callitriche verna*	no	yes / U2	Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained

No.	Approximate km of the ECI corridor	Species within the ECI corridor	Protection Status	Presence in the construction corridor	Impact type	Minimizing actions
10.	35,7 - 36,4	Sand sedge *Carex arenaria*	OCz	yes / FV	Trenchless methods (in the area of about 36.3 km below the area of the Naval Center in Ustka)	Trenchless methods, Derogations for destruction
11.	35,1 - 35,4; 36,2 - 36,8	Honeysuckle *Lonicera periclymenum*	OCz	yes / FV	Destruction of the species sites in connection with the implementation of excavations	Metaplantations

OCz - species under partial protection, Protection status: FV - proper condition, U1 - unsatisfactory, U2 - bad

Source: Own elaboration based on the data from the Final Report on the Environmental Inventory of the Connection Infrastructure of the MFW Bałtyk III Offshore Wind Farm and the Connection Infrastructure of the MFW Bałtyk II Offshore Wind Farm

Table 10.2. *Species of bryophytes exposed to potential destruction as a result of the implementation of the planned Project in the Investor's option.*

No.	Approximate km of the ECI corridor	Species within the ECI corridor	Protection Status	Presence in the construction corridor	Impact type	Minimizing actions
1.	35 – 36,2; 43,6; 46,1 – 47,8	Bielistka siwa *Leucobryum glaucum*	OCz	yes / FV	Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained
2.	35,5 – 35,9; 47,2	Brodawkowiec czysty *Pseudoscleropodium purum*	OCz	yes / FV	Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained
3.	47,5 – 47,7	Fałdownik nastroszony *Rhytidiadelphus squarrosus*	OCz	yes / U1	Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained
4.	35; 36,2; 47,3	Gajnik lśniący *Hylocomium splendens*	OCz	no	Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained
5.	46,5; 46,8; 47,6-47,7	Miedzik płaski *Frullania dilatata*	OCz	yes / FV	Destruction of the species sites in connection with the implementation of excavations wykopów i wejściem do stacji PSE	A derogation for destruction should be obtained
6.	43,7; 46,1 - 46,8; 47,3-47,4; 47,6	Nastroszek kędzierzawy *Ulota crispa*	OCz	yes / FV i U1	Destruction of the species sites in connection with the	A derogation for destruction should be obtained

No.	Approximate km of the ECI corridor	Species within the ECI corridor	Protection Status	Presence in the construction corridor	Impact type	Minimizing actions
					implementation of excavations	
7.	36,2	Piórosz pierzasty *Ptilium crista-castrensis*	OCz	no	Trenchless methods (near the Naval Center in Ustka). If it is necessary to destroy it, derogations must be obtained	
8.	36,1	Płaszczeniec marszczony *Buckiella undulata*	OCz	no	Trenchless methods (near the Naval Center in Ustka). If it is necessary to destroy it, derogations must be obtained	
9.	36,1	Próchniczek błotny *Aulacomnium palustre*	OCz	no	Trenchless methods (near the Naval Center in Ustka). If it is necessary to destroy it, derogations must be obtained	
10.	35,7; 36-36,1; 47,3-47,4	Rokietnik pospolity *Pleurozium schreberi*	OCz	yes / FV	Destruction of the species sites in connection with the location of the starting chamber under the passage under the area of the Naval Center and the implementation of excavations	A derogation for destruction should be obtained
11.	36,1	Torfowiec frędzlowany *Sphagnum fimbriatum*	OCz	no	Trenchless methods (near the Naval Center in Ustka). If it is necessary to destroy it, derogations must be obtained	
12.	47,3	Tujowiec tamaryszkowaty *Thuidium tamariscinum*	OCz	yes / U1	Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained
13.	36,1; 46,8	Widłoząb kędzierzawy *Dicranum polysetum*	OCz	no	Trenchless methods (near the Naval Center in Ustka). Destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained

OCz - species under partial protection, Protection status: FV - proper condition, U1 - unsatisfactory.

Source: Own elaboration based on the data from the Final Report on the Environmental Inventory of the Connection Infrastructure of the MFW Bałtyk III Offshore Wind Farm and the Connection Infrastructure of the MFW Bałtyk Offshore Wind Farm

Table 10.3. *Habitats exposed to potential destruction as a result of the implementation of the planned project in the Investor's option.*

No.	Approximate km of the ECI corridor	Habitat within the ECI corridor	Presence in the construction corridor	Impact type	Minimizing actions
1.	42 - 45	sub-atlantic oak-hornbeam forests *Stellario-Carpinetum*	yes / U1 i U2	Destruction in connection with the implementation of excavations	A derogation for destruction should be obtained
2.	35,9 – 36,1	Dry heathland *Pohlio-Callunion*	yes / U1	Destruction in connection with the	A derogation for destruction should be obtained

No.	Approximate km of the ECI corridor	Habitat within the ECI corridor	Presence in the construction corridor	Impact type	Minimizing actions
				implementation of excavations	
3.	36,4; 45,8	acid beech forests *Luzulo-Fagetum*	yes / U1	Destruction in connection with the implementation of excavations	A derogation for destruction should be obtained
4.	36	Acid oak forests *Quercion robori-petraeae*	yes / U2	Destruction in connection with the implementation of excavations	A derogation for destruction should be obtained
5.	35 -37	Mixed forests and coniferous forests on coastal dunes *mailny Empetro nigri-Pinetum*	yes / U1	Destruction of species due to logging in the landfall area and excavation work	A derogation for destruction should be obtained
6.	38,7	Riparian oak-elm-ash forests *Ficario-Ulmetum*	no	Destruction in connection with the implementation of excavations	A derogation for destruction should be obtained
7.	35	White coastal dunes *Elymo Ammophiletum*	no	HDD controlled drilling or HDD controlled drilling combined with offshore trench	
8.	35	Grey coastal dunes (priori ty habitat) *Helichryso-Jasionetum litoralis*	no	HDD controlled drilling or HDD controlled drilling combined with offshore trench	
9.	36	Dry heaths *Calluno-Genistion, Pohlio-Callunion, Calluno-Arctostaphylion*	yes / U1	Destruction in connection with the implementation of excavations	A derogation for destruction should be obtained
10.	43,2 - 46,8	Fertile beech forests *Galio odorati-Fagetum*	tak / U1 i U2	Destruction in connection with the implementation of excavations	A derogation for destruction should be obtained

Protection status: U1 - unsatisfactory, U2 - bad

Source: Own elaboration based on the data from the Final Report on the Environmental Inventory of the Connection Infrastructure of the MFW Bałtyk III Offshore Wind Farm and the Connection Infrastructure of the MFW Bałtyk Offshore Wind Farm

The impacts of the construction phase on the vegetation and natural habitats will be negative, direct, simple, long-term and permanent (due to the permanent elimination of habitats), and their spatial range will be within the boundaries of the ED. The sensitivity / uniqueness of the environment was defined as average, due to the transformations of this space related to the buildings of the Navy Center which operates here. The table below summarizes the assessment of the significance of the negative impacts of the planned project on vegetation and natural habitats during the construction phase.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long term	**(3)**
Constant	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(15) moderate**

The sum of the significance weights of negative impacts is 15, therefore the impact on the vegetation and natural habitats during the construction phase was assessed as moderate. The negative impacts on the vegetation and natural habitats in the construction phase will primarily concern the transformation and occupation of the land as well as the removal of vegetation and natural habitats in the construction corridor. These impacts can be significantly reduced through the implementation of trenchless passages and metaplantations (detailed information in Chapter 16).

Operation phase

The operation phase of the planned pgroject will be related to permanent deforestation within a technological corridor up to 10-31 m wide for 220 kV lines and up to 20 m wide for 400 kV lines. At the construction design stage, the Investor will try to limit this strip. Agricultural land can still be used for agriculture, and forest areas will be permanently deforested. In these areas it will be possible to return plants with a shallow root system.

Within the technological corridor, the forests will be followed by secondary succession towards lowland/ forest clearing / porębowy and grassland habitats and species, and further use will be possible in agricultural areas. Permanent deforestation will have a permanent impact in the form of interrupting the continuity of a patch of habitats, the disappearance of species characteristic for a given natural habitat and the entry of alien habitat species, which, on the one hand, may translate into an increase in biodiversity in a given section, also by increasing the area of shrubs in the forest edge, and on the other - to degeneration of the patches of natural habitat.

During the operation of the planned Project, potential negative impacts on vegetation and natural habitats may be related to their destruction as a result of cyclical cutting of greenery and service works.

An access road will be built along the infrastructure of the underground cable lines, following the trail or nearby of the existing forest road leading towards the beach, approx. 600 m long. The area of the permanent construction corridor should be covered by post-construction environmental monitoring due to the possibility of expanding invasive plant species in its area.

The calculations carried out for cable lines with a voltage of 220 kV and 400 kV indicate that the thermal effect of the cables introduces slight changes in temperature at the ground surface in the area above the cables (Annex 6, Volume IV). Therefore, no negative impacts on vegetation of natural habitats related to heat emission are expected.

Taking into account the surface of natural habitats and the prevalence of vascular plant species and bryophytes identified during the natural inventory, it can be concluded that the impact of the planned project's operation phase on vegetation and natural habitats will be negative, indirect, secondary, long-term and permanent. The spatial range of the impacts will be within the limits of the ED. The sensitivity / uniqueness of the environment was defined as average.

The table below summarizes the assessment of the significance of the negative impacts of the planned project on vegetation and natural habitats in the operation phase.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long term	**(3)**
Constant	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(14) moderate**

The sum of the significance weights of negative impacts is 14, therefore the impact on vegetation and natural habitats in the operation phase was assessed as moderate.

The negative impacts on vegetation and natural habitats will primarily concern the succession and the possibility of the appearance of invasive plant species. In order to limit the impact of the exploitation phase on vegetation and habitats, it is proposed to include the post-construction environmental monitoring of the technological corridor in terms of the expansion of invasive plant species (detailed information in Chapter 17).

10.5.2. Forests

The route of the underground cable lines will pass through forest divisions of the Ustka Forest District (Nadleśnictwo Ustka). The northern part of the planned ECI corridor is dominated by fresh forests, with a small proportion of dry forests and fresh mixed forests. In contrast, the southern part is dominated by fresh and moist forests. These are protective forests: resort forests (between 35 and 37 km) and in and around cities due to their location within 10 km of the administrative borders of Słupsk (a city with more than 50 000 residents) (between 42.5 and 47 km). Forests occupy about 60% of the route of the planned IP.

Construction phase

The main impacts of the construction phase will be the same as the above-mentioned impact of the planned project on the flora and natural habitats of which forest habitats constitute an important component. Natural habitats such as mixed forests and coniferous forests in coastal dunes 2180, acid oak forests 9190, sub-Atlantic oak-hornbeam forest 9160, fertile beech forests 9130, acid beech forests 9110, riparian oak-elm-ash forests 91F0 constitute over 90% of all forest communities in the ECI corridor. The greatest impacts will take place in the construction corridor, with a maximum width of 30-32 m to approx. 50-100 m and extensions in the vicinity of the marine/land cable connection. These will be areas directly related to construction works, including places where the top layer of soil, undergrowth, and trees and shrubs are removed.

Smaller trenchless crossings in the vicinity of roads, watercourses and the local railway line reduce the need to carry out tree felling along a section of approx. 1.47 km (figure 10.1). Cable lines will run below the root system.

In connection with the implementation of the planned project, there will be a cut in the construction corridor, the area of which will not exceed 23.1 ha. In the northern part of the IP, deforestation will occur over a distance of approx. 2 km (between 35 and 37 km), and in the southern part - around 5.5 km (between 42.4 and 47.5 km). The table below shows the estimated areas of tree felling based on the data from the Forest Data Bank[588]. The total area of the 14.32 ha does not reflect the actual land cover due to the lack of data in the Forest Data Bank and the presence of closed areas along the ECI route. In the absence of data, orthophotos were used that show the actual land cover. Inventory of trees and shrubs intended for felling is not possible at this stage. The table below presents a detailed list of forest divisions against the construction corridor, which will be directly related to construction works and in which cuttings will be carried out. An inventory of trees and shrubs intended for felling is not possible at this stage. Nevertheless, on the basis of the current design submissions regarding the construction strip and the data of the State Forests, the expected area of clearing in forest areas was estimated, along with the determination of the dominant tree species on individual sections of the corridor of the planned Project. The table below presents a detailed list of forest divisions against the background of the construction belt, which will be directly related to construction works and in which felling will be carried out.

[588] *https://www.bdl.lasy.gov.pl/portal/uslugi-mapowe-ogc – as at 21.09.2022.*

Table 10.4. *The course of the planned project (Investor's option) against the background of habitat types together with the data of the State Forest taxation descriptions (as of 09/21/2022)*

Km of the route	Forestry	Community	Forest address	Area (ha)	Habitat type	Forest function	Protection category	Dominant trees	Max age of the forest stand	Age of felling	Area in the corridor of the planned project [ha]	Area in the construction corridor [ha]
35	Modlinek	Ustka	98-03-1-01-03237-a-00	6,05	BŚW	OCHR	OCH SOLIS	SO	45	110	0,007	0,003
36	Modlinek	Ustka	11-20-1-03-113-a-00	6,20	BS	OCHR	OCH UZDR	SO	143	100	0,276	-
36	Modlinek	Ustka	11-20-1-03-113-b-00	7,50	BS	OCHR	OCH UZDR	SO	143	100	0,008	-
36	Modlinek	Ustka	11-20-1-03-114-a-00	1,49	BŚW	OCHR	OCH UZDR	SO	133	0	1,513	0,15
36	Modlinek	Ustka	11-20-1-03-114-b-00	2,56	BŚW	OCHR	OCH UZDR	SO	10	100	2,739	1,63
36	Modlinek	Ustka	11-20-1-03-114-c-00	2,17	BŚW	OCHR	OCH UZDR	SO	5	100	2,21	0,35
36	Modlinek	Ustka	11-20-1-03-114-d-00	7,75	BŚW	OCHR	OCH UZDR	SO	133	100	7,025	0,14
36	Modlinek	Ustka	11-20-1-03-115-a-00	2,04	BŚW	OCHR	OCH UZDR	SO	10	100	0,648	-
36	Modlinek	Ustka	11-20-1-03-115-b-00	1,86	BŚW	OCHR	OCH UZDR	SO	4	100	0,055	-
36	Modlinek	Ustka	11-20-1-03-115-d-00	3,38	BŚW	OCHR	OCH UZDR	SO	133	100	1,901	-
36	Modlinek	Ustka	11-20-1-03-117-a-00	8,54	BŚW	OCHR	OCH UZDR	SO	123	100	0,183	0,02
36	Modlinek	Ustka	11-20-1-03-118-a-00	0,80	BMŚW	OCHR	OCH UZDR	SO	93	100	0,217	0,03
36	Modlinek	Ustka	11-20-1-03-118-b-00	1,62	LMŚW	OCHR	OCH UZDR	SO	20	100	1,616	1,39
36	Modlinek	Ustka	11-20-1-03-118-c-00	0,81	LMŚW	OCHR	OCH UZDR	BK	13	0	0,831	0,3
36	Modlinek	Ustka	11-20-1-03-118-d-00	1,51	LMŚW	OCHR	OCH UZDR	SO	29	100	1,401	0,26
36	Modlinek	Ustka	11-20-1-03-118-i-00	0,51	-	-	-	-	0	0	0,368	0,1
36	Modlinek	Ustka	11-20-1-03-119-a-00	0,30	LMŚW	OCHR	OCH UZDR	BK	133	110	0,032	-
36	Modlinek	Ustka	11-20-1-03-119-b-00	3,52	LMŚW	OCHR	OCH UZDR	BK	38	110	1,689	0,25
36	Modlinek	Ustka	11-20-1-03-119-c-00	2,97	LMŚW	OCHR	OCH UZDR	BK	93	110	0,267	-
36	Modlinek	Ustka	11-20-1-03-119-f-00	0,41	-	-	-	-	0	0	0,087	-
35	Modlinek	Ustka	11-20-1-03-89-a-00	5,71	BŚW	OCHR	OCH UZDR	SO	73	100	2,405	0,70
35	Modlinek	Ustka	11-20-1-03-89-c-00	0,51	-	-	-	BRZ	33	0	0,512	-
35	Modlinek	Ustka	11-20-1-03-90-a-00	8,08	BŚW	OCHR	OCH UZDR	SO	83	100	4,15	1,52
35	Modlinek	Ustka	11-20-1-03-90-b-00	0,39	-	-	-	SO	153	0	0,063	-
35	Modlinek	Ustka	11-20-1-03-90-c-00	4,77	BS	OCHR	OCH UZDR	SO	143	100	2,248	0,41
44	Pęplino	Ustka	11-20-1-09-292-d-00	9,23	LW	OCHR	OCH MIAST	DB	173	140	0,406	-

44	Pęplino	Ustka	11-20-1-09-292-f-00	1,59	LŚW	OCHR	OCH MIAST	DB	51	140	0,359	0,02
44	Pęplino	Ustka	11-20-1-09-292-j-00	0,54	LW	OCHR	OCH MIAST	OL	37	80	0,004	-
44	Pęplino	Ustka	11-20-1-09-292-n-00	1,62	LŚW	OCHR	OCH MIAST	DB	10	140	0,503	0,2
44	Pęplino	Ustka	11-20-1-09-292-o-00	1,36	LMŚW	OCHR	OCH MIAST	BK	153	110	0,307	0,23
44	Pęplino	Ustka	11-20-1-09-292A-f-00	2,56	LŚW	OCHR	OCH MIAST	SO	32	100	0,119	-
43	Pęplino	Ustka	11-20-1-09-292A-g-00	2,70	LŚW	OCHR	OCH MIAST	DB	31	140	0,024	-
43	Pęplino	Ustka	11-20-1-09-292A-h-00	3,87	LŚW	OCHR	OCH MIAST	BK	18	110	0,161	-
43	Pęplino	Ustka	11-20-1-09-292A-i-00	2,99	LŚW	OCHR	OCH MIAST	BK	18	0	0,135	-
43	Pęplino	Ustka	11-20-1-09-292A-j-00	3,23	LŚW	OCHR	OCH MIAST	BK	153	110	0,101	-
43	Pęplino	Ustka	11-20-1-09-292A-k-00	1,21	LŚW	OCHR	OCH MIAST	BK	98	110	0,059	-
43	Pęplino	Ustka	11-20-1-09-292A-l-00	2,09	LŚW	OCHR	OCH MIAST	BK	98	110	0,13	-
43	Pęplino	Ustka	11-20-1-09-292A-o-00	1,49	LŚW	OCHR	OCH MIAST	BK	108	110	0,057	-
42	Pęplino	Ustka	11-20-1-09-292A-p-00	2,97	LŚW	OCHR	OCH MIAST	BK	16	110	0,078	-
44	Pęplino	Ustka	G121020017-103-c-00	0,04	LW	GOSP	-	OL	60	60	0,001	0,001
45	Pęplino	Ustka	11-20-1-09-295-b-00	2,31	LŚW	OCHR	OCH MIAST	DB	143	140	0,329	0,23
45	Pęplino	Słupsk	11-20-1-09-295-f-00	1,10	LŚW	OCHR	OCH MIAST	DB.S	143	140	0,201	-
45	Pęplino	Słupsk	11-20-1-09-295-g-00	1,84	LW	OCHR	OCH MIAST	DB	8	140	0,191	-
45	Pęplino	Słupsk	11-20-1-09-295-h-00	1,23	LŚW	OCHR	OCH MIAST	DB.S	138	140	0,011	-
45	Pęplino	Słupsk	11-20-1-09-296-a-00	2,32	LŚW	OCHR	OCH MIAST	DG	15	100	0,615	0,27
45	Pęplino	Słupsk	11-20-1-09-296-b-00	0,72	LŚW	OCHR	OCH MIAST	BK	26	110	0,011	0,19
45	Pęplino	Słupsk	11-20-1-09-296-c-00	0,90	LW	OCHR	OCH MIAST	DB.S	5	0	0,353	0,16
45	Pęplino	Słupsk	11-20-1-09-296-d-00	1,36	LW	OCHR	OCH MIAST	DB	10	140	0,415	0,31
45	Pęplino	Słupsk	11-20-1-09-296-g-00	1,65	LW	OCHR	OCH MIAST	DB.S	3	0	0,412	0,3
46	Pęplino	Słupsk	11-20-1-09-306-g-00	5,57	LŚW	OCHR	OCH MIAST	BK	83	110	0,502	-
46	Pęplino	Słupsk	11-20-1-09-306-h-00	3,36	LŚW	OCHR	OCH MIAST	BK	98	110	0,035	-
46	Pęplino	Słupsk	11-20-1-09-306-i-00	2,14	LŚW	OCHR	OCH MIAST	BK	58	110	0,284	-
45	Pęplino	Słupsk	11-20-1-09-306-k-00	0,40	-	-	-	-	0	0	0,057	-
45	Pęplino	Słupsk	11-20-1-09-307-a-00	5,23	LŚW	OCHR	OCH MIAST	BK	28	110	1,087	0,83
45	Pęplino	Słupsk	11-20-1-09-307-b-99	0,90	LW	OCHR	OCH MIAST	DB	9	140	0,403	0,21
45	Pęplino	Słupsk	11-20-1-09-307-f-00	1,02	LŚW	OCHR	OCH MIAST	DB	51	140	0,468	0,19

45	Pęplino	Słupsk	11-20-1-09-307-g-00	3,47	LŚW	OCHR	OCH MIAST	JD	17	110	0,205	0,08
46	Pęplino	Słupsk	11-20-1-09-307-n-00	2,23	LŚW	OCHR	OCH MIAST	BK	78	110	0,646	0,45
46	Pęplino	Słupsk	11-20-1-09-307-o-00	2,18	LŚW	OCHR	OCH MIAST	BK	25	110	0,797	0,60
46	Pęplino	Słupsk	11-20-1-09-307-p-00	0,57	-	-	-	-	0	0	0,093	0,05
46	Pęplino	Słupsk	11-20-1-09-321-b-00	1,98	LW	OCHR	OCH MIAST	OL	18	80	0,23	-
46	Pęplino	Słupsk	11-20-1-09-321-d-00	2,62	LŚW	OCHR	OCH MIAST	BK	78	110	0,171	0,001
46	Pęplino	Słupsk	11-20-1-09-321-f-00	1,49	LŚW	OCHR	OCH MIAST	BK	93	110	0,396	0,001
46	Pęplino	Słupsk	11-20-1-09-321-h-00	1,13	LW	OCHR	OCH MIAST	DB	32	140	0,074	-
46	Pęplino	Słupsk	11-20-1-09-322-a-00	16,05	LŚW	OCHR	OCH MIAST	BK	93	110	1,96	1,47
46	Pęplino	Słupsk	11-20-1-09-322-c-00	2,10	LW	OCHR	OCH MIAST	DB	45	140	0,419	0,24
47	Pęplino	Słupsk	11-20-1-09-334-a-00	4,74	LŚW	OCHR	OCH MIAST	DB	32	140	1,852	0,72
47	Pęplino	Słupsk	11-20-1-09-334-b-00	0,63	LW	OCHR	OCH MIAST	DB	51	140	0,266	0,001
47	Pęplino	Słupsk	11-20-1-09-334-c-00	4,32	LW	OCHR	OCH MIAST	SO	93	100	1,281	0,32
										Suma:	**48,659**	**14,32***

* This value does not reflect the actual land cover (no data in the Forest Data Bank and the presence of closed areas on the ECI route)

BMŚW - Fresh mixed coniferous forest, BS - Dry coniferous forest, BŚW - Fresh coniferous forest, LMŚW - Fresh mixed forest, LŚW - Fresh forest, LW - Wet forest, OL – Alder

OCHR – conservation forests, GOSP - economic

OCH UZDR – health resorts, OCH CITY - in and around cities, OCH SOILS - soil-protective

BK - common beech, BRZ - warty birch, DB - undefined oak, DB.S - English oak, DG - Douglas fir, JD - Norway fir, OL - black alder, SO - Scots pine

Source: Own elaboration based on https://www.bdl.lasy.gov.pl/portal/uslugi-mapowe-ogc

According to the above table, the construction belt is dominated by forests and fresh forests. According to the division of forest into protection categories according to Decision No. 56 of the Minister of Environmental Protection Natural Resources and Forestry dated 12.08.1999 (DLOPiK.lp-0233-59/99) and Decision of the Minister of Environment dated 30.10.2001. (BOA - lplo - 283/2439/2001) in the northern part of the construction belt are protective forests of spas, and in the southern part are protective forests in and around cities due to the location within 10 km from the administrative borders of Słupsk (a city with more than 50 thousand residents). The dominant tree species in the divisions crossed by the Project's construction strip currently under consideration are: 1) pine, which is dominant in 13 crossed clearcuts, on a total construction strip area of approximately 6.92 hectares (relative to 48.66 hectares of the total area of the said clearcuts) - the maximum age of the stand, depending on the clearcut, varies from 5 to 143 years; 2) beech, which is dominant in 10 crossed clearcuts, on a total construction strip area of approx. 4.32 hectares (in relation to 36.21 hectares of the total area of the affected divisions) - the maximum age of the stand, depending on the division, varies from 13 to 153 years; 3) indeterminate and pedunculate oak, which dominate on 11 (9+2) crossed divisions, on a total area of the construction strip of approx. 2.58 hectares (in relation to 18.82 hectares of the total area of the subject clearcuts) - the maximum age of the stand, depending on the clearcut, varies from 3 to 143 years; 4) green Douglas fir, which dominates on 1 crossed clearcut, on a total construction strip area of 0.27 hectares (in relation to 2.32 hectares of the total area of the subject clearcut) - the maximum age of the stand in the clearcut is 15 years; 5) the common fir, which dominates on 1 crossed division, on the area of the construction strip of 0.08 hectares (in relation to 3.47 hectares of the total area of the division in question) - the maximum age of the stand in the division is 17 years. It should be noted that the above-mentioned areas do not reflect the actual coverage of the area with trees.

The construction phase is also related to the operation of construction vehicles and machines as well as the emission of noise and dust. The construction equipment used may additionally create a potential contamination hazard due to equipment failure and leakage of hazardous substances. In this aspect, its condition should be ensured and only technically functional equipment should be allowed to work. During the construction phase, due to the use of heavy equipment, losses and abrasions may occur in the area of tree trunks at a height of 2-4 m. To prevent this, minimizing measures related to the protection of trees along the construction corridor have been proposed (Chapter 16).

After the end of the construction phase, the area will be restored to its original condition, with the exception of a 20 m wide technological corridor for 400 kV lines and 10-31 m for 220 kV lines, which will be permanently deforested. Agricultural land will be returned to its original state and will be used for agriculture.

The impacts of the construction phase on forests will be negative, direct, simple, long-term and permanent, and their spatial extent will be within the boundaries of the ED. The sensitivity/uniqueness of the environment was defined as average, due to the transformations of this space related to the buildings of the Navy Center that already operates here.

The table below summarizes the assessment of the significance of the negative impacts of the planned project on forests during the construction phase.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Straight	**(1)**
Long term	**(3)**
Constant	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, therefore the impact on the forests during the construction phase was assessed as moderate and will mainly forest

clearing with a maximum area of 23.1 hectares. This impact will be limited as a result of the implementation of trenchless crossings.

Operation phase

The route of the underground cable lines will be associated with a permanent cut in a 20 m wide technological corridor for 400 kV lines and 10-31 m for 220 kV lines. At the construction design stage, the Investor will strive to limit this strip. In this area, it will be necessary to maintain permanent clearing within the forests.

The route of the underground cable lines in the technological corridor will pass through forest divisions of the Ustka Forest District. Fresh forests (37%) and fresh coniferous forests (31%) dominate here, with pine being the dominant species. These are protection forests: resort forests (between 35 and 37 km) and in towns and around towns, due to their location within 10 km from the administrative borders of Słupsk (a city with over 50,000 inhabitants) (between 42.5 and 47 km).

According to the Forest Management Plan of the Ustka Forest District, the area of forest land in the Ustka Forest District is approximately 13,731 ha. Permanent deforestation will be of a small extent, within the boundaries of the ED. The loss of forest resources in the scale of the Forest District will be only 0.13%. There will be secondary succession in these areas.

For example, in the dominant type of mixed forests and coastal coniferous forests in the area of the open excavation, ecological niches with specific habitat conditions are created. The resulting depressions will favor the development of moisture-loving vegetation, and the hills with heaped soil - vegetation that prefers dry habitats. Many species found also within and around the windthrows may occur here, e.g. *Polytrichum strictum* fine mosses and *Sphagnum fimbriatum* sphagnum mosses, which grow in many protrusions and depressions, or an increase in the share of *Carex arenaria* sand sedge occurring naturally on dry, sandy low in humus content positions. Partially, therefore, an open trench may, similarly to natural excavations, constitute an element increasing its species diversity. Forest phytocoenoses growing on areas outside the natural habitats identified at the stage of the natural inventory are heavily degraded by a large amount of planted pine or the presence of invasive and expansive species: the American bird cherry *Prunus serotina*, the saplings of the common maple *Acer platanoides*, red oak *Quercus rubra* and elderberry *Sambucra*.

Due to its deforestation over the entire area of the technological corridor, the coniferous forest patch will transform into substitute phytocoenoses associated with the succession stages towards heathlands with the dominant common heather *Calluna vulgaris* or towards sandy surfaces, where the main phytocoenotic role will be played by *Carex arenaria* sand sedge, brushwood gray *Corynephorus canescens*, red fescue *Festuca rubra* and others.

Impacts of the exploitation phase of the planned project on forests will be negative, indirect, secondary, long-term and permanent. The spatial range of the impacts will be within the limits of the ED. The sensitivity / uniqueness of the environment was defined as average.

The table below summarizes the assessment of the significance of the negative impacts of the planned project on forests in the operation phase.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long term	**(3)**
Constant	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(14) moderate**

The sum of the significance weights of the negative impacts is 14, therefore the impact on the forests during the operation phase was assessed as moderate. The negative impacts on forests will primarily concern secondary succession in a deforested area, and thus increasing the

pressure of non-forest species (including invasive species) on other forest phytocoenoses. In order to limit the impact of the operation phase on forests, it is proposed to include the technological corridor in terms of the expansion of invasive species (detailed information in Chapter 17). This impact will be limited as a result of the implementation of trenchless crossings.

10.5.3. Biota of large-fruited mushrooms and lichens

Within the corridor of the planned Project, in the Investor's variant, 3 species of naturally valuable Macromycetes were found, including 1 species - chaga - *Inonotus obliquus*, subject to partial protection according to the Regulation of the Minister of the Environment of October 9, 2014 on the protection of species of fungi (Journal of Laws No. .2014.1408). No species under strict protection were found (Chapter 8.5.3. figure 8.9).

The study area is also characterized by a significant abundance and diversity of lichen (lichen biota), with a large share of valuable species (protected, rare, endangered). During the inventory, within the ECI corridor in the Investor's option, 8 naturally valuable species were found, including 2 species subject to strict legal protection: *Ramalina fraxinea* and Ramalina fastigiata, 5 species subject to partial legal protection (Chapter 8.5.3. figure 8.10).

Construction phase

The main impacts of the construction phase on the biota of Macromycetes and lichens will be related to the temporary occupation of land for a construction corridor with a width of approx. 30-32 m (approx. 50-100 m and extensions in the vicinity of the marine/land cable connection), including construction of the underground cable line, the location of construction back-up facilities, access roads and maneuvering areas. In the area of the open trench, the top layer of soil will be permanently destroyed, and trees and shrubs will be removed. In such cases, the mycelium will be destroyed, and thus - the site belonging to this species will be eliminated. It will be an area where the top layer of soil will be permanently destroyed, which will result in the removal of ground taxa sites (forest, bristle and reindeer moss). Apart from the construction corridor, the impact during the construction phase of the planned project will be insignificant and will be limited to the possible destruction of individual fruiting bodies. The mycelium present in the soil and under the bark of trees will then remain intact. During the construction phase, sulfur oxides and nitrogen oxides will be emitted as a result of the operation of construction machinery. Epiphytic lichen species are particularly vulnerable to air pollution. The construction equipment used may additionally pose a potential risk of contamination due to equipment failure and leakage of hazardous substances from vehicles and construction machinery. In this aspect, its condition should be ensured and only technically functional equipment should be allowed to work.

The preservation of the epiphytic lichen population is favored by leaving well-preserved deciduous old trees both in forest communities and along forest and municipal roads. The presence of well-preserved stands determines the proper diversity of species biodiversity in lichens. During the implementation of the planned project, priority should be given to preserving the stands of epiphytic lichen species by protecting the trunks of trees on which they occur, surrounding old-growth forests with a net or tape, which will ensure that investments in old-growth habitats are not encroached. In the case of protection of ground lichens, it is required to limit the construction site to the smallest possible area, and the soil from the excavation should be placed on a protective film spread over the surface. The loss of a tree and lichen with it is difficult to compensate for in nature. The only way to compensate for the loss of epiphytic lichens, as well as of other organisms associated with old trees, is by planting new trees. Depending on various environmental factors, it usually takes many years for a newly planted tree to become a lichen habitat again. The older the tree, the more rich and varied the epiphytic lichen biota is. Metaplantation is not used in the case of Macromycetes and lichens. The species of Macromycetes and lichens occurring in the area of the construction corridor are common and common species in the area of dry coniferous forests and roadside trees, however, the impact associated with the construction of the construction corridor should be as small as possible and limited to the movement of machines only on existing roads and to a narrow belt directly adjacent to the route of the excavation / drilling. On the other hand, temporary access roads, maneuvering areas and construction facilities should be moved

beyond the phytocoenosis of natural habitats. According to Fałtynowicz[589] (2016), a relatively simple procedure is to mechanically scratch the lichen's thallus and leave them on the side of the road. Such actions definitely increase the chance of diaspora dispersion and re-colonization, which can be an alternative to the loss, which is the destruction of the thallus by transporting them along with the logs of felled trees. In the case of lichens, the ally in dispersing diasporas is wind.

The following table (figure 10.5) shows the lichen species potentially exposed to destruction as a result of the planned Project. The table lists species occurring within the ECI corridor with a width of up to 60 m. However, the area directly associated with the construction work (technical/construction corridor) will be much narrower; its maximum width will be 30-32 m approx. 50-100 m and extensions in the vicinity of the marine/land cable connection.

Table 10.5. *Lichens exposed to potential destruction as a result of the implementation of the planned project in the Investor's option*

No.	Approximate km of the ECI corridor	Habitat within the ECI corridor	Presence in the construction corridor	Impact type	Minimizing actions
1.	35; 36	Forest moss *Cladonia arbuscula*	yes / FV	HDD controlled drilling or HDD controlled drilling connected with sea excavation and trenchless passage under the Naval Center in Ustka	If destruction is necessary, derogations for destruction must be obtained
2.	35; 35,6	Bristle moss *Cladonia portentosa*	no	destruction of the species sites in connection with the implementation of excavations	A derogation for destruction should be obtained
3.	35; 35,6	Reindeer moss *Cladonia rangiferina*	yes / FV	HDD controlled drilling or HDD controlled drilling combined with offshore trench	
4.	35; 42,9; 44,4-44,5; 46,1; 47,3-47,6	Evernia prunastri *Evernia prunastri*	yes / FV	HDD controlled drilling or HDD controlled drilling combined with sea excavation, destruction of species sites in connection with tree felling	A derogation for destruction should be obtained
5.	47,6	cartilage lichen *Ramalina fraxinea*	yes / FV	destruction of the species sites in connection with tree felling	A derogation for destruction should be obtained
6.	42,9	Odnożyca kępkowa *Ramalina fastigiata*	no	destruction of the species sites in connection with tree felling	A derogation for destruction should be obtained
7.	47,6	Odnożyca mączysta *Ramalina farinacea*	yes / FV	destruction of the species sites in connection with tree felling	A derogation for destruction should be obtained
8.	35,7-35,8	Popielak pylasty *Imshaugia aleurites*	no	destruction of the species sites in connection with tree felling	A derogation for destruction should be obtained

Conservation status: FV - proper conditio

Source: Own elaboration based on the data from the Final Report on the Environmental Inventory of the Connection Infrastructure of the MFW Bałtyk III Offshore Wind Farm and the Connection Infrastructure of the MFW Bałtyk II Offshore Wind Farm

[589] *Fałtynowicz W. 2016.*

Consequently, the impact of the construction phase on the biota of Macromycetes and lichens will be negative, direct, simple, short-term and permanent, and their spatial extent will be within the limits of the ED. The sensitivity / uniqueness of the environment was defined as average.

A summary of the significance of the negative impacts of the planned project on the biota of Macromycetes and lichens in the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Constant	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(13) moderate**

The sum of the significance weights of the negative impacts is 13, therefore the impact of the construction phase on the biota of Macromycetes **and lichens was assessed as moderate.** The negative impact on the biota of Macromycetes and lichens during the construction phase will mainly concern the temporary transformation and occupation of the area. This impact can be limited by protecting the trunks of the trees on which they occur, surrounding the old trees with a net or tape, which ensures that investments in the habitats of old trees are not interfered with. In the case of protection of ground lichens, it is required to limit the construction site to the smallest possible area, and the soil from the excavation should be placed on a protective foil spread over the surface (details in Chapter 16).

Operation phase

During the operation of the planned project, the potential negative impact on the biota of Macromycetes and lichens may be related to the destruction of habitats and microhabitats as a result of cyclical cutting of greenery in the technological corridor. Heat emissions from cables, introducing slight changes in temperature at the surface, will not have any impact on the biota of Macromycetes and lichens.

After the excavation is completed, the 20 m wide technological corridor area for the 400 kV line and 10-31 m for the 220 kV line will remain permanently deforested, and it will be possible to continue to use it in agricultural areas. Permanent deforestation will have a permanent impact in the form of the disappearance of species of arboreal (epiphytic) lichens, saprophytic and parasitic arboreal Macromycetes, as well as terrestrial lichens and Macromycetes, along the entire line of the excavation.

In areas where the top layer of the earth is permanently destroyed, trees and shrubs are removed, there will be a secondary succession towards habitats, and grassland species. Part of the planned ECI will be carried out using the trenchless method (approx. 1.47 km) and no logging will be necessary in this area (figure 10.1). An access road will be built along the infrastructure of the underground cable lines following or nearby the existing forest road leading to the beach, approx. 600 m long. Where secondary succession occurs towards sandy, grass or grassland habitats, the reappearance of fungi and terrestrial species may occur which, as pioneering organisms, prefer to enter even anthropogenically damaged or reclaimed areas. This may concern, for example, species of fungi from the family of Ceps (*Tricholomataceae*) or hardwood (*Marasmiaceae*) or lichens from the family of *Peltigeraceae* or *Cladoniaceae* lichens.

Summing up: at the stage of operation of the planned project, no impacts that could adversely affect the biota of Macromycetes and lichens are expected. Within the technological corridor, there will be a secondary succession towards pore and grassland habitats and species, which may be colonized with time by terrestrial species of Macromycetes and lichens.

The impacts on the biota of fungi and lichens in the exploitation phase were assessed as negative, direct and simple. Impacts will be short-term and reversible as they will cease when the maintenance works are completed. The receptor sensitivity was rated as small.

A summary of the significance of the negative impacts of the planned project on the biota of fungi and lichens in the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Small	**(3)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, therefore the impact in the exploitation phase on the biota of fungi and lichens was assessed as **insignificant.**

10.5.4. The fauna of invertebrates

Within the corridor of the planned project and in the area of the potential impact of the connection in the Investor's option, the presence of 2 invertebrate species under partial species protection wereas found (Journal of Laws 2016.2183, i.e. as amended) and species of the genus *Bombus sp*. These include: the rudnica ant (*Formica rufa*), zmieraczek plażowy (*Talitrus saltator*) and bumblebees (*Bombus sp*.). The redhead ant was the most frequently observed species (14 sites). The presence of the remaining species was determined on the basis of individual findings.

The potentially negative impacts of the MFW Bałtyk II and MFW Bałtyk III Connection Infrastructure on fauna mainly relate to its construction and are related to:

- execution of the starting chamber of the HDD passage,
- leveling work under construction facilities in the area of the cable exit to land and construction of cable chambers,
- carrying out open excavations necessary for laying cable lines and entry and exit chambers on the sections planned to be crossed using trenchless methods (roads, local railway line, wetlands or naturally valuable areas),
- leveling the land and destroying the top layer of soil during the construction of trenchless passages, cable lines, ONS stations and access roads,
- emission of noise and pollutants to the atmosphere from construction equipment and vehicles,
- possible drainage of excavations and the construction site in places with shallow water retention.

Construction phase

During the construction phase, invertebrates will be scared off and their habitats will probably be destroyed. The species found during the nature inventory can be considered as common and nationally (reddish ant, field cricket, bumblebees) (chapter 8.5.1 and Annex 2, Volume III). Therefore, their sensitivity to the impacts related to the construction of the planned project was assessed as low.

An anthill has been inventoried in the northern part of theECIcorridor, but the construction phase will not result in its destruction because it is located where a trenchless crossing is planned. Therefore, the construction phase will not cause a threat to any of the inventoried anthills.

In the case of bumblebees, only this group of insects foraging was observed in the study area, although their nests could probably also have been located there. In the area of the potential impact of the planned Project, common bumblebee species have been found, numerous populations of which probably also live in the areas where construction works will be carried out. Therefore, there will be no significant losses in the local populations of the identified bumblebee species in connection with the implementation of the planned project. Therefore, it does not seem justified to compensate for damaged breeding habitats. However, felling trees and preparatory works (removing the top layer of soil with vegetation) should, as far as possible, take place in a period that does not pose a risk of destroying bumblebee nests, usually placed in abandoned burrows, moss, cracks in the ground, hollows, birdhouses, etc. (Chapter 16).

Impacts on the beach hake are discussed in the marine section (Section 9.4.6.). No impact on the local population of the beach hake is anticipated, as it will be minimized by limiting construction and preparatory works will not be carried out within the beach area.The construction works will be carried out in the coastal part - bringing the connection ashore by trenchless HDD method. These will be neutral impacts.

Impacts on *Talitrus saltator* will be minimized by limiting construction works in the coastal part - conducting the connection on land by using the HDD trenchless method. These will be neutral interactions.

The implementation of the planned project and its subsequent operation, in the case of applying the above minimization measures, will not have a significant impact on any of the identified species and their habitats, as well as on the condition of their populations both in the country and in the region.

Impacts on entomofauna during the construction phase were assessed as negative, direct and simple. Impacts will be short-term and reversible. The sensitivity of entomofauna to the identified impacts was assessed as low.

A summary of the significance of the negative impacts of the planned project on entomofauna during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, therefore the impact on the entomofauna during the construction phase was assessed as **insignificant.**

Operation phase

During the operation of the planned project, potential negative impacts on entomofauna may be related to the destruction of habitats and microhabitats as a result of cyclical cutting of greenery and service works.

The impacts on entomofauna in the operation phase were assessed as negative, direct and simple. Impacts will be short-term and reversible as they will cease upon completion of service and maintenance works. The receptor sensitivity was assessed as low.

A summary of the significance of the negative impacts of the planned project on entomofauna during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, therefore the impact on the entomofauna during the operation phase was assessed as insignificant.

Permanent changes in land use, consisting in the conversion of forest areas into forestless communities dominated by herbaceous plants, may have a positive character on the population of

bumblebees and other pollinators. This fact may contribute to increasing the biodiversity of invertebrates in the area of the planned project.

Significant impacts on entomofauna are not expected due to the emission of magnetic fields and heat, which will not differ significantly from the background radiation. Current scientific research also confirms the high adaptation of insects to anthropogenic noise. Continuous, uniform noise can attract some invertebrate species and even have a positive effect on the condition and behavior of ants in colonies[590][591]. In addition, insects that communicate with each other by stridulation can modulate the frequency of the attraction depending on the level of environmental noise[592]. These will be neutral interactions.

10.5.5. Ichthyofauna

Struga Lędowska, which is characterized by a constant water flow, is of the greatest importance for the fish fauna in the corridor of the planned project. However, a poor species composition and a low number of fish were shown here. These include: pike (*Esox Lucius*) and tench (*Tinca tinca*), as well as the stickleback (*Gasterosteus aculeatus*). In other watercourses, fish may occur periodically, mainly in estuaries.

Construction phase

Due to the poor composition of the ichthyofauna of the Lędowska Struga, typical for small lowland streams with great morphological transformation, no significant impacts of the planned project on the ichthyofauna should be expected.

The planned Project crosses the Struga Lędowska in the area of 37.2 km. The watercourse will be crossed by the HDD method. In this aspect, the impact of the construction phase on the ichthyofauna will be neutral. The only potential threat is the discharge of water from the drilling fluid directly into the network of drainage ditches, which may result in their runoff to rivers and then to Lake Modła. According to the assessment of the impact on surface waters, due to the uniqueness and sensitivity of Lake Modła to changes in water conditions, it is forbidden to take the water necessary for the drilling of the drilling fluid (due to the planned trenchless passage of HDD) from Lake Modła and discharge the waters into this lake and watercourses adjacent with it, i.e. from 36.9 km to 37.5 km (see section 10.4.1.). In addition, it is recommended to pre-treat the water from the drilling fluid and to apply the sprinkling method to the ground, which will prevent these impacts.

Operation phase

At the stage of operation, there will be no impact on the ichthyofauna.

10.5.6. Herpetofauna

The nature inventory carried out showed that in the area of the ECI corridor one representative of reptiles (sand lizard 3 sites, grass snake - 2 sites) and 5 representatives of amphibians were found. The identified groups of amphibian species include brown frogs (grass and marsh frogs) and a complex of green frogs (marsh frog, pool frog and edible frog). With the exception of the moor frog, which is under strict species protection, all identified species are partially protected. 3 species and representatives of the green frog complex are listed in the annexes to the EU Habitats Directive. The most common species in the area of the planned project were species belonging to the group of brown frogs and the complex of green frogs.

Construction phase

The results of the wildlife inventory indicate the presence of amphibian breeding habitat within theECIcorridor.Impacts during the construction phase will mainly consist of the destruction of breeding sites, migration routes and transformation of the environment as a result of:

- deforestation of the construction corridor, construction of new access roads, occupation of land for ONS stations,

[590] *Bunkley, et al 2017.*
[591] *Cammaerts M, Cammaerts D., 2018.*
[592] *Mario Gallego-Abenza, et al 2020.*

- habitat fragmentation due to deforestation and the construction of access roads.

These will be permanent and long-term impacts in relation to interference in *breeding sites* with habitats. The reproductive sites of amphibians were found along the ECI route, which are listed in the table below.

Table 10.6. *Existing and potential amphibian breeding sites in the corridor of the planned Project*

No.	Mileage	Length [km]	Species in the cable corridor	Species in the construction corridor
1.	36,4 – 37,5	1,1	Żaba brunatna (*Rana sp.)* Ropucha szara (*Bufo bufo)*	Ropucha szara (*Bufo bufo)*
2.	38,6 - 39,6	1	Żaba trawna (*Rana temporaria)*	Żaba trawna (*Rana temporaria)*
3.	43,6	-	Żaba brunatna (*Rana sp.)*	Żaba brunatna (*Rana sp.)*
4.	44,6 – 44,8	0,2	Żaba trawna (*Rana temporaria)*	Żaba trawna (*Rana temporaria)*
5.	46,1 – 46,3	0,2	Żaba brunatna (*Rana sp.)* Żaby zielone kompleks (*Pelophylax esculentus complex)* Ropucha szara (*Bufo bufo)*	Żaby zielone kompleks (*Pelophylax esculentus complex)*
6.	46,6	-	Żaby zielone kompleks (*Pelophylax esculentus complex)*	Żaby zielone kompleks (*Pelophylax esculentus complex)*
7.	47,1 – 47,3	0,2	Żaba brunatna (*Rana sp.)* Żaba trawna (*Rana temporaria)*	Żaba brunatna (*Rana sp.)* Żaba trawna (*Rana temporaria)*
8.	47,6 – 47,8	0,2	Żaba brunatna (*Rana sp.)* Żaba trawna (*Rana temporaria)*	Żaba brunatna (*Rana sp.)* Żaba trawna (*Rana temporaria)*

Source: Own elaboration based on the data from the *Final Report on the Environmental Inventory of the Connection Infrastructure of the MFW Bałtyk III Offshore Wind Farm and the Connection Infrastructure of the MFW Bałtyk II Offshore Wind Farm*

Habitats and breeding sites of herpetofauna located in the construction corridor that will be destroyed will be the most vulnerable to impacts associated with construction works: gray toad *Bufo bufo*, moor frog *Rana arvalis*, grass frog *Rana temporaria*, brown frogs not designated to the species *Rana sp*., green frog *Pelophylax esculentus* complex, anoles lizard *Lacerta agilis*. However, it should be noted that some of the breeding sites will be crossed using a trenchless method, which will significantly reduce the impact on herpetofauna, especially in the 39 km area. In addition, preparatory and earthworks will cause obstruction, or prevent the migration of amphibians to breeding and/or wintering sites. Nevertheless, the species found in the area of the planned project are relatively common in the country and region (green and brown frogs, gray toad, common newt, sand lizard and grass snake) (Chapter 8.5.6 and Appendix 2 Volume III) so their sensitivity to impacts, related to the construction of the planned connection, was determined as medium.

In order to reduce the possibility of destruction or deterioration of these habitats and to reduce amphibian mortality during the construction phase, it is necessary to introduce protective measures that include:

- setting up temporary protective fences, i.e., during the period of migration and breeding of amphibians and reptiles (from March 1 to October 15) on both sides of the construction corridor, in places of open excavations,
- in spring (from March 1 to April 30) and in autumn (from August 15 to October 15) in places of intense amphibian migration on animal migration routes, in addition to protective fencing, use a system of buckets dug into the ground, distributed along the fence.

The construction phase should be supervised by a herpetologist. If amphibian habitat is destroyed, it will be necessary to capture herpetofauna and relocate them to alternative (Chapter 16).

The construction phase should be supervised by a herpetologist. If amphibian habitat is destroyed, natural compensation will be required to create replacement reservoirs (Chapter 16).

Impacts on herpetofauna during the construction phase, were assessed as negative, direct and simple. The impacts will be short-term and permanent. The receptor's sensitivity to the aforementioned impacts was assessed as medium.

A summary of the significance of negative impacts of the planned Project on herpetofauna during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Permanent	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Medium	**(3)**
Impact classification	**(13) moderate**

The sum of the significance weights of the negative impacts is 13, so the impact during the construction phase on herpetofauna is rated as moderate. Negative impacts will mainly relate to breeding sites destruction and habitat fragmentation. These impacts, after the application of minimizing and compensating measures, will be reduced, through, among other things, the use of herpetological fences during the migration and breeding period (see Chapter 16 for details).

Operation phase

During the exploitation phase of the planned Project, potential negative impacts on herpetofauna may be associated with habitat destruction as a result of cyclic vegetation clearing. Nevertheless, these will be temporary impacts of local extent.

The route of the underground infrastructure will not be fenced, and therefore will not be an obstacle during the migration of herpetofauna species. ONS stations in agricultural areas, where an inventory of herpetofauna species has not been performed, will be fenced.

Negative impacts on reptile and amphibian species associated with the emission of magnetic and heat fields are not expected and they will not deviate significantly from background radiation. The main source of noise emissions will be ONS stations. Studies show that noise pollution, may cause difficulties in amphibian mating communication, and thus may affect the reproductive success and viability of species. However, the level of noise generated from the above-mentioned point sources, which will be much lower than, for example, traffic noise, will not significantly affect herpetofauna. This fact is confirmed by numerous observations of amphibians and their breeding sites in the vicinity of the PSE Słupsk - Wierzbięcino station (Appendix 2 Volume III), i.e. one of the main noise emitters in the area of the planned Project.

In view of the above, the impacts on herpetofauna during the operation phase were assessed as negative, direct and simple. The impacts will be short-term and reversible, as they will cease when maintenance work is completed. The sensitivity of the receptor was assessed as medium.

A summary of the significance of the negative impacts of the planned Project on herpetofauna during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Within the limits of ED	**(2)**
The sensitivity / uniqueness of the environment	
Medium	**(3)**
Impact classification	**(11) insignificant**

The sum of the significance weights of the negative impacts is 11, so the impact during the operation phase on herpetofauna has been assessed as insignificant. Negative impacts will be primarily related to the destruction of habitats as a result of periodic greenery cutting. In order to minimize the negative impact of the operation of the planned Project on herpetofauna populations during

the operation phase, trenchless crossings will be implemented. Moreover, it is recommended to introduce minimizing measures: prohibition of fighting shrub and woody vegetation formed as self-sowing in the technological corridor, with total herbicides causing the destruction of all plants, including those providing hiding places especially for reptiles, and the use (except for arable land) of annual mowing of grass and herbaceous vegetation once a year, optimally from 01. 08. to 30.09., which will prevent the strong growth of shrubby and woody vegetation and promote the maintenance of a belt of melliferous plants and "weeds" that are a hiding place not only for reptiles, but also invertebrates, small mammals and birds (see Chapter 16 for details).

10.5.7. Birds

The wildlife inventory conducted showed that 21 breeding sites of 10 bird species were confirmed in theECIcorridor area during the wildlife inventory (Ch. 8.5.8, Appendix 2, Volume III). Most of them are numerous and widely distributed species. Particularly noteworthy, however, are the sites of the black woodpecker (1), red-backed shrike (2), woodlark (1), little flycatcher (2) and crane (1), i.e. valuable species listed in Annex I of the EU Birds Directive.

Construction phase

Impacts during the construction phase will mainly consist of the transformation of the environment, due to:

- habitat destruction, e.g. through deforestation of the construction corridor, construction of new access roads, occupation of land for LSE stations,
- habitat fragmentation caused by deforestation and construction of access roads,
- possible frightening of individuals from habitats adjacent to the construction site.

The most vulnerable to the works associated with the construction phase will be the breeding birds occupying the habitats to be felled/destroyed. It should be noted that only part of the habitats of the above-mentioned species will be destroyed, as their territories extend beyond the zone of influence. Habitat loss and deterioration may result in the relocation of individual pairs of birds within the boundaries of their territories or to adjacent areas with similar habitat parameters.

Within the boundaries of theECIcorridor, i.e. in the area of direct impacts, during the natural inventory, mainly numerous and widely distributed species were confirmed. Among the most valuable are the sites of black woodpecker (1), red-backed shrike (2), woodlark (1), little flycatcher (2) and crane (1), i.e. species of EU interest. The sensitivity of avifauna to impacts associated with the construction of the planned Project, was determined to be medium.

In addition to the identified sites of valuable species, a number of valuable habitats for common and numerous species of birds under species protection were also identified within the boundaries of the corridor covered by the DWA application during the ornithological inventory. These include sections within old stands (over 100 years old), which provide important nesting and foraging habitat for forest bird species. The second type of habitats valuable for common and numerous species of birds under species protection are wetlands, i.e. mid-forest ponds and stagnant water. Wetland bird species use them as nesting sites, and a number of other species also use them as feeding and resting places. The location of the aforementioned identified habitats is described in Table 10.7. The forest divisions listed below should be preserved where possible.

Table 10.7. *Location of the most valuable areas in terms of avifauna within the corridor boundaries IP*

No.	Species habitats	Location / Geographical coordinates (width N, length E)
1.	Habitat garden warbler, lesser whitethroat, common chiffchaff, common reed bunting, sedge warble i Eurasian wren,	In corridor: 47,2 km: WGS 84 (54° 30' 25.69" N; 16° 53' 41.157" E)
3.	Habitat great tit, common whitethroat, willow tit, woodpeckers, woodpeckers, crests, hoods, scythes, blacksmiths, cuckoo, roosters, bluebirds, mouse rabbits, pansies, forest crawlers, garden crawlers, frogs,,common chiffchaff, moths, urchin, raniuszka,	In corridor: 36,3-36,5 km: fragments of forest branches: - **117 a-00** (pine 124 years) polygon with coordinates:

No.	Species habitats	Location / Geographical coordinates (width N, length E)
	ruddy, poor tits, pines, jays, starlings, singer, wood chirp, wood chirp, wood chirp, finches and candles	54° 34' 0.427" N, 16° 48' 28.108" E; 54° 34' 0.885" N, 16° 48' 28.161'' E; 54° 34' 0.603" N, 16° 48' 32.277" E; 54° 34' 1.668" N, 16° 48' 33.318" E; **- 118 a-00** (pine 94 years) polygon with coordinates: 54° 33' 59.974" N, 16° 48' 27.248" E; 54° 34' 0.107" N, 16° 48' 28.193" E; 54° 34' 0.264" N, 16° 48' 31.947" E; 54° 33' 59.588" N, 16° 48' 31.287" E; 54° 33' 58.818" N, 16° 48' 27.755" E.
4.	Habitat great tit, common whitethroat, willow tit, woodpeckers, woodpeckers, crests, hoods, scythes, blacksmiths, cuckoo, roosters, bluebirds, mouse rabbits, pansies, forest crawlers, garden crawlers, frogs,common chiffchaffflies, nettle, raniuszka, ruddy, poor tits, pine, jay, starfish, singer, wood chirp, wood chirp, wood chirp, wood chirp, finches and candles	In corridor: 42,9-43,1 km; 43,2-43,4 km fragments of forest branches: **- 292A-o-00** (beech 109 years), polygon with coordinates: 54° 32' 14.122" N, 16° 52' 41.951" E; od punktu 54° 32' 14.59" N, 16° 52' 42.38" E to the point 54° 32' 13.847" N, 16° 52' 44.362'' E course along the boundary of the planned Project corridor; 54° 32' 13.604" N, 16° 52' 43.632" E; 54° 32' 13.833" N, 16° 52' 43.136" E; - **292A-l-00** (beech 99 years), polygon with coordinates: 54° 32' 11.154" N, 16° 52' 54.648" E; od 54° 32' 11.651" N, 16° 52' 55.237" E do 54° 32' 11.01" N, 16° 52' 58.805" E course along the boundary of the planned Project corridor; 54° 32' 10.48" N, 16° 52' 58.317" E; 54° 32' 10.57" N, 16° 52' 56.793" E; - **292A k-00** (beech 99 years), polygon with coordinates: 54° 32' 10.48" N, 16° 52' 58.317" E; od 54° 32' 11.01" N, 16° 52' 58.805" E do 54° 32' 10.735" N, 16° 53' 0.455" E course along the boundary of the planned Project corridor; 54° 32' 10.237" N, 16° 52' 59.995" E; - **292A j-00** (beech 154 years), polygon with coordinates: 54° 32' 10.237" N, 16° 52' 59.995" E; 54° 32' 10.735" N, 16° 53' 0.455" E; 54° 32' 9.876" N, 16° 53' 3.369" E; 54° 32' 9.395" N, 16° 53' 2.855" E;
5.	Habitat great tit, common whitethroat, willow tit, woodpeckers, woodpeckers, crests, hoods, scythes, blacksmiths, cuckoo, roosters, bluebirds, mouse rabbits, pansies, forest crawlers, garden crawlers, frogs,,common chiffchaff, moths, urchin, raniuszka, ruddy, poor tits, pines, jays, starlings, singer, wood chirp, wood chirp, wood chirp, finches and candles	In corridor: 44,1-44,4 km fragments of forest branches: **- 292 d-00** (oak 174 years) i **292 i-99** (beech 134 years), polygon with coordinates: 54° 31' 56.148" N, 16° 53' 38.864" E; od 54° 31' 57.083" N, 16° 53' 39.808" E do 54° 31' 52.378" N, 16° 53' 44.428" E course along the boundary of the planned Project corridor; 54° 31' 52.608" N, 16° 53' 43.554" E; 54° 31' 53.017" N, 16° 53' 43.348" E;

No.	Species habitats	Location / Geographical coordinates (width N, length E)
		54° 31' 56.003" N, 16° 53' 39.024" E
6.	Habitat great tit, common whitethroat, willow tit, woodpeckers, woodpeckers, crests, hoods, scythes, blacksmiths, cuckoo, roosters, bluebirds, mouse rabbits, pansies, forest crawlers, garden crawlers, frogs,common chiffchaff, moths, urchin, raniuszka, ruddy, poor tits, pines, jays, starlings, singer, wood chirp, wood chirp, wood chirp, finches and candles	In corridor: 44,6-44,7 km: fragments of forest branches **292 o-00** (beech 154 years) polygon with coordinates: 54° 31' 44.209" N, 16° 53' 37.194" E; 54° 31' 44.21" N, 16° 53' 38.867" E; 54° 31' 42.279" N, 16° 53' 38.91" E; 54° 31' 40.767" N, 16° 53' 38.661" E; 54° 31' 41.104" N, 16° 53' 37.016" E
7.	Habitat great tit, common whitethroat, willow tit, woodpeckers, crests, hoods, scythes, blacksmiths, cuckoo, roosters, bluebirds, mouse rabbits, pansies, forest crawlers, garden crawlers, frogs,,common chiffchaff, moths, urchin, raniuszka, ruddy, poor tits, pines, jays, starlings, singer, wood chirp, wood chirp, wood chirp, finches and candles	In corridor: 44,9-45,1 km: fragments of forest branches **295 b-00** (oak 144 years) polygon with coordinates: 54° 31' 34.358" N, 16° 53' 33.834" E; 54° 31' 34.027" N, 16° 53' 35.125" E; 54° 31' 30.499" N, 16° 53' 32.665" E; 54° 31' 30.887" N, 16° 53' 31.078" E
8.	Habitat great tit, common whitethroat, willow tit, woodpecker, woodpecker, crest, hoods, scythe, blacksmith, cuckoo, roosters, bluebirds, mouse rabbits, pansy, forest crawler, garden crawler, fowl, primitive, hives, raniuszka, ruddy, poor tits, pine, jay, starling, singer, wood chirp, wood chirp, wood chirp, wood chirp, wood chirp, wood chirp, chirp candle	In corridor: 45,3-45,6 km: fragments of forest branches: **- 295 f-00** (pedunculate oak 144 years), polygon with coordinates: od 54° 31' 23.112" N, 16° 53' 32.208" E do 54° 31' 19.251" N, 16° 53' 35.072" E course along the boundary of the planned Project corridor; 54° 31' 18.814" N, 16° 53' 34.271" E **- 295 h-00** (pedunculate oak 139 years) polygon with coordinates: 54° 31' 15.458" N, 16° 53' 36.056" E; od 54° 31' 15.579" N, 16° 53' 36.676" E do 54° 31' 15.22" N, 16° 53' 36.723" E; 54° 31' 15.136" N, 16° 53' 36.229" E

Source: own compilation based on data from Volume III Appendix 2.

In addition, within the avifauna observation points, 239 species of birds were found flying over theECIcorridor area during spring and autumn migration.

The planned Project, provided that minimising measures are applied, will not have a negative impact on any of the identified species and their habitats as well as on the status of their populations both nationally and regionally. In order to minimise the negative impact of the planned Project on nesting bird populations:

- carry out tree and shrub should be felling outside the bird breeding season, i.e. outside the period from 1 March to 31 August (confirmed by an ornithologist, as breeding seasons may start later or end earlier)
- take measures during the construction phase to minimise and prevent the nesting of the sand martins *Riparia riparia*.

If trees are cut down with the destruction a habitat of birds inhabiting the hollows, it will be necessary to carry out nature-compensatory measures, which will consist in hanging nesting boxes in the adjacent forest and woodland areas. The number of nest boxes should be proportional to the area of lost avifauna breeding habitats as a result of the planned Project. The number of nesting boxes should be no less than 10 boxes for each hectare of cleared wooded area, which results from the average

density of birds inhabiting hollow trees[593] . The boxes used should be diversified typologically, in the ratio: 40% type A, 40% type B and 15% type D, 5% type E. The locations of the boxes to be hung should be agreed with the natural supervisor - ornithologist, at the stage of implementation of the planned Project.

The planned Project, which consists of underground cable lines on a long-term basis, will not cause negative impacts on breeding, wintering, as well as migratory birds, and in particular on the avifauna of the Lake Modła Nature Reserve and ecological corridors.

The type of impacts on avifauna during the construction phase, have been assessed as: negative, direct and simple. Impacts will be local, short-term and permanent. The receptor sensitivity to the above impacts has been assessed as medium and the impact significance as moderate.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(14) moderate**

The sum of the significance weights of the negative impacts is 14, so the impact during the construction phase on avifauna has been assessed as moderate. Negative impacts will primarily relate to loss of bird habitat.

Operation stage

During the operational stage of the planned Project, potential impacts on birds may be related to changes in habitat conditions and cyclical tree felling and maintenance works. During these works, birds will be disturbed and their habitats destroyed. However, these impacts will be temporary and local in extent.

Once the construction works are completed, the site will undergo succession processes. As a result, new habitats will be created that can be used by birds, which will mitigate the effects of land conversion and fragmentation in the forest area. In addition, for at least 3 bird species, the above habitat changes will make the deforested area more attractive as a breeding or foraging site. These species include the tawny owl, the European nightjar and the woodlark, the latter two of which are considered to be valuable species. The planned Project, which consists of underground cable lines, will not cause any negative impacts on breeding, wintering or migrating birds in the long-term impact and in particular on the avifauna of the Lake Modła Nature Reserve and ecological corridors..

In order to minimise the negative impact of the operation of the planned Project on bird populations, it is recommended that the following minimisation measures are implemented (Chapter 16):

- a prohibition on the control of shrub and woody vegetation arising as self-sown vegetation along the course of the planned Project using total herbicides, whose use results in the destruction of all plants, including "weeds" which are a food base for birds,
- annual mowing of grasses and herbaceous vegetation once a year along the route of the planned Project (outside the arable land), which will prevent the strong growth of shrubby and woody vegetation and will promote the maintenance of a belt of "weeds" that are a food base for seed-eaters and are a habitat for invertebrates, reptiles and small mammals that are food for insectivorous birds and raptors.

No negative impacts on birds are anticipated due to the emission of magnetic and thermal fields, which will not significantly deviate from the background radiation. Also the noise generated from the LSE station, which will be much lower than e.g. traffic noise, will not have a significant impact on this group of animals. It is true that birds may avoid areas in the immediate vicinity of noise sources.

[593] *Mikusek R., 2012. Birdhouses. Foundation for Supporting Ecological Initiatives. Kraków.*

However, this will depend on the characteristics of the species. Some species are very sensitive to noise and will avoid areas close to the emitter (e.g. European nightjar). For others, noise is a source of increased exposure to predation hazards (e.g. lapwing, partridge, black-tailed godwit). Still others tolerate high levels of environmental noise (e.g. common woodpigeon, white stork)[594] . A species that is very sensitive to noise impacts and at the same time breeds in the area of potential impact of the planned Project is the European nightjar. However, due to its location in the coastal zone, away from the proposed LSEs, it will not be adversely affected by noise. Impacts on other species have been assessed to be insignificant, of local scale.

Therefore, the impacts on avifauna during the operational phase, have been assessed as negative, direct and simple. Impacts will be short term and reversible as they will cease upon completion of servicing and maintenance works. The sensitivity of the receptor has been assessed as medium and the significance of the impacts as insignificant.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the DDA	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(11) insignificant**

The sum of the significance weights of the negative impacts is 11, so the impact during the operational stage on avifauna has been assessed as insignificant. Negative impacts will primarily relate to bird scaring and habitat destruction as a result of periodic felling and maintenance works.

10.5.8. Land Mammals

Within the corridor of the planned Project and in the area of potential impact in the Investor's variant, 2 species of mammals under partial species protection were found, including one listed in Annexes II and V of the EU Habitats Directive - the European beaver. Of the valuable species, the squirrel was found most often. The observation of beaver refers to single old bites.

Construction phase

The construction phase will result in the disturbance of mammals and the probable destruction of their habitats, which will undergo restoration. Small mammals, occupying habitats that will be eliminated during construction, will be the most vulnerable to the work associated with the construction phase. The species identified during the inventory (Section 8.5.9 and Appendix 2 Volume III) were the European mole and the common squirrel. The earthworks, which are being carried out, will periodically hinder the migration of mammals, especially ungulates. However, the aforementioned species are common in the country and region, and therefore, their sensitivity to impacts associated with the construction phase was assessed as low.

All observations of beavers concerned their foraging (bite) or migration tracks, not feeding grounds, and were located near drainage ditches and watercourses in the area of the PSE S.A. substation. (47.6 km). Implementation of trenchless works near watercourses will ensure the patency of local beaver migration paths. The beaver is able to move efficiently on "dry" land, so periodic disturbance of water relations at the site of the works will not be a significant impact for this species. The breeding habitats of beavers within Lake Modla, due to their considerable distance, will not be threatened by the planned Project. Therefore, these impacts can be considered insignificant.

[594] *Garniel A, et al. , 2007.*

Accordingly, impacts on teriofauna during the construction phase, were assessed as: negative, direct and simple. Impacts will be short-term and reversible. The sensitivity of the receptor was assessed as low.

A summary of the significance of the negative impacts of the planned Project on teriofauna during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, so the impact during the construction phase on teriofauna was assessed as insignificant. Negative impacts will mainly relate to the disturbance of mammals and destruction of their habitat.

Operation phase

During the operation phase of the planned Project, potential impacts on mammals may be related to scaring during maintenance work and cyclic vegetation cutting. After the completion of construction works, the area of the planned Project, and the boundaries of the technological corridor with a width of 20 m for the 400 kV line and 10-31 m for the 220 kV line, will undergo succession processes. New habitats will be created that can be used by animals, which will mitigate the effects of land transformation and fragmentation during construction.

The route of the underground cable will not be fenced, and therefore will not be an obstacle during mammal migration. Negative impacts on mammal species associated with the emission of magnetic fields and heat are not expected, which will not deviate significantly from background radiation. Also noise, generated from the ONS station, which will be much lower than, for example, traffic noise, will not significantly affect the discussed group of animals. The investment in the long-term impact will not cause negative impacts on mammals.

Accordingly, impacts on teriofauna during the operation phase, were assessed as negative, direct and simple. The impacts will be short-term and reversible, as they will cease upon completion of service and maintenance work. The receptor's sensitivity was assessed as low.

A summary of the significance of the negative impacts of the planned Project on teriofauna during the operational phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Mała	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, so the impact during the operation phase on teriofauna was assessed as insignificant. Negative impacts will mainly relate to the frightening of mammals and destruction of their habitats.

10.5.9. Bats

Within the corridor of the planned Project and in the area of potential impact, 4 bat species have been identified of which 2 in the Investor's variant. All of them are under strict species protection in Poland and are listed in Annex IV of the EU Habitats Directive. Four potential breeding sites of the soprano pipistrelle and four hibernation sites of the Daubenton's bat were found. Within the corridor of the planned Project in the Investor's variant and in the area of impact, there are 4 confirmed bat wintering sites, within the ruins of the 9th Permanent Artillery Battery in Ustka (Annex 2, Volume III). One of the wintering sites of the Daubenton's bat is located in the technical belt in the site no. 504 (gun emplacement) (Chap. 8.8. Figure 8.30, Photo 8.5), thus in direct collision with the planned Project. In addition, in kilometers 36 - 37 and 45 - 47, mating critters of the soprano pipistrelle were found.

Construction stage

The greatest potential impacts of the construction phase are related to the wintering site of the Daubenton's bat at site no. 504 (gunnery). The site is part of the fortification complex of the 9th Permanent Battery in Lędów (9 BAS), which is listed in the provincial register of monuments (section 8.8). According to the preliminary opinion of the Pomeranian Provincial Conservator of Monuments (ZND.5183.438.2022.KM), there is a possibility of locating the planned infrastructure from the conservation-listed gun emplacement No. 4 at a minimum distance of 10 m from its foundations (sec. 10.8), which would reduce the impact of the construction phase on this species. The site is part of the fortification complex of the 9th Permanent Battery in Lędowo (9 BAS), which is listed in the provincial register of monuments (section 8.8). According to the preliminary opinion of the Pomeranian Provincial Conservator of Monuments (ZND.5183.438.2022.KM), there is a possibility of locating the planned infrastructure from the conservation-listed gun emplacement No. 4 at a minimum distance of 10 m from its foundations (sec. 10.8), which would reduce the impact of the construction phase on this species. If this site is decommissioned, one of the species' hibernation sites will be destroyed. This is a long-term impact, but is reversible as bats will be scared away and move to other nearby roosts. This impact can be minimised by carrying out construction works outside of the bat wintering period, i.e. from 1 April to 15 November, or by carrying out works under the supervision of a chiropterologist. These will be negative, direct and simple impacts. The sensitivity of the receptor has been assessed as medium.

In addition, incidental bat scaring and habitat destruction may occur during the construction stage. The sections of the forest where swarming soprano pipistrelles have been found (36.6 km IP) will be most affected. This most likely indicates the presence of nearby, summer roosts of bats. In order to minimise impacts, the felling of trees from forested areas should be carried out outside the breeding and peak activity period, i.e. outside 1 June - 15 September, and under the supervision of a naturalist - chiropterologist.

To compensate for habitat loss through tree felling, 4 bat boxes should be put up for every 1 ha of forest or woodland felled. Stratmann-type bat boxes made of wood or sawdust concrete should be placed in groups of 10 in close proximity to each other at a height of 4-5 m above the ground, ensuring that the entrance to the box is accessible and not obstructed by branches. The boxes should be placed both inside the forest and at its edge, in the immediate vicinity of the planned Project (section 16).

Impacts on chiropterofauna during the construction stage, have been assessed as negative, direct and secondary. Impacts will be short-term and reversible. The receptor sensitivity has been assessed as medium.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the DDA	**(1)**

Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(12) moderate**

The sum of the significance weights of the negative impacts is 12, so the impact during the construction stage on chiropterofauna has been assessed as moderate. Negative impacts will primarily relate to the destruction of habitats and hibernation sites. The implementation of the planned Project, provided that minimising measures are applied, will not have a negative impact on any of the identified protected, rare and endangered bat species and their habitats, as well as on the status of their populations either nationally or regionally.

Operation stage

During the operational stage of the planned Project, potential impacts on bats may be related to animals scaring during servicing works and periodic vegetation clearance. After completion of the construction works, the area in the service strip will undergo succession processes. New habitats will be created that can be used by animals, which will mitigate the effects of land transformation and fragmentation during construction.

In order to minimise the negative impact of the operation of the planned Project on bat populations, it is recommended that minimisation measures are introduced:

- a prohibition on the control of shrub and woody vegetation established as self-sown along the route of the planned Project using total herbicides, whose use will result in the destruction of all plants, including a variety of herbaceous vegetation constituting a feeding ground for nocturnal butterflies, which are the food base of bats,
- annual mowing of grass and herbaceous vegetation once a year between 01.08. and 30.09 along the route of the planned Project (outside the arable land), which will prevent a strong growth of shrub and tree vegetation and will favour the maintenance of a belt of diverse herbaceous vegetation constituting a feeding ground for nocturnal butterflies constituting a food base for bats.

The route of the underground cable will not be fenced and therefore will not be an obstacle to bat migration. Negative impacts on chiropterofauna associated with the emission of magnetic and thermal fields are not expected either, and will not significantly deviate from background radiation. Current scientific studies, confirm that anthropogenic noise pollution, causes a decrease in hunting efficiency of bats, which use echolocation for this purpose. In this situation, some species are able to adjust their echolocation frequency or, in extreme cases, reduce their activity at noisy sites[595, 596] . Confirmed bat swarming sites in the vicinity of the planned Project are located at a distance of min. 3 km from the site of the planned LSE stations. Therefore, the planned Project will not cause any negative impacts on bats in the long-term impact.

Therefore, impacts on chiropterofauna during the operational phase, have been assessed as negative, direct and simple. Impacts will be short term and reversible as they will cease upon completion of servicing and maintenance works. The sensitivity of the receptor has been assessed as medium.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the DDA	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(1)**
Impact classification	**(9) insignificant**

[595] *Allen LC, et al. 2021*
[596] *Jessie P. et al. 2015*

The sum of the significance weights of the negative impacts is 9, so the impact during the operational phase on chiropterofauna has been assessed as insignificant. Negative impacts will primarily relate to disturbance as a result of periodic vegetation clearance and maintenance works.

10.6. IMPACT ON PROTECTED AREAS, INCLUDING NATURA 2000, ECOLOGICAL CORRIDORS AND BIODIVERSITY

10.6.1. Impact on the protected landscape area coastal belt west of Ustka

The planned Project is located in the Pas Pobrzeże Protected Landscape Area to the west of Ustka, between 35 and 37 km of the ECI corridor, where forests dominate.

In accordance with the provisions of Resolution No. 259/XXIV/16 of the Regional Council (Sejmik) of Pomorskie Voivodeship dated July 25, 2016 on protected landscape areas in Pomorskie Voivodeship, the arrangements for active protection of ecosystems within the Protected Landscape Area Pas Pobrzeża west of Ustka include activities in the field of active protection of forest ecosystems, including:

1) maintaining the spatial coherence and sustainability of forest ecosystems by limiting their fragmentation, especially along ecological corridors of supra-regional and regional importance, and preventing their allocation for non-forest purposes, and not allowing overexploitation of their resources;

2) increasing the existing degree of land coverage by forest stands, promoting the creation of compact forest complexes with a rational field-forest boundary, introducing afforestation especially in such areas where it is possible from a natural and economic point of view, e.g. ecological corridors;

3) Promoting natural regeneration processes with composition and structure corresponding to the habitat;

4) increasing the proportion of admixture and biocenotic species; creating ecotone zones from these species;

5) leaving monumental trees, residual trees, hollow trees, dead parts until they completely decompose;

6) taking measures to stabilize water relations, especially in wet and swampy habitats, (i.e., in swampy forests and birches, alder forests and riparian forests) through the construction of small retention facilities, in accordance with the small retention programs of the Pomeranian voivodeship;

7) to preserve and maintain in a state close to natural the existing mid-forest watercourses, wetlands, glades, peat bogs, heathlands and sand grasslands; not to allow them to become productive and successional;

8) Control of insect pests and fungal pathogens, as well as reduction of hunting damage

9) protection of sites of protected species of plants, animals and fungi; in cases where objects and areas of natural value (sites of rare, protected plants, animals, fungi, etc., as well as remnants of natural ecosystems) are found, to apply to the appropriate nature protection authority for their protection;

10) development and implementation of programs of active protection and restoration of rare and endangered species;

11) The use of forests for recreational, sightseeing and educational purposes should be based on designated hiking trails and existing and new educational and nature trails;

12) conducting rational hunting management;

According to the above Ordinance, the following prohibitions apply in the Protected Landscape Area Pas Pobrzeże to the west of Ustka:

1) killing wild animals, destroying their burrows, lairs, other shelters and breeding places and spawning grounds, deposited eggs, with the exception of amateur fishing and activities related to rational agricultural, forestry, fishing and hunting management,

2) implementation of projects likely to have a significant impact on the environment within the meaning of the provisions of the Act of October 3, 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments,

3) liquidation and destruction of mid-field, roadside and waterside plantings, if they do not result from the need for flood protection and ensuring the safety of road or water traffic or the construction, reconstruction, maintenance, repair or renovation of water facilities,

4) mining for economic purposes of rocks, including peat, and fossils, including fossil remains of plants and animals, as well as minerals and amber,

5) carrying out earthworks permanently deforming the relief of the terrain, with the exception of works related to anti-storm, flood or landslide protection or maintenance, construction, reconstruction, repair or renovation of water facilities,

6) making changes in water relations if they serve purposes other than nature protection or sustainable use of agricultural and forest land and rational water or fisheries management,

7) liquidation of natural water reservoirs, oxbow lakes and wetlands,

8) construction of new buildings within a 100-meter-wide strip from: a) the shoreline of rivers, lakes and other natural water reservoirs, b) the extent of the water surface in artificial water reservoirs located on flowing waters at the normal level of accumulation specified in the water permit referred to in Article 122 paragraph 1 item 1 of the Act of July 18, 2001. - Water Law - with the exception of water devices and facilities for rational agricultural, forestry or fishing management.

In accordance with Article 24 of the Law of April 16, 2004 on Nature Protection (Journal of Laws 2021.1098, as amended) the prohibitions indicated in the Resolution do not apply to public purpose investments, which is the planned Project.

Construction phase

Within the range of the Protected Landscape Area Pas Pobrzeże to the west of Ustka the following disturbances will occur:

- temporary transformation and occupation of land for the construction of underground cable lines, including the construction of HDD passage launch chambers;
- in case of shallow occurrence of the first underground water level, periodic dewatering of excavations;
- elimination of vegetation cover;
- impact on fauna, mainly its periodic frightening.

The impact on the Protected Landscape Area Pas Pobrzeże to the West of Ustka during the construction phase will be primarily related to tree felling in the construction corridor of a width of 30-32 m to approx. 50-100 m and extensions in the vicinity of the offshore and onshore cable connection. The planned location of the HDD passage launch chamber includes an area partially deforested and paved due to the functioning of the fortification complex of the 9th Permanent Artillery Battery Ustka - Lędowo in this area. The surface of the area for horizontal directional drilling (HDD) and horizontal directional drilling (HDD) combined with marine excavation will be the same and will be approximately 0.85 hectares. The foundation of underground power infrastructure will require tree and shrub clearing along the section from the cables' landfall (cable wells), further through forest areas up to the 37 km of the ECI corridor. Temporary access and permanent roads, as well as maneuvering areas will be implemented in the construction corridor. During the construction phase, there will be increased vehicle traffic due to the transportation of materials and people.

After the cessation of the construction phase, the area will be restored to its original state, with the exception of a 10-31-meter wide technological corridor, which will be permanently deforested (excluding locations where trenchless technology will be used).

The route of the ECI corridor in the northern part, within the boundaries of the Protected Landscape Area Pas Pobrzeża to the west of Ustka, will lead partly along the road leading towards the beach, through forested, fragmentarily transformed areas. In the area of 35.5 km there is a landfill of

rubble, construction elements, which will need to be cleaned up as part of site preparation. The forest road in a small section is paved.

One of the longest trenchless crossings along the ECI corridor is planned within the Protected Landscape Area. It will run through the closed area of the Naval Center in Ustka in the area of 36.3 km. No logging will be required along the section of the trenchless passage. Only at the locations of the foundation of the entrance and exit chambers of the drill will logging be necessary.

The Protected Landscape Area Pas Pobrzeże to the west of Ustka is located within the boundaries of JCWP Karwina to Lake Modła (Chapter 8.4.1.). Objectives have been set for this river JCWP, including, among others, *the formation of water relations on agricultural land allowed only within the framework of rational agricultural management, with absolute preservation of wetlands, including peat bogs and wetlands, as well as spring areas of watercourses. Preservation and protection of surface water ecosystems (natural and artificial, flowing and standing, including oxbow lakes) along with a belt of surrounding vegetation*. The planned project within the boundaries of the Protected Landscape Area Pas Pobrzeza to the west of Ustka will include a fragmentary complex of wet meadows in the area of 37 km, with Struga Lędowska, which will be crossed by trenchless method. Potential impacts associated with the drilling may relate to the disruption of water relations in the area. In order to prevent this, there is a ban on the extraction of water necessary for forming the drilling mud and the discharge of drilling mud from Struga Lędowska, Lake Modła and smaller watercourses crossed by the ECI corridor in the section from 36.9 km to 37.5 km, as well as maximum restriction of drainage of the entrance and exit chambers of the trenchless passage under Struga Lędowska (e.g., by using sheet piling). In addition, it is recommended that the water from the drilling mud be treated and the method of dispersal into the ground be used, which will prevent these impacts.

The Protected Landscape Area Pas Pobrzeza to the west of Ustka within the limits of the corridor of the planned Project is a partially developed area, due to the presence of the fortification complex in the area of 35 km, the radio-navigation facility and the Naval Center in Ustka (36.3 km) and related facilities (barracks within the boundaries of the closed areas, sports field, railroad line) (figure 10.8). As a result of the operation of investment in this area, the role of the Protected Landscape Area Pas Pobrzeże to the west of Ustka is disturbed and weakened in this area.

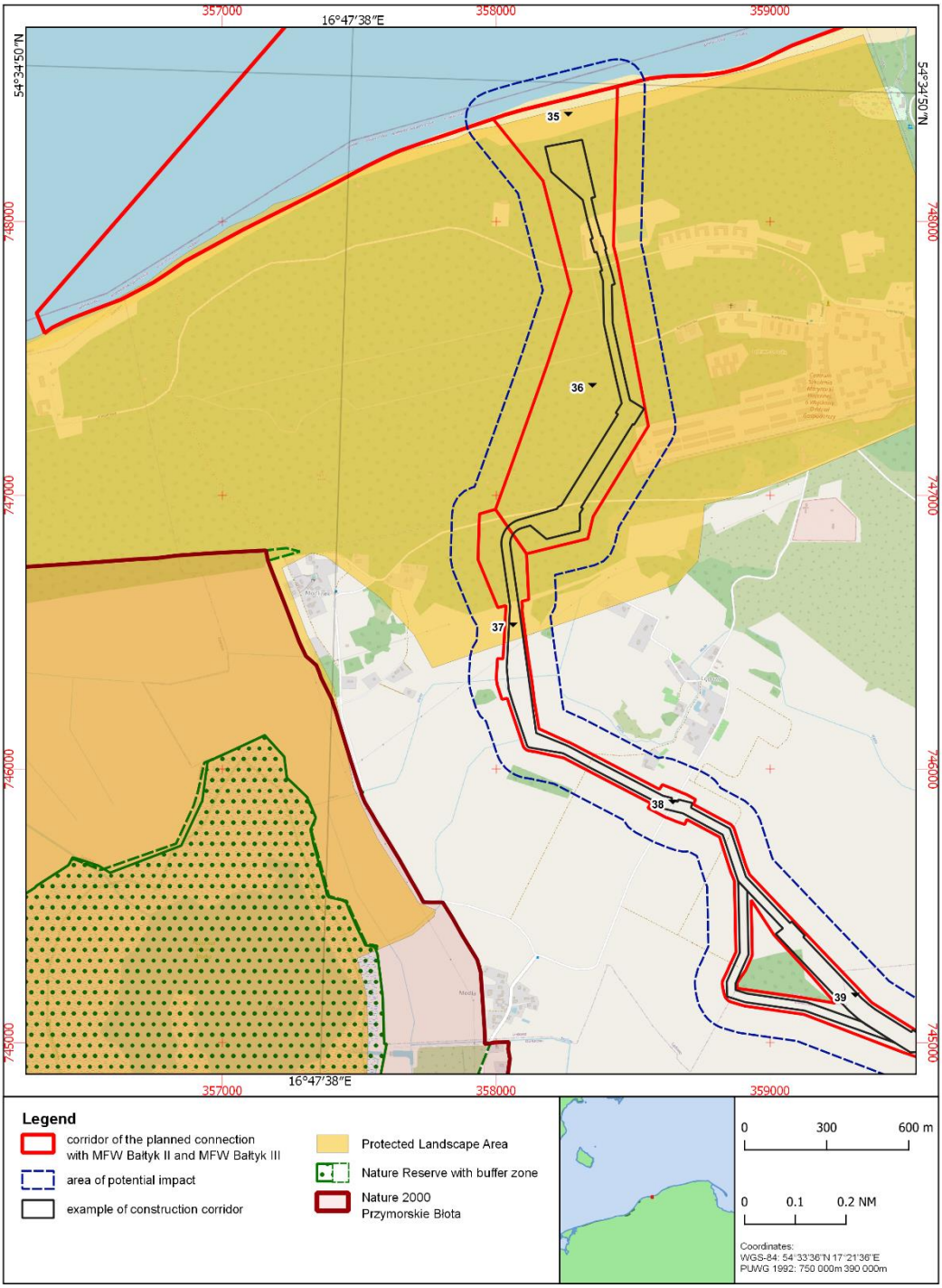


Figure 10.8. *The planned course of the ECI corridor against the background of the Protected Landscape Area Pas Pobrzeże to the west of Ustka*

Source: own elaboration

Impacts of the construction phase on the Protected Landscape Area Pas Pobrzeza to the west of Ustka will be negative, direct, simple, long-term and permanent, and their spatial extent will be within the limits of the DWA. The sensitivity/uniqueness of the environment was determined to be medium, due to the transformation of this space associated with the facilities that have been operating here for years.

A summary of the significance of the negative impacts of the planned Project on the Protected Landscape Area Pas Pobrzeże to the west of Ustka during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Permanent	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Medium	**(3)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, so the impact during the construction phase on the Protected Landscape Area Pas Pobrzeże to the west of Ustka was assessed as moderate. Negative impacts on the Protected Landscape Area during the construction phase will mainly concern temporary transformation and occupation of the area, elimination of forests, vegetation and periodic disturbance of fauna. These impacts can be reduced by introducing the minimization measures proposed for the various elements of nature, including the implementation of trenchless crossings. The planned project is a public purpose investment and, in accordance with Article 24 of the Law of April 16, 2004 on Nature Protection (Journal of Laws 2021.1098, as amended), the prohibitions indicated in the Resolution do not apply to it.

Operation phase

Due to the nature of the planned Project, including primarily the underground route, no significant impact is expected on the landscape which is the subject of protection of the Protected Landscape Area Pas Pobrzeże to the west of Ustka.

The operation phase of the planned Project is associated with permanent tree felling within a section of about 1.5 km within the limits of the technological corridor of a width of about 10-31 m. In these areas it will be possible to return plants with a shallow root system. Part of the planned ECI will be implemented by trenchless method, and in this area logging will not be necessary.

4 cable wells/chambers will be visible in the forest landscape. These are cuboid objects of small size (with side lengths of a few meters at most). Along the infrastructure of the underground cable lines, an access road will be implemented along the route or nearby of the existing forest road leading towards the beach, with a length of about 600 meters.

Impacts of the construction phase on the Protected Landscape Area Pas Pobrzeże to the west of Ustka will be negative, indirect, secondary, long-term and permanent. The spatial extent of the impacts will be local. The sensitivity/uniqueness of the environment was determined to be medium, due to the transformation of this space associated with the facilities operating here for years.

A summary of the significance of the negative impacts of the planned Project on the Protected Landscape Area Pas Pobrzeże to the west of Ustka in the exploitation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long-term	**(3)**
Permanent	**(3)**
Spatial range of impact	
Local	**(2)**
The sensitivity / uniqueness of the environment	
Medium	**(3)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, so the impact during the exploitation phase on the Protected Landscape Area Pas Pobrzeże to the west of Ustka was assessed as moderate. The negative impacts will mainly relate to the appearance of a deforested space with a width of about 10-31 m over a length of about 1.5 km. However, this space will not be

occupied by anthropogenic elements that will be visible in the landscape. The use of trenchless methods for the passage of cables under the site of the Naval Center in Ustka, in the area of about 36.3 km of the ECI corridor, and the associated lack of deforestation will reduce this impact.

10.6.2. Impact on the Natura 2000 sites

A full assessment of the impact on Natura 2000 sites, in accordance with the European Commission's guidance, has been carried out in Appendix 7 (Volume IV) of this Report. The following are the main conclusions of the assessment.

PLH20024 Przymorskie Błota

Appropriate assessment was made only for habitat 3150 Old river beds and natural eutrophic water bodies with *Nymphaeion Potamion* communities. The possibility of indirect impact was analyzed, which may occur in connection with the planned trenchless crossing of Struga Lędowska (in the area of km 37.2 of theECIcorridor), which flows into Lake Modła (at a distance of about 1 km from the borders of the planned Project).

No direct threat to the habitat was identified during the construction and operation stages. The implementation of the proposed measures, such as the prohibition of the intake of water necessary for the drilling mud from Struga Lędowska, Lake Modła and smaller watercourses crossed by the ECI corridor from 36.9 km to 37.5 km, and the prohibition of the discharge of water into these watercourses eliminatesthe risk of any impacts on the Natura 2000 site, including on habitat 3150. The proposed measures are highly effective and allow the elimination of potential impacts on the habitats during the construction stage.

As the assessment did not identify the potential for significant adverse impacts on Natura 2000 sites, the assessment was completed at Stage 2 Appropriate Assessment.

The planned project will not have a significant negative impact on the conservation objectives of Natura 2000 PLH220024 Przymorskie Błota, in particular it will not lead to:

- deterioration of natural habitats or the habitats of plant and animal species for whose conservation a Natura 2000 site has been designated;
- negative impact on species for whose protection the Natura 2000 site has been designated;
- deterioration of the integrity of the Natura 2000 site or its connection to other sites.

In addition, the planned Project, due to its nature and location, will not affect the possibility of implementing conservation measures and achieving the objectives set out in the Plan of Conservation Tasks for Natura 2000 PLH220024 Przymorskie Błota.

PLH320068 Jezioro Wicko i Modelskie Wydmy

The planned Project will not be implemented within the boundaries of the Natura 2000 site Jezioro Wicko i Modelskie Wydmy PLH320068, and at a distance of approx. 2.4 km from the boundaries of this site, including approx. 2.5 km from the boundaries of the technical (construction) corridor, which is directly related to the construction works, includes places where the topsoil, undergrowth will be destroyed, or trees and shrubs will be removed.

The Jezioro Wicko i Modelskie Wydmy PLH320068 Natura 2000 site consists mainly of the best developed and preserved coastal white dunes and their initial forms in the West Pomeranian Voivodeship. Wicko Lake, located about 9.8 km from the borders of the planned Project, is a very well preserved coastal lake (habitat 1150), whose shores are mostly preserved in their natural state and are not urbanised.

As the assessment the planned Project will be implemented at a considerable distance from protected habitats and species and the nature of impacts that will arise during implementation will be local and short-term, did not identify the potential for significant adverse impacts on any of the objects of protection of this, the assessment was completed at Stage 1 of the Screening.

10.6.3. Impact on ecological corridor

The planned Project is located within:

- Pobrzeże Słowińskie- corridor of national importance,
- Nadmorski corridor of supra-regional importance,
- eastern Atlantic migratory route of birds.

In addition, the planned Project crosses local migration routes identified during the wildlife inventories conducted for this Report.

Construction phase

The construction phase associated with the felling of trees, implementation of excavation and laying of the cable line and construction of the ONS substation will result in a temporary interruption of spatial continuity within: the corridor of national importance Pobrzeże Słowińskie,

- Nadmorski corridor of supra-regional importance,
- eastern Atlantic migratory route of birds.

The foundation of underground power infrastructure will require tree and shrub clearing in a construction corridor 30-32 m to approx. 50-100 m and extensions in the vicinity of the offshore and onshore cable connection. Temporary access and permanent roads, as well as maneuvering areas will be realized. During the construction phase, there will be increased vehicle traffic due to the transportation of materials and people.

Construction of the underground cable line will be in sections of about 1 km, and the construction site will not be fenced. The implementation of the planned Project associated with the use of heavy noise-emitting equipment will cause the migration of species identified within the Project boundaries to neighboring areas. Both on the migration routes of mammals, amphibians, reptiles, as well as on the migration routes of birds and bats, construction works will be carried out only for a short period of time, in short sections, which will not significantly affect the migration conditions of animals. Construction work, including tree cutting, may periodically cause frightening of migrating animals. Since construction work will generally be carried out during daylight hours, frightening animals will cause a minor and short-term reduction in the functionality of ecological corridors. The disruption of spatial continuity in a 30-32-meter to 50-100 m and extensions in the vicinity of the offshore and onshore cable connection represents a negligible area in relation to ecological corridors, and tree cutting, conducted during appropriate phenological periods, will minimize potential impacts.

The construction works will not create a barrier effect within the range of the Pobrzeże Słowińskie corridor, the supra-regional Coastal Ecological Corridor or the East Atlantic bird migration route.

Local amphibian migration routes have been identified along the route of the panoramic Project on the basis of the Inventory. This issue is discussed in more detail in Section 10.5.6.

Impacts from the construction phase on ecological corridors will be negative, direct, simple, short-term and reversible, and their spatial extent will be within the boundaries of the ED. The sensitivity/uniqueness of the environment has been identified as medium, due to the transformation of this space associated with the Naval Centre development operating here.

A summary of the significance of the negative impacts of the planned Project on the ecological corridors during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Within the limits of ED	**(1)**
Impact classification	
Average	**(3)**
Impact classification	**(11) insignificant**

The sum of the significance weights of the negative impacts is 11, so the impact during the construction phase on the ecological corridors has been assessed as insignificant. Negative impacts on ecological corridors during the construction phase will mainly relate to the temporary transformation and occupation of land, forest clearance, elimination of vegetation cover and periodic disturbance of fauna.

Operation phase

The planned project in the variant of the Investor's variant at the stage of exploitation will not affect the following ecological corridors: Pobrzeże Słowińskiego (a corridor of national importance), Nadmorski (a corridor of supra-regional importance) or the East Atlantic bird migratory route.

After the cessation of the construction phase, the site will be restored to its original state, with the exception of the ONS substation and technological corridor from underground cable lines:

- 220 kV with a width of 10-31 m,
- 400 kV with a width of 20 m.

The areas within the boundaries of the aforementioned strips will be permanently deforested in the forest part. The agricultural areas will revert to their original state and be used for agriculture.

Once construction has ceased, the land will undergo processes of secondary succession, new open habitats will be created that can be used by birds and animals, which will mitigate the effects of land conversion and fragmentation in the forest area. The location of the ONS station is planned in an agricultural and industrial area, outside the boundaries of the Coastal Corridor. The planned underground cable line project will not cause impacts that could affect bird migration routes or other plant and animal species. The planned project will not pose an obstacle to animal movements and therefore there will be no barrier effect. These will be neutral impacts.

10.6.4. Impact on biodivesity

According to the legal definition of this concept in Article 5(16) of the Nature Conservation Act of 16 April 2004: biodiversity means the variability of living organisms occurring in ecosystems, within and between species, and the variability of the ecosystems themselves. The term includes animals as well as plants and fungi.

The greatest biodiversity is shown in the areas that have been identified as the most valuable and these are listed in section 8.5.11 Nature Valorisation.

The most biodiverse sections along the ECI route include areas:

- coastal grey dunes (35 km),
- mixed forests and forests on coastal dunes (35-36.5 km),
- wet meadow complex with the Struga Lędowska (36.9-37.5),
- fertile beech forests (43, 44, 46-47 km),
- acid beech (36.5, 45.8 km).

In addition, the ECI route highlights areas that are characterised by biodiversity in a monotonous farmland setting:

- in the area of 38.6-39.0 km, habitat 91F0 Riparian oak-elm-beech forest occurs. This is an area surrounded by arable fields and is valuable for herpetofauna,
- In an area of 39.7 km, the planned Project crosses the historical railway line "Szlak zwiniętych torów". There is a depression of land with periodic wetlands. The area is overgrown by trees and shrubs. It acts as an ecological link, allowing fauna to migrate through the monotonous landscape of the surrounding agricultural fields.

As shown in the previous chapters, the implementation of the planned Project will have a moderate impact on protected plant species, habitats, forests, fungi and lichens, herpetofauna and avifauna. The greatest impacts will be associated with the construction phase. Most impacts will be negative, direct and simple of a short-term and reversible nature. Due to the permanent clearing of habitats and forests, impacts on breeding birds and bat breeding habitats will be long-term and permanent. Minimisation measures have been proposed for this aspect (parent 16).

Biodiversity in the area of the planned Project is determined by the presence of habitat systems typical of Pomerania with varying status and perspectives. In the area of the land corridor there is a priority habitat 2130 coastal grey dunes, which will be crossed by a trenchless method. Within the corridor of the planned connection, 11 valuable vascular plant species were found, including 8 taxa under legal protection. No strictly protected plant species were found. In addition, the briological inventory showed the presence of 13 partially protected bryophyte species. No strictly protected bryophyte species were found. The area of the terrestrial corridor of the planned connection is characterised by a diversity of moss species typical of the forests of Gdansk Pomerania. All moss species are common taxa. In the Investor's variant there are 9 natural habitats of varying status. As part of the Inventory (Appendix 2 Volume III) it was found:

- 3 species of large-flowered fungi of natural value, including 1 species - subcortical spinner - Inonotus obliquus subject to partial protection,
- 8 naturally valuable lichen species, including 2 species under strict legal protection: ash borer (Ramalina fraxinea) and tufted borer (Ramalina fastigiata), 5 species under partial legal protection,
- 15 species of breeding birds under strict species protection, including 6 listed on Annex I of the EU Birds Directive,
- 4 strictly protected bat species, listed on Annex IV of the EU Habitats Directive,
- 2 mammal species under partial species protection, including one listed on Annexes II and V of the EU Habitats Directive - the European beaver.

The planned Project does not pose a threat to biodiversity. The most valuable area (with the greatest biodiversity) is located within the boundaries of the Pas Pobrzeże Protected Landscape Area to the west of Ustka. Its function is impaired due to the transformation of this space associated with the facilities that have been operating here for years (the Naval Centre).

Negative impacts on the Protected Landscape Area (between 35 and 37 km of the ECI corridor) during the construction phase will mainly relate to temporary transformation and occupation of the site, removal of forests, vegetation and periodic disturbance of fauna. These will be moderate impacts. Due to the permanent felling, there will be long-term impacts (related to the operation phase), permanent and within the limits of the ED. There will be no impacts that could significantly threaten the permanent loss of habitats and species. With the application of minimisation measures, the impacts of the construction phase have been assessed as moderate or insignificant. Therefore, the impact on biodiversity can also be considered moderate.

A summary of the significance of the negative impacts of the planned Project on biodiversity s during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long term	**(3)**
Constant	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(15) moderate**

The sum of the significance weights of negative impacts is 15, therefore the impact on biodiversity during the construction phase was assessed as moderate. Negative impacts will mainly relate to the transformation and occupation of land and the removal of vegetation in the construction corridor. These impacts can be mitigated by implementing the minimisation measures proposed for the various nature elements, including the implementation of trenchless crossings,

Operation phase

Due to the nature of the planned Project, including primarily the underground route, no negative impact on biodiversity is expected. After the cessation of the construction phase, the site will be restored

to its original state, with the exception of a technological corridor 20 m wide for the 400 kV line and 10-31 m for the 220 kV line, which will be permanently deforested. Plants with shallow root systems will be allowed to return to these areas. There will be secondary succession towards oak and grassland habitats and species. Agricultural land will revert to its original state and be used for agriculture. Negative impacts on biodiversity will mainly relate to succession and the possibility of invasive plant species. A positive aspect is the creation of new habitats that can be used by animals.

The planned Project poses no threat to biodiversity during the operational phase. There will be neutral impacts. The planned Project poses no threat to biodiversity during the operational phase. These will be neutral impacts.

- Due to the need to maintain permanent deforestation in the technology corridor:
- the control of shrub and woody vegetation established as self-sown using total herbicides is prohibited,
- it is proposed to use annual mowing of grasses and herbaceous vegetation, which will prevent strong growth of shrub and woody vegetation and promote the maintenance of a belt of diverse herbaceous vegetation providing a food base for birds, small mammals and bats; part of the mown biomass, e.g. 25%, can be left on site as hiding places for entomofauna and small vertebrates (Chapter 16).

10.7. IMPACT ON LANDSCAPE

In the northern part of the planned Project there are high landscape values, due to the banded landscape pattern of moraine uplands, extensive coastal plains, dunes and beaches. There are transformations associated with the facilities that have been operating here for years (the Naval Centre). Agriculturally used areas in the middle course of the ECI corridor (between 38 and 42.5 km) are areas whose landscape has been recognised as culturally disharmonious, where human activity relatively strongly transforms the surrounding landscape (vicinity of the fish processing plant MOWI S.A.).

10.7.1. Construction phase

The impact of the planned Project on the landscape during the construction phase will be related to the necessity to remove trees and shrubs in the construction corridor of 30-32 m to approx. 50-100 m and extensions in the vicinity of the offshore and onshore cable connection, construction works, presence of construction machinery and equipment, excavation works and will cease upon completion of the works.

The planned location of the HDD passage launching chamber at the cable landfall (35 km) includes an area partially deforested and hardened due to the functioning of the fortification complex of the 9th Permanent Artillery Battery Ustka - Lędowo in this area. The area for horizontal directional drilling (HDD) and horizontal directional drilling (HDD) combined with offshore excavation will be the same and will be approximately 0.85 ha. The route of the ECI corridor in the northern part, will run partly along the road leading towards the beach, through fragmented woodland. In the area of 35.5 km there is a dump of rubble, construction elements, which will need to be cleaned up as part of the site preparation. The forest road is paved for a small section.

The planned Project is located in the Pas Pobrzeże Protected Landscape Area to the west of Ustka, between 35 and 37 km of the corridor, where forests dominate. Negative impacts on the Protected Landscape Area during the construction phase will primarily relate to temporary transformation and occupation of the site, removal of vegetation and periodic disturbance of fauna (Section 10.6.1.).

Upon completion of the construction works, the areas along the trenches will be restored to their previous use. Taking into account the fact that the works will progress, as the construction of a approx. 1 km section of the route (open excavation) will take approximately 12 weeks, the impacts of the planned Project will be within the limits of the environmental decision application. Due to the permanent felling of forests, the impacts will be long-term and permanent (due to permanent removal of forests and habitats).

The construction of the ONS stations will take place in an agricultural-industrial landscape. The ONS stations will be built on agricultural land, in close proximity to the MOWI S.A. fish processing plant. The stations will be more than 700 m from the nearest buildings in a southerly direction.

A summary of the significance of the negative impacts of the proposed Project on the landscape during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long term	**(3)**
Constant	**(3)**
Spatial range of impact	
Within the limits of ED	**(1)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, so the impact during the construction phase on the landscape has been assessed as moderate. Negative impacts on the landscape during the construction phase will mainly relate to the temporary transformation and occupation of land and cuttings. These impacts can be reduced by implementing trenchless crossings.

10.7.2. Operation phase

Due to the type of planned Project - underground power cables - no significant negative impact on the landscape, including the Protected Landscape Area, is expected (section 10.6.1.).

During the operation phase, the negative impact will be related to permanent deforestation (this will occur during the construction phase, but the effects will be visible during the operation phase) in a permanent corridor of 10-31 m - for 220 kV cables and 20 m - for 400 kV cables.

Elements permanently altering the landscape include cable wells and ONS stations. In the forest landscape, 4 cable wells will be visible as small cuboid objects (with side lengths of a few metres at most), which will be erected on previously undeveloped land in the area of the fortification complex of the 9th Battery of Fixed Artillery Ustka - Lędowo. Within the boundaries of the ONS station the following cubature objects will be located: a technological building, switchgear buildings, a building for fire tanks and pumps. The stations will be built on agricultural land more than 700m to the south of the nearest buildings. On the west side of the ONS over 500 m away is the MOWI company with an area of about 20 ha, and on the east side is the Poliart printing company. The area is not attractive for landscape or tourism. There are no forms of nature conservation in the area. The onshore stations will be visible from the nearby community road and cycle route.

The ONSs will form a new element in the agricultural-industrial landscape, between two existing businesses making its impact on the landscape less than if it were located in open countryside.

A summary of the significance of the negative impacts of the planned Project on the landscape during the operational phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long term	**(3)**
Constant	**(3)**
Spatial range of impact	
Local	**(2)**
The sensitivity / uniqueness of the environment	
Average	**(3)**
Impact classification	**(16) moderate**

The sum of the significance weights of the negative impacts is 16, therefore the impact on the landscape in the exploitation phase was assessed as moderate. Negative impacts will primarily affect the onshore substations (ONS), which will become a permanent part of the agricultural

and industrial landscape of the Ustka commune, but will not be a dominant landscape feature in the area. The use of trenchless methods and the associated lack of cutting will reduce the impact of the planned Project on the landscape.

10.8. IMPACT ON MONUMENTS

In the corridor of the planned Connection (35.3 km) there is a complex of fortifications of the 9th Permanent Battery in Lędów (9 BAS) listed in the provincial register of historical monuments. Apart from this, there are no archaeological sites or historical objects in the corridor of the planned Project. In the area of potential impact there are archaeological sites and the complex of the Naval Training Centre, 46 buildings of which are listed in the register of historical monuments. In addition, the planned Project is crossed by a disused historic railway line (39.7 km).

10.8.1. Construction phase

9th Fixed Artillery Battery in Lędów (9BAS) (35.3 km)

In the corridor of the planned Project (35.1 km) there are 2 sites numbered 503 and 504 (gun emplacements) and site number 511 (35.3 km) - crew shelter 503 and 504 forming part of the 9th Fixed Artillery Battery in Lędów. In the area of 35.1 km, it is planned to locate the HDD passage launching chamber, the location of cable wells and further open excavation. Remnants of fortifications are located here (Section 3.2.2. Photo 3.1). In addition, on satellite maps and also on hypsometric maps, there is a facility described as a school fire station within the ECI corridor boundary, which is not included in the conservation area (Appendix 8 Volume IV).

Pursuant to Article 36 of the Act of 23 July 2003 on the protection and care of historical monuments (Journal of Laws 2022.840, consolidated text), carrying out construction works at the monument and in its surroundings, as well as undertaking other actions which could lead to the violation of the substance or change of the appearance of the monument entered in the register requires the permission of the provincial conservator of monuments.

Prior to construction, the developer will apply to the Provincial Conservation Officer for the relevant approvals. According to the preliminary opinion of the Pomeranian Voivodship Conservator of Monuments (ZND.5183.438.2022.KM), it is possible to locate the planned infrastructure from the conservation-protected gun emplacement No. 4 at a minimum distance of 10 m from its foundations (Appendix 8 Volume IV).

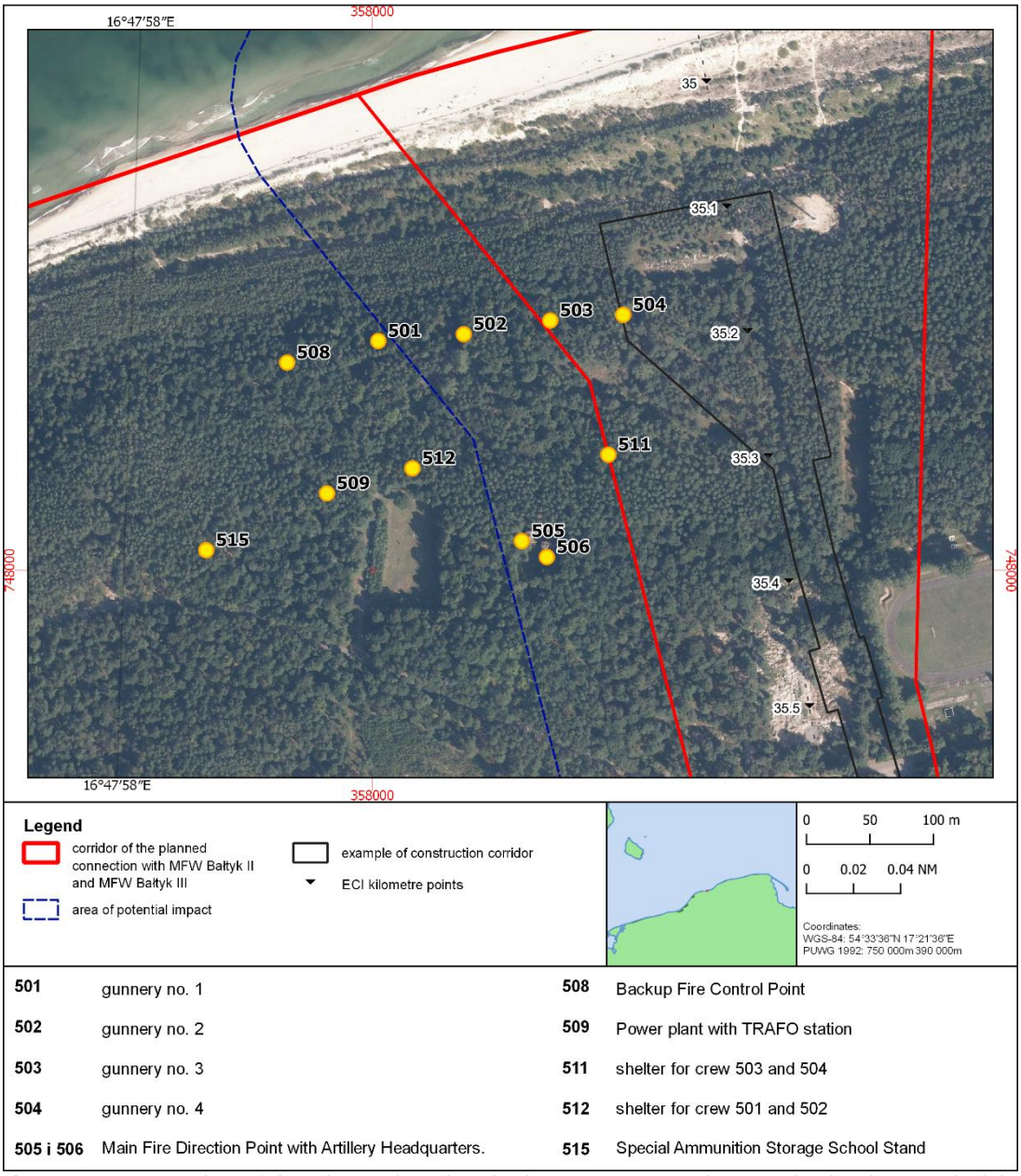


Figure 10.9. *Location of the planned Project in the Investor's variant on the background of the fortification complex of the 9th Battery of Standing Artillery in Lędów (9BAS))*

Source: own compilation based on data provided by the Association of Fortress Enthusiasts

The area of potential impact includes archaeological sites 14 and 15 and the Naval Training Centre complex, 46 of whose buildings are listed on the Register of Historic Buildings.

Archaeological site no. 14 (37.9 km)

Archaeological Site No. 14 is located approximately 40 m from the boundaries of the planned Project and approximately 80 m from the boundaries of the construction corridor that will be directly associated with the construction works. A trench approximately 3[597] m deep and 10 m wide will be excavated in this strip. There will be a complete transformation of the topsoil and relief.

Archaeological site no. 14 is located between a single-family housing development in Lędowo and the district road DP 1103 G between Lędowo and Modła, which is to be crossed using a trenchless method. A starting chamber for the HDD trenchless crossing will be located in the vicinity of the archaeological site.

[597] *In particularly justified cases, this depth may be greater*

The works to be carried out will be confined to the boundaries of the construction corridor, therefore impacts of the construction phase on archaeological site 14 will not occur. The impact will be neutral.

Archaeological site no. 15 (37.6 km)

Archaeological Site No. 15 is located approximately 80 m from the boundaries of the planned Project and approximately 95 m from the boundaries of the construction corridor that will be directly associated with the construction works.

The works to be carried out will be confined to the boundaries of the construction corridor, therefore impacts of the construction phase on archaeological site 15 will not occur. The impact will be neutral.

The planned Project will be implemented at a distance of approx. 150 m from the village of Lędowo, which has preserved cultural elements. There are buildings listed in the municipal register of historical monuments. The impact of the construction phase on these objects will be neutral.

The location of the above archaeological sites in relation to the proposed Project is shown in the figure below.

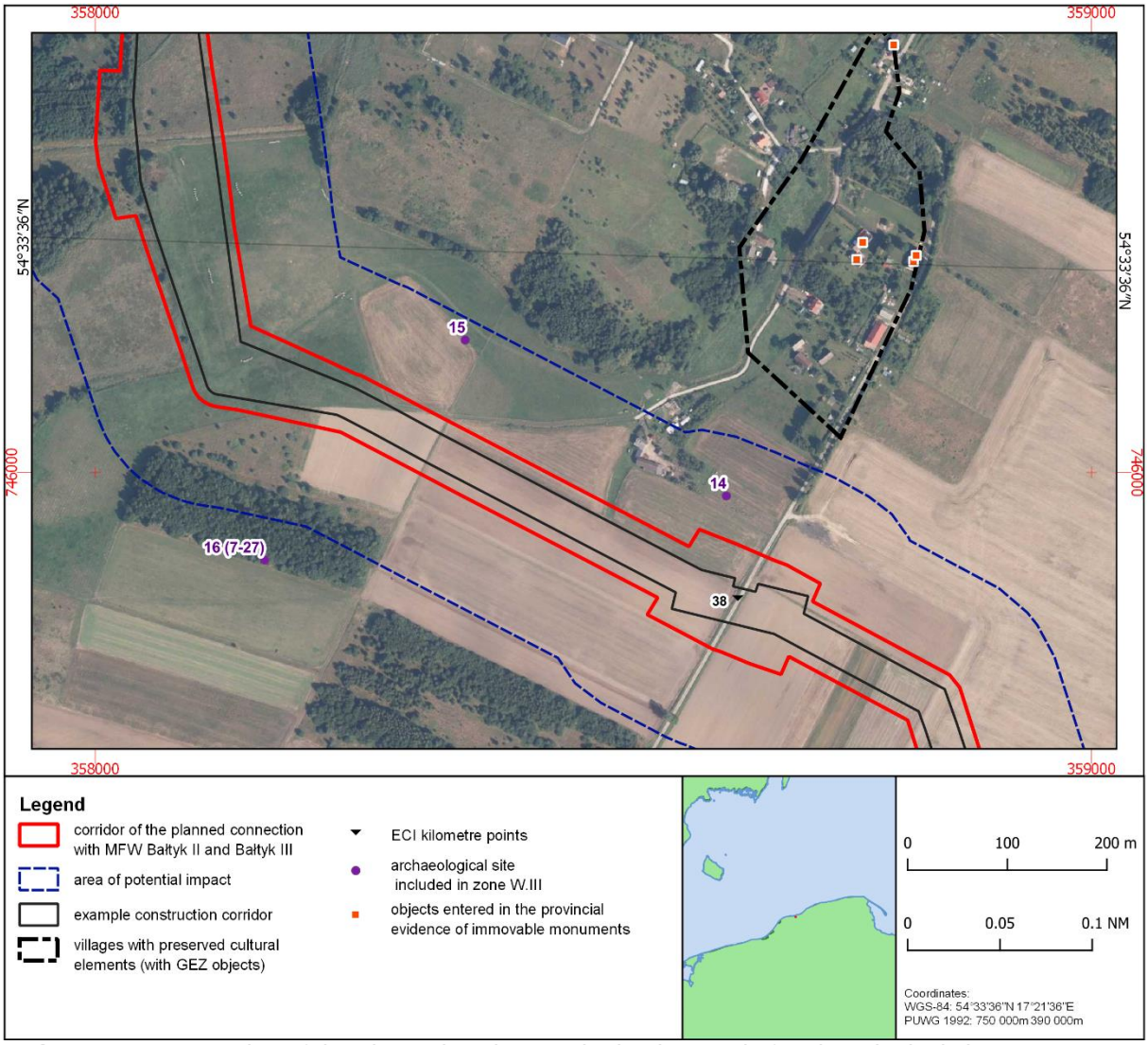


Figure 10.10. *Location of the planned Project on the background of archaeological sites No. 14, 15 and 16*

Source: own elaboration

If, during the course of construction or earthworks, the Contractor discovers an object which is presumed to be a historical monument, in accordance with the provisions of the Act of 23 July 2003 on the protection and care of historical monuments (Journal of Laws 2022.840, consolidated text), it shall:

- stop any work that might damage or destroy the object discovered;
- secure, using available means, this object and the place where it was discovered;
- immediately notify the competent provincial conservator of monuments, and if this is not possible, the competent mayor (mayor, city president).

The Provincial Conservator of Monuments should then inspect the discovered object and issue a decision which:

- allows interrupted works to continue if the object discovered is not a monument;
- allows for the continuation of the interrupted works if the object discovered is a monument and the continuation of the works will not lead to its destruction or damage;
- orders that the works be further halted and that archaeological investigations be carried out to the extent necessary, at the expense of the individual or organisational unit funding the works.

Once the archaeological investigations have been completed, the Provincial Conservator of Monuments will issue a decision allowing the interrupted works to continue.

The Provincial Conservator of Monuments may also impose an obligation to carry out permanent archaeological supervision on plots in the immediate vicinity of archaeological sites. During permanent archaeological supervision, observation of cultural layers and control of construction works will be carried out. Such measures are intended to prevent the destruction of as yet undiscovered archaeological monuments or sites whose extent is greater than that established during surface surveys.

Naval Training Centre (36.3 km)

It is located within the potential impact area of the planned Project, approximately 50 m from the boundaries of the construction corridor that will be directly associated with the construction works. The location of the HDD trenchless launching chamber is planned here. The works to be carried out will be confined to the boundaries of the construction corridor, therefore impacts of the construction phase on the historic buildings of the Naval Training Centre will not occur. The impact will be neutral.

Forester's lodge (Gajki 1) (45.8 km)

It is located within the potential impact area of the proposed Project, approximately 70 m from the boundaries of the construction corridor that will be directly associated with the construction works where the excavation will take place. The impact will be neutral.

Historic railway line (39.78 km) "Trail of the rolled-up tracks"

According to the "Study of the Conditions and Directions of Spatial Development of the Municipality of Ustka", it has been classified as a cultural asset. It is a non-functional railway line, from which the tracks have already been removed and only embankments and ravines with periodically occurring waterlogging remain. The area is currently used as a recreational horse trail.

The crossing of the historic railway line is not yet determined at this stage, two options are being considered: trenchless crossing and open excavation. The construction works may disrupt the existing use of the area (currently used as a recreational horse and pedestrian route) and in the future may affect the restriction of development and use of the historic railway line depending on the selected crossing option. The impact of the construction phase will be localised and short term. The impact will be neutral. However, it requires agreement with the Ustka Municipality.

In summary: construction works will take place at a distance from archaeological sites, historic buildings of the Naval Training Centre and the Gajki 1 Forester's lodge, with no risk of negative impact. Conducting construction works in the area of the complex of the 9th Battery of Standing Artillery in Lędów (9BAS) requires the agreement of the Voivodeship Conservator of Monuments, and in the area of the historical railway line - the Office of the Municipality of Ustka.

10.8.2. Operation phase

During the operation phase, the planned Project will have no impact on archaeological sites, the historic buildings of the Naval Training Centre and the Gajki 1 Forester's Lodge. The operation of the planned Project is a virtually maintenance-free process, limited to maintenance and servicing works, mainly in the area of cable wells, socket positions. In the area planned for the location of the ONS station, which is an agricultural and industrial area, there are no historical objects. During the operation phase, the road leading towards the beach along the facilities comprising the complex of the 9th Fixed Artillery Battery in Lędów (9BAS) (fortifications, school firing positions) will be used for these purposes. Due to the nature of the works, the impact will be neutral.

10.9. IMPACT ON CLIMATE AND ATMOSPHERIC CLEANLINESS

The planned Project will have an impact on atmospheric cleanliness during the construction phase and on the climate during the operation phase.

10.9.1. Construction phase

The planned Project will have an impact on air quality during the construction phase through:

- exhaust emissions from equipment and vehicles at the construction site,
- fugitive dust emissions (dust from heaps and dirt roads).

The operation of equipment and vehicles powered by internal combustion engines results in emissions of exhaust gases containing pollutants NOx, PM10, volatile organic compounds (VOCs) and carbon monoxide (CO). The amounts emitted depend on the type of engine, usage pattern, service history and fuel composition. The table below shows the emission factors for the different types of pollutants resulting from the combustion of fuel in internal combustion engines of machinery, which were included in the EMEP/EEA Air Pollutant Emission Inventory Quidebook (2007) published by the European Environment Agency. For the calculation of the amount of pollutants arising from the combustion of 1 kg of fuel, the highest rates were adopted for industrial and forestry machinery.

Table 10.8. *Emission factors for atmospheric pollutants resulting from the combustion of 1 kg of diesel in commercial machinery engines*

Diesel engline [g·kg^{-1} of fuel]	NO_x	NM-VOC	CH_4	CO	NH_3	N_2O	PM	$PM_{2,5}$
Industrial machines	48,8	7,08	0,17	15,8	0,007	1,30	2,29	2,15
Forest machines	50,3	6,50	0,17	14,5	0,007	1,32	2,42	2,27

Source: EMEP/EEA air pollutant emission inventory quidebook (2007)

Based on data from the Investor, the quantities of fuel required for the construction of the onshore part of the planned Project have been provisionally estimated.

For the trenchless passage through the coastal zone in the onshore part:

- construction/improvement of access roads - total approx. 50 m^3,
- generators for onshore drilling equipment - total approx. 400 m^3, if electric drilling equipment is used, hydraulic equipment consumes considerably more fuel (approx. 50% more = 600 m^3),
- construction equipment (excavators, cranes, etc.) - approx. 50 m^3.

Vehicles and equipment used for smaller trenchless crossings on land (regardless of the technology chosen):

- construction/improvement of access roads - approx. 10 m^3 in total,
- generators for onshore drilling equipment - approx. 300 m^3, hydraulic equipment consumes considerably more fuel (approx. 50% more = 450 m^3),
- construction equipment (excavators, cranes, etc.) - approx. 25 m^3.

Vehicles and equipment used for laying cables on land:

- backhoe loaders - total approx. 800 m^3,
- cranes - total approx. 55 m^3,

- trucks and vans - total approx. 650 m^3.
- ONS station construction:
- work and transport vehicles - up to 300 m^3.

In addition, there will be traffic of transport and construction vehicles and vehicles used to transport workers to and from the construction site.

Emissions of pollutants into the air during the construction phase will relate to the operation of small groups of equipment working simultaneously on small fragments, so emissions will be spread over time and space. It is assumed that the construction of approx. 1 km section of the route (open excavation) will take approximately 12 weeks. The highest concentrations of pollutants relate to NO2 emissions, which is a natural consequence of diesel combustion.

For construction machinery used in trenchless technology, it is estimated that there will be a lower environmental impact related to carbon dioxide emissions compared to traditional methods. Significantly less diesel-powered equipment is required when drilling with trenchless technology, as mainly hydraulic power units and generator-driven pumps are used, and excavator time is limited.

Fugitive emissions in the form of dust during the construction of the planned Project can be caused by various activities: vehicle traffic on dirt and gravel roads, earthworks. The fugitive dust emissions from construction activities will be variable in nature, depending on soil type, weather conditions and road surface conditions. For example, dry weather combined with higher than average wind speeds may generate more dust. Dust generated by construction activities is mainly of a size larger than the PM10 fraction, which can potentially affect human health. Construction activities may contribute to local and short-term increases in the concentration of this dust. Activities causing fugitive dust emissions are:

- heavy vehicle traffic on the construction site on dry or paved haul roads,
- earthworks, due to the handling, storage and disposal of soil,
- the use of construction aggregates, due to the transport, unloading, storage and use of dry and dusty materials (such as cement and sand).

Dust emissions due to vehicle traffic, excavation and soil storage will occur periodically and will be mainly confined to the construction area. The magnitude of such emissions is dependent on atmospheric conditions, for example, the humidity of the ground significantly reduces the uplift of dust due to vehicle traffic on dirt roads.

In the zone of influence of the planned Project there are 3 residential buildings (in the village of Lędowo near 38 km, in the village of Pęplino near 45 km and in the village of Gajki near 46 km), whose inhabitants may be temporarily exposed to minor fugitive dust emissions. Adverse impacts at these locations can be significantly reduced or eliminated.

The implementation of the planned Project during the construction phase will be associated with:

- a periodic increase in energy demand for construction, leading to an indirect increase in greenhouse gas emissions,
- an indirect increase in greenhouse gas emissions associated with the energy intensity of the Project (production of materials, transport, etc.)
- periodic direct increases in greenhouse gas emissions due to vehicle and machinery traffic, waste generation and deforestation.

The onshore construction phase will last approximately 1.5 years. In the permanently deforested construction corridor, there will be an increase in insolation and air temperature, an increase in ventilation and a decrease in humidity. There will be minor moisture and thermal changes at the ONS station due to the conversion of the active area.

Mitigation measures, i.e. the prevention or reduction of greenhouse gas emissions (and thus climate change mitigation), mainly consist of increasing the share of renewable energy in gross final energy consumption, improving energy efficiency, reducing the energy intensity of the economy, CO2 sequestration. For CO2, NO2 and particulate matter, standard mitigation measures consist of:

- carrying out the work during daylight hours,
- limiting the operation of vehicle engines to the minimum necessary,

- using modern and efficient equipment,
- locating the Project at sites with optimum transport and organisation in terms of pollution.

The planned Project will not have a significant impact on the climate during the construction phase, while the impact on air quality will be minor. This impact will be short-term, direct, confined to the limits of the Project's area of influence, and recoverable. Exhaust emissions during construction of such projects are not standardised.

A summary of the significance of adverse impacts of the planned Project on climate and air quality during the operational phase is presented below

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Local	**(2)**
The sensitivity/ uniqueness of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

The sum of the significance weights of the negative impacts is 10 and classifies the climate and air quality impacts during the construction phase as insignificant.

10.9.2. Operation phase

There will be no significant sources of air emissions during the operation phase, these will only be associated with maintenance and servicing works and will be limited to specific locations.

Climate impacts during the operation phase will be positive. The implementation of the planned Project is closely linked to the construction of the offshore wind farms Bałtyk II and Bałtyk III and they cannot operate independently. Environmental decisions have been issued for the Bałtyk II and Bałtyk III offshore wind farms. The generation of electricity from the wind farms, being a non-emitting and renewable source of energy, will significantly reduce emissions from coal combustion. It is estimated that the productivity of both farms will be approximately 10660 GWh per year, with a maximum capacity of 1.2 GW at each farm. As a result of the operation of both offshore wind farms, emissions of atmospheric pollutants in the form of CO2, SO2, NOX, CO and dust will be avoided. The projected reductions are shown in the table below.

Table 10.9. *Possible reduction ofatmospheric emissions from energy sources as a result of 25 years of operation of MFW BII and MFW BIII [t].*

	CO_2	**SO_2**	**NO_X**	**CO**	**pył**
As a result of 25 years operation	211 040 500	192 733,5	187 893,2	73 813,7	10 925,5
Divided into one year	8 441 620	7 709,34	7 515,728	2 952,548	437,02

Source: Environmental Impact Report for the MFW Bałtyk II (2021), Environmental Impact Report for the MFW Bałtyk III (2019)

The construction of offshore wind farms fits into the goals of climate change mitigation and adaptation, and greenhouse gas emissions from wind sources are significantly lower than those from conventional sources[598]. Transmission transport of energy from wind farms does not emit pollutants into the air, including greenhouse gases, further reducing the impact on climate.

[598] *Hyrzyński, R. i in., 2019*

Poland's dynamically developing economy is facing the problem of increasing demand for electricity and the need to upgrade transmission networks, while sticking to its international commitments to reduce greenhouse gas emissions. Offshore wind farms are recognised as an important component of the European offshore economy and as one of the most promising sectors. The introduction of new sources of electricity generation will influence the diversification of energy sources, which implies national energy security and independence.

Climate change mitigation should be understood as the way in which a project is planned, implemented, operated and decommissioned in such a way that it does not contribute to exacerbating change. Adaptation, on the other hand, is the adaptation of a project to climate change and the associated occurrence of extreme weather events. The following areas are identified as the most vulnerable to climate change: water management, forestry, agriculture, biodiversity, energy, construction, land use, transport, urban areas, health, mountain areas and coastal zones[599]. The investor's option of constructing an underground cable line along the entire length of the Project is part of the adaptation of the Project to changing weather conditions, as the cable line is much less prone to failures due to ice or strong winds. In the case of the energy sector, electricity demand is forecast to increase, while in the case of heat demand, a decrease or maintenance of current needs is forecast . Adaptation of the energy sector consists primarily of adjusting the energy system to fluctuations in electricity and heat demand and using renewable energy sources[600].

The coastal zone in which the planned Project is located is particularly vulnerable to the consequences of climate change. Scenarios indicate an increase in mean sea level along the entire coastline of approximately 5 cm by 2030. Negative impacts will also include an increase in the frequency and intensity of extreme events, in the case of the Baltic Sea this refers in particular to the duration, number and intensity of storms. In addition, there will be increased eutrophication, more frequent flooding of low-lying areas and coastal erosion. The occurrence of such phenomena will put strong pressure on coastal infrastructure.[601].

The European Green Deal aims to make Europe climate-neutral by 2050. The European Commission has proposed a European climate law to make this target legally binding. Among other things, it sets a new, more ambitious target for net greenhouse gas emissions - a reduction of at least 55% by 2030 compared to 1990 levels.[602]

A document focused on climate change issues and guaranteeing energy security is the Framework Strategy for a Sustainable Energy Union based on a forward-looking climate policy[603]. The strategy identifies the global challenges facing the EU energy system, which requires countries to work together and show solidarity to guarantee secure, affordable and sustainable energy for consumers. The objectives and priorities of the strategy include:

- reducing emissions by promoting investment in new technologies and new infrastructure and creating an integrated internal energy market by: creating more interconnections between EU countries to facilitate the rapid and free flow of energy; intensifying the construction and maintenance of essential infrastructure;
- ensuring security of supply by: diversification of energy sources, close cooperation between neighbouring countries in case of energy shortages or crises.

On adaptation to climate change, the overall objective of the EU Strategy is set to contribute to making Europe more resilient to climate change, which involves increasing preparedness and capacity to respond to the impacts of climate change at local, regional, national and EU level.

The Council of Ministers in 2013 adopted the Strategic Adaptation Plan for Sectors and Areas Vulnerable to Climate Change up to 2020 with an Outlook to 2030. Among the main directions was

[599] GDOŚ. Climate change mitigation and adaptation in environmental impact assessment Climate change mitigation and adaptation in environmental impact assessment.
[600] Adapting to climate change in Poland on the basis of the Strategic Adaptation Plan for Sectors and Areas Vulnerable to Climate Change up to 2020 with an Outlook up to 2030
601 ibidem
[602] European Union, Climate Action and Green Deal
[603] A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Policy. Communication from the European Commission (COM 2015/80 final), 2015.

ensuring energy security and good environmental status. The implementation of the planned project is in line with environmental objective 1.3 - Adaptation of the energy sector to climate change - Adaptation measure: Design of transmission networks, including, inter alia, underground and aboveground networks taking into account extreme weather situations, in order to reduce the risk of, inter alia, ice and snow, flooding and damage in cases of strong wind.

The impact of the planned Project on the state of atmospheric air and climate during the operation phase is assessed as positive.

10.10. IMPACT ON THE ACOUSTIC CLIMATE

10.10.1. Construction phase

The impact on the acoustic climate during the construction phase will be generated by vehicles and machinery used during construction, and will vary depending on the phase of the Project and the type of equipment used. Noise will be associated with the transport of construction materials, equipment and people, and will affect both the areas of direct construction work and areas around access roads.

The construction phase of underground cable lines, ONS substations will be a source of temporary noise, which will be caused by:

- preparatory works, organisation of construction facilities, material deliveries;
- tree felling with root cutting for cable lines and access roads;
- excavation work with excavators to dig a trench for the cable lines;
- trenchless drilling;
- drainage of excavations using needle-filters;
- earthworks carried out with bulldozers consisting of backfilling the trench and levelling the area.

The duration of construction will be a approx. 1.5 years. It is assumed that the construction of a approx. 1 km section of the route (open trench) will take approximately 12 weeks.

Due to the linear nature of the project and the nature of the open space works, noise will only occur in the section where the works are carried out and will subside as construction progresses.

Examples of noise levels (at a distance of 7 m from the working device) emitted by construction equipment and machinery are:

- crawler excavator - 85 dB;
- bulldozer - 87 dB;
- generator - 80 dB.

The planned Project will include trenchless crossings, which are an additional source of noise. There is then more machinery on site than when the section is constructed using the open excavation method. In addition, there are pumps with a sound power of approx. 93 dB, a mud recycling and recovery unit with a sound power of approx. 99 dB, a mud preparation mixer with a sound power of 89 dB and a drilling platform with a sound power of approx. 108 dB. The main difference that increases the impact on the acoustic climate of trenchless methods is the need for continuous operation (around the clock).

The construction works will be carried out in principle entirely in the vicinity of forest and agricultural areas at a distance from acoustically protected areas. In the zone of influence of the planned Project there are 3 residential buildings (in the village of Lędowo near 38 km, in the village of Pęplino near 45 km and in the village of Gajki near 46 km), whose inhabitants may be temporarily exposed to noise emissions.

In order to reduce noise nuisance, it is proposed in the sections of the connection route adjacent to residential buildings (km IP: 37.7-38.2; 45.8-45.3; 45.8-46.j3) to carry out construction works only during daytime hours, excluding Sundays and holidays.

In accordance with the guidelines contained in the Regulation of the Minister of Economy of 21 December 2005 on the essential requirements for equipment used outdoors in terms of noise emission to the environment (Dz.U.2005.263.2202 as amended), the level of acoustic power of equipment used in the construction industry is subject to limitations depending on the type of equipment and installed power.

The planned Project in the construction phase will not have a significant impact on the acoustic climate. Noise generated during the construction phase will be temporary, short-term, direct and local.

A summary of the significance of the negative impacts of the planned Project on the acoustic climate during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial range of impact	
Local	**(2)**
The sensitivity/ uniqueness of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

The sum of the significance weights of the negative impacts is 10 and qualifies the impact on the acoustic climate during the construction phase as insignificant.

10.10.2. Operation phase

Acoustic nuisance ECI of MFW Bałtyk II and MFW Bałtyk III in the operation phase will be related to the operation of the ONS substations. As part of the preparation of the EIA Report, calculations of noise emissions from the ONS station were made (Volume IV, Attachment 4).

Permissible noise levels emitted into the environment are set for areas of a protected nature, such as residential areas, leisure and recreation areas, hospitals, etc., while no permissible noise levels are set for forest, industrial and agricultural land. Permissible noise levels are therefore set for a given site, depending on the function of the site as defined primarily in the local zoning plan or, if there is no local plan, they depend on the actual use of the site.

The closest areas surrounding the stations, taking into account the actual surrounding land use are agricultural and forest areas, which are not acoustically protected, and the Poliart printing company located on plot No. 185/1, as well as the MOWI POLAND S.A. companies. The nearest single-family residential development in the village of Pęplino is located at a distance of about 729 m from the ONS stations.

The area of the analyzed ONS stations is covered by the provisions of the local spatial development plan (LDP) in accordance with Resolution No. XLV.564.2018 of the Ustka Municipality Council, dated October 26, 2018, on the adoption of a local spatial development plan for a part of the area located within the geodesic area of Pęplino, Ustka municipality. According to the above-mentioned MPZP, the area of the planned substations, are areas for the location of electric power equipment, for which no requirements have been specified with regard to the permissible noise level.

To the northeast of the site of the proposed stations, according to the local zoning plan, there are agricultural areas, industrial and service areas (Poliart printing company) and a small section of land designated for residential development. The area is currently overgrown with forest.

Issues relating to permissible levels of noise in the environment are regulated in the Regulation of the Minister of the Environment of June 14, 2007 on permissible levels of noise in the environment (Journal of Laws 2014.112 i.e.). According to the current regulations, the following normative (permissible) noise levels are assumed for single-family residential development:

- 50 dB - during the daytime (6:00-22:00)
- 40 dB - during the nighttime (22:00-6:00).

However, the following normative (permissible) noise levels are adopted for homestead, residential-service and multifamily developments:

- 55 dB - during the daytime (6:00-22:00)
- 45 dB - during the nighttime (22:00-6:00).

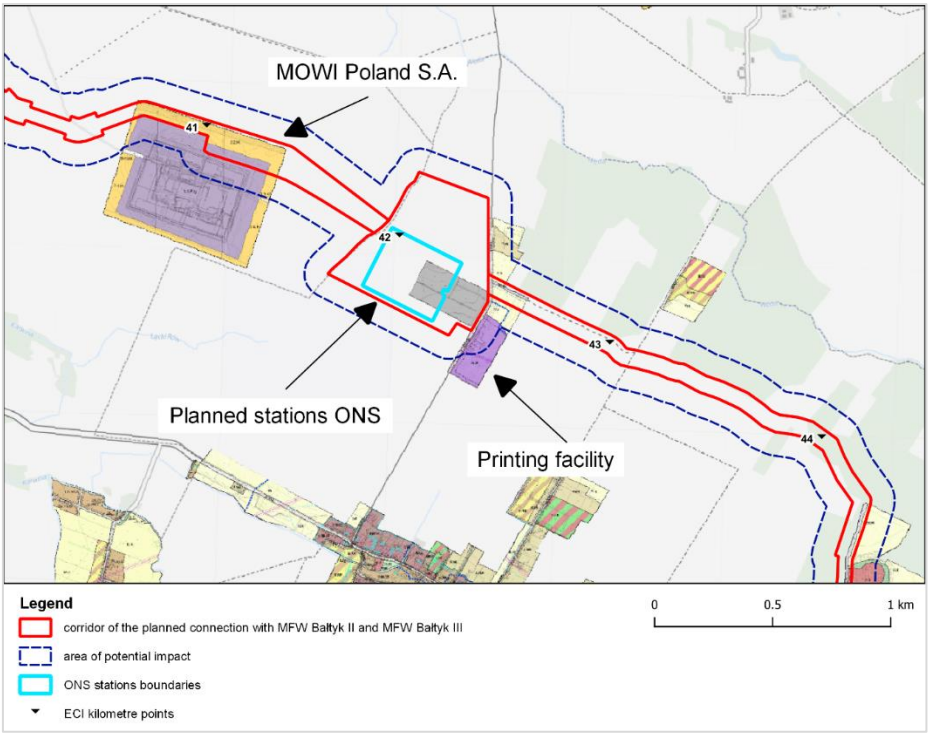


Figure 10.11. *Location of planned ONS stations against the background of local land use plans.*

Source: in-house study

The results of the model calculations showed that after construction and commissioning, the operating ONS stations, all of whose noise source equipment will operate continuously (24 h/day) at maximum acoustic power, will not result in exceeding the sound level limit set for the nighttime (40 dB) and time of day (50 dB) in the area of the nearest existing protected development (figure 10.12).

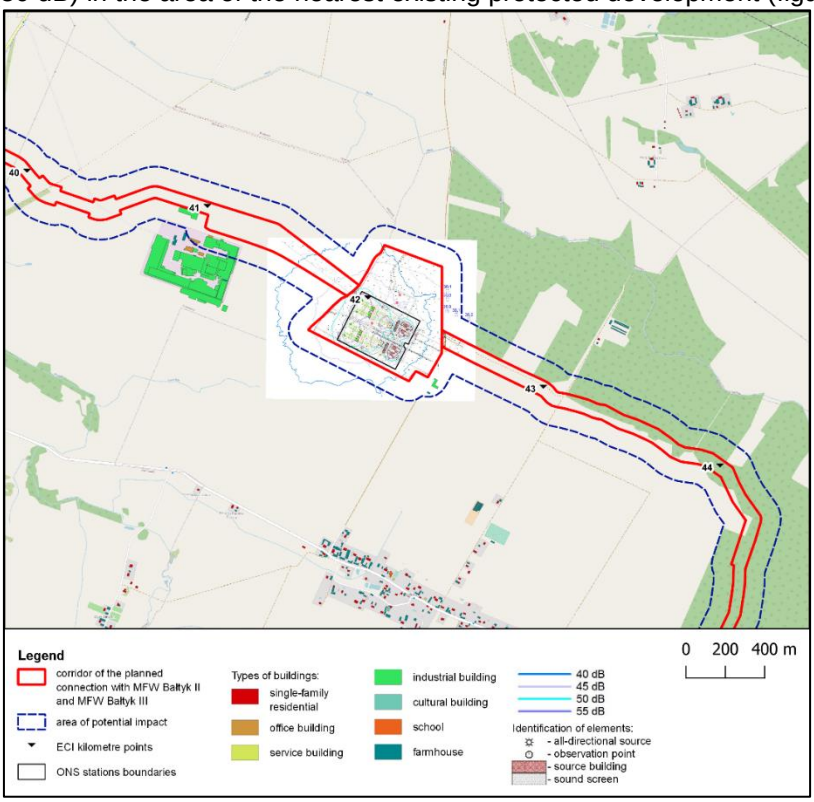


Figure 10.12. *Visualization of calculation results for time of day and night - in relation to actual land use*

Source: Noise emission calculations (Volume IV, Appendix 4).

The forest area near the station (to the northeast), which is designated for residential development in the LDP, will not be within the range of above-normal noise both at night (and during the day (figure 10.13).

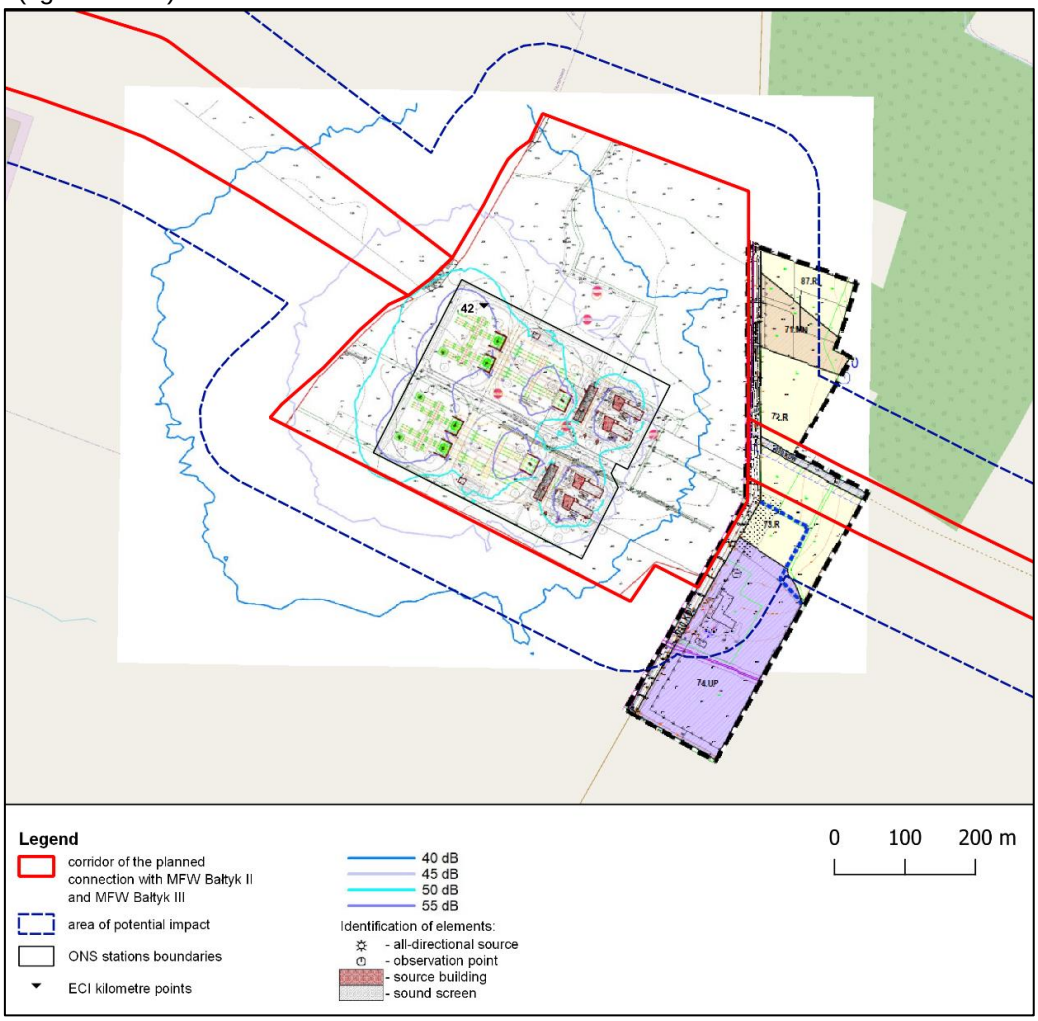


Figure 10.13. *Visualization of the results of calculations for the time of day and night - with reference to the MPZP.*

Source: Noise emission calculations (Volume IV, Appendix 4).

Summary: The planned Project in the operation phase will be a source of noise from the ONS station. However, it will not result in exceeding the sound level limit set for the nighttime (40 dB) as well as for the daytime (50 dB), both in the areas of actual land use and those designated for residential development in the MPZP[604].These will be indirect, long-term, permanent and local impacts. A summary of the significance of the negative impacts of the planned Project in the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long-term	**(3)**
Permanent	**(3)**
Spatial range of impact	
Local	**(2)**
The sensitivity/ uniqueness of the environment	
Small	**(1)**
Impact classification	**(13) Moderate**

[604] *Uchwała nr XL.514.2022 Rady Gminy Ustka z dnia 19 maja 2022 r. w sprawie uchwalenia miejscowego planu zagospodarowania przestrzennego dla obszaru obejmującego obręb geodezyjny Pęplino, gmina Ustka*

The sum of the significance weights of the negative impacts is 13 and qualifies the noise impact from the ONS station during the operation phase as moderate. Although the implementation of the planned Project will locally worsen the acoustic climate, acceptable noise levels will not be exceeded at the border of existing and planned development.

10.11. IMPACT ON ELECTROMAGNETIC FIELDS AND THERMAL IMPACTS

10.11.1. Electromagnetic fields in the operating phase

Any conductor carrying a current, both an overhead line conductor and a power cable, is a source of an electromagnetic field, which in certain situations, with significant values of individual field components, may have a negative impact on the environment and human health.

The elements of the current lines of most power devices generate an electromagnetic field, which due to the low frequency (50 Hz - the so-called quasi-stationary field) can be identified on the basis of two separately measured components: electric (E - electric field intensity) and magnetic (H - magnetic field intensity).

Electric fields with significant intensity values are generated mainly by elements of high-voltage systems, while the magnetic component reaches relatively high values in the vicinity of high-current circuits.

High voltage power cables (220 and 400 kV), due to the presence of sheaths shielding the working conductor of the cable, are not the source of the electric field, as its normal (radial) component disappears completely due to the presence of a semi-conductive screen surrounding the working conductor, copper or aluminum, and a conductive screen surrounding the insulating sheath. Consequently, estimating the levels of the electrical component outside the cable has no justification whatsoever.

On the other hand, the electric current flowing through the working conductor of the cable is the source of the magnetic field of relatively high values. The value of this field, usually determined above the cable line, to a height of 2.0 meters above ground level (in accordance with the requirements of the Regulation of the Minister of Climate of February 17, 2020 *on the methods of checking compliance with the permissible levels of electromagnetic fields in the environment*, the depth of laying the cable line underground and the distance between individual conductors (phases) forming a common electric circuit (cable run) have a decisive influence.

Reports on the negative impact on living organisms of the magnetic component of the electromagnetic field have appeared in the scientific literature for quite a long time, and although the mechanism of the impact of electromagnetic fields on biological structures is not thoroughly known, regulations have been introduced in many countries, including Poland, limiting exposure to these types of fields.

The legal act on protection against the effects of electromagnetic fields in environmental exposure is the Regulation of the Minister of Health of 17 December 2019 *on the permissible levels of electromagnetic fields in the environment* (Dz.U.2022.2630 consolidated text).

Pursuant to the provisions of this ordinance (appendix to the aforementioned ordinance), the electromagnetic field level with a frequency of 50 Hz allowed in the environment should not exceed the following limit values in places accessible to the public:

- electric field strength (E) - 10 kV / m,
- magnetic field strength (H) - 60 A / m.

Therefore, it is recognized, similarly to the provisions of the regulations in force in other countries, that fields with the above levels (and also those with lower levels) do not adversely affect any of the environmental elements (plants, animals, water or air), including humans, at the same time, not showing any cumulative and synergistic effects.

However, the cited legal act contains two important limitations regarding the above-mentioned limit values. One of them relates directly to the electric field (the electric component E of the electromagnetic field) with a frequency of 50 Hz. It stipulates that in areas designated for housing development, the electric component (E) of the electromagnetic field with a frequency of 50 Hz must not

exceed the value of 1 kV/m. This limitation, which is important in the case of high-voltage overhead lines, has no significance in the case of cable lines, including high-voltage cable lines, because, as already mentioned, power cables equipped with shielding coatings are not a source of an electric field penetrating into the environment (to the ground and air).

As part of the preparation of the Environmental Impact Report for the planned Project, calculations of magnetic field strength distribution in the vicinity of the proposed cable tracks were performed (Appendix 5 Volume IV).

According to the study: The results of the calculations show that regardless of the implementation of cable runs (4 lines operating at 220 kV or 2 lines operating at 400 kV), the highest values of the magnetic field strength over the cable route can be expected just above the ground (0.2 m above area level). At a height of 2 m above area level these values will be over three times lower.

The conducted estimates clearly indicate that even with the maximum load of individual cable lines, and consequently the entire cable run, the permissible value of the magnetic field strength (60 A / m) determined by the aforementioned regulation, will not be exceeded above the ground level, in particular at the height of 2.0 m above the area level. This means that the presence of people (environmental exposure) even directly above the cable lines will be allowed without any time limits.

Oddziaływania pól magnetycznych od podziemnych linii kablowych uznano za neutralne.

10.11.2. Thermal impacts in operation phase

The flow of electricity through cable power lines is not a lossless process, energy losses are generated in the form of heat released, in particular in the working conductor of the cable (they are related to the current flow and conductor resistance) and the main insulation of the cable (dielectric losses). The occurrence of energy losses in power cables causes the cables to heat up and the phenomenon of thermal influence on the environment when the temperature of the cable (its outer sheath) rises above the ambient temperature.

The magnitude of the thermal impact depends on many factors, the most important of which are: technical parameters of the cables used, the value of the current flowing, the method and depth of laying cable lines in the ground, the presence of other heat sources (e.g. other cable lines), soil parameters (e.g. thermal resistivity), humidity, degree of compaction, ground temperature, etc.) in which the cable lines are laid.

W ramach opracowania Raportu o oddziaływaniu na środowisko planowanego Przedsięwzięcia wykonano obliczenia rozkładu temperatury w otoczeniu projektowanych torów kablowych dla różnych konfiguracji geometrycznych układu kablowego (Załącznik 6 Tom IV).

The performed calculations for the assumed conditions for laying cable lines with a voltage of 220 kV and 400 kV show that the thermal effect of the cables introduces slight changes in temperature at the ground surface in the area above the cables. Taking into account that the performed calculations were made for a maximum load factor of 1, which assumes continuous transmission of maximum power through the designed cable lines, it can be concluded that the actual thermal impact of the designed cable lines will be smaller, as the actual power generation of the wind farm is closely related to weather conditions (depending on the wind speed) and reaches the maximum generation only for short periods of the year.

Thermal impacts from underground cable lines were considered neutral.

10.12. IMPACT ON HUMAN HEALTH AND LIFE AND MATERIAL ASSETS

The assessment of the potential socio-economic impact of the planned Project was conducted in terms of human health and living conditions, and separately on material assets.

To analyse the potential impact on material assets and human health and life, a detailed map analysis was conducted, followed by a site inspection at selected locations. The purpose of the site visit was to identify all material assets and residential development within the boundaries of the application for an environmental decision and within the boundaries of the potential impact assumed as a 100 m

wide strip of land from the boundary of the Project, as places potentially exposed to the negative impact of the construction. The site visit is summarised in the Site Inspection Cards (Subchapter 6.2) describing potential conflicts with existing and planned land use.

The Site Inspection Cards list the locations where the route of the planned Project passed near residential buildings, industrial facilities, monuments, roads, railways and other technical infrastructure.

The most part of the Project runs through forest and agricultural land, which in total cover over 92,8% of the area. It is located outside of residential development, away from high-density housing development, only fragmentarily crosses the MOWI fish processing plant site and passes through military areas, so there will be no significant negative impact on people and material assets during the construction phase.

Available statistical and business data (REGON data) to assess the impact of the planned Project on the socio-economic situation of the municipalities through which the corridor of the planned Project runs, was also used.

Statistical data on the labour market in the Pomorskie Voivodeship in 2020[605], made available by the Statistical Office in Gdansk, shows that the employment structure is dominated by industry in the municipality of Słupsk. The smallest number of people is employed in agriculture - about 133 persons (out of 18 206 inhabitants). In the case of the Ustka municipality, the employment structure is difficult to determine, as available statistical data is incomplete (table 10.10). The lack of availability of data on the number of persons employed in total and on those employed in industry is, according to the explanations of the CSO, due to the necessity of maintaining statistical secrecy and the impossible and pointless collection of information, which, as can be assumed, is related to the location of military facilities in this municipality. Based on the available data, it can only be deduced that approx. 59 people are employed in agriculture (out of 8,295 inhabitants of the municipality) - table 10.10.

Table 10.10. *Number of employed persons by employment section in the municipalities of Ustka and Słupsk in 2020.*

Municipality	Population	Population density	Total employed	Employed by section:			
				Agriculture*	Industry	Trade**	Financial and insurance activities***
Ustka	8,295	38.1	no data available	59	no data available	no data available	535
Słupsk	18,206	69.6	5,760	133	3,711	779	1,137

** - and forestry, hunting and fishing*

*** - repair of motor vehicles; transport and storage; accommodation and catering and information and communication*

**** - real estate services, other services*

Source: In-house study based on 'Labour market in Pomorskie Voivodeship in 2020'.

It could be tentatively assumed that the dominant source of employment in the Ustka municipality may be industry, as there is a big fish processing company, MOWI S.A, which employs about 4,000 people, which corresponds to half of the municipality's population (the planned Project is directly adjacent to MOWI S.A premises).

Employment in the Słupsk municipality is dominated by industry (there are about 40 big industrial-related companies), however the planned Project is located at a considerable distance from the industrial areas of the municipality concentrated in the immediate vicinity of the city of Słupsk. Other main types of employment are agriculture and services.

[605] *https://gdansk.stat.gov.pl*

In 2020, 811 entities were engaged in economic activity in the municipality of Ustka (table 10.11). The most numerous were entities providing accommodation and catering services - 203 entities. This is because of the touristic nature of the municipality. In towns such as Modlinek, Lędowo or Duninowo, located not more than 1 km from the planned Project, there is tourist accommodation in the form of pensions and bungalows for rent.

In 2020, 1,630 entities were engaged in business activity in the Słupsk municipality. The most numerous is the wholesale and retail trade - 340 entities. This is followed by entities providing services in the construction industry (286 entities). Entities providing accommodation and catering services are only 68.

Table 10.11. *Types of predominant activities in the municipalities of Ustka and Słupsk by individual sections of PKD 2007 in 2020.*

Section	Name	Number of business entities	
		Ustka	**Słupsk**
A	Agriculture, forestry, hunting and fishing	59	51
B	Mining and quarrying	1	2
C	Industrial processing	52	163
D	Electricity, gas, steam, hot water, and air conditioning supply	0	0
E	Water supply; sewerage, waste management and remediation activities	2	2
F	Construction	122	286
G	Wholesale and retail trade; repair of motor vehicles and motorbikes	146	**340**
H	Transport and storage	32	127
I	Accommodation and food service activities	**203**	68
J	Information and communication	13	32
K	Financial and insurance activities	10	46
L	Real estate activities	16	30
M	Professional, scientific, and technical activities	63	156
N	Administrative and support service activities	28	55
O	Public administration and defence; compulsory social security	0	0
P	Education	9	40
Q	Health care and social services	27	127
R	Arts, entertainment, and recreation activities	9	16
S and T	Other activities	19	89
U	Extraterritorial organisations and bodies	0	0
Total		**811**	**1630**

Source: Central Statistical Office, https://www.polskawliczbach.pl.

10.12.1. Construction phase

The main potential impact on people and their living conditions and on material assets will be related to the construction phase. The construction work on the onshore section is planned to start in late 2024/2025. The construction work will last approximately 1.5 years. Therefore, periodically, and locally, there may be impacts/nuisances to people such as:

- an increase in the volume of passenger and heavy vehicle traffic and the associated emissions of noise, atmospheric pollutants, and vibrations,
- a periodic inflow of more people (employees),

- a greater intensity of use of road infrastructure,
- reducing the use of agricultural and forestry land.

Health and living conditions of people

The planned Project covers the area of 7 villages, 3 of which are located in the municipality of Ustka: Lędowo, Duninowo, Pęplino and 4 in the municipality of Słupsk: Gajki, Wielichowo, Bruskowo Małe, Bruskowo Wielkie.Within the borders of the planned Project (the corridor covered by the application for the environmental decision) there are no residential buildings. However, in the area of the potential impact of the planned Project, 3 single-family buildings were identified - two in the municipality of Ustka, one in the municipality of Słupsk (figure 10.14):

- near km 37.8 at a distance of approx. 67 m from the corridor boundary, a residential building with a farm (Lędowo 6, Ustka municipality),
- around km 45.2 at a distance of approx. 53 m from the corridor boundary, a residential building (Graniczna 3, Pęplino, Ustka municipality),
- around km 45.8 at approx. 60 m from the corridor boundary, a residential/forestry building (Gajki 2, Bruskowo Leśnictwo precinct, Słupsk municipality).

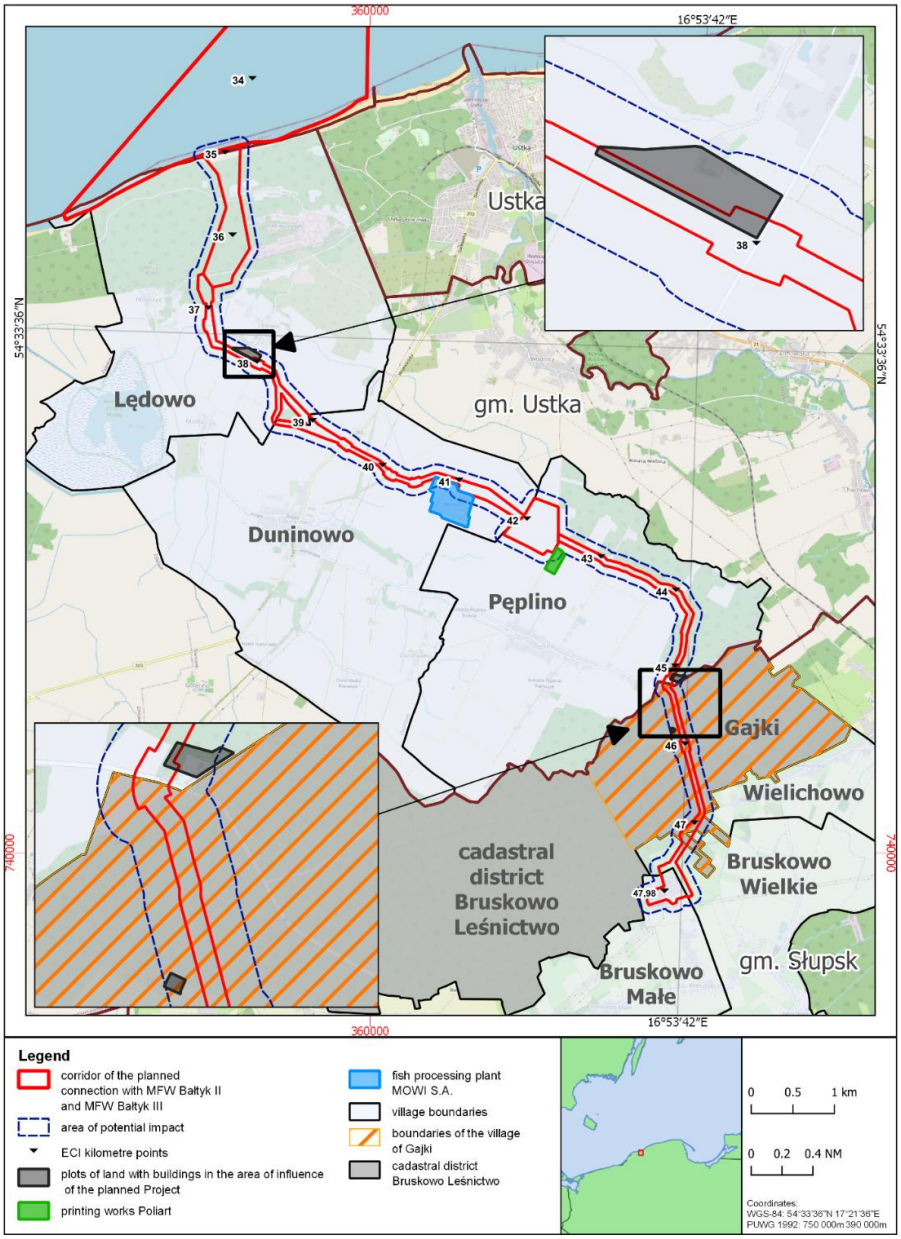


Figure 10.14. *Planned projects in the municipality of Ustka and the municipality of Słupsk*

Source: In-house study

The biggest construction-related nuisance will be at the place of the planned landfall of the cable lines because of the considerable extent of felling, earthworks and long-term continuous operation of drilling equipment, and heavy equipment traffic. The planned landfall site is at a considerable distance from any settlements (it is a wooded military area), directly adjacent to the firing range, the school fire station, and the main fire control point. The nearest residential development is more than 500 m away (Lędowo - Osiedle) from the planned cable landfall site.

The residential development sites found near the planned Project will be exposed to the construction phase impact of a smaller intensity, associated with the stream-lined frontage of cable line laying works. People living in these buildings will be temporarily exposed to nuisances such as:

- noise emissions from machinery and equipment working in the construction corridor (excavators, loaders, trucks with cable spools, etc.),
- vibration emissions at the location of short trenchless sections (road and watercourse crossings)
- emissions of dust pollutants (earthworks during windy weather),
- emissions from the combustion of oil in the engines of equipment and machinery working on the site,
- periodic difficulties in accessing properties next to the construction site.

The impact will decrease as the construction works progress. It is assumed that construction of a approx. 1-km section of excavation will take approximately 12 weeks. In case of obstructions to property access associated with the construction of the Project, some solutions (e.g., alternative access route) will be proposed and agreed upon in advance with property owners so as not to cause obstructions to communication.

The periodic nuisance of the construction phase may also affect people living in military areas, while the planned trenchless crossing of the Naval Training Centre site i.e., railway ramps, military buildings (barracks), roads and warehouses will reduce the negative impact associated with the construction.

The construction work around the MOWI S.A. fish processing plant in Duninowo (on the section of the ECI from kilometre 40 to 42.5) may periodically affect the access of workers and the continuity of the plant's operation, as the route of the ECI corridor crosses access roads to the plant and runs near the car park. Maintaining the smooth running of the plant, which employs about 4,000 people, during its operating hours and the shifts of employees should be considered when planning the organisation of works in this area.

To reduce the inconvenience of the construction phase for people, it is proposed in the sections of the connection route next to residential buildings (km: 37.7-38.2; 44.9-45.4; 45.6-46.1), to conduct construction works only during daytime hours, excluding Sundays and holidays.

In the Ustka municipality, some residents make their living from tourism during the summer season, therefore, when planning the organisation of works around tourist villages neighbouring with the planned Project, i.e.: Lędowo, Duninowo and Modlinek, it is necessary to take into account the limitation of inconvenience of the construction phase in the period from July to August (e.g. limitation of intensive transport through the area of these villages, ensuring traffic flow on access roads to these villages).

This may not be possible in the case of works that have to be conducted continuously, e.g., drilling, but efforts should be made to reduce vibrations and noise as much as possible. Developments next to obstacles that are planned for trenchless passage are:

- around km 37.8 a residential building with a farm (Lędowo 6, Ustka municipality) at a distance of approx. 200 m from the planned trenchless crossing of the district road No. DP 1103G,
- around km 45.2 a residential building (Graniczna 3, Pęplino, Ustka municipality) at approx. 120 m from the planned trenchless crossing of district road No. DP 1108G,

In addition, when planning construction work, noise-generating equipment should be moved away from single-family buildings as much as possible so that it does not interfere with the daily lives of residents. Atmospheric emissions of pollutants generated by construction equipment and devices will not be significant, also no exceedances related to these emissions will occur. Anticipated pollutant types and quantities are provided in Subchapter 3.3., 3.4., and 10.13.

Nuisance related to the impact of road transport of construction materials, equipment, and people, i.e., atmospheric pollution (exhaust fumes and dust from roads), noise, ground vibrations will be spatially limited to the immediate vicinity of the main access roads and temporarily limited to the period of construction works. Since the planned Project is far away from dense residential development, mostly at considerable distances from rural development areas, the above-mentioned nuisances will not significantly affect people. Because of the moderate extent of construction works and vehicular transport, and their implementation during daytime, no negative impact on human health is expected.

In view of the inflow of workers during the construction phase in the municipalities of Ustka and Słupsk, traffic intensity on roads may increase and the number of people using services (i.e., shops, restaurants, guest houses) may also increase. The presence of construction equipment moving on public roads may cause periodic traffic problems. The municipalities of Ustka and Słupsk belong to the tourist municipalities, where accommodation, services and accompanying infrastructure are adapted to a bigger inflow of people.

A periodic positive impact of the planned Project can also be expected, as the inflow of workers during the year can contribute to the development of services not only in summer, but also in winter, which will enable the nearby residents to receive budget revenues throughout the year. In addition, the planned Project may create new jobs during the construction and increase employment for residents. Therefore, the construction of the Project and the inflow of workers may cause negative and positive impacts on the socio-economic situation of the municipality, but the scale of these impacts will be temporary and local.

The construction phase also involves restricting access to areas affected by the construction work, such as forests or agricultural land. The tourist functions of the forests during the construction phase may be locally reduced. As the construction of a approx.1 km section of excavation will take approximately 12 weeks, the restriction will only occur in the section where construction work is currently taking place. Agricultural activities will have to be stopped for the duration of the construction in a strip of approx.32 m wide (including necessary extensions e.g. for trenchless crossings and extensions in the vicinity of landfall cables), while after the construction phase the condition of the arable land will be brought back to its original state, and the land will be used for agriculture again. Therefore, the negative impact associated with the restriction of access to agricultural land will be short-term, local, and reversible.

The cable corridor will run through the plots of private owners in addition to the land given for the construction of the ONS, which has already been bought by the Investor. Due to the need for open excavation, it will be necessary to cut trees, shrubs, and agricultural crops. There will be restrictions because of the works within the boundaries of a private plot, but once the works have been completed, it will be possible to use this land in accordance with its earlier use, except for the restriction of the possibility to plant trees. In addition, owners of plots of land through which the planned Project will run will be compensated, and farmers will be financially compensated for their losses during cultivation.

The table below summarises the assessment of the significance of the negative impact of the planned Project on people, health and living conditions during the construction phase:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(10) insignificant**

The sum of the significance weights of the negative impact is 10, so the impact during the construction phase on the population, health and living conditions have been assessed as insignificant. The main negative impact on people and living conditions during the construction phase will be nuisance related to noise, emissions, pollution and increased traffic, and restrictions on access

to agricultural land and forests. The positive impact will relate to the potential increase in employment for nearby residents and the development of services during the construction period.

Material assets

Material assets were assessed in relation to residential development, industrial development, military facilities, historic buildings and technical infrastructure.

The route of the planned Project avoids residential development and therefore no negative impact on residential and business development is expected during the construction phase.

There is industrial activity near the planned Project. In Ustka municipality, at 30 m from the ECI corridor border, there are buildings of the printing company Poliart, and at a distance of 9 m - buildings of the fish processing company MOWI S.A. The cable corridor passes through the MOWI S.A. car park. It is recommended to move the construction sites away from the existing car park. It is assumed that the construction works will be conducted in such a way as not to interfere with the proper functioning of the above-mentioned companies. It is recommended to consult with the owners of the two companies and inform them about the construction work in their vicinity to avoid conflicts related to the construction phase. The negative impact that may occur during the construction phase on industrial developments are short-term, reversible and within the boundaries of the Environmental Decision.

The crossing of the closed areas of the Naval Training Centre will be trenchless, so there is no potential for a negative impact on the buildings found there.

The planned Project crosses a disused historical railway line (‘Szlak zwiniętych torów’) around 39.7 km. At this stage, the crossing is not yet decided, and two options are being considered: trenchless crossing and open excavation. The construction works may disrupt the existing use of the area (currently used as a recreational horse and pedestrian route) and in the future may affect the restriction of development and use of the historic railway line depending on the crossing method chosen.

The paved roads and the railway line will be crossed using trenchless methods, so the Project will not cause traffic disruption due to the temporary exclusion of roads or railway lines from use. At this stage, a trenchless crossing is planned under the following roads and railway line:

- the public road - Bosmańska Street,
- railway line No. 405,
- district road No. DP 1102G,
- district road No. DP 1103G,
- regional road No. 203,
- municipal road No. 101047G-1,
- municipal road No. D 101202G-1,
- district road No. DP 1108G.

The crossing of the municipal road No.1107 G (km 45.9 of the ECI corridor) is currently planned to use an open excavation, as is the crossing of the access road leading from this road to the residential building/forestry house (Gajki 2, Bruskowo Leśnictwo precinct, Słupsk municipality). Due to the open excavation, construction works may periodically block or restrict access to the forester's lodge. Therefore, making a trenchless crossing of the communal road No. 1107G should be considered, which will avoid disruption of access to the above-mentioned property.

The presence of heavy construction equipment and machinery and increased traffic will cause exploitation of public roads and their more frequent damage. The construction of the planned Project may cause local damage to roads, especially those that are currently in poor condition. It may also improve the condition of roads, i.e., where the surface of currently dirt roads will be paved.

During the construction phase, demolition work is likely to be needed within the Ustka municipality. The building of the disused shooting range at the 35.5 km ECI corridor (building in poor technical condition) is scheduled for demolition. It is a decommissioned building of approximately 55 m^2. The building is likely to be demolished, the debris removed, and the entire site cleaned up. In addition, on the site of the planned ONSs, it is planned to cable the existing power line there and remove the existing poles. The demolition work will periodically cause noise, vibration and emissions, and the cabling of the power line may cause short-term power cuts.

In the case of the demolition of the disused shooting range, it will not cause nuisance to people as it is located at a considerable distance from residential development and surrounded by woodland. In the case of the cabling of the overhead line around the ONS substation, the nearest residential development is at a distance of approximately 729 m, however the extent of the demolition work will be smaller (removal of a few poles), so the nuisance will also be temporary.

The table below summarises the assessment of the significance of the adverse impact of the planned Project on material assets during the construction phase:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impact is 9, so the impact on material assets during the construction phase has been assessed to be insignificant. The negative impact on material assets during the construction phase will primarily relate to the use of existing road infrastructure.

10.12.2. Operation phase

The planned Project is maintenance-free in the operation phase; periodic service works may be conducted. During the operation phase, there will be the permanent noise emissions from the ONS and small heat emissions from underground cables. In addition, the Project will have potential benefits for people during operation, socio-economic related to improved energy security and financial benefits from land rent and taxes.

Health and living conditions of people

The permanent nuisances associated with the operation of the ECI of MFW Bałtyk II and MFW Bałtyk III relate to noise from both ONS substations and small heat and magnetic field emissions (underground cables).

The underground cable lines in operation will not cause a significant thermal impact. The heat emissions will be at a level of a few degrees above the assumed ground temperature, and the buried cables will also not cause the magnetic field limit to be exceeded. The results of the calculations show that, irrespective of the implementation of the cable lines (4 tracks operating at 220 kV or 2 tracks operating at 400 kV), the highest values of magnetic field strength can be expected just above the ground surface (0.2 m HAGL). At 2 m HAGL, these values will be more than three times lower.

The estimates clearly show that even at the maximum load of the individual cable lines, the field strength limit (60 A/m) will not be exceeded above ground level, particularly at a height of 2.0 m HAGL. This means that people will be allowed to stay even directly above the cable lines without any time restrictions (Volume IV, Attachment 5).

The nearest existing single-family residential development is approximately 729 m from the planned ONSs. The calculations of noise levels show (Volume IV, Appendix 4) that:

- after construction and commissioning, the functioning LSE stations, all of whose noise source equipment will operate continuously (24 h/day) at maximum acoustic power, will not cause exceedance of the permissible sound level set for the night time (40 dB) and day time (50 dB) in the area of the nearest existing protected development;
- the forest area located in the vicinity of the station (from the northeast), which is designated for residential development in the MPZP, will not be within the range of above-normal noise both at night and during the day (see Chapter 10.10.).

The planned Project conditions the use of clean energy from the offshore wind farms MFW Bałtyk II and MFW Bałtyk III, therefore, during the operation phase of the connection, positive health effects can be

shown by reducing the use of emission sources and using green energy that does not emit carbon dioxide into the atmosphere. Submerged and underground cables will transmit clean energy that will not worsen the cleanliness of the air inhaled by people, which will have a positive impact on their health.

The operation of the planned Project will also have a positive impact on people's living conditions. It will have a positive impact on the local economy of both municipalities. It is forecast that up to approx. 2% of the Project's value will go to the budgets, which will indirectly cause better living conditions of the inhabitants through the possibility of new investments in the municipalities. In addition, owners of plots of land through which the planned Project will run will receive compensation, and farmers will be financially compensated for their losses during cultivation.

The operation of the planned Project will improve the conditions of the inhabitants in terms of electricity supply for household and domestic needs. It will improve the condition of the electricity system in the region, including increasing its reliability, which will improve the supply of electricity to residential and working facilities. The implementation of the planned Project is a key step towards improving energy security. The development of the electricity transmission system will have a good impact on the development of the distribution system in the region, which is currently in need of modernisation and expansion.

A beneficial impact for the region will be the Investor's non-business activities related to corporate social responsibility, which allow the social interests of various stakeholder groups to be considered. The Investor is currently piloting classes for secondary school students and has created new secondary and tertiary education courses related to energy and electricity. These activities are aimed at educating the local workforce and supplying development and employment for municipalities and residents. Such measures will have a positive impact on the living conditions of residents.

The table below summarises the assessment of the significance of the negative impact of the planned Project on people, health and living conditions during the operational phase:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the boundaries of the ED	**(1)**
Sensitivity/vulnerability of the environment	
Low	**(1)**
Impact classification	**(11) insignificant**

The sum of the significance weights of the negative impact is 11, so the impact during the operational phase on the population, health and living conditions has been assessed as insignificant. The main potential negative impact on people and living conditions during the operational phase will relate to noise emissions (ONS substations) and small heat and magnetic field emissions (overground cable lines).

Material assets

No negative impact of the planned Project on material assets is expected during the operation phase of the planned connections. However, within the technological zone, up to 10-31 m wide, there will be restrictions related to the need to ensure the safety of energy transmission: it will be prohibited to erect structures and set up permanent storage facilities and afforestation in the safety zone. The safety zone will be considered when considering applications for development conditions to eliminate the possibility of planning new buildings within the construction corridor.

Summary of the socio-economic impacts of the planned Project

The following table (table 10.12) shows the most important socio-economic conditions that have been considered in assessing the socio-economic impact of the planned Project.

Table 10.12. *Summary of socio-economic conditions considered in assessing the impact of the planned Project*

Socio-economic conditions	Municipalities	
	Ustka	**Słupsk**
Length of the ECI route within the municipality	11 km	3 km
Population	8,295 people	18,206 people
Villages to be crossed by the ECI route	Lędowo Duninowo Pęplino	Gajki Wielichowo Bruskowo Małe Bruskowo Wielkie
The nearest residential development	residential building (Graniczna 3, Pęplino) approx. 53 m from the corridor boundary	residential/forestry building (Gajki 2, Bruskowo Leśnictwo precinct), approx. 60 m from the corridor boundary
Paved roads planned for trenchless passage	7 roads	fragment of a municipal road by the PSE S.A. station. Słupsk Wierzbięcino
Roads planned to be crossed by open trench	-	1 road
Enterprises in the corridor of the planned Project	A part of the MOWI S.A. car park.	-
Companies in the zone up to 100 m	Poliart printing company (ONS area)	-
Crossed railway lines	1 local railway line	-
Dominant source of employment	industry	industry
Tourist destinations around the Project	• Modlinek (approx. 320 m from the ECI corridor) • Lędowo (approx. 320 m from the ECI corridor) • Duninowo (approx. 600 m from the ECI corridor)	• Gałęzinowo (more than 2 km from the ECI corridor)
Places attractive to tourists interfering with the ECI	• Cycle route on road No. 203 (approx. 39.5 km of the ECI corridor) • Disused railway line " Szlak zwiniętych torów " • (approx. km 39.78 of the ECI corridor) • Eurovelo 10 cycle route • (approx. 42.5 km of the ECI corridor)	-

Source: In-house study

A much longer section of the planned Project runs through the territory of the Ustka municipality, and therefore there are more objects on its territory that may be affected by the construction phase. These are: 7 roads, 3 bicycle routes, 1 local railway line (and the disused line of the so-called 'Szlak zwiniętych torów') and single residential buildings in close proximity to the ECI corridor (including tourist destinations) and the industrial area of MOWI S.A. Apart from one residential house and one road, there are no sensitive objects in the municipality of Słupsk.

The number of the identified potential collisions is low, and the potential impact can be minimised through a proper organisation of the works:

- in the area of km 39.4 to 42.5 of the ECI corridor, when planning the organisation of works, access to MOWI S.A. should be provided taking into account the work shift (roads: No.101202G-1 (Site Inspection Card No. 15) and district road No. 203 (Site Inspection Card No. 12),
- in the area of km: 37.7-38.2; 44.9-45.4; 45.6-46.1 of the ECI corridor, the construction works are recommended to only be conducted during daytime hours, excluding Sundays and holidays, because of the proximity of residential buildings,
- in the area of tourist villages around the planned Project, i.e.: Lędowo, Duninowo and Modlinek, the limitation of nuisance of the construction phase in the period July - August should be taken into account (e.g., limitation of intensive transport through the area of these villages, ensuring traffic flow on the access roads to these villages).

Furthermore, from the assessment conducted for the construction and operation phase, in addition to the insignificant negative impact, the possibility of the positive impact was found, related to the potential increase in income from the provision of property, accommodation and catering for workers. Moderate impacts have been identified with regard to noise emissions from the LSE station. The operation of the ONS stations will not result in exceeding the permissible value of the sound level set for the night time (40 dB) as well as for the day time (50 dB), both in the areas of actual land use and those intended for residential development in the ONS[606].

The socio-economic impact is summarised in the table (table 10.13).

Table 10.13. *Summary of the socio-economic impact of the construction and operation phases*

Impact	**Impact**	
	Population, health and living conditions	**Material assets**
Construction phase - duration approx. 1.5 years		
Noise, vibration and pollutant emissions	Negative insignificant	Negative insignificant
Increase in traffic	Negative insignificant	Negative insignificant
Land occupation	Negative insignificant	Negative insignificant
Employment of staff	**Positive**	No impact
Inflow of workers in the region	Negative insignificant and **positive**	Negative insignificant
Operation phase - duration approx. 30 years		
Thermal and magnetic field emissions (cable)	Negative insignificant	No impact
Noise emissions from the ONS	Moderate	No impact
Land occupation	**Positive**	Negative insignificant (concerns historic railway line)
Green energy production	**Positive**	**Positive**
Improving energy security	**Positive**	**Positive**
Budget revenue	**Positive**	**Positive**
Non-business benefits	**Positive**	**Positive**
Employment of staff	**Positive**	No impact

Source: In-house study

[606] *Uchwała nr XL.514.2022 Rady Gminy Ustka z dnia 19 maja 2022 r. w sprawie uchwalenia miejscowego planu zagospodarowania przestrzennego dla obszaru obejmującego obręb geodezyjny Pęplino, gmina Ustka*

10.13. WASTE MANAGEMENT

The planned Project will generate waste at each of its stages. The predicted types and quantities of waste generated during the construction, operation and decommissioning phase are presented in the form of a table. Waste names and their codes are in accordance with the Regulation of the Minister of Climate of 2 January 2020 on waste catalogue (Journal of Laws 2020 item 10). At the current stage of work advancement, it is not possible to precisely determine types of generated waste and their quantities, therefore the table includes all theoretically possible types of waste and estimates their maximum expected quantities on the basis of information on the assumed technology and the longest assumed duration of onshore and offshore works.

10.13.1. Construction phase

The planned Project will be a source of waste from typical construction work associated with the excavation of cables, construction of the onshore substation and the 400 kV overhead line - table 10.14.

The trenchless transition from sea to land will generate waste code 16 10 *02 Aqueous liquid wastes other than those mentioned in 16 10 01*. The amount of waste will result from the adopted trenchless technology and estimated to be 600 - 800 m^3.

Table 10.14. *A summary of maximum estimated amounts of waste generated during the onshore construction phase*

Waste code (*hazardous waste)	**Type of waste**	**Estimated maximum quantity [Mg/year]**
05	**Wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal**	
05 01 17	Bitumen	0.04
08	**Wastes from the manufacture, formulation, supply and use of coatings (paints, varnishes and vitreous enamels) adhesives, sealants and printing inks**	
08 01 11*	Waste paint and varnish containing organic solvents or other dangerous substances	0.25
08 01 12	Waste paint and varnish other than those mentioned in 08 01 11	<0.3
08 01 17*	Wastes from paint or varnish removal containing organic solvents or other dangerous substances	0.06
13	**Waste oils and liquid fuel wastes (excluding edible oils and groups 05, 12 and 19)**	
13 03 07*	Mineral-based non-chlorinated insulating and heat transmission oils	0.22
15	**Packaging wastes: absorbents, wiping cloths, filter materials and protective clothing not otherwise specified**	
15 01 01	Paper and cardboard packaging	< 1.9
15 01 02	Plastic packaging	< 1.9
15 01 03	Wooden packaging	< 3.7
15 01 04	Metallic packaging	< 1.9
15 01 06	Mixed packaging	0.5
15 01 10*	Packaging containing residues of or contaminated by dangerous substances	5.5
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	0.6
15 02 03	Absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	0.6

17	**Waste from construction, renovation and demolition of buildings and road infrastructure (including soil and soil from contaminated sites)**	
17 01 01	Concrete	1.3
17 01 03	Tiles and ceramics	0.03
17 01 07	Mixtures of concrete, bricks, tiles and ceramics	216
17 01 81	Waste from road renovation and reconstruction	6.2
17 02 01	Wood	75
17 02 03	Plastic	1.9
17 03 01*	Bituminous mixtures containing coal tar	1.5
17 04 01	Copper, bronze, brass	1.6
17 04 02	Aluminium	0.3
17 04 03	Lead	0.8
17 04 04	Zinc	0.01
17 04 05	Iron and steel	0.3
17 04 07	Mixed metals	7
17 04 11	Cables other than those mentioned in 17 04 10	1
17 05 04	Soil and stones other than those mentioned in 17 05 03	160
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	11
17 09 03*	Other construction and demolition wastes (including mixed wastes) containing dangerous substances	0.3
20	**Municipal wastes including fractions collected separately**	
20 01 01	Paper and cardboard	< 0.3
20 01 02	Glass	< 0.3
20 01 21*	Fluorescent tubes and other mercury-containing waste	< 0.06
20 01 39	Plastics	< 0.3
20 01 40	Metals	< 0.6
20 03 01	Mixed municipal waste	< 2

Source: In-house study

The demolition work will generate waste from group 17 - waste from construction, repair and dismantling of buildings. Demolition will only concern the old shooting range building and the 15 kV overhead line. The demolition work will generate waste such as concrete and concrete rubble, bituminous masses, cables, and wood, iron and steel, among others. Old concrete slabs and building remains (ruins) may be encountered in the vicinity of the shooting range building and may need to be cleaned up. table 10.15 provides an estimate of the amount of waste generated during demolition works.

Table 10.15. *A summary of maximum estimated amounts of waste generated during decommissioning*

Waste code (*hazardous waste)	**Type of waste**	**Estimated maximum quantity [Mg/year]**
17	**Waste from construction, renovation and demolition of buildings and road infrastructure**	
17 01 01	concrete	58.0
17 02 01	wood	1.0

Waste code (*hazardous waste)	**Type of waste**	**Estimated maximum quantity [Mg/year]**
17 02 02	glass	0.5
17 02 03	plastic	0.01
17 04 01	copper, bronze, brass	0.01
17 04 05	iron and steel	18.0
17 04 11	cables other than those mentioned in 17 04 10	0.01
17 05 03*	soil and stones containing dangerous substances	0.01
17 05 04	soil and stones other than those mentioned in 17 05 03	0.01
17 06 04	insulation materials other than those mentioned in 17 06 01 and 17 06 03	0.01
17 09 03*	other construction and demolition wastes (including mixed wastes) containing dangerous substances	0.15

Source: In-house study

In accordance with national legal requirements, the Act of 14 December 2012 on waste (Journal of Laws 2021.779, as amended), the producer of waste generated during construction works is the contractor of these works. He will be obliged to manage waste in accordance with the requirements of the aforementioned Act, i.e. in the first place to prevent the generation of waste, and in the event of its generation to collect it selectively and transfer it to entities holding a permit for the transport or collection of waste. All waste will be:

- sorted in containers on site and transported to the local collection facility by specialised external companies - in accordance with the waste transport and handling permits, hazardous waste should be collected in labelled, closed and leak-proof containers;
- wastewater will be collected in tanks. Further handling of wastewater will be carried out by companies with appropriate permits.

Transport and further waste management will be the responsibility of specialist companies - in accordance with transport and waste management permits. All generated waste and wastewater will be collected and then delivered to an approved treatment plant in accordance with legal requirements. No direct discharge of wastewater into the environment is anticipated.

The construction work shall be carried out in such a way as to minimise the amount of construction waste generated, materials used in the course of construction work shall be used rationally. Construction work should be carried out with care so as to eliminate the possibility of damage to the facilities under construction.

10.13.2. Operation phase

During the operation phase of the planned Project small amounts of waste will be generated as a result of the operation of the substation. This will include waste arising from the normal operation of the facilities, as well as waste arising from periodic maintenance and refurbishment work. (table 10.16).

Table 10.16. *A summary of maximum estimated amounts of waste generated in one year of operation onshore*

Waste code (*hazardous waste)	**Type of waste**	**Estimated maximum quantity [Mg/year]**
08	**Wastes from surface treatment including paints, varnishes and enamels**	
08 01 11*	Waste paint and varnish containing organic solvents or other dangerous substances	<0.375

Waste code (*hazardous waste)	**Type of waste**	**Estimated maximum quantity [Mg/year]**
08 01 17*	Wastes from paint or varnish removal containing organic solvents or other dangerous substances	0.06
08 01 18	Wastes from paint or varnish removal other than those mentioned in 08 01 17	0.01
13	**Used oils and wastes of liquid fuels**	
13 01 05*	Non-chlorinated emulsions	1.0
13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	1.0
13 03 07*	Mineral-based non-chlorinated insulating and heat transmission oils	0.2
13 05 02*	Sludges from oil/water separators	0.03
13 05 06*	Oil from oil/water separators	0.01
13 05 07*	Oily water from oil/water separators	<0.01
15	**Packaging waste, absorbents, filter materials, wiping cloths and protective clothing**	
15 01 01	Paper and cardboard packaging	0.01
15 01 02	Plastic packaging	0.01
15 01 10*	Packaging containing residues of or contaminated by dangerous substances	0.5
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	0.3
15 02 03	Absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	0.02
16	**Wastes not included in other groups**	
16 01 07*	Oil filters	0.06
16 02 13*	Discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12	0.03
16 02 14	Discarded equipment other than those mentioned in 16 02 09 to 16 02 13	0.004
16 02 15*	Hazardous components removed from discarded equipment	0.004
16 02 16	components removed from discarded equipment other than those mentioned in 16 02 15	0.004
16 05 04*	Gases in pressure containers (including halons) containing dangerous substances	0.02
16 06 01*	Lead batteries	1.9
16 06 02*	Ni-Cd batteries	0.3
16 06 04	Alkaline batteries (except 16 06 03)	0.1
17	**Wastes from construction and renovation of buildings**	
17 01 03	Tiles and ceramics	0.01
17 04 01	Copper, bronze, brass	0.01
17 04 02	Aluminium	0.01
17 04 05	Iron and steel	0.01
17 04 11	Cables other than those mentioned in 17 04 10	2.0
17 09 03*	Other construction and demolition wastes (including mixed wastes) containing dangerous substances	0.004
17 09 04*	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	0.01

Waste code (*hazardous waste)	Type of waste	Estimated maximum quantity [Mg/year]
20	**Municipal wastes including fractions collected separately**	
20 01 01	Paper and cardboard	< 0.3
20 01 02	Glass	< 0.3
20 01 21*	Fluorescent tubes and other mercury-containing waste	< 0.01
20 01 39	Plastics	< 0.3
20 01 40	Metals	< 0.3
20 03 01	Mixed municipal waste	< 0.6

Source: In-house study

The amount of waste generated during the operation phase of the substation will be significantly smaller than during the construction phase. The onshore substations is a source of a negligible amount of waste generated only during its operation, small quantities of both hazardous and non-hazardous waste may be generated. This will be waste generated during normal operation of the facility as well as during periodic maintenance and repair work.

It is assumed that the need for service repairs will not occur earlier than after several years of operation. Waste generated during the operation phase will be taken away for disposal in containers prepared for this purpose by authorised companies.

The decommissioning process is the reversed building process, with the same logistic layout. The offshore section will consist of decommissioning offshore substations (OSS) and submarine cables. The offshore substations will be drained from their oils and lubricants, will be dismantled and their foundations cut away from the seabed. All parts will be recycled.

In the case of cables, once de-energized and inactivated, two possible methods of decommissioning are envisaged, either by leaving them in the bottom and in the ground or by removing them. The final decision on how the Project will be decommissioned will be made after the operation is completed.

10.14. RESTRICTED AREAS

The route of the planned Project in the Investor's option on the section of about 1.4 km runs through the military area of the Naval Training Centre in the area of the village of Lędowo (Ustka commune) - the area of km approx. 35.1 to km approx. 36.5. The military area through which the connection will pass was established by Decision No. 80/MON of the Minister of National Defence dated 8 June 2022 on the determination of closed areas in the national Defence Ministry. These are the following plots of land: 357/8, 357/24, 359, 89/4, 89/5, 90/6, 113/2, 113/3, 114/3, 115/5, 117/5 precinct Lędowo, rural municipality of Ustka (Figure 10.15.).

Within the military area, the route of the ECI corridor runs through dunes, forest areas and built-up areas. At the design stage, it will be necessary to contact the manager of the closed area, i.e. the Regional Infrastructure Management Board in Gdynia.

The crossing of the closed areas of the Naval Training Centre is planned with the open excavation method, excluding plot no. 359, Lędowo precinct, which will be crossed with the trenchless method due to the presence of military buildings there.

Negative impacts during construction will be related to emissions of noise, pollutants and vibrations from heavy machinery. These impacts will be local, short-term and reversible. As work is carried out on the remaining plots using the open excavation method, it will be necessary to cut down trees in a corridor up to approx..32 m wide and restrict land use in this area, i.e. prohibit the erection of

warehouses and other cubic buildings. These will be negative impacts, within the limits of the ED, long-term and permanent.

In the exploitation stage, apart from the permanent felling of trees and the lack of possibility to build a permanent technological corridor (except for plot 359), no other negative impacts are expected. The results of magnetic field emissions from underground cables showed no exceedances and thermal impacts slightly deviate from the background.

Impacts during the construction and operation phases on restricted areas have been assessed as negative insignificant.

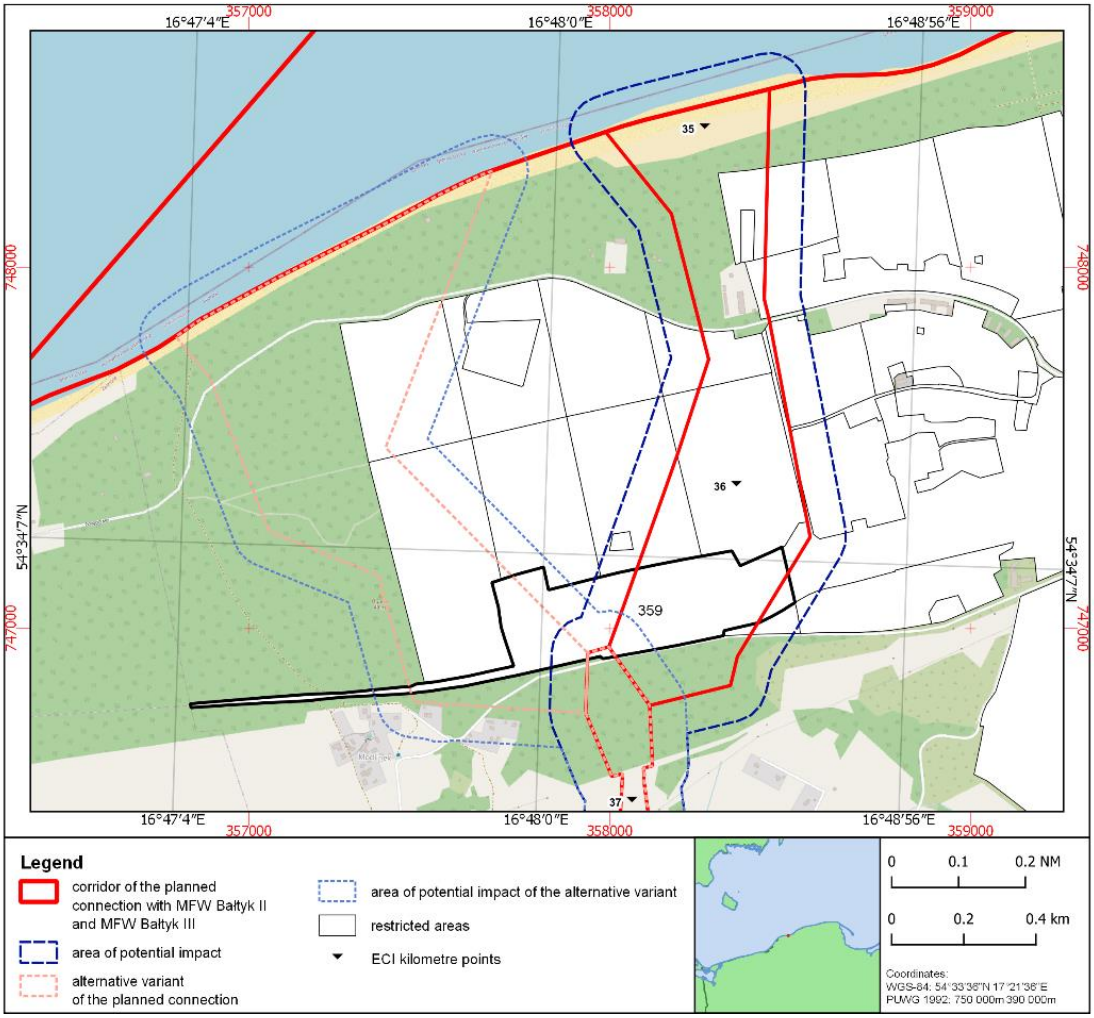


Figure 10.15. *Closed areas along the route of the planned Project*

Source: In-house study

10.15. IMPACTS OF THE DECOMMISSIONING PHASE

The decommissioning process is a reverse construction process, with the same logistical layout. The impacts during the decommissioning phase of the ECI from MFW Bałtyk II and MFW Bałtyk III will be similar to the impacts of the construction phase.

Prior to the end of operation of the Project, the onshore stations will be emptied of oil and lubricants for disposal. The stations will be dismantled and all parts recycled. The impacts associated with the decommissioning of the ONSs will be the same as the construction phase. The decommissioning of the facilities will result in the reclamation of the land for its original agricultural use.

In the case of cables, once de-energised and inactive, two possible decommissioning options are envisaged, either by leaving them in the ground or removing them. At this stage it is not possible to prejudge what the decision will be regarding the decommissioning of the Project. The cessation of use

of the underground cable line will be associated with the reclamation of the land for its forest and agriculture use.

Impacts during the decommissioning phase of the ECI from MFW Bałtyk II and MFW Bałtyk III will be similar to those of the construction phase, and there will even be positive impacts on components such as landscape and people and material assets. Cessation of use of the ECI will result in the absence of emissions of electromagnetic fields, thermal impact and noise.

The negative impact of the planned Project on the ground surface, relief, geological structure and soils in the decommissioning phase will be possible only in case of a decision on removal of the transmission cables located under the ground surface. It will be the same as the impact of the planned Project at the construction phase. It should be emphasised that the interference will involve an already transformed surface (during the construction phase). Impacts to the dune will be negative, direct, secondary, short-term, reversible and within the boundaries of the ED, subject to the need to apply the proposed solutions to divert traffic and construction machinery away from the dune and maintain the vegetation on the dune surface after the decommissioning phase.

The negative impact of the planned Project on surface water will be the same as the impact of the Project during the construction phase. When planning the works, particular attention should be paid to the possible dismantling of the cables in the area of the wet valley and Struga Lędowska (37.2 km), so as not to affect the hydrological conditions there.

During the decommissioning phase of the planned Project, when the decision is taken to remove the transmission cables under the ground surface, there will be a further transformation of the technological corridor of 20 m for the 400 kV line and 10-31 m for the 220 kV line, which will once again affect the course of secondary succession in this section. The direction of these changes is currently difficult to determine. It can only be assumed that the deforested construction corridor will see the expansion of ubiquitous species, leeks or species characteristic of the forest edges and ecotones of other ecosystems through which the construction corridor will pass. In such a case, the renewed action of decommissioning the Project may, on the one hand, "reverse" the secondary succession to its initial state, which, with the subsequent cessation of the impact, may be an opportunity for the return of species characteristic of the habitats concerned. It may also "accelerate" secondary succession towards further transformation into replacement communities and habitats, but thus contribute to the biodiversity of the area. Most of the impacts of the decommissioning phase of the Project on flora and fauna species will be negative, direct and simple. These impacts will be localised, short-term and reversible as, like in the construction phase, they will cease upon completion of the construction works.

In summary, impacts during the decommissioning phase will be similar to those during the construction phase. The exceptions are components such as the landscape, for which the decommissioning of the ONS will allow the restoration of the original agricultural use of the land, and people, for whom the impacts associated with thermal, noise and magnetic field emissions will be reduced. For the other components, the impacts of the decommissioning phase are dependent on the decision to remove the cables or leave them underground.

11. IDENTIFICATION OF THE ENVIRONMENTAL IMPACT OF THE RATIONAL ALTERNATIVE

The rational alternative options evaluated in this chapter are (Figure 11.1):

- western variant ofECIlandfall using HDD guided drilling or HDD guided drilling combined with sea trench;
- 400 kV overhead cable line connecting the LSE substation with the PSE Słupsk Wierzbięcino substation.

Other elements of the Project remain unchanged from the Investor's variant. Therefore, this chapter focuses on assessing the impact on individual environmental components of two aspects: a different route alignment at the western landfall and related environmental impacts during the construction phase; and impacts of the construction phase and operation of the 400 kV overhead line (instead of the underground cables proposed in the Investor's variant) along a section of about 6 km between the planned LSE stations and the PSE Słupsk Wierzbięcino substation. The construction phase of the mid-forest 400 kV overhead line will be associated with tree tree felling in a 32 m wide strip, over a distance of approximately 6 km. The operation phase of the 400 kV overhead line, on the other hand, will be associated with the establishment of a 70 m wide technological corridor from the 400 kV line (35 m each from the line axis in both directions).

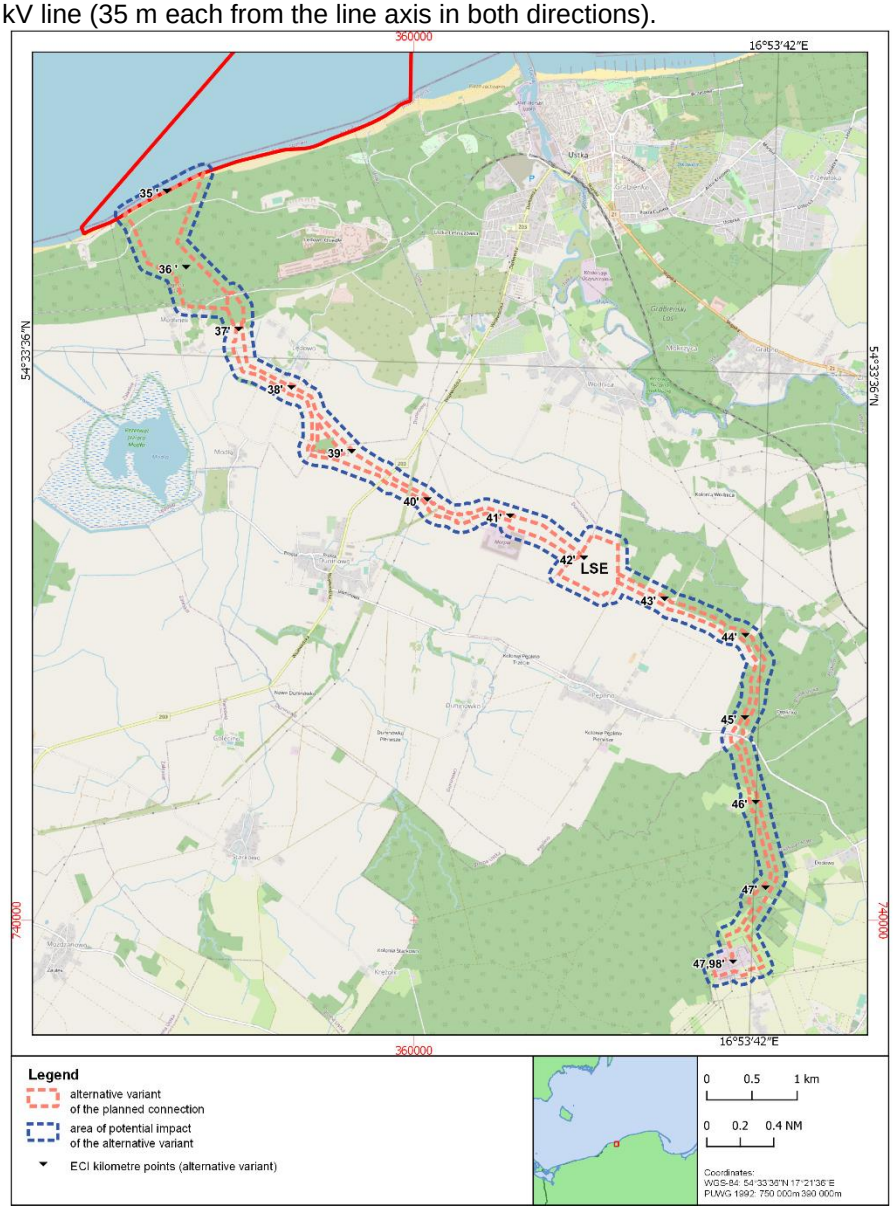


Figure 11.1. *Planned Project Alternative*

Source: own elaboration

11.1 IMPACT ON LAND SURFACE

The route of the planned Project in the alternative option is characterised by significant differences in terrain; between km 35' and 36' there are significant differences in elevation from 0-20 m a.s.l. The highest point is Góra Ognica (40 m a.s.l.), in the area of km 36'. The foreland of the dunes is a flat foreland of a flat moraine plateau with an altitude of about 5 m a.s.l. Then, an undulating moraine plateau begins to form, with altitudes reaching about 36.6 m a.s.l. in the area of the PSE S.A. Słupsk Wierzbięcino station.

Construction phase

The shore area and the Lędowskie Dunes

During the construction phase of the alternative option, an area of shoreline extending between 235.0 and 238.75 km of shoreline and a wide strip of dunes occurring to the rear of the shoreline will fall within the range of potential impact (figure 11.2).

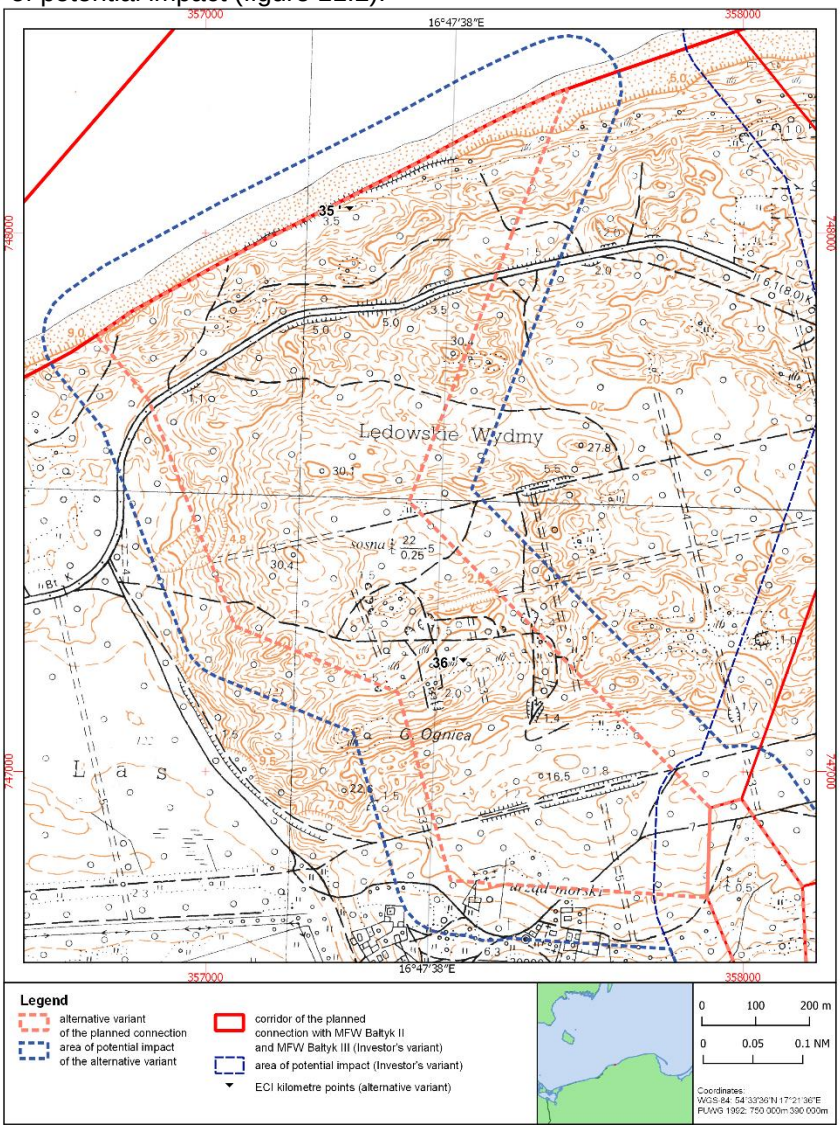


Figure 11.2. *Landforms in the area of the western landfall of the cables - alternative option*

Source: own elaboration

The change in terrain in the shoreline and dune zone will also be caused, as in the case of the Investor's option, by the construction of a launch chamber for the HDD crossing, levelling works for the construction facilities in the area of the cable landfall and the construction of cable wells.

The cables will be brought ashore by a trenchless method, using HDD guided drilling or HDD guided drilling combined with marine trench. Due to site location constraints (the presence of a closed

military training ground) and the associated necessary length of drilling, two additional trenchless shore crossing technologies are possible: microtunnel or Direct Pipe (DP). Construction works are likely to take place partly within the construction corridor and require the agreement of the Director of the Maritime Office in Gdynia.

As in the Investor's alternative, the shore structure will not be disturbed as a result of the trenchless technology. Impacts of the construction phase on the shore (i.e. up to the landfall of the cables) will not occur.

The construction area for the cable landfall using HDD technology will also be approximately 0.85 ha. If microtunneling or Direct Pipe technology is used, the area will be larger and will be approximately 3.3 ha. The differentiating factor is the development of the area (Photo 11.1 and Photo 11.2). This is not a transformed area as in the case of the Investor's option. There are mixed forests and forests on coastal dunes (habitat 2180) (Photo 11.2). Four cable wells will be located here. This will require clearing and levelling of a maximum area of 33,000 m^2. Due to the significant differences in elevation, which range from 0 m above sea level to 20 m above sea level (ul. Bosmańska), the levelling will be of considerable extent. Preparation of the construction site by levelling the ground and removing vegetation, due to the gradients present here, will be very difficult and may intensify aeolian processes. The impacts of the construction phase on the land surface and relief in the area of the western landfall of the cables will be negative, direct, secondary (resulting from the complexity of the aeolian processes), long-term, permanent and local. These impacts can be considered significant.

Cable route, ONS stations

The impacts on the ground surface associated with the construction of the underground cable route from the western cable landfall to the ONS and substation will be the same as in the Investor's alternative (Section 10.1.). These will be insignificant impacts.

Photo 11.1. *Coastal grey dunes (habitat 2130) in the area of 35'km (alternative option)*

Photo 11.2. *Mixed forests and coniferous forests on coastal dunes (habitat 2180) in the area of 36' km (alternative option)*

Source: EKO-KONSULT Sp. z o.o.

400 kV overhead line

In connection with the construction of the 400 kV overhead line connecting the ONS substation with the PSE S.A. substation, permanent tree tree felling will be required, in a strip of up to approx. 32 m wide (approx. 16 m from the line axis).

As part of the construction of the overhead line, excavations will be carried out for prefabricated pole foundations of up to 15-20 pieces with dimensions of 8 x 10 m and a maximum depth of 4 m. It is planned to excavate poles with pile foundations to a depth of approx. 15 m below ground level on weak-bearing soils (sand, peat).

For a single pole site, four excavations will be made for the construction of four foundations. Foundations for the support structures will be in accordance with standards and requirements, and foundation types for all pole post locations will be selected taking into account existing geotechnical

conditions, as determined by detailed geotechnical investigations of soil parameters to be carried out at the construction project stage. Changes to the ground surface and near-surface soil layer will be limited to the pole sites and will be of local impact throughout the Project. Excavated soil will be used to backfill the foundation trenches. Adequate compaction of the soil will eliminate ground settlement in the area of the foundations.

An assessment summary of the significance of this option negative impacts of on the land surface and relief during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(19) significant**

The sum of the significance weights of the negative impacts is 19, so the impact during the construction phase of the alternative option on the land surface and relief has been assessed as significant. Implementation of the alternative option in a wide strip of the Lędowskie Dunes overgrown by mixed woods and coniferous forests and the existing and planned cuttings, as well as due to the significant altitude differences occurring here, may intensify eolian processes. As a result of the activation of these processes, significant changes in the character of the relief may occur both within the construction corridor and in neighbouring areas. Dune processes may significantly affect adjacent habitats. These will be significant impacts.

Operation phase

The negative impacts of the operational stage in the Lędowo dune belt associated with the landform change that will take place here are associated with a high probability of starting aeolian processes. Infrastructure elements may then be exposed or buried by eolian transport of sandy material. These impacts will be negative, direct, secondary, long-term, permanent and local. Dunes are characterised by high sensitivity; it is a highly vulnerable ecosystem.

No impacts are anticipated that may adversely affect the earth's surface and relief due to the operation of the 400 kV overhead line.

A summary of the significance of the negative impacts of the alternative on the land surface and relief during the operation phase is given below

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(19) significant**

The sum of the significance weights of the negative impacts is 19, so the impact during the operation phase of the alternative option on the dunes has been assessed as significant, due to the high probability of triggering eolian processes in the region of the Lędowskie Dunes.

11.2 IMPACT ON GEOLOGICAL STRUCTURE AND DEPOSITS

Along the route of the alternative option, in the area of the western landfall of the cables, there are weak soils: eolian sands on dunes (between 35' and 36.6' km). In addition, as in the Investor's option, peats, peats on sands, peaty silts and valley bottom silts and sands are present along the ECI route, which may hinder earthworks with heavy construction equipment.

The planned Project in the alternative option is located outside of the concession areas and there are no mineral deposits or mining areas. No prospective sites of useful minerals have been identified either.

Construction phase

The construction phase and associated impacts on the geological structure will be the same as for the Investor's Option with regard to the implementation of excavations for underground cable lines, cable wells, entry and exit chambers in connection with planned trenchless crossings, levelling, construction of ONS substations and access roads. These will be negative, direct, simple, short-term, reversible impacts and their spatial extent will be within the boundaries of the ED.

The impact of the construction phase will not affect the deeper geological layers and can be considered insignificant.

Impacts of the construction phase on the geological structure may occur in connection with the burial to a depth of about 15 m below sea level of the 400 kV overhead line poles with pile foundations on weak-bearing soils: peats on sands (44' km), peaty silts (45.5', 47' km) and silts and sands of valley bottoms (47' km). These soils may impede earthworks with heavy construction equipment. The construction phase is associated with the risk of contamination of the deeper sedimentary layers in case of failure. However, with proper site protection and organisation of the work, the likelihood of such an event is low.

The table below summarises the assessment of the significance of the negative impacts of the alternative option on the geological structure during the construction phase.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(11) insignificant**

The sum of the significance weights of the negative impacts is 11, so the impact during the construction phase on the geological structure of the alternative option has been assessed as insignificant.

Operation phase

No impacts are anticipated during the operation phase that may adversely affect the geological structure.

Raw materials and deposits

Impacts of the construction and operation phase on mineral deposits and accessibility to mineral deposits are not anticipated.

11.3 IMPACT ON SOILS

The route passes through agricultural land, which covers approx. 41.7% of the area. The predominant soil types are brown soils (leached, acidic, proper). The most sensitive to potential impacts are hydrogenic soils of the silty, peaty and mucky types. They have low resistance to disturbance of the

soil profile, the balance of soil-water relations and pollution. Arenosols are also to be considered as soils with low resistance to contamination and sensitive to wind erosion.

Construction phase

In the alternative option, a significant complex of arenosols (35' to 36.3' km) will be affected by soil transformation as a result of the implementation of the western landfall of the cables. The intervention in the area of the HDD drill entrance chamber will last approximately 1 year (+ 2 months for site preparation). If micro-tunnel or Direct Pipe (DP) technology is used, it will be considerably longer at approximately 2 years (+ 4 months for site preparation). These soils are particularly sensitive to wind erosion. However, as with the Investor's option the mid-forest setting will reduce this impact and should not be significant.

The construction of the mid-forest 400 kV power line will be associated with permanent tree felling along a stretch of approximately 6 km. Soil compaction and disturbance of the permeability of the soil profile will occur within the construction corridor. The greatest impacts on soils due to the construction of the overhead line will be related to the local transformation of podsolic and brown soils in the pole foundation areas. Permanent disturbance of the soil profile will occur at these locations.

The construction phase and associated impacts on soils will be the same as for the Investor's option. They will be negative, direct, secondary, medium-term, reversible impacts and their spatial extent will be within the boundaries of the DWA.

A summary of the significance of the alternative option’s negative impacts on soils during the construction phase is given below

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Medium-term	**(2)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(13) moderate**

The sum of the significance weights of the predicted negative impacts is 13, so the impact of the construction phase on soils in the alternative option has been assessed to be moderate. Negative impacts on soils during the construction phase will mainly relate to changes in soil structure, disturbance of the soil profile change in water relations, compaction and potential contamination, but these impacts will be reversible.

Operation phase

During the operation phase of the alternative, no impacts likely to adversely affect soils are anticipated, as the operation of both the underground cables and the 400 kV overhead line is unmanned and does not require soil intervention.

Permanent conversion of soils will take place in the area of the planned cable wells, ONS stations and permanent access roads. The construction of the ONS will exclude the possibility of further agricultural use of the black earth and brown soils present here, II, III a and III b quality class.

During the operation phase, the potential impact on soils will be negative, indirect, simple, long-term and permanent due to the occupation of the site for the ONS industrial buildings.

A summary of the significance of the alternative option’s negative impacts on soils during the operation phase for the ONS station is presented below

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Simple	**(1)**
Long-term	**(3)**
Fixed	**(3)**

Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(13) moderate**

The sum of the significance weights of the negative impacts is 13, so the impacts during the operation phase on soils of the alternative have been assessed as moderate. The negative impacts on soils during the operation phase will mainly relate to the permanent occupation of the ONS station site with a total area of up to 16 ha and the exclusion of high quality soils from agricultural use.

11.4 IMPACT ON SURFACE AND GROUNDWATER AND FLOOD RISKS

11.4.1 Surface water

The planned Project in the alternative option, as in the Investor's option, will cross the Struga Lędowska (37.2' km) and the Pogorzeliczka (44.7; km). The watercourses, including drainage ditches, are in various states of maintenance. Some of them carry water periodically or episodically. The hydrographic network in the area gravitates to Lake Modla, located approximately 900 m west of the western boundary of the ECI corridor. The western option of the cable landfall crosses the Potynia catchment area.

The planned Project in the alternative option is located in the Oder River basin area, for which the *"Oder River Bas*in Management *Plan"* was prepared, adopted by the Regulation of the Minister of Infrastructure dated November 16, 2022 (Journal of Laws 2023.335.).

Construction phase

The projected impact of the construction phase of the alternative option on surface water will be the same as for the Investor's option up to and including the ONS station. As with the Investor's option, the greatest threats to the aquatic environment along the ECI corridor will be associated with the crossing of Struga Lędowska, whose waters drain into Lake Modła (Section 10.4.1.). Due to its uniqueness and sensitivity to changes in water relations, the intake of water necessary for the drilling mud (in connection with the planned trenchless HDD crossing) from Lake Modła and the discharge of water into this lake and the adjacent watercourses, i.e. from 36.9' km to 37.5' km, is prohibited. It is recommended to treat the water from the drilling mud and to use the method of dispersal into the ground.

Impacts of the construction phase on Struga Lędowska are expected to be local and short-lived and will not lead to disturbance of the hydrological conditions of Lake Modła. Land and water contamination is unlikely and will only affect the short-term construction phase of the underground cable lines.

Other impacts will occur due to the construction of a 400 kV overhead line connecting the ONS substation to the PSE S.A. substation. (42.4 'to 47.7' km). The construction of the 400 kV overhead line above the hydrographic facilities will be collision-free. Construction work for the line's poles (construction excavations for the poles' foundations and access roads to the poles) will be carried out outside the facilities by watercourses and ditches. The pulling of the pre-cable and the subsequent pulling of the 400 kV line conductors will not affect the hydrology of watercourses and ditches and their ecosystems, including aquatic vegetation and fauna. Such works will take 1-2 days and will be carried out within the timescales resulting from the construction schedule[607] . In this aspect, there will be no impacts associated with the crossing of the Pogorzeliczka (44.7' km) and drainage ditches. The planned pole foundation works may lead to surface water pollution due to potential leakage of pollutants from construction machinery and vehicles during the construction phase. As none of the support structures will be located in open surface waters, no impact of the 400 kV overhead line on their quality is forecast.

[607] *Report on the environmental impact of the project entitled "Construction of 400 kV line Piła Krzewina-Plewiska", PROEKO, 2018*

During the construction phase, the potential impacts of the alternative option on surface water will be negative, direct, secondary, short-term and reproducible, of local extent. Sensitivity due to the association with Lake Modla is considered to be high.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Short-term	**(1)**
Reproducible	**(2)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(16) moderate**

The sum of the significance weights of the negative impacts is 16, so the surface water impacts during the construction phase of the alternative have been assessed to be moderate. Negative impacts on surface water during the construction phase will primarily relate to the crossing of Struga Lędowska and land levelling and hardening. The works in the area of Struga Lędowska should be carried out using the proposed solutions: it is forbidden to take water necessary for the drilling mud from Lake Modła and to discharge water into this lake and the adjacent watercourses, i.e. from 36.9' km to 37.5' km.

Operation phase

The operation phase of the alternative option is a virtually maintenance-free process with respect to the underground cable line and the 400 kV overhead line, limited to service and maintenance works. In this aspect, the impact on surface water quality as in the Investor's option will be related to potential pollution due to accidental spills from machinery and vehicles in connection with maintenance works and in connection with the operation of the ONS substation (Section 10.4.1.).

Potential impacts on water may be associated with the operation of the ONS station. The operation of efficient water and wastewater management in the station areas will minimise these impacts.

In summary, the operation phase of the alternative option will have a minor impact on surface water mainly through the introduction of paved surfaces (LSE access road, buildings within the ONS) and a reduction in rainwater infiltration at this location. This impact has been assessed as insignificant:

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Simple	**(1)**
Long-term	**(3)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

11.4.2 Groundwater

In the northern part of the planned Project (up to 38' km) groundwater occurs at a depth of approximately 2.5 m and the runoff is from the southwest towards the coast. In the area of 39' km the groundwater occurs at a depth of 5 m and the further south the depth gradually increases to 25 m in the area of the PSE Wierzbięcino station (47.7' km).

The planned Project in the alternative option is located within the boundaries of the JCWPd PLGW600010. The status assessment for 2019[608] for the JCWPd indicated good chemical, quantitative and overall status of the water body.

[608] *http://mjwp.gios.gov.pl*

Construction phase

The projected impact of the construction phase of the alternative option on groundwater will be the same as for the Investor's option due to the construction of the underground cable line and ONS station.

The impact on groundwater in the construction phase of the 400 kV overhead line may concern short-term disturbance of the first groundwater table in excavations for foundations of some poles. According to the performed characteristics of hydrogeological conditions (Hydrogeological Map of Poland. Ustka Sheet 1:50,000, Chapter 8.4.), the first aquifer in the area of the overhead line (43' to 47' km) occurs at a depth of: 10-25 m. Due to the burial of the pile-founded poles at a depth of approximately 15 m below ground level, dewatering may be required. Regardless of the choice of dewatering method, this will be a short-term and local nature impact that will not permanently damage water relations and groundwater resources.

During the construction phase of the alternative option, any impact on groundwater will be negative, direct, secondary, short-term and reversible.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, so the impact during the construction phase on groundwater for the route of the planned ECI has been assessed as moderate. Negative impacts on groundwater during the construction phase will primarily relate to temporary trench dewatering.

Operation phase

Potential impacts of the alternative option on groundwater, in particular on groundwater and the first aquifer, may relate to contamination of the usable groundwater horizon as a result of inflow of pollutants (hydrocarbons, suspended solids) from equipment and machinery used during maintenance of the installation of connection infrastructure elements and from rainwater and snowmelt infiltrating both along underground cable lines, 400 kV overhead line poles and from the area allocated for ONS stations.

Impacts, as with the Investor's option, will be of local nature and short-term. Due to the scale and nature of the alternative option there will be no impact on the JCWPd during the operation phase. There is also no identified threat to the achievement of environmental objectives.

11.4.3. Impact on surface and groundwater bodies

The implementation of the planned Project in the alternative option will not affect the disturbance of water relations and therefore does not threaten the achievement of the environmental objectives indicated in the *"Odra River Basin* Management *Plan",* adopted by the Regulation of the Minister of Infrastructure dated November 16, 2022 (Journal of Laws 2023.335.).

As in the Investor's option, the most significant impacts on surface water will be related to the crossing of Struga Lędowska, flowing into Lake Modła, which is a sensitive and rich ecosystem. With proper execution of construction works, there will be no significant impact on the hydrographic network in this area. Other impacts typical of the implementation of underground and linear infrastructure will not result in significant impacts on surface water.

11.4.4. Flood risk areas

As in the Investor's option, the trenchless crossing of the coastal zone virtually eliminates flood risks from the sea. As required by the POM Plan in the coastal zone, the connection infrastructure will

be laid: - as far as possible perpendicular to the shoreline - below the surface of the seabed, and if this is not possible for environmental or technological reasons, other permanent safeguards will be used to ensure navigational safety - a minimum of 3 m below the mean depression of the bottom of the intertidal troughs.

Implementation of the alternative option will not increase the risk of flooding at any stage.

11.5. IMPACT ON NATURE

11.5.1. Vegetation and natural habitats

During the inventory in the alternative option, 18 valuable vascular plant species were found, i.e. 7 more than in the Investor's option, including 14 taxa subject to legal protection (section 8.5.1. table 8.6).

In addition to naturally valuable vascular plant species, the briological inventory revealed the presence of 14 partially protected bryophyte species. No strictly protected bryophyte species were found. The area of the terrestrial corridor of the planned connection is characterised by a diversity of moss species typical for the forests of Gdansk Pomerania. All moss species are common taxa.

The inventory showed the same presence of 9 natural habitats as within the Investor's option (section 8.5.1.,table 8.8).

Construction phase

During the construction phase of the alternative option, the main impacts on vegetation and natural habitats will be the same as for the Investor's option and limited practically to the limits of the construction corridor from the underground and overhead line. The implementation of the overhead line as well as the underground line requires tree felling in a strip of up to approximately 32 m in width. Nevertheless, there are differences due to the width of the individual natural habitats. The cables will be brought ashore by means of a trenchless method, using HDD guided drilling or HDD guided drilling combined with a sea trench[609] . The use of the trenchless method will completely avoid a much thinner strip of white and grey dunes than in the option indicated by the Investor. As in the Investor's option, the structure of the shoreline will not be disturbed as a result of the trenchless technology. Impacts of the construction phase on the shore (i.e. up to the landfall of the cables) will not occur.

It should be noted that the proportion of natural habitats of forests on coastal dunes (habitat 2180) and acid beech forests (habitat 9110) in the alternative option is significantly higher than in the option indicated by the Investor. The alternative option also contains sites of vascular plant species not present in the option indicated by the Investor. For example, this mainly concerns the fragrant flax *Linaria odora*, as well as the common marsh *Ledum palustre*, the greenflowered wintergreen *Pyrola chlorantha*, the sandy everlasting *Helichrysum arenarium* and the common club moss *Lycopodium clavatum* and the interrupted club moss *L. annotinum*. In addition, in the alternative option there are small areas of grey dunes (priority habitat 2130) less than a kilometre from the coast. They are a habitat for dune vegetation mainly of the dark-red helleborine *Epipactis atrorubens,* the common clubmoss *Lycopodium clavatum*, the sandy everlasting *Helichrysum arenarium* and many species of boreal mosses and ground lichens. As a result of implementing the Project in the alternative option, the sites of these species may be eliminated here.

The vegetation cover and natural habitats present on most of the site, apart from the coastal forest area, within the construction corridor and of the implementation of the open trench and the construction of the ONS station are among the relatively resilient and easily regenerating (e.g. grassland and meadow habitats). Impacts of the construction phase on vegetation and natural habitats will be negative, direct, simple, long-term and permanent (due to permanent habitat removal), and their spatial extent will be within the limits of the ED.

[609] *two additional trenchless shore crossing technologies can be used: microtunnel or Direct Pipe (DP)*

Increased magnitude of impact is to be expected due to permanent tree felling (approximately 32 m wide strip) and in areas of additional tree felling of trees likely to fall over the line. Impacts of the construction phase on vegetation and habitats associated with the implementation of the 400 kV overhead line will be negative, direct, simple, long-term and permanent, and their spatial extent will be the limits of ED. Minimising measures, as in the case of the option indicated by the Investor, should only concern vascular plant species relatively easy to metaplant from the families *Orchidaceae* (rusty-red helleborine, broad-leaved helleborine, white honeysuckle), *Caprifoliaceae* (Pomeranian honeysuckle) and *Ericaceae* (single-flowered pear tree, lesser pear tree). The above-mentioned taxa are among the species that tolerate transplantation and adaptation to a new site relatively easily, provided they are transplanted to patches that are identical or similar in habitat.

The impacts on bryophyte species will be the same as for the Investor's option for the western landfall of the cables, the implementation of the open trench for the underground cable lines and the construction of the ONS station. Once the construction phase has ended, the land will be restored to its original state, with the exception of the technology corridor, which will be permanently deforested. The agricultural land will be returned to its original state and used for agricultural purposes.

Impacts of the construction phase on vegetation and natural habitats will be similar to those of the Investor's option, i.e.: negative, direct, secondary, long-term and permanent (due to permanent elimination of habitats), and their spatial range will be local due to the fact that impacts of the construction phase related to cutting down in the area of Lędowskie Dunes may extend beyond the construction corridor due to the possibility of initiation of eolian processes. The sensitivity/uniqueness of the environment was determined to be high, due to the lack of transformation of this space and the dominance of the mixed forest and coniferous forest habitat on the dunes (2180).

The table below summarises the assessment of the significance of the negative impacts of the alternative option on vegetation and natural habitats during the construction phase.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(19) significant**

The sum of the significance weights of the negative impacts is 19, so the impacts during the construction phase on the vegetation cover and natural habitats have been assessed as significant. The negative impacts on the vegetation cover and natural habitats during the construction phase will mainly relate to the permanent transformation and occupation of the site and the removal of vegetation cover and natural habitats, which may lead to the initiation of eolian processes.

Operation phase

The operation phase and associated impacts on vegetation and natural habitats will be the same as for the Investor's option. There will be permanent deforestation within the technology corridor of up to 10-31 m width for the 220 kV underground line. Agricultural land will be allowed to continue to be used for agriculture, while forest areas will be permanently deforested. Plants with a shallow root system will be allowed to return to these areas.

Permanent deforestation of the technological corridor due to the operation of the 400 kV power line with a width of approx. 32 m will have a permanent impact in the form of discontinuation of a patch of habitats: sub-Atlantic oak-hornbeam (9160) and fertile beech-hornbeam (9130), disappearance of species characteristic for a given natural habitat and the encroachment of habitat-indifferent species, which on the one hand may translate into an increase in biodiversity in a given section also through the

increase of the area of shrubs in the forest edge, and on the other into the degeneration of patches of natural habitat.

The impacts of the operation phase of the alternative option on vegetation and natural habitats will be negative, indirect, secondary, long-term and permanent. The spatial extent of the impacts will be within the limits of ED. The sensitivity/uniqueness of the environment has been determined to be medium.

The table below summarises the assessment of the significance of the negative impacts of the alternative option on vegetation and natural habitats during the operation phase.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(5)**
Impact classification	**(16) moderate**

The sum of the significance weights of the negative impacts is 16, so the impact during the operation phase on the vegetation and natural habitats has been assessed as moderate. Negative impacts on vegetation and natural habitats, as in the case of the Investor's option, will mainly concern succession and the possibility of invasive plant species appearing.

11.5.2. Forests

The route of the underground cable lines and the 400 kV overhead line will pass through forest divisions of the Ustka Forest District. In the northern part of the planned ECI corridor - the alternative option is also dominated by fresh forests, with a small share of dry forests and fresh mixed forests. In the southern part, on the other hand, there are fresh and moist forests. These are protective forests: resort forests (between 35' and 37' km) and in and around towns due to their location within 10 km of the administrative borders of Słupsk (a city with more than 50,000 inhabitants) (between 42.5' and 47' km). Forests occupy about 60% of the route of the planned IP.

Construction phase

The main impacts of the construction phase will be identical to the impacts of the alternative option written above on vegetation and natural habitats, of which forest habitats are an important component.

The alternative in the area of the western landfall of the cables increases the proportion of natural habitats of forests on coastal dunes (habitat 2180) and acid beech forests (habitat 9110) in relation to the option indicated by the Investor. The ECI corridor in the alternative option crosses patches of acid beech forests, acid oak forests and coniferous forests on coastal dunes and then follows the same course as in the option indicated by the Investor. As in the option indicated by the Investor, natural habitats such as mixed forests and coniferous forests on coastal dunes (2180), acid oak hornbeam (9190), sub-Atlantic oak-hornbeam (9160), fertile beech (9130), acid beech (9110), riparian oak-elm-ash forests (91F0) constitute over 90% of all forest communities in the ECI corridor. Considering the above, the impacts associated with the implementation of the alternative option on forests during the construction phase will be the same as those for the option indicated by the Investor, which are not described in detail in Section 10.5.2.

In connection with the implementation of the planned Project in the alternative option, there will be tree felling in the construction corridor with an estimated maximum area of 19.3 ha.

The impacts of the construction phase on forests associated with the implementation of the 400 kV overhead line will be negative, direct, secondary, long-term and permanent, and their spatial extent will be within the boundaries of the AWD. The sensitivity/uniqueness of the environment has been

identified as high due to tree felling in the area of mixed forest and woodland habitat on coastal dunes (2180).

The table below summarises the assessment of the significance of the negative impacts of the alternative option on vegetation and natural habitats during the construction phase.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(19) significant**

The sum of the significance weights of the negative impacts is 19, so the impacts during the construction phase on forests have been assessed to be significant and will mainly concern forest clearing with a maximum area of 19.3 ha. Deforestation of the mixed forest and coniferous forest habitat on coastal dunes (2180) may intensify eolian processes.

Operation phase

The operation phase and associated impacts on the forests will be the same as for the Investor's option. The operation of the 400 kV mid-forest overhead line involves permanent tree felling in a strip of approximately 32 m wide. This is a factor that differentiates the scale of the planned works, as in the case of the 400 kV underground cable lines (Investor's option - Section 10.5.2.), a 20 m wide permanent tree felling is required.

During the operation phase in the Investor's option, the cuttings will occupy 14.2 ha. Whereas in the alternative option: 18 ha. In the mid-forest sections, additional tree felling will also be carried out of trees that could fall on the line and damage it, which may later be afforested.

Within the construction corridor of the 400 kV line, there will be secondary succession towards lowland and grassland habitats and species. Permanent deforestation will have a permanent effect in the form of a discontinuation of habitat patches, disappearance of species characteristic for a given natural habitat and the entry of habitat-indifferent species, which on the one hand may translate into an increase in biodiversity in a given section also through an increase in the area of shrubs in the forest edge, on the other hand into degeneration of natural habitat patches. This will mainly concern patches of acid beech, the share of which in the alternative option is much higher than in the option indicated by the Investor. On their edges created within the technology corridor and on the deforested area, there will be an expansion of moss or grass phytocoenoses dominated by the wavy hair-grass *Deschampsia flexuosa and the* bracken fern *Pteridium aquilinum,* or an expansion of sedges and the common rush Juncus effusus in the case of wet areas. Beech lowland/forest clearing phytocoenoses and their shrubs in the forest edge are often sites of spreading invasive species, mainly small balsam *Impatiens parviflora*.

In the alternative option, permanent deforestation will be greater (by 12 m). Secondary succession will occur here. In the patches of the coastal coniferous forest, on the whole area of the technology corridor, due to its deforestation, there will be a transformation of the forest patch towards substitute phytocoenoses associated with the stages of succession towards heathland with the dominant common heather *Calluna vulgaris* or towards sandy surfaces, where the main phytocenotic role will be played by the sand sedge *Carex arenaria,* grey hair-grass *Corynephorus canescens*, red fescue *Festuca rubra* and others.

The impacts of the operation phase of the alternative option on forests will be negative, indirect, secondary, long-term and permanent. The spatial extent of the impacts will be within the limits of ED. The sensitivity/uniqueness of the environment has been determined to be high.

The table below summarises the assessment of the significance of the negative impacts of the alternative on forests during the operation phase.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(16) moderate**

The sum of the significance weights of the negative impacts is 16, so the impact during the operation phase on forests has been assessed as moderate. Negative impacts on forests will mainly concern secondary succession on the deforested area and consequently increased pressure of non-forest species (including invasive species) on the remaining forest phytocoenoses.

11.5.3. Biota of Macromycetes and lichens

Within the corridor of the planned Project in the alternative option, 2 species of Macromycetes of natural value were found, including 1 species - chaga - *Inonotus obliquus* subject to partial protection according to the Regulation of the Minister of Environment of 9 October 2014 on the protection of species of fungi (Journal of Laws 2014.1408). No strictly protected species were found (section 8.5.3. table 8.9).

The study area is also characterised by a significant richness and diversity of lichens (lichen biota), with a high proportion of valuable species (protected, rare, endangered). In the course of the inventory, 15 valuable species were found within the ECI corridor under the alternative option, including 4 species under strict legal protection: cartilage lichen (*Ramalina fraxinea*), lichen fastigiatus *(Ramalina fastigiata)*, (*Parmelia submontana*) and mustard powder lichen (*Chrysothrix candelaris*), 10 species under partial legal protection (section 8.5.3. table 8.9).

Construction phase

During the construction phase of the alternative option the main impacts on the biota of Macromycetes and lichens will be the same as for the option indicated by the Investor (section 10.5.3.).

In the alternative option, there are small in area but well-preserved areas of grey dunes surrounding the western landfall of the cables, occurring less than a kilometre from the seashore. These provide habitat for terrestrial lichens, mainly of the genus *Cladonia*: shrubby cup lichen *Cladonia arbuscula*, reindeer cup lichen *C. rangiferina*, creem cup lichen *C. portentosa*. Epiphytic species are abundant on the pine trees surrounding these areas: beard lichen *Usnea hirta*, oakmoss *Evernia prunastri* and cartilage lichen *Ramalina farinacea.* As a result of the Project, the sites of these species may be eliminated here.

Impacts of the construction phase on the biota of Macromycetes and lichens will therefore be negative, direct, simple, short-term and permanent, and their spatial extent will be within the limits of the ED. On the other hand, the sensitivity/uniqueness of the environment has been determined as high, due to the lack of transformation of this space, mainly of habitat 2180 as in the Investor's option, where the majority of the coastal forest area is associated with the functioning buildings of the Naval Centre. In the untransformed forest phytocoenoses, the proportion of aboveground lichens, especially species of the *Cladonia* genus*,* is much higher than on sites where anthropogenic pressure is greater due to nearby development.

A summary of the significance of the negative impacts of the alternative on the biota of Macromycetes and lichens during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**

Fixed	**(3)**
Spatial extent of the impact	
Within the limits of ED	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(16) moderate**

The sum of the significance weights of negative impacts is 16, so the impact during the construction phase on the biota of Macromycetes and lichens has been assessed as moderate. Negative impacts on the biota of macrofungi and lichens during the construction phase will primarily relate to the temporary transformation and occupation of the site, mainly habitat 2180.

Operation phase

During the operation of the planned Project in the alternative option, as in the option indicated by the Investor, potential negative impacts on the biota of Macromycetes and lichens may be associated with the destruction of habitats and microhabitats as a result of cyclic tree felling and maintenance works. These are described in detail in Section 10.5.3. A differentiating factor is the amount of permanent tree felling, as the operation of the mid-forest 400 kV overhead line is associated with permanent tree felling in a strip of approximately 32 m wide, whereas for the underground 400 kV line a 20 m wide permanent tree felling is required.

Similarly to the option indicated by the Investor: during the operation phase of the alternative option, no impacts are foreseen which may adversely affect the biota of Macromycetes and lichens.

Impacts on fungi and lichen biota in the alternative option, during the operation phase, have been assessed as negative, direct and simple. Impacts will be short term and reversible as they will cease upon completion of servicing and maintenance works. The sensitivity of the receptor has been assessed as high.

A summary of the significance of the negative impacts of the alternative on fungal and lichen biota during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(13) moderate**

The sum of the significance weights of the negative impacts is 13, so the impact during the operation phase on the fungal and lichen biota has been assessed as moderate.

11.5.4. Invertebrate fauna

Within the ECI corridor in the alternative option, 3 species of invertebrates under partial species protection (OJ 2016.2183 i.e. as amended) were found. These include the red wood ant (*Formica rufa*), sandhopper (*Talitrus saltator*) and bumblebees (*Bombus sp.*). In addition, one species on the Red List of Animals, Endangered and Threatened in Poland[610] was found - the European field cricket (*Gryllus campestris*). The most frequently found species was the red ant (7 sites). The presence of the remaining species was determined on the basis of single sightings.

Construction phase

The impacts of the construction phase of the alternative option on invertebrate fauna are not significantly different from the impacts of the Investor's option. They will mainly involve scaring of individuals and destruction of their habitats.

[610] *Głowaciński Z, 2002.*

The western ECI landfall option, due to the greater extent of the impact and the presence of less transformed forests will involve the destruction of more sites and habitats for invertebrate species. One site of the field cricket *Gryllus campestris* and 7 sites of the red wood ant *Formica rufa* were found within the western ECI landfall, one of which is located within the construction corridor of the alternative option. In addition, there is habitat for the bumblebee *Bombus sp*. and the sandhopper *Talitrus saltator.*

The invertebrate species identified, within the range of impacts of the alternative option, are considered to be common locally and regionally and nationally. The sensitivity of entomofauna to the identified impacts has been assessed as low.

The measures to minimise negative impacts on invertebrate fauna to be taken are no different to those described in Section 10.5.4.

Impacts on entomofauna during the construction phase of the alternative option have been assessed as negative, direct and simple. Impacts will be short-term and reversible.

A summary of the significance of the alternative option's negative impacts on entomofauna during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, so the impact during the construction phase on entomofauna has been assessed as insignificant.

Operation phase

During the operation of the planned Project in the alternative option, potential negative impacts on entomofauna, may be associated with the destruction of habitats and microhabitats as a result of cyclic tree felling and maintenance works - similarly to the Investor's option. The operation of the mid-forest 400 kV overhead line is associated with permanent tree felling in a strip approximately 32 m wide, i.e. in a strip 12 m wider than in the Investor's option.

Impacts on entomofauna during the operation phase, have been assessed as negative, direct and simple. Impacts will be short term and reversible as they will cease upon completion of servicing and maintenance works. The sensitivity of the receptor has been assessed as low.

A summary of the significance of the alternative option's negative impacts on entomofauna during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, so the impact during the operation phase on entomofauna has been assessed as insignificant.

Summing up, as with the Investor's option, there will be no significant impacts on invertebrate fauna during the construction and operation phases of the alternative option. The most significant impact will be the disturbance of individuals and destruction of their habitat during the construction phase. For the western landfall of the IP, this impact may be greater. However, the significance of impacts has been classified as insignificant.

11.5.5. Ichthyofauna

The most important for ichthyofauna in the alternative option, as in the Investor's option, is Struga Lędowska, which is characterised by constant water flow. However, poor species composition and low fish abundance have been demonstrated here. These include northern pike (*Esox Lucius)* and tench (*Tinca tinca),* as well as three-spined *stickleback* (*Gasterosteus aculeatus*)*.* In the remaining watercourses, fish may occur intermittently, mainly in estuarine sections.

Construction phase

As with the Investor's option, in the alternative option the Struga Lędowska in the vicinity of 37.2' km will be crossed using a trenchless method, so the impacts of the construction phase on ichthyofauna will be neutral.

As the construction of the 400 kV overhead line will not interfere with watercourses impacts will not occur.

Operation phase

The planned Project in the alternative will not impact on ichthyofauna during the operation phase.

11.5.6. Herpetofauna

The nature inventory carried out showed that one reptile representative (grass snake - 2 sites were observed) and 74 sites of 4 amphibian species, i.e. grass frog *Rana temporaria*, common toad *Bufo bufo*, brown frog not specified to the species *Rana sp.* and green frog *Pelophylax esculentus complex were* found in the alternative option*.* All species found are partially protected. The 3 species and representatives of the green frog complex are listed in the annexes of the EU Habitats Directive. The most common species found in the area of the planned Project were those belonging to the brown frog group and the green frog complex.

Construction phase

The impacts of the construction phase of the alternative are not significantly different from the impacts of the Investor's option described in Section 10.5.6 and will mainly involve habitat destruction and fragmentation.

The most significant negative threats to amphibians associated with the construction of the overhead power line could be: excavation for foundations, drainage and lowering of groundwater levels, construction vehicle traffic.

Impacts on herpetofauna during the construction phase, have been assessed to be negative, direct and simple. Impacts will be short-term and permanent. The receptor sensitivity to the above impacts has been assessed as medium.

A summary of the significance of the alternative option’s negative impacts on herpetofauna during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(13) moderate**

The sum of the significance weights of the negative impacts is 13, so the impact during the construction phase on herpetofauna has been assessed as moderate

Operation phase

During the operation phase of the planned Project, potential negative impacts on herpetofauna may be associated with habitat destruction as a result of cyclic vegetation clearance and maintenance works. However, these impacts will be temporary and local in extent.

There are no data or publications on the effects of high voltage overhead lines on reproduction and migration of herpetofauna. The risks associated with noise and magnetic and thermal field emissions are described in Section 10.5.6 and are not significantly different for the alternative.

Impacts on herpetofauna during the operation phase, have been assessed to be negative, direct and simple. Impacts will be local, short term and reversible as they will cease when maintenance and servicing works are completed. The sensitivity of the receptor has been assessed as medium.

A summary of the significance of the negative impacts of the alternative on herpetofauna during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(11) insignificant**

The sum of the significance weights of the negative impacts is 11, so the impact during the operation phase on herpetofauna has been assessed as insignificant.

In summary, for the impact on herpetofauna, the alternative option is not significantly different from the Investor's option.

11.5.7. Birds

In the alternative option within the area of potential impact, 18 strictly protected breeding bird species were identified, including 6 listed on Annex I of the EU Birds Directive. In addition, 2 game species were identified as being of nature conservation value (partridge and woodcock). In the alternative option, the most common species found in the area were black corn bunting (8 sites), red-backed shrike (6 sites) and woodlark and whinchat (5 sites each). The least abundant were lapwing, green woodpecker, woodpecker, nighthawk, tawny owl, woodcock, grasshopper warbler and crane (1 site each).

In addition, within the avifauna observation points, 239 bird species were found flying over the ECI corridor area during spring and autumn migration.

The most valuable areas in terms of avifauna are the sections within the woodland, shrubland and wetlands, particularly at km 35' to 41' and km 42' to 48'.

Construction phase

Impacts during the construction phase of the alternative option on avifauna are not significantly different from the Investor's option and relate to habitat destruction and fragmentation.

These impacts will be permanent and long-term. The birds most affected by works during the construction phase will be breeding birds occupying the habitats to be partially destroyed. In the area of potential impact of the alternative option, 44 breeding sites of 18 bird species were confirmed during the nature inventory (Section 8.5.8, Annex 2 Volume III). Most of them are numerous and widely distributed species. However, special attention should be paid to the sites of valuable species: black woodpecker (2), red-backed shrike (6), nighthawk (1), woodlark (5), little flycatcher (3) and crane (1) - listed in Annex I of the EU Birds Directive.

The selection of the western option of the ECI landfall, due to the greater extent of the impact and the presence of less transformed forests will be associated with impacts on a greater number of avifauna sites. More sites of valuable bird species have been recorded within the alternative than in the Investor's option.

The sensitivity of avifauna to impacts associated with the construction of the planned Project has been assessed as medium. The type of impacts on avifauna during the construction phase have been assessed to be negative, direct and simple. Impacts will be local, short-term and permanent.

A summary of the significance of the negative impacts of the alternative on avifauna during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(14) moderate**

The sum of the significance weights of the negative impacts is 14, so the impact during the construction phase on avifauna has been assessed as moderate. Negative impacts will primarily relate to the loss of bird habitat.

Operation phase

During the operation phase of the planned Project, potential impacts on birds may be related to the occurrence of collisions of flying birds with overhead power infrastructure, i.e. with hanging wires or pole structures of the 400 kV line. This will be a long-term impact that will have a decidedly negative, permanent impact on birds, primarily related to their collisions with overhead lines and permanent habitat fragmentation.

Overhead power lines are estimated to be the second most serious factor (after buildings and glass surfaces) in bird mortality of anthropogenic origin[611]. In addition, exposure to electromagnetic fields under overhead lines can, under certain conditions, alter the behaviour and physiology of birds, negatively affecting their reproduction and development[612].

Bird migration surveys indicate that 239 species of birds pass through the area of the planned Project, including species with increased susceptibility to collisions with power lines[613] , i.e.: common pheasant *Phasianus colchicus,* curlew sandpiper *Calidris ferruginea,* red knot *Calidris canutus, dunlin Calidris alpina,* white stork *Ciconia ciconia,* northern lapwing *Vanellus vanellus, common ringed* plover *Charadrius hiaticula, European* golden plover *Pluvialis apricaria, grey* plover *Pluvialis squatarola and* crane *Grus grus,* as well as species of high vulnerability[614] , i.e. white-tailed eagle *Haliaeetus albicilla, Montagu's* harrier *Circus pygargus,* white stork *Ciconia ciconia, Euroasian* sparrow hawk *Accipiter nisus,* raven *Corvus corax, common* buzzard *Buteo buteo, common* kestrel *Falco tinnunculus, Eurasian* jay *Garrulus glandarius,* magpie *Pica pica,* grey crow *Corvus cornix*.

Accordingly, impacts on avifauna during the operation phase have been assessed as negative, direct and secondary. Impacts will be local, long-term and permanent.

A summary of the significance of the negative impacts of the alternative on avifauna during the operation phase is presented below.

[611] *Erickson et al. 2005.*
[612] *Fernie et al. 2000.*
[613] *Maniakowski M., et al. 2013*
[614] *Maniakowski M., et al. 2013*

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(17) significant**

The sum of the significance weights of the negative impacts is 17, so the impact during the operation phase on avifauna has been assessed as significant. These can be minimised by installing objects on lightning conductors to increase their visibility. The use of metal scarers to prevent birds from perching over vertically hung insulators or over phase wires suspended from insulators .

11.5.8. Terrestrial mammals

Within the corridor of the planned Project in the alternative option, 2 species of mammals under partial species protection were found, including one listed in Annexes II and V of the EU Habitats Directive - the European beaver. Of the valuable species, the squirrel was most frequently encountered. The observation of beaver refers to single old bites.

Construction phase

The impacts of the construction phase of the alternative option will not differ significantly from the impacts of the Investor's option. They will mainly involve scaring of mammals and destruction of their habitats.

The selection of the western option for the ECI landfall, due to the greater extent of the impact and the presence of less transformed forests will be associated with greater impacts on teriofauna. A greater number of mammals (protected and game combined) were observed in the alternative option (374) than in the Investor's option (325). More mammals (protected and game combined) were observed in the alternative option (378) than in the Investor's one (319). No other teriofauna species were observed within the alternative option's impact area than within the Investor's option.

Impacts will be local, short-term and reversible. Receptor sensitivity has been assessed as low.

A summary of the significance of the alternative option’s negative impacts on teriofauna during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, so the impact during the construction phase of the alternative option on teriofauna has been assessed as insignificant.

Operation phase

During the operation phase of the planned Project, potential impacts on mammals may be related to scaring of individuals during maintenance works and cyclic vegetation clearance. In addition, the overhead power line may be a barrier to mammal migration.

The overhead power line runs entirely through a local mammal migration corridor. Insufficient data and publications mean that the impact of the high-voltage line on the behaviour of this group of

animals is unknown. Some authors point out that crossings should not be created in the vicinity of electromagnetic radiation emitters as it causes deterrence to large mammals[615] . In addition, there is evidence of orientation disturbance in ungulates along power lines[616] . The impacts of the effects of overhead power lines on teriofauna are constantly being studied, so its effects on mammal migration cannot be clearly ruled out.

Impacts on teriofauna during the operation phase, have been assessed as negative, direct and simple. Impacts will be local, short term and reversible as they will cease when maintenance and servicing works are completed. The sensitivity of the receptor has been assessed as low.

A summary of the significance of the alternative option's negative impacts on teriofauna during the operation phase is provided below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(9) insignificant**

The sum of the significance weights of the negative impacts is 9, so the impact during the operation phase on teriofauna has been assessed as **insignificant**.

11.5.9. Bats

Four bat species have been identified within the corridor of the planned Project and in the area of potential impact for the alternative option. All of these are under strict species protection in Poland and are listed on Annex IV of the EU Habitats Directive. The greatest number of roosts, which provide breeding and hibernation sites, are found for the Daubenton's bat and the soprano pipistrelle. More bat roosts were found in the area of impacts of the alternative option (25) than in the area of the Investor's option (17).

In addition, 10 bat species were found flying over the area of the planned connection within the detector points. They were most abundant along roadside canopies, watercourses and the borders of patches of dense forest. Species found were the Noctule bat *Nyctalus noctula*, *Pipistrellus sp*., including the small *Pipistrellus pygmaeus,* the tiny Pipistrellus *pipistrellus* and the larger *Pipistrellus nathusii, the* barbastelle *Barbastella barbastellus*, the serotine *Eptesicus serotinus and greater mouse-eared bats Myotis sp*., including the large *Myotis myotis and the* red Myotis *daubentonii.*

The most valuable areas of the planned Project in terms of chiropterofauna are the northern, coastal part of the study area (km 35 - 37'), where most bat roosts have been found.

Construction phase

During the construction phase of the alternative option, no impacts other than those for the Investor's opttion, i.e. disturbance of bats and destruction of their habitat, are anticipated.

The selection of the western ECI landfall alternative would involve exposing a section of forest that is a swarming site for the small *Pipistrellus pygmaeus* to destruction. The alternative ECI corridor between kilometre 35' and 36' will pass through the largest bat mating grouping identified. Construction of the underground 220 kV cable line in this section will involve interference with potential summer roosts of chiropterofauna through tree felling. These impacts can be minimised and are not significantly different from those described in Section 10.5.9.

[615] *Kurek R. 2010.*
[616] *Begall S. et al. 2008*

The construction of the overhead power line will involve interference with the natural summer refuges of the chiropterofauna by tree felling conflicting with the course of the line and under the construction of the poles.

Impacts on chiropterofauna during the construction phase, have been assessed to be negative, direct and simple. Impacts will be local, short-term and reversible. The receptor sensitivity has been assessed as medium.

A summary of the significance of the negative impacts of the alternative on chiropterofauna during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(12) moderate**

The sum of the significance weights of the negative impacts is 12, so the impact during the construction phase on the chiropterofauna has been assessed as moderate, due to the potential destruction of a section of forest that is a swarming site for the the small *Pipistrellus pygmaeus* (between kilometre 35' and 36').

Operation phase

During the operation phase of the alternative option, potential impacts on bats may be related to scaring during maintenance works and periodic tree cutting. In addition, negative impacts from electromagnetic fields emitted by the overhead line can be expected.

The chiropterofauna during the operation phase may be potentially affected by the overhead power line. There is insufficient data and publications on the collision rate of this group of animals with power lines. Bats can detect objects as small as 1 mm in diameter from a distance of 2 m[617] . The few mortality monitors under low-voltage power lines in Poland show no information on bat mortality. However, studies indicate the effect of electromagnetic radiation emitters on the decrease of chiropterofauna activity[618] . There is no clear data on the impact of power lines on the orientation of bats in the field and their flight opportunities. The impact of noise emitted by the planned ONS stations is discussed in Section 10.5.9. Therefore, long-term impacts may affect the local population of chiropterofauna.

Impacts on chiropterofauna during the operation phase, have been assessed as negative, direct and simple. Impacts will be local, long-term and permanent. The sensitivity of the receptor has been assessed as medium.

A summary of the significance of the negative impacts of the alternative on chiropterofauna during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(13) moderate**

[617] *Griffin D. et al. 1960*
[618] *Nicholls B., Racey P. A. 2007*

The sum of the significance weights of the negative impacts is 16, so the impact during the operation phase on the chiropterofauna has been assessed as moderate.

11.6. IMPACT ON PROTECTED AREAS, INCLUDING NATURA 2000, ECOLOGICAL CORRIDORS AND BIODIVERSITY

11.6.1. Impact on the coastal protected landscape area west of ustka

The alternative option, which consists of the western landfall of the cables, includes the Protected Landscape Area Pas Pobrzeża to the west of Ustka, between 35' and 37' km of the ECI corridor, where forests dominate.

Construction phase

Impacts of the construction phase on the Protected Landscape Area Pas Pobrzeże to the West of Ustka will be similar to those identified in the Investor's option, due to construction works, presence of machinery and construction equipment, and will cease after the construction works are completed.

The impact assessment is influenced by other natural conditions in the area of the western landfall of the cables (between 35' and 37' km). There is a wide strip of mixed forest and dune coniferous forest habitat (2180). In this area, it is planned to lay a HDD guided drilling exit chamber or HDD guided drilling combined with a sea trench. This will require the deforestation of a habitat area of approximately 0.85[619] ha and significant levelling of this area. Unlike in the Investor's option, the site is not developed. As identified in section 11.1. due to the significant differences in elevation, which range from 0 m above sea level to 20 m above sea level (ul. Bosmańska), the leveling will be of considerable extent. Transformation in this area of such a large scale may result in intensification of aeolian processes.

The foundation of the underground electricity infrastructure will require cutting trees and shrubs along the section from the cable landfall (cable wells), further through forest areas up to the 37' km ECI corridor. Temporary access and permanent roads as well as manoeuvring areas will be realised in the construction corridor. During the construction phase, there will be increased vehicle traffic due to the transport of materials and people.

The impacts of the construction phase in the area of the western landfall of the cables will be negative, direct, secondary, long-term, permanent and local. These impacts can be considered significant.

As in the Investor's option, the planned Project in the alternative option within the boundaries of the Area of Protected Landscape Pas Pobrzeże to the West of Ustka will include a fragmentary complex of wet meadows in area 37' km, with Struga Lędowska. This watercourse will be crossed using a trenchless method. Potential impacts associated with the drilling may, as in the Investor's option, concern disturbance of water relations in this area. In order to prevent this, there is a ban on water intake necessary for the drilling mud and drainage of the drilling mud from Struga Lędowska, Lake Modła and smaller watercourses crossed by the ECI corridor on the section from 36.9' km to 37.5' km, as well as maximum limitation of drainage of the entrance and exit chambers of the trenchless passage under Struga Lędowska (e.g. by using sheet piling). In addition, it is recommended that the water from the drilling mud should be treated and the method of dispersal into the ground should be used to prevent these impacts.

The 400 kV overhead line connecting the ONS with the PSE substation will be located outside the boundaries of the Pas Pobrzeże Protected Landscape Area to the west of Ustka, at a distance of approximately 5 km from its borders.

A summary of the significance of adverse impacts of the alternative on the Pas Pobrzeże Protected Landscape Area to the west of Ustka during the construction phase is presented below.

[619] *If microtunneling or Direct Pipe technology is used, the area will be larger at around 3.3 ha.*

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(19) significant**

The sum of the significance weights of the negative impacts is 19, so the impact during the construction phase on the Protected Landscape Area Pas Pobrzeże to the West of Ustka was assessed as significant due to the transformation and occupation of the **area**, especially the habitat of mixed forests and coniferous forest on dunes (2180), which may intensify eolian processes. In addition, there will be loss of forest, vegetation cover and periodic disturbance of fauna.

Operation phase

Similarly to the Investor's option, due to the nature of the planned Project, including most of all, the underground route, no significant impact on the landscape being the subject of protection of the Protected Landscape Area Pas Pobrzeże to the West of Ustka is anticipated.

The area deforested as a result of the chamber construction related to the drilling through the coastal zone will be returned to its original state, with the exception of the area for the 10-31 m wide construction corridor over a distance of approximately 1.5 km. In these areas it will be possible for plants with shallow root systems to return. Four cable wells of small size will be visible in the forest landscape.

The impacts of the construction phase on the Protected Landscape Area Pas Pobrzeże to the West of Ustka will be, as for the Investor's option: negative, indirect, secondary, long-term and permanent. The spatial range of impacts will be local. The sensitivity/uniqueness of the environment has been determined as high.

A summary of the significance of adverse impacts of the alternative on the Pas Pobrzeże Protected Landscape Area to the west of Ustka during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(17) significant**

The sum of the significance weights of the negative impacts is 17, so the impact during the operation phase of the alternative option on the Protected Landscape Area Pas Pobrzeże to the West of Ustka has been assessed as significant, due to permanent changes to the landscape caused by cutting within the habitat of forests and coastal forests (2180), which may intensify aeolian processes.

11.6.2. Impact on natura 2000 sites

Natura 2000 impact assessment taking into account the recommendations of the European Commission handbook "Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC", European Commission, DG Environment, 2001 (chapter 1.4.3.) and data provided by RDOŚ in Gdańsk are presented in Annex 7 (Volume IV).

The alternative option of the planned Project is located at the following distances from the habitats that are the subject of protection of Natura 2000 sites:

- PLH220024 Przymorskie Błota:
  - 3150 Old river-beds and natural, eutrophic water bodies with associations from Nymphaeion and Potamion - approx. 1 km from the limits of the alternative option,
  - 6510 Extensively used fresh meadow - approximately 600m from the boundary of the alternative option,
  - 7230 Mountain and lowland alkaline fens of spring fen, sedge fen, and sedge-moss fen characteristics - approx. 500 m from the limits of the alternative option.
- PLH320068 Lake Wicko and Model Dunes:
  - 1130 River estuaries - approximately 1.4 km from the boundary of the alternative option. This is the closest habitat to the boundary of the alternative option.

As the alternative option also involves a trenchless crossing of Struga Lędowska, the identified potential impacts and minimisation and monitoring measures would need to be adopted if the alternative is implemented (Appendix 7 Volume IV).

The planned Project in the alternative option will not have a significant negative impact on the protection objectives of Natura 2000 sites PLH220024 Przymorskie Błota nor PLH320068 Lake Wicko and Modelskie Wydmy, including in particular the following:

- significant deterioration of natural habitats or the habitats of plant and animal species for whose conservation a Natura 2000 site has been designated;
- significant negative impact on species for whose protection the Natura 2000 site has been designated;
- significant deterioration of the integrity of the Natura 2000 site or its connection to other sites.

Furthermore, the planned Project, due to its nature and location, will not affect the possibility of implementing conservation measures and achieving the objectives set out in the Plan of Conservation Tasks for the Natura 2000 PLH220024 Przymorskie Błota site.

11.6.3. Impact on ecological corridors

The alternative option is located within:

- Pobrzeże Słowińskie corridor of national importance,
- Coastal corridor of supra-regional importance,
- eastern Atlantic flyway of birds.

In addition, the planned Project in the alternative option crosses local migration routes identified during the wildlife inventories conducted for this Report.

Construction phase

The construction phase, as in the Investor's option, will be associated with the felling of trees, the realisation of excavations and the laying of the cable line and the construction of the ONS station and will result in a temporary interruption of spatial continuity within:

- Pobrzeże Słowińskie corridor of national importance,
- Coastal corridor of supra-regional importance,
- eastern Atlantic migratory bird route .
- In addition, a 400 kV overhead line of approximately 6 km will be constructed to connect the ONS stations with the PSE S.A. station. (42.4 'to 47.7' km) within the above-mentioned ecological corridors. The construction of the overhead line will be carried out in sections, with a spot concentration of work occurring at pole locations. In the case of the mid-forest sections of the line, the basic tree felling will include a strip of land limited to a width of approx. 32 m in the clearing of the tree trunks, i.e. approx. 16 m from the line axis on both sides. Construction works, including tree felling in the mid-forest sections, may periodically cause disturbance to migrating animals. As construction works will generally be carried out during the daytime, in a given section over a period of several days, scaring of animals will cause a minor and short-lived reduction in the functionality of ecological corridors.

The construction of infrastructure for the landfall of the cables from the sea (location of the drill exit chamber, construction of cable wells, manoeuvring yards and access roads) in the area of 35' km will restrict the use of this space by the species of mammals, amphibians, reptiles found here, for a period of approximately 1.5 years. Due to the conditions occurring here (habitat 2180, Lędowskie Dunes) the sensitivity of this area has been determined as high.

The construction phase impacts on the alternative's ecological corridors will be negative, direct, simple, short-term and reversible, and their spatial extent will be within the limits of ED. The sensitivity/uniqueness of the environment has been determined to be high.

A summary of the significance of the alternative's negative impacts on ecological corridors during the construction phase is provided below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(3)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, so the impact during the construction phase on the ecological corridors has been assessed as moderate. Negative impacts on the ecological corridors during the construction phase will primarily relate to land transformation and its occupation, especially in the coastal strip due to the construction of infrastructure for the landfall of cables from the sea. In addition, they will be related to forest clearing, removal of vegetation and periodic scaring of fauna.

Operation phase

Once the construction phase has ceased, the site will be restored to its original state, with the exception of the technological corridor from:

- underground 220 kV cable lines with a width of 10-31 m,
- 400 kV power line with a width of 32 m.

These areas will be permanently deforested. The agricultural areas will be returned to their original state and used for agriculture. Plants with a shallow root system will be allowed to return to these areas.

The creation of a deforested space with the dominance of an overhead line and 2-track poles will result in the discontinuation of the spatial continuity of the ecological corridors - in a strip 32 m wide and about 6 km long. In the area of the planned Project runs a part of one of the most important bird migratory routes in Central Europe - of the eastern Atlantic migratory route , connecting the breeding grounds in northern Europe with wintering grounds located in southern and western Europe, Africa, and for a small number of species also in Asia. Millions of migratory birds fly over this area, migrating towards the wintering grounds in autumn and towards the breeding grounds in spring. The flight ceilings of the birds vary greatly, depending primarily on weather conditions. In this context, a high collision of birds with the planned 400 kV overhead power line is forecast. Collision with the 400 kV overhead power line will also affect local birds nesting in the area.

The impacts of the operation phase on the ecological corridors of the alternative option of the Project will be negative, direct, secondary, long-term and permanent, and their spatial extent will be supra-local. The sensitivity/uniqueness of the environment has been determined to be high.

A summary of the significance of the alternative's negative impacts on ecological corridors during the construction phase is provided below.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Supra-local	**(3)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(20) significant**

The sum of the significance weights of the negative impacts is 20, so the impact during the operation phase on the ecological corridors **has been assessed as significant, due to the** location in the area of the East Atlantic migration route corridor, which poses a risk of high bird mortality caused by the planned high voltage line.

11.6.4. Impact on biodiversity

Construction phase

The impact of the alternative option on biodiversity will be greater than that of the Investor's option due to the presence of mixed forest and woodland on coastal dunes (habitat 2180) in the area of the western landfall of the cables. This is not a transformed area as in the case of the Investor's option. There are sites of vascular plant species that are not present in the Investor's option. These include the strandsporre *Linaria odora*, the marsh Labrador tea *Ledum palustre, the* green flower wintergreen *Pyrola chlorantha*, the sandflower *Helichrysum arenarium* and the common club moss *Lycopodium clavatum* and the stiff club moss *L. annotinum.* As a result of implementing the Project in the alternative option, the sites of these species may be eliminated here.

As shown in the previous chapters, the implementation of the planned Project will be significant for protected plant species, habitats, forests and birds. Moderate impacts will affect fungi and lichen biota and herpetofauna. The greatest impacts will be associated with the construction phase. Most impacts will be negative, direct and simple of a short-term and reversible nature. Due to permanent habitat and forest clearance, impacts on breeding birds and bat breeding habitat will be long-term and permanent. The operation of the mid-forest 400 kV overhead line will have definite negative, permanent impacts on birds, primarily related to their collisions with overhead lines and permanent habitat fragmentation.

The most valuable area (with the greatest biodiversity) is located within the boundaries of Protected Landscape Area Pas Pobrzeża to the West of Ustka. Impacts of the construction phase on the Protected Landscape Area Pas Pobrzeże to the West of Ustka are assessed to be significant due to transformation and occupation of the area, particularly the habitat of mixed forests and coniferous forests on dunes (2180), which may intensify eolian processes. In addition, there will be the removal of forests, vegetation cover and periodic scaring of fauna. Therefore, the impact on biodiversity can also be considered significant.

A summary of the significance of the negative impacts of the alternative on biodiversity during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(19) significant**

The sum of the significance weights of the negative impacts is 19, so the impact during the construction phase on biodiversity has been assessed as significant, due to the transformation and occupation of the land, especially the habitat of mixed forest and dune coniferous forest (2180), which may intensify eolian processes. In addition, there will be the removal of forests, vegetation cover and periodic scaring of fauna.

Operation phase

Once the construction phase has ceased, the land will be restored to its original state, with the exception of a technological corridor of approximately 10-31 m for the underground 220 kV line and 32 m for the 400 kV overhead line. This area will be permanently deforested. In addition, additional tree felling will be carried out of trees that could fall over the line. Plants with a shallow root system will be able to return to these areas. There will be secondary succession towards lowland and grassland habitats and species. Agricultural land will return to its original state and be used for agriculture. Negative impacts on biodiversity will mainly relate to succession and the possibility of invasive plant species. A positive aspect is the creation of new habitats that can be used by animals.

A summary of the significance of the negative impacts of the alternative on biodiversity during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Indirect	**(1)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(16) moderate**

The sum of the significance weights of the negative impacts is 16, so the impact during the operation phase of the alternative option on biodiversity has been assessed as moderate, due to tree felling within the coastal woodland and forest habitat (2180) and the potential for invasive plant species.

11.7. IMPACT ON THE LANDSCAPE

In the area of the western landfall of the cables (beach and Lędowskie Wydmy), there is considerable terrain variation; from 0 to 20 m above sea level, with the highest elevation being Góra Ognica (40 m above sea level). Further on, the landscape is formed by extensive coastal plains and moraine uplands.

Construction phase

Impacts on the landscape of the alternative option during the construction phase will be similar to those identified in the Investor's option, due to construction activities, the presence of construction machinery and equipment, and will cease once construction activities are completed.

The greatest impacts will occur due to the foundation of the drill exit chamber through the coastal zone. This will require deforestation of the mixed forest and dune forest habitat (2180) of approximately 0.85 ha and significant levelling of this area. Unlike the Investor's option, this is not a developed area (Photo X). Transformation in this area of such a large scale may result in intensification of eolian processes. Therefore, the impacts of the construction phase in the area of the western landfall of the cables will be negative, direct, secondary, long-term, permanent and local. The sensitivity has been determined to be high. The impact can be considered significant.

During the construction phase of the 400 kV overhead line, the main impact on the landscape will be the periodic, specific physiognomy of the construction area, primarily in the area of pole stands

involving construction machinery and equipment. After completion of the construction works, the areas around these posts will be restored to their original use. These will not be significant impacts.

A summary of the significance of the alternative option's negative impacts on the landscape during the construction phase is presented below

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Within the limits of ED	**(1)**
Sensitivity/vulnerability of the environment	
Large	**(5)**
Impact classification	**(17) significant**

The sum of the significance weights of the negative impacts is 17, so the impact during the construction phase on the landscape has been assessed as significant. Negative impacts on the landscape during the construction phase will primarily relate to tree felling in the area of the western exit of the cables to the counters, which may result in the initiation of eolian processes.

Operation phase

Permanent landscape changes will occur as a result of the implementation of the western landfall of the cables and in the mid-forest sections of the power line route. Around 15-20 power poles with a maximum height of 100 m are planned along the entire length of the line. The 400 kV overhead line will be a new linear landscape feature in the mid-forest and in the agricultural-industrial and forest surroundings. The interference with the landscape will be significant, with a supra-local scope. The tall electricity poles and the planned ONS will be visible from a long distance and will become a dominant landscape feature in the area.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Supra-local	**(3)**
Sensitivity/vulnerability of the environment	
Average	**(3)**
Impact classification	**(17) significant**

The sum of the significance weights of the negative impacts is 17, so the impact during the operation phase on the landscape has been assessed as significant. Negative impacts will mainly relate to power poles and onshore substations, which dominate the landscape.

11.8. IMPACT ON MONUMENTS

There are no listed buildings, archaeological sites or historic buildings in the alternative option. There is 1 archaeological site 26 in the area of potential impact. In addition, the planned Project in the alternative option, crosses a disused historic railway line (39.8' km).

The impact of the construction and operation phases on the monuments will be neutral. However, they require agreement with the Ustka Municipality in connection with the crossing of the historic railway line ("Trail of the Rolled-up Tracks") (39.7 km).

11.9. IMPACT ON CLIMATE AND ATMOSPHERIC CLEANLINESS

Construction phase

The impact of the alternative option of the planned Project on atmospheric cleanliness and climate is similar to the Investor's option. The difference will be the construction of an overhead line from the ONS bstation to PSE.

During the construction phase, there will be a negative impact on atmospheric air, but this will be short-lived and local, point-wise at the pole construction sites and linearly along the access routes to the poles. Due to the anticipated shorter duration of construction of the overhead line, there may be fewer emissions to air.

The impact on climatic conditions will be negligible, the construction of the line will slightly affect thermal and humidity changes related to the transformation of the active surface in the range of pole foundations and temporary access to some pole positions, and anemometric changes in the range of erected pole structures. Changes in local climatic conditions will mainly involve mid-forest sections and will be associated with tree felling. The consequences will be an increase in air temperature, an increase in insolation, an increase in ventilation and a decrease in humidity.

The planned Project alternative will not have a significant impact on climate during the construction phase, while the impact on air quality will be minor. This impact will be short-term, direct, confined to the boundaries of the Project impact area, and recoverable.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

The sum of the significance weights of the negative impacts is 10 and qualifies the climate and air quality impacts during the construction phase as insignificant.

Operation phase

During the operation phase, the impact on air status and climate will be positive as in the Investor's option.

In terms of the impact of climate change on the planned Project, the overhead line will have a greater impact than the Investor's option. There will be more frequent and more intense extreme weather events as a result of ongoing climate change. The overhead network, unlike the cable network, is much more vulnerable to failures due to ice or strong winds.

11.10. IMPACT ON THE ACOUSTIC CLIMATE

Construction phase

The construction works constituting the source of noise will be carried out basically entirely in the surroundings of forest and agricultural areas away from the acoustically protected areas. In the zone of influence of the alternative option there are 4 residential buildings (in the village of Modlinek near 36' km, in the village of Lędowo near 38' km, in the village of Pęplino near 45 km and in the village of Gajki near 46' km) whose inhabitants may be temporarily exposed to noise emissions.

The planned Project will not have a significant impact on the acoustic climate during the construction phase. Noise generated during the construction phase will be time-limited, short-term, direct and local.

A summary of the significance of the negative impacts of the alternative on the acoustic climate during the construction phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

The sum of the significance weights of the negative impacts is 10 and classifies the impact on the acoustic climate during the construction phase as **insignificant**.

Operation phase

Noise sources during the operation phase of the alternative will be:

- LSE stations,
- 400 kV overhead line.

Calculations of noise associated with the operation of ONS stations can be found in Appendix 4 Volume IV. Noise impacts from ONS stations were considered as.moderated (chap. 10.10.).

400 kV double circuit overhead line

Noise (hum) is one of the main nuisances to residents for overhead lines. The intensity of emissions is affected by weather conditions - with increased humidity, the level of noise emitted increases. In order to reduce noise, three-wire bundle conductors will be used, which results in a definite decrease in the noise level generated by the overhead line compared to the noise generated by single conductors or two-wire bundles.

Studies of the acoustic nuisance of 400 kV lines in operation show that the average noise level at a distance of 30 m from a 400 kV line made with bundle conductors, even in the worst weather conditions, does not usually exceed the values of 39.0 - 44.5 dB(A), depending on the type of bundle and the geometrical configuration of the conductors. Regardless of weather conditions, the noise level decreases with distance from the overhead line.

As part of the preparation of the Environmental Impact Report for the planned Project, calculations of noise levels in the vicinity of the 400 kV double overhead line were carried out (Appendix 4 Volume IV).

The results of sound level distribution calculations in the vicinity of the 400 kV overhead double-track line designed as an alternative indicate that:

- the maximum value of the sound level under the most unfavourable operating conditions of the line (bad weather) will not exceed the value at any point below the line (at 4.0 m a.s.l.):
  - in the span made of E33P-E33P poles: 47.5 dB, which means a value 2.58 dB higher than the permissible value set in the Regulation of the Minister of the Environment of 14 June 2007 on permissible levels of noise in the environment (Dz.U.2014.112 t.j.) for residential areas at 45 dB,
  - in the span made of E33P-E33M3 poles 47.8 dB, which means a value 2.8 dB higher than the permissible value set in the Regulation of the Minister of the Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws 2014.112 i.e.) for residential areas at 45 dB,
  - in the span made of E33P-E33M6 poles 47.6 dB, which means a value 2.2 dB higher than the permissible value set in the Regulation of the Minister of the Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws 2014.112 i.e.) for residential areas at 45 dB,
- the area of land under the analyzed 400 kV overhead line, where computational analyses indicate values above the permissible t.i.e. 45 dB (for the areas of residential development) is exceeded,

extends (at a height of 4.0 m a.s.l.) to a maximum distance (irrespective of the span) of 18 m from the axis of the line in both directions, and thus the area is entirely contained within the so-called "technological zone", 70 m wide (2 x 35 m).

- in the vicinity of the system of parallel 400 kV overhead lines, the construction of residential buildings, due to the possibility of exceeding the permissible noise level (45 dB), would not be possible in an area 78 m wide (2 x 39 m).

The nearest single-family residential development is located in the village of Gajki (45.8' km) i.e. approximately 60 m from the ECI corridor. The operation of the overhead line would not cause noise exceedances in the village of Gajki, but due to its close proximity, the sensitivity of the environment was considered medium.

A summary of the significance of the negative impacts of the alternative on the acoustic climate during the operation phase is presented below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Medium	**(3)**
Impact classification	**(17) significant**

The sum of the significance weights of the negative impacts is 17 and qualifies the impact on the acoustic climate during the operation phase as **significant.**

11.11. IMPACT ON ELECTROMAGNETIC FIELDS AND THERMAL EFFECTS

Electromagnetic fields in the operation phase

The source of the electromagnetic field in the alternative will be:

- underground 220 kV cable lines,
- 400 kV overhead line.

Calculations of the magnetic field strength distribution in the vicinity of the designed cable lines can be found in Appendix 5 Volume IV. Magnetic field impacts from underground cable lines were considered neutral (Section 10.11.).

Electromagnetic field associated with the operation of 400 kV overhead line

Calculations of the electric and magnetic field strength distribution in the vicinity of the 400 kV overhead line (Appendix 5 Volume IV) showed:

- the electric field strength under the line (at any point at a height of 2.0 m above sea level) will not exceed at any point the value of: **8.5 kV/m**, and this value can only occur at the maximum overhang of the conductors, i.e. under the most unfavourable operating conditions of the line. This means that the expected maximum values of the electric field strength, irrespective of the bay under consideration, do not exceed the limit value of this magnitude (E_{dop} = 10 kV/m) set by the applicable regulations for places accessible to people;
- in the area to -25 m ÷ +25 m from the axis of the line, the permissible electric field strength limit set for the areas intended for residential development (1 kV/m) may be exceeded, which means that in the area under the line with a width of 50 m residential development is not permitted. If the alternative option, i.e. the construction of a double-circuit 400 kV overhead line, is implemented, this issue will be sanctioned by establishing a transmission easement in a 70 m wide area (2 x 35 m).
- calculations, which were carried out for the smallest distance from the ground of the phase conductors (h = h_{min}), showed that the magnetic field strength (H) under the line (in any place at a height of 2.0 m above sea level) will not exceed at any place the value of: **16.5 A/m**, and this value can only occur at the maximum sag of the conductors and at its maximum current load (I_{max} = 1250

A), i.e. under the most unfavourable operating conditions of the line. This means that the expected maximum values of the magnetic field strength, irrespective of the bay under consideration, do not exceed the permissible value of this magnitude (H_{dop} = 60 A/m) established in the current regulations for places accessible to people and areas intended for residential buildings.

The electric and magnetic field strength impacts in the vicinity of the 400 kV overhead line were considered neutral.

Thermal impacts during the operation phase

In the alternative option, thermal impacts from the operation of the underground cable line will be the same as in the Investor's option. Thermal impacts from underground cable lines were considered neutral.

In the section between the ONS and PSE S.A. stations. (42.4 'to 47.7 km) thermal impacts will not occur, due to the operation of the 400 kV overhead line.

11.12. IMPACT ON HUMAN HEALTH AND LIFE AND MATERIAL ASSETS

Construction phase

The impact on the population, health and living conditions of people for the alternative option during the construction phase will be similar to the Investor's option. The differentiating factors will be the larger number of single-family dwellings located in the Project's impact zone exposed to nuisance from construction activities (Section 6, Field Inspection Sheet no. 7). Impacts during the construction phase have been assessed as insignificant.

Impacts on material assets during the construction phase will be the same as for the Investor's option. These impacts have been assessed to be insignificant.

The table below summarises the assessment of the significance of the negative impacts of the alternative on people, health and living conditions during the construction phase:

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Simple	**(1)**
Short-term	**(1)**
Reversible	**(1)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(10) insignificant**

The sum of the significance weights of the negative impacts is 10, so the population, health and living conditions impacts during the construction phase of the alternative have been assessed to be insignificant. Negative impacts on people and living conditions during the construction phase will mainly relate to nuisance related to noise, emissions, pollution and increased traffic, and restrictions on access to agricultural land and forests. Positive impacts will relate to increased employment for nearby residents and the development of services during the construction period.

Operation phase

Impacts on material assets during the operation phase will be the same as for the Investor's option. These impacts have been assessed to be insignificant.

Impacts during the operation phase will be similar to the Investor's option, differing at the location of the 400 kV overhead power line. The most significant nuisances associated with the operation of the line relate to noise emissions and electromagnetic radiation. In addition, the metal poles will cause a problem for the owners of the plots, as the existing use of the land will not be possible due to the presence of the poles.

As part of this Report, the electromagnetic field distributions from the 400 kV overhead power line were calculated (Appendix 5 Volume IV), which showed that there are no exceedences of the permissible values set in the applicable regulations for places accessible to people and areas intended for residential development.

The results of the sound level distribution calculations (Appendix 4, Volume IV), in the vicinity of the 400 kV double-circuit overhead line designed as an alternative option, indicate that in the vicinity of the system of parallel 400 kV overhead lines, the implementation of residential development, due to the possibility of exceeding the permissible noise level (45 dB), is not possible in an area with a width of 78 m (2 x 39 m).

Electricity lines are more failure-prone compared to underground cables, also there is a higher probability of cable damage and power outage. Therefore, the alternative option is less favourable compared to the Investor's option. In addition, during maintenance works, the load on the access road to the substation and the line will increase, which will contribute to increased emissions of dust (car traffic) and exhaust fumes, mainly from car engines.

During operation, the overhead line will be a dominant feature in the surrounding area and will cause some restrictions on the daily use of agricultural and forest land. The overhead power line and the power poles on the plot may also be more problematic for the Investor. The owner of the plot has a claim for the removal or alteration of the line, further reduces the value of the property and may be an obstacle to obtaining planning permission for the construction of the house[620] . This can cause legal and procedural problems for the Investor and prolong the procedure for obtaining an environmental decision and other permits.

The negative impacts on people, health and living conditions during the operation phase of the alternative are shown in the table below.

Type of impact and its severity	
Negative	**(1)**
Direct	**(3)**
Secondary	**(2)**
Long-term	**(3)**
Fixed	**(3)**
Spatial extent of the impact	
Local	**(2)**
Sensitivity/vulnerability of the environment	
Small	**(1)**
Impact classification	**(15) moderate**

The sum of the significance weights of the negative impacts is 15, so the impacts during the operation phase on the population, health and living conditions have been assessed as moderate. The negative impacts on people and living conditions during the operation phase will mainly relate to nuisance related to electric field emissions and the establishment of a transmission easement in an area 70 m wide (2 x 35 m), and noise emissions exceedance, which is related to the exclusion of areas designated for residential development in an area 78 m wide (2 x 39 m).

11.13. ENCLOSED AREAS

The route of the planned Project in the alternative option on the section of about 1.5 km runs through the military area of the Naval Training Centre in the area of Lędowo village (Ustka commune). The military area through which the connection will pass was established by Decision No. 80/MON of the Minister of National Defence of 8 June 2022 on the determination of closed areas in the national defence ministry. These are the following plots of land: 359, 92/7, 93/3, 116/4, 120/3, precinct Lędowo, rural municipality of Ustka.

[620] *https://blog.ongeo.pl/linia-energetyczna-na-dzialce*

Within the military area, the route passes through dunes, woodland and built-up areas. At the design stage, it will be necessary to contact the manager of the closed area, i.e. the Regional Infrastructure Management Board in Gdynia.

The possible negative impacts in the alternative option will be the same as in the Investor's option.

11.14. IMPACTS OF THE DECOMMISSIONING PHASE

As in the Investor's variant, the decommissioning process will be a reverse construction process, with the same logistical layout (Chapter 10.15).

The decommissioning of the 400 kV overhead line will involve the removal of the dismantled elements of the line (wires, poles and their foundations) and the resulting waste from the Project site to the place of their final disposal or storage, by authorised companies. As a result of the decommissioning of the facilities, the area will be recultivated in the primary direction – agricultura.

12. CUMULATIVE IMPACT

In accordance with Article 63 par. 1 point 3f of the EIA Act, an assessment of the cumulative impact should cover the projects executed, being executed and planned to be executed within the range of the implementation and impact of the project. Determination of the existing and planned projects in the area of the planned ECI corridor of the offshore wind farm MFW Bałtyk II and MFW Bałtyk III was based on a search conducted in January and February 2022. The sources of data are as follows:

- information obtained from RDOŚ in Gdańsk and Municipal Offices in Ustka and Słupsk (issued and pending environmental decisions);
- findings on the basis of the official portal of the maritime administration - SIPAM (applications and issued PSZW and PUUK decisions);
- information on MFW Bałtyk II and MFW Bałtyk III in the Environmental Decision and on MFW Bałtyk I (information from the Investor).

In the table below (table 12.1.), the results of the search are presented and the location of the identified projects considered in the analysis of the cumulative impact is shown in figure 12.1 (offshore) and figure 12.2 (onshore). The collected information shows that, in the area of the planned Project, there were 14 applications for issuance of the decision on environmental conditions in the distance of 100 m from the planned ECI of MFW Bałtyk II and MFW Bałtyk III. The table below also presents the assessment of the possibility of the cumulative impact occurrence.

Table 12.1. *Assessment of the potential cumulative impact of the planned Project and other projects in its vicinity*

No.	Status of the project	Name of the project, stage of the EIA procedure	Project characteristics	Assessing whether a cumulative impact may occur
OFFSHORE AND ONSHORE PART				
1.	Planned before the start of the EIA procedure	Connection infrastructure for offshore wind farm **MFW Bałtyk I** - no environmental decision (not yet in process) - project planned for implementation,	The planned connection infrastructure of the offshore wind farm MFW Bałtyk I will be located within the same offshore corridor as the ECI of MFW Bałtyk II and MFW Bałtyk III. Investor: MFW Bałtyk I S.A. This is also an Equinor and Polenergia project, so there will be cooperation and implementation so that cumulative impacts do not occur. At this stage, the exact route in the onshore part is not known except for the trenchless landfall, which will be implemented together with the ECI of MFW Bałtyk II and Bałtyk III.	Due to the early stage of the investment process (the application for an environmental decision has not yet been submitted), it is not possible to identify the potential impact and assess the possibility of cumulation. The planned connections from MFW Bałtyk II and MFW Bałtyk III will be the main sources of impact during the construction phase, while MFW Bałtyk I will be implemented in the so-called second phase, so there will certainly be no cumulative impact of the construction phase. The potential impact of the operation phase, i.e. magnetic field and heat emissions, are assessed in this Report as insignificant, therefore no potential for the cumulative impact is forecast at this stage. This issue will be the subject of the EIA Report for the connection from MFW Bałtyk I. The investor is currently planning to execute the landfall using a trenchless method to eliminate interference in the coastal zone, including the sea shore. The investor is planning to execute the drillings simultaneously for all three farms, i.e., MFW Bałtyk I, MFW Bałtyk II and MFW Bałtyk III, which will eliminate the impact of the construction phase of MFW Bałtyk I related to the land occupation necessary for the organisation of the trenchless passage construction site. Thus, the potential cumulative impact of the construction phase will be eliminated. Construction works will be carried out once, without the need to bring in heavy construction equipment again, cut down trees, organise the access road, etc. In summary, the potential cumulative impact is not forecast.
2.	Planned Procedure in progress (RDOŚ Gdańsk)	Construction of **FEW BALTIC II** Connection Infrastructure - administrative procedure in progress – the EIA Report has been published. Application for the decision on environmental conditions for the project entitled: 'Construction of the Connection Infrastructure of FEW BALTIC II' dated 17 January 2022, case No.: BSP-BTI-CNS-LET-8012_01	The connection from MFW FEW Baltic II runs parallel to the MFW Bałtyk II and MFW Bałtyk III corridor on the western side. After making landfall, the connection from MFW FEW Baltic II moves away from the planned Project towards the planned Krzemienica substation.	In the offshore section, it is predicted that in case of overlapping of the execution dates of the FEW Baltic II connection infrastructure and the MFW Bałtyk II connection infrastructure (and partly of MFW Bałtyk III), the impact of the construction phase may be cumulated. This refers to a situation in which two cables will be executed simultaneously in close proximity. Then, a cumulative impact related to the temporary emission of underwater noise and an increase in suspended solids concentration in the water will occur. This is an unlikely situation, and, in view of the local scale, insignificant or moderate impacts predicted in this Report, it should not result in cumulative impacts that would cause significant adverse effects on the marine environment. This also applies to the joint passage through the Natura 2000 sites PLC990001 Ławica Słupska and PLB990001 Przybrzeżne wody Bałtyku, as the infrastructure corridor designated in the POM Plan for offshore wind farm connections is planned in a place where the protected areas' values are the lowest. The planned projects will cause temporary interference in the seabed of Ławica Słupska and a disturbance of benthic organisms in a narrow strip of widht about 5 m for each of the four cables (2 cable lines from FEW BALTIC II and 2 cables from MFW Bałtyk II), but within about 2 years, recolonisation with native benthofauna and phytbenthos species should occur, and the environment should be restored to its original state. The offshore cumulative impacts relate to the construction phase only and will be local, temporary, reversible, and have been assessed to be moderate and not a threat to Natura 2000 protected sites. During the operation phase, due to the distance between the cable lines (minimum 50 m), no cumulative magnetic field emissions or heat emissions are expected to occur. Both in the Report for FEW BALTIC II and in this Report, these impacts have been assessed as insignificant, limited only to the immediate vicinity of the cables. In the onshore section, cumulative construction phase impacts may occur if the works are carried out at the same time. A short-term impact, mainly related to noise and exhaust emissions, may only occur in the northern part at the length of about 2 km, where the cable routes are adjacent. These impacts will be temporary, local and reversible, and will not cause significant adverse impacts on the terrestrial environment. In summary, the potential significant negative cumulative impact is not forecast.
3.	Existing	450 kV DC transmission system Sweden-Poland (**SWEPOL Link**) - Project implemented	The existing SWEPOL Link cable line runs parallel to the planned Project, along the western border, both onshore and offshore. Within the Baltic Sea II offshore wind farm, the SWEPOL Link cables run at a length of approximately 2 km in the corridor of the planned Project. The line connecting the Stärnö peninsula in Sweden with the Słupsk Wierzbięcino substation was put into service in August 2000. The line's capacity is 600 MW at a voltage of 450 kV. In the onshore part, the SWEPOL Link cable approaches the planned Project in the ECI corridor of the MFW Bałtyk	The SwePol High Voltage Direct Current (HVDC) cable project was completed and commissioned in August 2000. Therefore, it is anticipated that cumulative impacts may only relate to the operational phase in terms of power field emissions and temperature emissions. Taking into account the small range of thermal emissions of the planned Project (limited to the closest vicinity of the cable), the magnitude of the magnetic fields generated by the cables (6 times smaller than the Earth's magnetic field, and the field values drop to zero at a distance of approx. 10 m from the cable axis) and the distance between the cable lines of the planned Project and the SwePol Link cable, cumulative impacts will not occur. In conclusion, the potential significant negative cumulative impact is not forecast.

No.	Status of the project	Name of the project, stage of the EIA procedure	Project characteristics	Assessing whether a cumulative impact may occur
			II and Bałtyk III in 3 places: at the cable entry onshore, at the location of onshore substations, and at the entrance to the Słupsk Wierzbięcino substation.	
4.	Planned – the Environmental Decision issued (RDOŚ Gdańsk)	Construction of offshore wind farm **MFW Bałtyk II** - decision on environmental conditions No.: RDOŚ-Gd.WOO.4211.26.2015.KSZ.20 dated 27 March 2017 amended by decision no: RDOŚ-Gd-WOO-420.3.2021.KSZ.14 dated 26 October 2021.	The project will be implemented in a small section within the area of the MFW Bałtyk II. The area designated for the construction of the MFW Bałtyk II is approximately 122 km^2. The MFW Bałtyk II will consist of: a maximum of 60 wind power plants, whose basic elements are the foundation, tower, nacelle, with power generator and rotor, with a total capacity of no more than 1,200 MW, 1 internal offshore substation and a maximum of 200 km of offshore power and telecommunication cable sections.	It is anticipated that in case of overlapping of the execution of the wind turbines and the OSS of MFW Bałtyk II and the execution of the northern part of the cable corridor of the ECI of Bałtyk II, a cumulation of construction phase impacts related to the temporary emission of underwater noise and an increase in suspended solids concentration in the water may occur. These impacts will be temporary and local and the accumulation of impacts will only occur for a few days or so, as the works related to laying of the cable lines will move away from the MFW Bałtyk II field. Therefore, no significant negative cumulative impact on the marine environment is expected. No significant cumulative impact is expected during the operational phase of the project, as offshore wind farms cause different effects than submarine cables. In case of cables, the only permanent impact relates to magnetic field and heat emissions, which are limited to the immediate vicinity of the cable. In summary, the potential significant negative cumulative impact is not forecast.
5.	Planned - the Environmental Decision issued; RDOŚ Gdańsk	Construction of an offshore wind farm **MFW Bałtyk III** - decision on environmental conditions No.: RDOŚ-Gd.WOO.4211.12.2015.KSZ.22 dated 7 July 2016.	The project runs for approx. 6 km through the western part of MFW Bałtyk III. The total area of the MFW Bałtyk III is approximately 117 km^2. The MFW Bałtyk III will consist of: maximum 120 wind power plants, whose basic elements are the foundation, tower, nacelle, with power generator and rotor, maximum 6 offshore substations and maximum 200 km of offshore power and telecommunication cables. The maximum power of the Bałtyk Środkowy III offshore wind farm is no more than 1,200 MW.	It is anticipated that in case of overlapping of the execution of the wind turbines and the OSS of MFW Bałtyk III and the execution of the northern part of the cable corridor of the ECI of Bałtyk III, a cumulation of construction phase impacts related to the temporary emission of underwater noise and an increase in suspended solids concentration in the water may occur. These impacts will be temporary and local and the accumulation of impacts will only occur for a few days or so, as the works related to laying of the cable lines will move away from the MFW Bałtyk III field. Therefore, no significant negative cumulative impact on the marine environment is expected. No significant cumulative impact is expected during the operational phase of the project, as offshore wind farms cause different effects than submarine cables. In case of cables, the only permanent impact relates to magnetic field and heat emissions, which are limited to the immediate vicinity of the cable. In summary, the potential significant negative cumulative impact is not forecast.
6.	Planned the Environmental Decision issued, RDOŚ Gdańsk	Offshore Wind Farm **Baltica 2** - issued decision on environmental conditions No.: RDOŚ-Gd-WOO.4211.21.2017.MJ.PW.AJ.37 dated 24 January 2020.	The Baltica 2 area borders the northern part of the Project corridor. The area of the OWF Baltica (Baltica 2 area and Baltica 3 area) is approximately 268 km^2. The Baltica offshore wind farm (Baltica 2 area and Baltica 3 area) will consist of: maximum 209 wind power plants, whose basic elements are the foundation, tower, nacelle, with power generator and rotor, maximum 25 additional structures (substations, research and measurement and/or accommodation and maintenance platforms) and maximum 418 km of offshore power and telecommunication cable sections. The maximum installed capacity is 2,550 MW.	Cumulative impacts may only occur during the construction phase, if construction works on the Baltica 2 farm and the connector between MFW Bałtyk II and MFW Bałtyk III overlap; this only applies to the connector in the northern part at a length of approx. 2 km. As the link will not be currently implemented, cumulative impacts of the construction phase are excluded.
7.	Existing	**TSS Ławica Słupska** shipping route - existing route	The project route crosses the TSS Ławica Słupska shipping route.	It is anticipated that during the construction phase of the planned Project, vessel traffic along the TSS Słupska Ławica route may be disturbed. The navigational analysis shows that at the crossing of the cable route of the Project with the navigational route of TSS Słupska Ławica, the installation works will be carried out at the highest possible speed determined by the geological structure of the seabed in the area of works. It will enable to limit work time of installation vessels on the TSS Ławica Słupska route to the minimum i.e., approximately 2 - 3 days, which will directly translate into minimising restrictions on vessel traffic on the TSS Ławica Słupska route. In summary, the potential significant negative cumulative impact is not forecast.
ONSHORE PART				
Municipality of Ustka				
1.	Existing	Fish processing company **MOWI POLAND S.A.** - operating since 1995, formerly known as Morpol S.A. In August 2016, a decision was issued by the Voit of the Municipality of Ustka on the	The site of approx. 13 ha, located in the middle of the planned Project route, is located in the area of potential Impact of the ECI of the MFW Bałtyk II and Bałtyk III to the north.	The potential cumulative impact during both the construction and operational phases is not anticipated. Because of MOWI POLAND S.A. employing approximately 4,000 workers, construction works related to cable laying may cause disruptions in the flow of car traffic - employees commuting to work shifts. This requires construction to be organised in such a way as to ensure traffic flow both on the access road to MOWI and on provincial road No. 203. This issue is described in more detail in Subchapter 10.13 Impact on people and material assets.

No.	Status of the project	Name of the project, stage of the EIA procedure	Project characteristics	Assessing whether a cumulative impact may occur
		lack of need to conduct an environmental impact assessment for: the expansion of the fish processing plant "Morpol" S.A by social, office and storage rooms on plots no. 39/1, 78/1, 39/15, 39/18 in Duninowo, case No: OŚR.6220.3.6.2016		In summary, the potential significant negative cumulative impact is not forecast.
2.	Planned - the Environmental Decision issued by the Voit of the Municipality of Ustka	Construction of a **PV Pęplino 3 photovoltaic power plant** with a capacity of up to 2 MW and accompanying infrastructure within Pęplino, plot No. 192, Ustka Municipality - decision on environmental conditions dated 30 June 2020, case No: GOR.6220.9.10.2019	The construction of the photovoltaic power plant is planned on a plot, which is located within the corridor borders and within the potential impact of the ECI of MFW Bałtyk II and Bałtyk III. The total area of the plot is 2.85 ha, the entire area of plot No. 192 is intended for the investment, on which the construction of PV Pęplino 3 is planned.	The planned Project interferes with the planned construction of a photovoltaic power plant. At this stage, the potential negative cumulative impact of the construction and operation phases is not expected. The realisation of both investments will require the agreement of the investors and the adoption of solutions not conflicting with each other at the stage of the construction project. Furthermore, it is worth emphasising that the implementation of the ECI belongs to strategic and public purpose investments.
	Planned - the Environmental Decision issued by the Voit of the Municipality of Ustka	Construction of a **PV Pęplino 5 photovoltaic power plant** with a capacity of up to 3.5 MW, together with associated infrastructure within Pęplino, plots No. 236/2, 238 in the municipality of Ustka - decision on environmental conditions dated 30 June 2020, case No: GOR.6220.11.12.2019	The construction of the photovoltaic power plant is planned on plots that are located within the corridor borders and within the potential impact of the ECI of MFW Bałtyk II and Bałtyk III. The total area of the plots is 5.65 ha, approx. 4.85 ha is planned for the investment (construction of PV Pęplino 5).	The planned Project interferes with the planned construction of a photovoltaic power plant. At this stage, the potential negative cumulative impact of the construction and operation phases is not expected. The realisation of both investments will require the agreement of the investors and the adoption of solutions not conflicting with each other at the stage of the construction project. Furthermore, it is worth emphasising that the implementation of the ECI belongs to strategic and public purpose investments.
4.	Planned - the Environmental Decision issued by the Voit of the Municipality of Ustka	Construction of the **PV Pęplino 13 photovoltaic power plant** with capacity of up to 5 MW and accompanying infrastructure within Pęplino, plots No. 230, 193, in the municipality of Ustka - decision on environmental conditions of 30 November 2020, case No: GOR.6220.17.8.2020	The construction of the photovoltaic power plant is planned on plots that are located within the corridor borders and within the potential impact of the ECI of the MFW Bałtyk II and Bałtyk III. The total area of the plots is 7.5 ha, approx. 7,47 ha is planned for the investment (construction of PV Pęplino 13)	The planned Project interferes with the planned construction of a photovoltaic power plant. At this stage, the potential negative cumulative impact of the construction and operation phases is not expected. The realisation of both investments will require the agreement of the investors and the adoption of solutions not conflicting with each other at the stage of the construction project. Furthermore, it is worth emphasising that the implementation of the ECI belongs to strategic and public purpose investments.
Municipality of Słupsk				
5.	Existing	400/110 kV **Słupsk-Wierzbięcino substation** - Project completed	An existing substation with an area of approx. 13 ha, to which Swe-Pol Link cables and the high-voltage overhead lines Dunowo-Słupsk Słupsk-Żarnowiec and Żydowo-Kierzkowo-Słupsk are connected. Connection to the 'Słupsk Wierzbięcino' substation according to a document issued by PSE[621] will be implemented in 2025.	No accumulation of impacts of the planned Project with the existing Słupsk - Wierzbięcino substation is expected, as both facilities cause different effects. Cable lines cause thermal impacts and emission of magnetic fields, and substations emit mainly noise. Therefore, the potential cumulative impact is not forecast.
6.	Implemented the Environmental Decision issued by the Voit of the Municipality of Słupsk	Decision on environmental conditions dated 6 February 2013 for the project entitled**: Extension of 110 kV switch station** to the target layout for field 12-21 at the 400/110 kV substation in **Wierzbięcino**	The extended switch station is located on plots no. 112/6 and 113/3, Bruskowo Małe precinct, which are in the area of potential impact of the ECI of MFW Bałtyk II and Bałtyk III.	No accumulation of impacts of the planned Project with the planned switch station at the Słupsk - Wierzbięcino substation is anticipated, as both objects cause different impacts during the operation phase. The cable lines cause thermal effects and emission of magnetic fields, while the switch station emits mainly noise. Therefore, the potential cumulative impact during the operation phase is not forecast.
7.	Implemented the Environmental Decision issued by the Voit of the Municipality of Słupsk	Decision on environmental conditions dated 24 July 2013 for the project entitled: **Reconstruction of a fragment (approx. 800 m) of 400 kV** line on the route Słupsk Żarnowiec, in the foreground of 400/110 kV Słupsk-Wierzbięcino substation, on the plots No.: 81; 82/5; 82/2; 227; 272; 271; 270; 269; 167; 166; 168/1; 168/2; 168/3; Bruskowo Wielkie district 97; 99/4; 100/2; 101/2; Bruskowo Małe district.	The reconstructed high-voltage power line enters the Wierzbięcino substation in its south-eastern part. The plots where the investment is located are within the area of potential impact of the ECI of MFW Bałtyk II and MFW Bałtyk III.	No accumulation of impacts of the planned Project and the overhead power line is expected, as the two facilities cause different effects during the operation phase. Underground cable lines cause thermal impacts and emission of magnetic fields of small range, while overhead lines emit mainly noise and electromagnetic fields, while during the design phase of the cable lines the existing power facilities will be taken into account, and solutions which do not cause cumulation of electromagnetic fields will be adopted.

Source: In-house study

[621] *Projekt planu rozwoju w zakresie zaspokojenia obecnego i przyszłego zapotrzebowania na energię elektryczną na lata 2023-2032, PSE, marzec, 2022 r.*

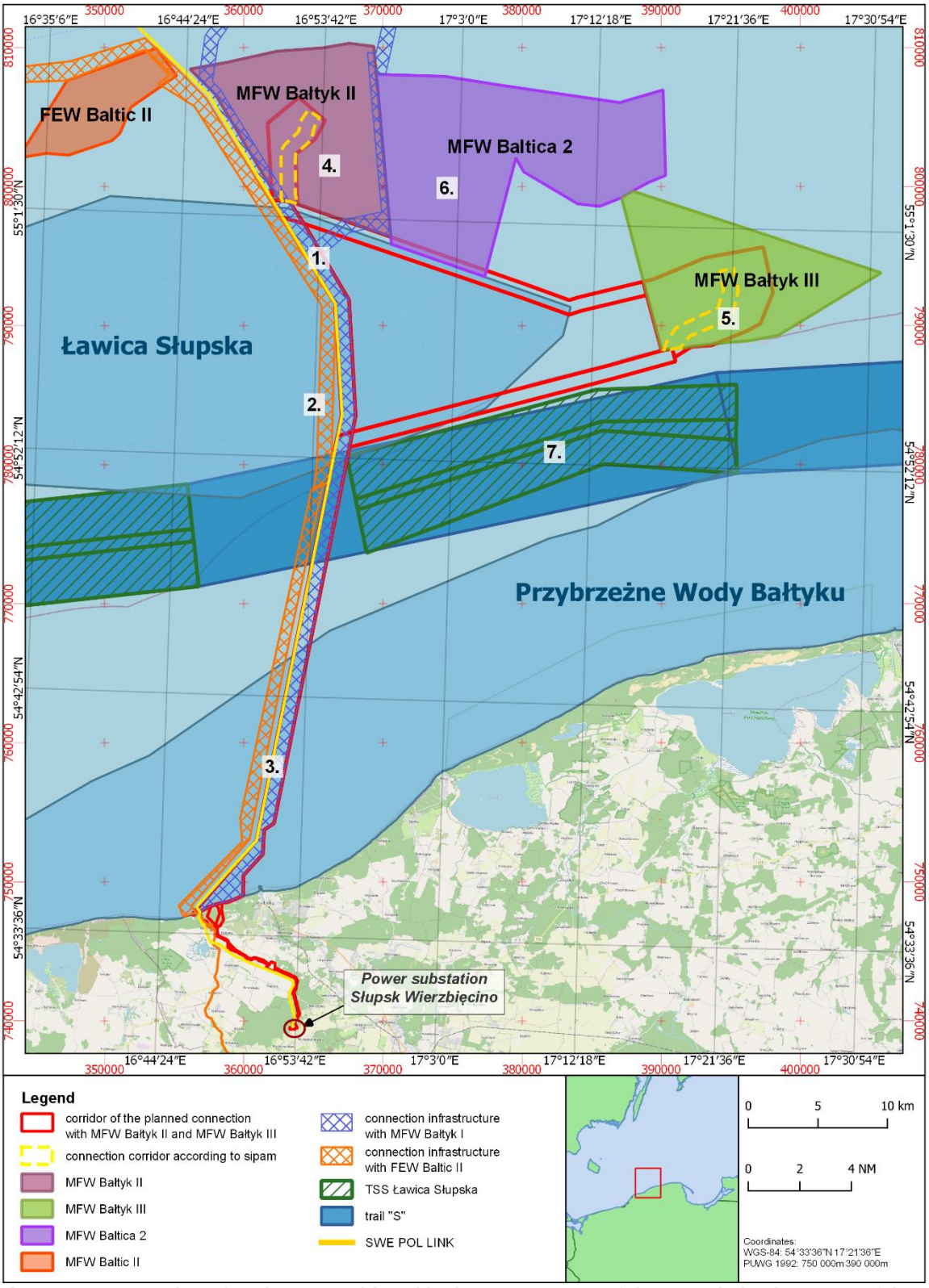


Figure 12.1. *Location of projects considered in the assessment of the cumulative impact - offshore part*

Source: In-house study

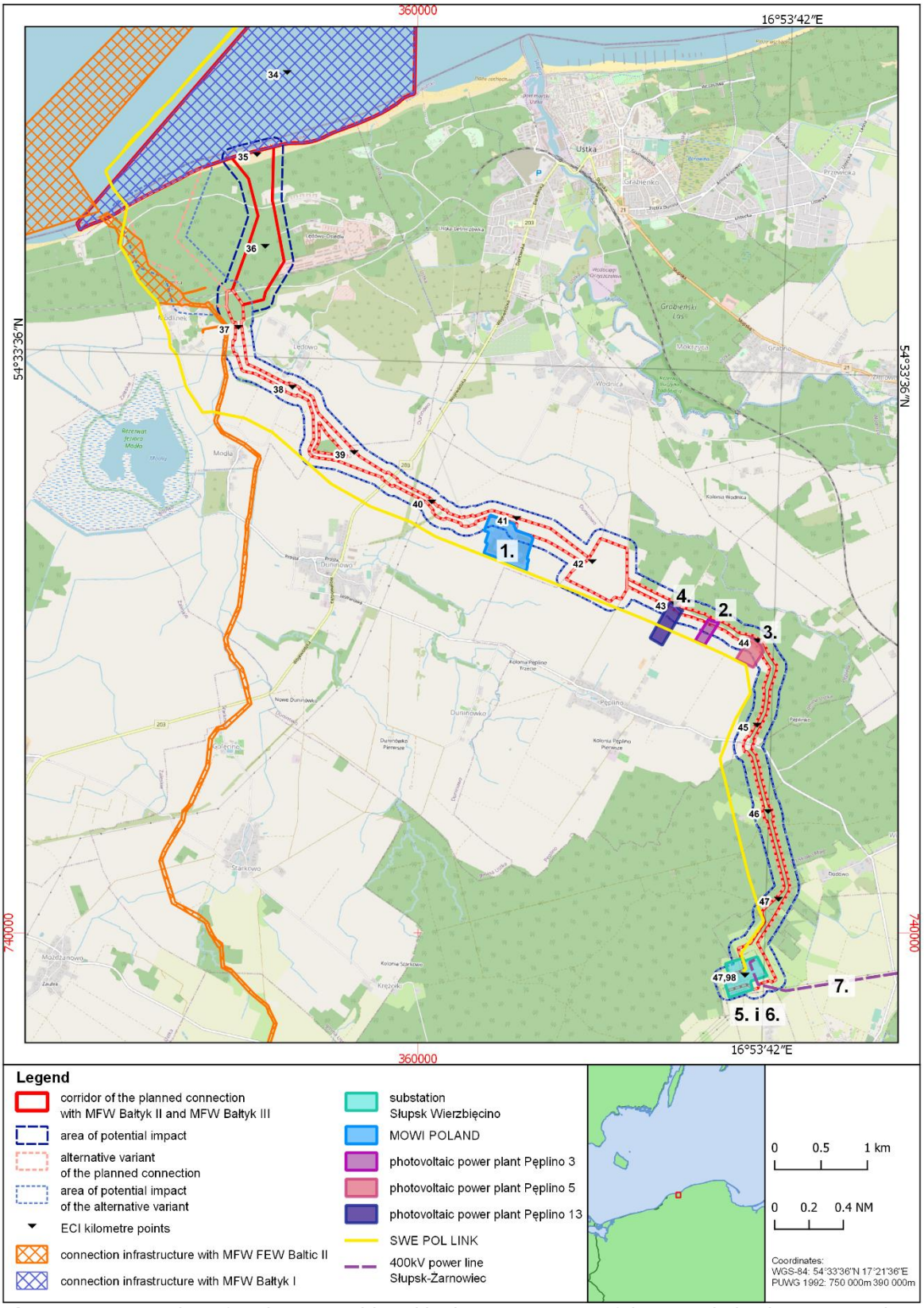


Figure 12.2. *Location of projects considered in the assessment of the cumulative impact - onshore part*

Source: In-house study

Summarising the information gathered above about the projects, whose impacts may cumulate with the planned Project, it should be emphasised that the vast majority concerns cable lines for transmission of electrical energy - both the existing SWEPOL Link and the planned power connections from the offshore wind farms, which connect either to the Słupsk Wierzbięcino substation or to the planned Krzemienica substation. Combining linear infrastructure into infrastructure corridors is a well-thought-out planning activity and it is beneficial from the point of view of seabed fragmentation. Negative impact, albeit of short-term and local character, will occur at the stage of construction of offshore wind farm connections. The impact of the construction phase will be minimised at the most critical location, i.e. in the coastal zone, by execution of the cable landfall, both for connections from MFW Bałtyk II and MFW Bałtyk III, as well as the possible execution of drilling for connections from MFW Bałtyk I.

Investments planned or executed onshore are also connected with the development of electricity networks resulting from a political decision to develop offshore wind energy, including the expansion of the existing Słupsk Wierzbięcino substation.

Additionally, in the Ustka Municipality, three planned projects for which environmental decisions were issued were identified (three planned photovoltaic farms in the area of Pęplin). At this stage, no potential negative cumulative impact of the construction and operational phases of the planned Project and the planned photovoltaic farms is anticipated. The realisation of these investments will require agreement between the investors and the adoption of non-colliding solutions and schedule of works at the stage of the construction project.

The character of the planned Project results in the lack of negative impact at the stage of operation, i.e. over a long period of time, therefore the phenomenon of accumulation of negative impacts should not occur. Negative impacts of heat emission and magnetic fields may potentially accumulate as a result of laying several cable lines in one corridor. These impacts can be minimised by selecting an optimal cable technology. Only the impacts of the construction phase may be cumulative, however, the Investor plans to reduce these impacts to the minimum by implementing the connection infrastructure from both MFW Bałtyk II and MFW Bałtyk III, as well as including the landfall connection with MFW Bałtyk I during construction, simultaneously.

13. TRANSBOUNDARY IMPACT

Due to the location and method of implementation of the planned Project, it is not expected that its implementation, at any stage, will cause the occurrence of transboundary impact on the environment. The distance of the construction site of the planned Project to the maritime border, i.e. the Polish exclusive economic zone is about 35 km.

14. RISK OF A MAJOR FAILURE OR RISK OF A NATURAL OR CONSTRUCTION-RELATED DISASTER

14.1. MAJOR FAILURE

In accordance with the definition in Article 3 point 23 of the Act of 27 April 2001 on Environmental Protection Law (Journal of Laws 2021.1973 consolidated text as amended) a major failure means *an event, in particular emission, fire or explosion, occurring during an industrial process, storage or transportation, in which one or more hazardous substances are used, leading to the immediate hazard to life or health of people or to the environment, or the delayed occurrence of such a hazard*.

The planned Project will not be a site for the storage of substances determining the classification of the Project as a plant with an increased or high risk of a serious industrial accident in accordance with the Regulation of the Minister of Development of 29 January 2016 on the types and quantities of hazardous substances present in the plant, determining the classification of the plant as a plant with an increased or high risk of a serious industrial accident (Journal of Laws 2016.138).

Marine area

Potential serious emergencies that may occur during the construction, exploitation and decommissioning of the offshore part of the Project are:

- incidents at sea - collisions, contacts, groundings,
- spills of petroleum substances,
- explosions of unexploded munitions and unexploded military ordnance as a result of accidental damage to undetected munitions during installation works,
- mechanical damage of the cable lines,
- the discharge of municipal waste or domestic sewage,
- introduction of biocidal substances.

Incidents at sea - collisions, contacts, groundings

An assessment of the risks of offshore incidents during the execution, operation and decommissioning phases of the planned Project has been carried out as part of the navigational analysis, which is an attachment to the EIA Report (Volume IV, Attachment 3) The navigational analysis identifies the risks and estimates their level in order to assess the risk index and identify appropriate risk management measures.

For this purpose, the corridor designated for the ECI has been subdivided into 7 sections with different levels of risk associated with the current traffic intensity of different vessels. The division into water areas is shown in figure 14.1, and a description of the separated water areas is provided in table 14.1

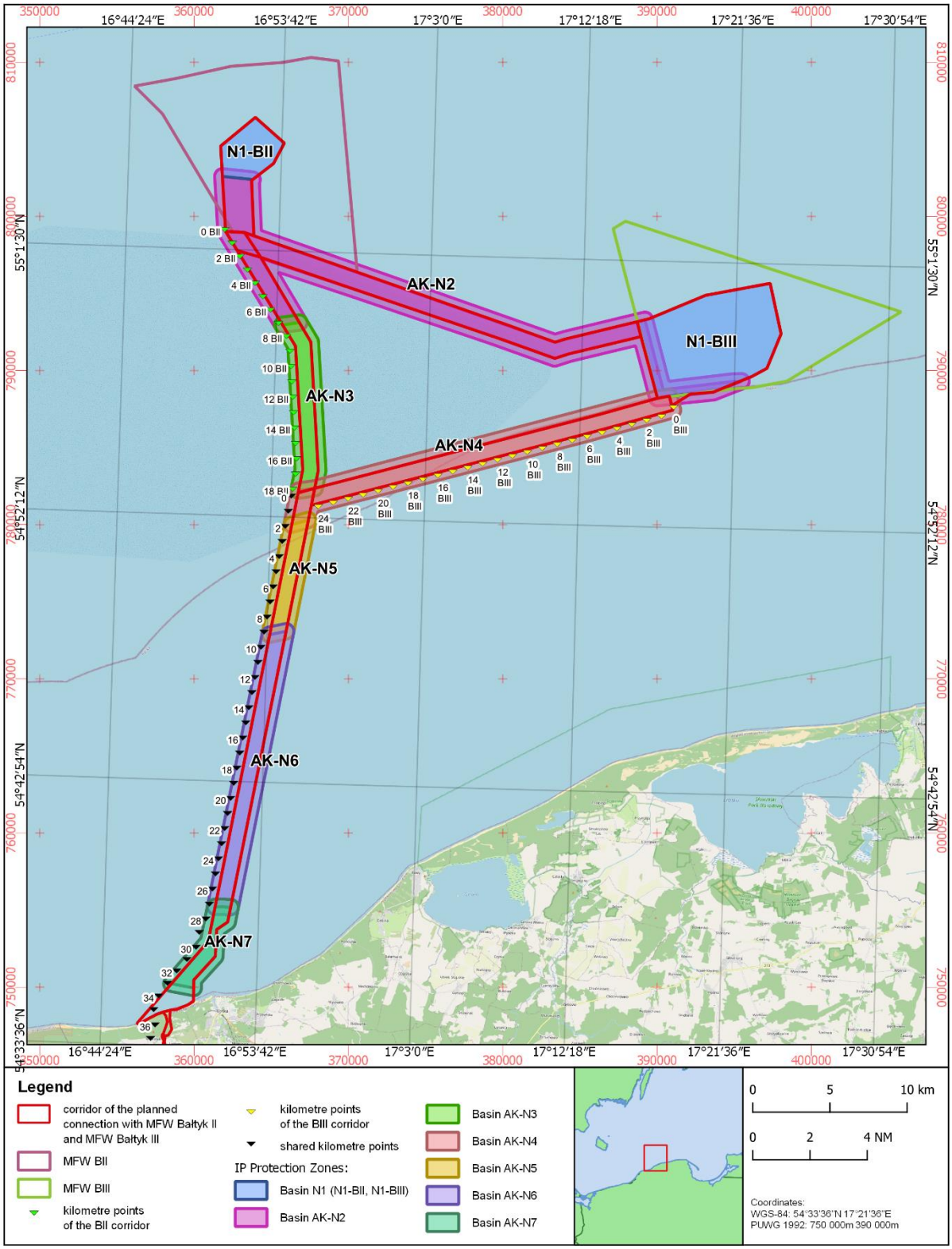


Figure 14.1. Location of the areas designated for offshore incident risk assessment

Source: Navigational expertise (Volume IV Attachment 3)

Table 14.1. *Characteristic of the water areas located on the ECI of the MFW BII and BIII route*

Area's name	Description	Direction	Impact on navigation / cumulative impact
N1	The ECI implemented in the area of MFW BII and MFW BIII, in the area of the EEZ		No impact
AK-N2	The ECI executed between the borders of the MFW and Ławica Słupska. It also includes the section of the Project consisting in connecting the MFW BII and BIII, in the area of the EEZ	W-E; N-S	Small and medium-sized vessel traffic passing north of Ławica Słupska ECI of the MFW Baltica 2 projects ECI of the FEW Baltic II project
AK-N3	The ECI implemented outside the MFW in Ławica Słupska area, in the EEZ	N-S	Minor small vessel traffic ECI of the FEW Baltic II project Domestic passenger shipping - A, B
AK-N4	The ECI in the immediate vicinity of TSS Ławica Słupska, central part, on the boundary between the EEZ and territorial waters	W-E	Significant longitudinal large vessel traffic in west direction Domestic passenger shipping - A, B, C
AK-N5	The ECI partly in TSS Ławica Słupska area and the zone connecting the western and central parts of the TSS, on the boundary between the territorial waters and the EEZ	N-S	Significant lateral traffic of large vessels ECI of FEW Baltic II project
AK-N6	The ECI in the coastal traffic zone - in the territorial waters area	WE	Significant multi-directional small and medium vessel traffic, negligible traffic of large vessels. ECI of FEW Baltic II project Domestic passenger shipping A, B, C
AK-N7	The ECI in the coastal waters area, from the line marking the distance of 3 Mm from the coast	N-S	Approach to the port of Ustka Domestic passenger shipping - A, B, C, D ECI of FEW Baltic II project

Source: Navigational expertise (Volume IV Attachment 3)

The results of the risk assessment analysis, i.e. the risk index assessment and the risk management recommendations, are presented in table 14.2.

Table 14.2. *Risk index assessment and risk management recommendations*

Area identification	Description of vessel traffic	Potential risks	Risk							
			Primary			Risk reduction measures	Secondary			
			Fi	Ci	Ri		Fi	Ci	Ri	
N1 area, connection section in the area of MFW BII, BIII	No traffic, area closed due to the MFW construction	Collision, contact	3	4	7	Area closed to boating and fishing. Protection zone 500 m. Marking and direct monitoring	1	4	5	
	Limited number of MFW and ECI of IMF-BII/BIII vessels		2	3	5	Internal safety procedures (SMS)	1	2	3	
AK-N2 area, connection section from the border of the MFW to Ławica Słupska,	Multidirectional traffic of small and medium-sized commercial vessels	Collision, contact	3	4	7	1 km protection zone, indirect monitoring, Securite messages, security procedures due to violation of the zone	2	3	5	

Area identification	Description of vessel traffic	Potential risks	Risk						
			Primary			Risk reduction measures	Secondary		
			Fi	Ci	Ri		Fi	Ci	Ri
Connection of MFW BII and BIII	Limited number of MFW and ECI of MFW BII/BIII vessels and traffic of vessels of MFW Baltica 2 and Baltica 3		3	3	6	Internal safety procedures (SMS)	1	3	4
AK-N3 area, connection section crossing Ławica Słupska	Variable distance from lateral vessel traffic over 300,000 DWT very rare, frequent vessel traffic over 200,000 DWT	Collision, contact	2	3	5	1 km protection zone, indirect monitoring, Securite messages, security procedures due to violation of the zone	1	3	4
	Limited number of the ECI of MFW-BII/BIII and ECI of FEW-Baltic II vessels		2	3	5	Internal safety procedures (SMS)	1	2	3
AK-N4 area, connection section parallel to the main shipping lane in a western direction passing through the vicinity of the TSS central part (W direction)	Lateral vessel traffic over 300,000 DWT very rare, frequent vessel traffic over 200,000 DWT	Collision, contact	4	5	9	1 km protection zone, direct monitoring, marking the area with buoys, Securite messages, safety procedures due to violation of the zone Cooperation with VTS Ławica Słupska	2	4	6
	Limited number of the ECI of MFW Baltica 2 vessels		2	3	5	Internal safety procedures (SMS)	2	2	4
AK-N5 area, connection section perpendicular to the water area connecting the western and central parts of the TSS Ławica Słupska	Lateral small vessel traffic very rare, domestic passenger shipping area for Classes A and B	Collision, contact	6	5	11	1 km protection zone, direct monitoring, marking the area with buoys, Securite messages, safety procedures due to violation of the zone Cooperation with VTS Ławica Słupska	3	5	8
	Limited number of the ECI of MFW Baltica 2 vessels		2	3	5	Internal safety procedures (SMS)	1	3	4
AK-N6 area, connection section in the coastal traffic zone	Significant multidirectional small and medium vessel traffic negligible large vessel traffic	Collision, contact	5	3	8	1 km protection zone, direct monitoring, Securite and Pan-Pan messages, navigational marking with buoys, safety procedures due to violation of the zone Cooperation with VTS Ławica Słupska 1 km protection zone, direct monitoring, marking the area with buoys,	3	3	6
	Limited number of the ECI of MFW-BII/BIII and ECI of FEW-Baltic II vessels		2	3	5	Internal safety procedures (SMS)	2	2	4

Area identification	Description of vessel traffic	Potential risks	Risk							
			Primary			Risk reduction measures	Secondary			
			Fi	Ci	Ri		Fi	Ci	Ri
AK-N7 area, section of the connection in the coastal traffic zone, within 3 Mm from the shore	Large multidirectional traffic of small and medium-sized vessels, approach zone to the port of Ustka	Collision, contact	6	2	8	1 km protection zone, indirect monitoring, marking of the area with buoys, Securite messages, safety procedures due to violation of the zone Co-operation with VTS Ławica Słupska and Kapitanat Portu Ustka	3	2	5
	Limited number of the ECI of MFW Baltica 2 vessels		2	4	6	Internal safety procedures (SMS)	2	2	4

The offshore incident risk assessment for the operational phase of the planned Project has shown that the probability of an incident occurrence is extremely low, i.e. there is a probability of one incident over the lifetime of a vessel (20 years) in a set of 5,000 vessels.

Spills of petroleum substances

Spills of petroleum substances can primarily result from the failure of installation and service vessels as a result of collision, contact, sinking, grounding (this risk is assessed above as extremely rare).

At the stage of construction, operation and decommissioning of the Project, there is also a risk of leakage of petroleum substances (mainly diesel oil) to the sea during refuelling of vessels. The refuelling of installation and service vessels is expected to take place within the port area, at a specially designated jetty, via fuel tankers.

The release of petroleum-based substances, such as diesel, hydraulic, transformer, lubricating oils and petrol, can also result from leaks and spills from leaking installations.

Table 14.3 shows the classification of the size of petroleum contamination with spill limits.

Table 14.3. *Qualification of spill sizes and risks*

Qualification	Spill sizes	Description
Level 1 (small spills)	to 20 m^3	Minor spills of petroleum-based substances that do not require intervention with additional forces and resources and can be cleaned up by in-house means. These are the most common types of spills, caused by minor accidents or unintentional spills. These spills do not cause particular technical difficulties in their removal and do not pose a major threat to the maritime environment. Visible traces of contamination can, under favourable conditions, disappear spontaneously in up to a week due to evaporation, dispersion in the water.

Qualification	Spill sizes	Description
Level 2 (medium spills)	20 - 50 m^3	Spills of petroleum substances, at a scale that exceeds in-house capabilities and requires counteraction at the regional level, which includes activities within the maritime area, subordinate to the territorially competent director of the maritime office. Such spills are the result of failures of larger vessels or their collisions and more serious accidents. They require intervention of forces and resources included in the National Plan for Combating Hazards and Pollution of the Marine Environment. The decision on the required scale of counteraction is made by the director of the maritime office.
Level 3 (catastrophic spills)	over 50 m^3	Spills of petroleum substances having the character of an extraordinary threat to the environment, combating which requires the forces and resources subordinate to more than one director of the maritime office (including foreign ones). The decision about the required scale of counteraction, extension or suspension of the rescue action is taken by the director of the maritime office, in accordance with the Act on the Prevention of Pollution from Ships, dated 16 March 1995 (Journal of Laws 2020.1955 consolidated text, as amended).

Source: In-house study according to the guidelines of International Tank Owners Pollution Federation Limited - ITOPF).

The range of the spill depends on the type and quantity of the spilled substance, the protection of the body of water, and the meteorological and hydrodynamic conditions prevailing at the time. It is estimated that in the open sea, under unfavourable hydrometeorological conditions, the range of a diesel oil spill of several hundred cubic metres is from 5 to 20 km. Areas of particular sensitivity to potential contamination are the Natura 2000 network sites: Przybrzeżne wody Bałtyku PLB990002 and Ławica Słupska PLC990001. In order to counteract these threats, all vessels should comply with the conditions of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), in particular including the procedures contained in the *National plan for dealing with hazards and pollution of the marine environment.*

Explosions of unexploded munitions and unexploded military ordnance

During installation works, there is a risk of release of hazardous substances into the sea from containers with chemical weapons lying on the bottom, or the uncontrolled explosion of unexploded munitions and unexploded bombs - remnants of military exercises and of World Wars I and II. The above-mentioned incidents may occur during installation works as a result of mechanical disturbance of the above-mentioned objects or containers. In order to exclude the occurrence of the aforementioned risks, a preliminary survey of the seabed was carried out by the Investor (Volume III. Attachment 11) to assess the risks associated with unexploded ordnance and chemical weapons. As a result of the preliminary reconnaissance (bathymetric and sonar surveys), no objects with the characteristics of potentially hazardous objects of the torpedo type were identified.

Prior to the commencement of the installation works, the Investor will carry out a detailed ferromagnetic reconnaissance limited to the place where the cable is to be laid and, in the places, where the installation vessels are to be anchored. Then, the Investor shall qualify the objects lying along the route of the connection infrastructure and decide whether to excavate the hazardous objects and dispose of them or determine the route of the connection infrastructure without the locations of objects classified as hazardous. In addition, the Investor will draw up a plan for dealing with potentially hazardous objects, train the personnel carrying out the installation work in the event of encountering

potentially hazardous objects and equip them with resources and measures to reduce the effects of contact with the aforementioned objects.

Due to the results of the initial geophysical reconnaissance of the corridor under the ECI of the MFW Bałtyk II and MFW Bałtyk III, and the ferromagnetic surveys planned before the installation works commence and limited to the cable laying and anchoring areas, the risk of release of hazardous substances or uncontrolled explosion of unexploded munitions and unexploded ordnance is assessed as negligible - omissible.

Mechanical damage of the cable lines

At the stage of the Project's operation, there is a risk of failure of the connection infrastructure: phase short-circuit, transient short-circuit and/or phase interruption. The above-mentioned events may occur as a result of mechanical damage to the cable line during the sailing activities during anchoring ships and fishing activities with the use of bottom fishing gear, such as trawls and dredges. The risk of connection infrastructure failure is also expected as a result of design (e.g., incorrect selection of materials, protections, calculation errors) and installation errors. **Due to the technology adopted for the installation of the connection infrastructure (taking into account all the requirements of the POM, in particular regarding the embedding of the cable in the seabed at an depth of 1 - 3 m, the permanent protection of sections of the connection infrastructure not submerged in the seabed and the establishment of safety zones around the connection infrastructure in which vessel anchoring will be prohibited), the risk of damage to the cable line as a result of mechanical damage to the cable is to be considered negligible – omissible.**

Discharge of municipal waste or domestic sewage

In the marine area, during the construction, operation and decommissioning phases of the Project, there is a risk of the discharge of municipal waste or domestic sewage generated by construction and maintenance workers into the sea. The aforementioned event may occur as a result of human error or the failure of the reception facilities during the transfer of the aforementioned waste and wastewater from the unit to another unit or to land. **Due to the anticipated small amount of waste and wastewater, it is considered that their eventual discharge into the sea will not alter water status. Therefore, the effects of the above-mentioned accident are assessed to be negligible - omissible.**

Introduction of biocides

The hulls of installation and service vessels will be coated with antifouling coatings. The antifouling coatings contain biocidal substances. These substances can penetrate the water, then settle in the bottom sediments. **However, it is considered that due to the number of installation vessels (i.e. 1 cable ship, 1 trenching vessel and 4 support vessels) and the number of service vessels (i.e. 4 catamarans) used sequentially during the construction and decommissioning and operation phases of the Project, the amount of biocides that may enter the water is negligible - omissible.**

To address the risks of biocidal substances entering marine waters, the Investor will engage vessels with current ship class certificates.

Land area

The main environmental risks during construction, operation and decommissioning of the onshore part of the ECI:

- potential leakage of harmful substances (sewage, petroleum products),
- atmospheric emissions (SF_6),
- fires.

The emergency incidents of the cables and the onshore substation can be caused by:

- material defects,
- damage to cables as a result of a short circuit,
- failure of technological safeguards,

- leaks in electrical apparatus,
- excessively high pressure in electrical equipment,
- equipment failure.

Power cables and substations are also exposed to various external hazards such as:

- flooding washout and strong winds,
- mechanical damage,
- mechanical damage during construction work with the use of heavy equipment,
- illegal human interference.

The possible occurrence of an accident in the onshore section during construction, operation and decommissioning of the Project is associated with accidental spills of petroleum products resulting from an accident or mechanical failure of construction and service equipment. This involves contamination of soil and water with hazardous substances. This type of situation should be eliminated by proper supervision of the operation of machinery and keeping it in good working order. Water from excavations, which may be contaminated with e.g. petroleum substances, will be extracted from the excavation, removed from the site and handed over to subcontractors authorised to manage/dispose/treat these substances. However, it should be noted that this impact is short-term (temporary) and usually one-off (accidental). Only small amounts of contaminants may enter the environment, local or point in extent, not posing a threat to human life and health. Surveillance requirements and technical standards will reduce or eliminate the risk of oil spills from vehicles and equipment into the environment.

Neither during normal operation of the underground cable (operational phase) nor during emergency operating states (e.g. a short circuit accompanied by immediate shutdown of the cable line by various types of protection) are there any emissions, fires or explosions. Nor are there any hazardous substances released that could endanger human life or health or have a negative impact on the environment. In this context, it is not possible to speak of a major accident for this type of installation.

In the event of an underground cable line failure, the following sequence of actions is assumed:

- the location of the damaged section of cable and the type of damage,
- removal of the damaged section of cable (if the cable cannot be repaired),
- cable repair, including jointing and laying the cable underground.

In the event of minor mechanical damage, it is possible to repair the cable without having to replace the entire section. During the operation of the cable lines, periodic inspections are also carried out by the owner in accordance with the regulations in force.

The potential impacts of failures occurring on the ONS may involve:

- emissions to the atmosphere of gaseous substances or products of combustion in the event of fire,
- contamination of transformer trays and the ground with oil and fire extinguishing agents.

In the case of onshore substations, there is a slight risk of fire in some equipment, such as transformers. Transformers contain cooling fluid (mineral oil or ester oil depending on the voltage level). Mineral oil can ignite in the event of a transformer failure and release contaminants into the environment. Any leaks from transformers will be collected in sumps under the transformers to prevent release to the ground. Fires occurring at substations are rare, the use of the latest technology and warning systems fully prevent this type of event.

A substation failure may also result in gaseous emissions to the atmosphere due to leakage of power apparatus (e.g. circuit breakers in switchgear)) in SF_6 (sulphur hexafluoride) gas insulation; amount of such gas will be negligable. Leakage of power apparatus in SF_6 gas insulation is temporary and can be caused by a sudden, temporary increase in pressure inside the apparatus due to the occurrence of an arc when switching off a short-circuit current in a circuit breaker or in any of the equipment with SF_6 gas, or by deformation of the seals caused by thermal expansion of the enclosure, which is the most common reason of leakage. The material used for the seals must be resistant to SF_6 gas and its decomposition products, and have a life expectancy equal to that of the equipment. The use of the latest equipment and procedures helps to prevent such occurrences while preventing the emission of gas into the air.

14.2. NATURAL DISASTERS

In accordance with Art. 3 par. 2 of the Act of 18 April 2002 on the state of natural disaster (Journal of Laws 2017. 1897 consolidated text) the meaning of *natural disaster is understood as an event associated with the action of forces of nature, in particular lightning, seismic shocks, strong winds, intense precipitation, prolonged occurrence of extreme temperatures, landslides, fires, droughts, floods, ice phenomena on rivers and the sea as well as lakes and reservoirs, mass occurrence of pests, plant or animal diseases or infectious diseases of humans or the impact of another element*.

Maritime part

The potential risk of a natural disaster during the construction, operation and decommissioning phases of the offshore ECI of the MFW B II and B III is related to:
seismic shocks,
strong winds,
ice phenomena.

The Project's implementation and impact area is located in aseismic and panseismic areas**. Therefore, the risk of damage to the connection infrastructure in the offshore part as a result of seismic shocks is assessed as negligible - omissible.**

Wind is among the factors that determine sea level and wave parameters and thus the amount of energy reaching the shore, the magnitude of currents and the intensity of sediment movement, all of which have a direct impact on the processes that shape the coastal zone. In view of the above, it should be considered that high winds could potentially be an indirect cause of the exposure of the connection infrastructure in the shore zone in the area from the boundary of the special flood hazard area to the depth of the sea closure zone, i.e. to a depth of approximately 7-9 m (Chapter 7.7). In this zone, there is a ± 1-2 m change in the bottom ordinate as a result of the movement of the reefs (Chapter 7.2). In view of the technology adopted for the installation of the connection infrastructure, taking into account all the requirements of the POM, in particular regarding the laying of the transmission infrastructure under the seabed surface at least 3 m below the average depth of the bottom of the inter-reef troughs/depressions, the risk of damage to the cable line as a result of strong winds is to be considered negligible - omissible.

During the construction phase, no risk of a natural disaster related to strong winds is anticipated. Construction works will only be carried out under hydrometeorological conditions allowing them to be carried out safely, i.e. when the wind speed does not exceed 10 m/s (5 on the Beaufort scale, wave height up to approx. 2m).

In the area of the planned Project, the beginning of the ice phenomena is observed in the period from 2 January 2 until about 26 March[622]. The maximum number of days with ice is 59 days, with an average of 8 to 9 days. The thickness of the ice does not exceed 10 cm. Winters in this area are mild and very mild. They are the mildest among winters in other regions of the Polish coast. The research conducted in 1971-1990 showed that during that time no ice was recorded in the area of the planned Project during 14 seasons. Information presented in the Environmental Assessments of the Polish marine areas of the Baltic Sea performed on the basis of monitoring data over the decades confirms the absence of hazards related to ice phenomena[623]. **Taking into account the technology adopted for the installation of the connection infrastructure, the risk of damage to the cable line as a result of ice phenomena must be considered negligible - omissible.**

Land part

The risk of a natural disaster in the area of the planned Project is negligible due to its location:
in a region with a very low probability of a major seismic event,

[622] *Sztobryn, M., Wójcik, R., & Miętus, M. (2012). Występowanie zlodzenia na Bałtyku-stan obecny i spodziewane zmiany w przyszłości. Warunki klimatyczne i oceanograficzne w Polsce i na Bałtyku Południowym, 189-215*.
[623] *https://www.gios.gov.pl/pl/stan-srodowiska/monitoring-wod*

outside landslides and areas threatened by mass movements in accordance with the Landslide Protection System[624] ,
outside flood-prone areas, with the exception of the boundaries of the construction corridor of the shoreline, which is an area of special flood risk in accordance with Article 16 point 34) of the Water Act (Journal of Laws 2022.2625 consolidated text as amended); the Investor plans a trenchless method of crossing the shoreline zone.

In the onshore part, the planned Project will be primarily an underground cable line, also there is no risk of a natural disaster. Substations and overhead lines, whose spans as well as poles can exceptionally be broken and blown over in adverse weather conditions such as hurricanes and icy conditions are much more likely to be damaged. Wind speeds around the eye of the cyclone in the strongest hurricanes can exceed 300 km/h. Such strong winds uproot trees, topple power poles, tear off roofs and even destroy buildings. However, local atmospheric conditions are taken into account in the choice of technology and materials, so the possibility of a natural disaster is minimal.

Taking into account natural disasters resulting from climate change, such as lightning, drought, changes in temperature, changes in wind speed, icing, an analysis has been developed with the possibility of their impact on the operation of the planned Project:
heat waves - will not cause negative impacts on the operation of the LSE and underground and submarine cables, the materials used for construction will be heat resistant,
strong winds - will not adversely affect the operation of the cables, but may cause damage to one of the elements of the ONS (breakage of a cable or pole). As the occurrence of such situations has been taken into account during the design, the designed apparatus has been adapted to the possibility of damage to electrical components. In the case of the Project in question, strong wind may only cause short-term disruption.
flooding - there will be no adverse impact on the operation of the ONS and underground and submarine cables, the planned Project is located outside the flood-prone areas, except for the boundaries of the construction corridor of the shore. The Investor plans a trenchless method of crossing the coastal zone there.
droughts - will not cause an adverse impact on the operation of the ONS and underground and submarine cables,
thunderstorms and rain/snowfall - rain and snowfall will not cause an adverse impact on the operation of the ONS and underground and submarine cables, the materials used for construction will be resistant to heavy rainfall. Thunderstorms may affect the operation of the installation, but due to the stringent technical standards taken into account during design, pole deformation or cable breakage is unlikely,
frost waves - there will be no negative impact on the operation of the ONS and underground and submarine cables, the materials used for construction will be resistant to low temperatures.

The planned Project is adapted to atmospheric conditions associated with climate change, so the possibility of a natural disaster is negligible. During design, materials and apparatus were adapted to monitor and forecast atmospheric phenomena. If any factors, nevertheless, affect the operation of the ONS or the submarine and underground cables, the effects will be local, temporary and without risk to the environment, including people.

14.3. CONSTRUCTION DISASTERS

Pursuant to Art. 73 of the Construction Law of 7 July 1994. (Journal of Laws 2021.2351, as amended), *a construction disaster is an unintentional, sudden destruction of a building object or its part, as well as structural elements of scaffolding, elements of forming devices, sheet piling and excavation lining.*

Maritime part

[624] *http://geoportal.pgi.gov.pl/portal/page/portal/SOPO/ (GIOS data from 2002-2019)*

No construction, scaffolding, forming equipment, sheet piling or excavation is planned in marine areas. Therefore, **no risk of a construction disaster is anticipated in the marine areas**.

The Investor plans to use the latest technologies that are in line with the current legislation, in particular the POM plan, to ensure safety, reliability of electricity transmission and compliance with relevant environmental standards and requirements. The risk of a major accident, or a natural and construction disaster for the planned ECI is minimal.

Land part

A building disaster is not [625]:

- an installation failure,
- damage to or destruction of building equipment associated with buildings,
- damage to a component incorporated in the work which can be repaired or replaced.

The legislator has defined a set of objects, the destruction of which may be considered a construction disaster - including in this set, in addition to buildings, objects used during the execution of construction works:

- structural elements of the scaffolding,
- forming devices,
- sheet piling,
- trench shoring.

The planned Project, due to its nature (submarine and underground cable lines) is not a potential source of construction catastrophes and hazards for the immediate environment, including people. By definition, the probability of a construction disaster occurring during the operation of the Project is negligible and involves possible unintentional damage to the ONS structure. The construction of the onshore substations will be carried out on flat, treeless terrain, outside of urbanised areas which will be conducive to trouble-free implementation and result in minimal possibility of a construction disaster. The construction of onshore substations is a common investment in Poland and the risk of a construction disaster is negligible.

The design work associated with the planned Project will take into account the requirements of the applicable regulations, standards, technical approvals and technical conditions. The use of modern technologies planned by the Investor is intended to ensure the safety and reliability of electricity transmission and to meet the relevant standards and environmental requirements**.**

In addition, equipment related to the operation of the transmission infrastructure from the MFW Bałtyk II and MFW Bałtyk II will have to undergo approvals and authorisations by the UDT (Office of Technical Inspection). The UDT is a state legal entity operating in the area of safety of technical equipment on the basis of a number of legal acts, primarily the Act of 21 December 2000 on technical supervision. The UDT supervision allows all safety and management standards to be maintained during the implementation of the Project, so as to exclude the likelihood of failure and construction catastrophe.

14.4. MANAGING EMERGENCIES AT SEA

The marine emergencies described in chapter 14.1 are assessed as unlikely. A vessel collision or grounding, if not accompanied by an oil spill, will not pose a risk to the marine environment.

The following describes how to deal with an incidental oil spill at sea.

The captain of the vessel which has caused a hazard or pollution at sea is obliged to, so far as it is reasonably practicable, take immediate action in order, in particular, to stop or reduce the discharge of the harmful substance and to prevent its spreading.

The operator of the vessel which has caused a hazard or pollution at sea is obliged to take immediate action to minimise the effects of the pollution on the marine environment, in particular by removing the polluting substance.

[625] *https://inzynieriasrodowiska.com.pl/encyklopedia/katastrofa-budowlana-definicja*

Actions to combat marine hazards or pollution by the ship's captain and shipowner will be carried out under the supervision of the Director of the Maritime Office in Gdynia.

It is envisaged that possible contamination of marine waters with oil-derived substances will be tackled using mechanical methods. For this purpose, it is predicted to use dams (flexible, rigid or sorptive) or skimmers (oleophilic, weir or vortex). If the action manager decides otherwise, he/she will apply to the Director of the Maritime Office in Gdynia for permission to use methods other than mechanical for pollution control, e.g. using sorbents, dispersants or burning. The use of the aforementioned methods will be possible only upon approval of the Director of the Maritime Office in Gdynia.

The action against marine pollution will begin by locating the source of the pollution and fencing off the spill. The boom will be positioned in such a way that it does not create problems with pumping out the water-oil mixture and allows the oil to flow to the collection area. In the event of a large spill, it is envisaged that additional booms will be used to protect the basin, particularly on the leeward side. The boom will be positioned in such a way that no oil will flow outside the boom. The length of the boom will be min. 3 vessel lengths. As far as possible, all vessels with the potential to impede the spill response will be removed from the spill site. Vessels at the centre of the spill will not be removed - the crews of these vessels will be evacuated and all work in the danger zone will be stopped. In the event of a fire hazard, all persons in the vicinity of the contamination zone will be evacuated. Once the above activities have been carried out, the units conducting the combating action will successively remove the spills with the highest density of oil fraction (thickest oil layer), clean up hard-to-reach areas containing a significant amount of oil, remove the remaining oil spills, clean up the water surface by collecting the remaining, trace amounts of oil that were not removed by the skimmers through e.g. the use of sorbents, cleaning of vessels, and remove the waste generated as a result of the spill elimination (oil-water mixture/emulsion, contaminated sorbents). Before the end of the action, the services will clean the equipment used during the action.

The anti-pollution action at sea will be conducted under suitable hydrometeorological conditions. Full-scale anti-pollution action will be conducted when the wind force does not exceed 3 (Beaufort scale). For winds of force 4-6, the action will be able to be carried out to a limited extent. During winds exceeding 6, the action will be impossible to carry out. In this case, there will be a strong dispersion of oil contaminants in water, promoting biodegradation and limiting the possibility of oil splashing. There will also be an increase in oil viscosity as a result of emulsification and evaporation of the lighter fractions. Dispersion of the oil will occur naturally, within a few to several days.

15. SUMMARY OF SIGNIFICANCE OF THE IMPACT AND COMPARISON OF OPTIONS

15.1. OFFSHORE PART

The analysis of the impacts of the planned Project showed that there will be no significant impacts on the abiotic components of the marine environment, including water body use and human health and life, during either the construction or operational phases. Moderate to significant impacts are expected in the context of animate nature.

A summary of the assessment of impacts on individual abiotic and biotic components, both during construction and operation is presented in table 15.1.

Table 15.1. *Summary of results of significance of impacts of the planned Project by component*

Component		IMPACTS -OFFSHORE PART	
		Construction phase	Operation phase
Structure of the water body		insignificant	insignificant
Geological structure, bottom sediments and deposits		insignificant	insignificant
Seawater		insignificant	insignificant
Phytobenthos		moderate	insignificant
Macrozoobenthos		moderate	insignificant
Ichthyofauna		moderate / significant - GD	insignificant
Marine mammals		moderate	insignificant
Sea birds		moderate	insignificant
Sand hopper		-	-
Natura 2000	PLC990001 Ławica Słupska	moderate	insignificant
	PLB990002 Przybrzeżne wody Bałtyku	insignificant	insignificant
	PLH220052 Dolina Słupi	significant	negligible
Ecological corridors		significant	insignificant
Biodiversity		moderate	negligible
Underwater cultural heritage		negligible	negligible
Climate and air quality		insignificant	**pozytywny**
Acoustic climate		insignificant	insignificant
PEM		-	insignificant
Thermal		-	insignificant
Material assets		-	-
Fisheries		insignificant	insignificant
Maritime transport		insignificant	insignificant
Human health and life		insignificant	negligible

GD – bi-environmental fish

Source: In-house study

In the case of animate nature, reversible changes have been identified for most components during the construction phase, and the significance of these impacts is moderate at best. The impacts with the largest range - supralocal - relate to ichthyofauna and marine mammals, while those with a local range relate to birds. The smallest range, within the boundaries of the DIA, relates to phytobenthos and macrozoobenthos. In terms of duration, impacts are short-lived for most of the components, with the exception of betnoflagellate organisms, for which impacts are visible for several years before restoration and colonisation of degraded habitats occurs. Significant impacts relate to bi-environmental fish in the context of spawning migrations to the Natura 2000 protected area PLH220052 Dolina Słupi; Atlantic salmon and river lamprey enter the Slupia River to spawn, using the migration corridor that runs in the coastal zone, which is in the direct range of construction works.

During the operational phase, all impacts on biotic components have been identified as insignificant.

In order to reduce the impacts occurring during the construction phase, a number of measures have been proposed to minimise the impact of the planned Project on the marine environment (Chapter 16).

15.2. ONSHORE PART

Varianting of the planned Project, by location and technology variants, is described in detail in Chapter 4. Due to the findings already made and the decisions and conditions of implementation obtained (see Chapter 1.3.), as well as the applicable findings of the POM Plan, the possibility of location variants in the offshore part was limited. Therefore, the variants of the planned Project apply only to the onshore part.

After analyzing the variant possibilities of the planned Project, the Investor considered that the feasible variant (the Investor's variant) is the technological variant consisting in the derivation of power from the MFW only by underground cables of 220 kV and 400 kV, and the preferred location of the cables' landfall is the eastern variant (figure 4.1). The location of the ECI on land was determined based on the analysis of the results of pre-investment surveys and environmental inventories (avoiding the most naturally valuable areas), as well as agreements on the connection route with the Naval Center in Ustka.

The Investor's option was considered to be:

- eastern variant of ECI landfall using HDD guided drilling or HDD guided drilling combined with offshore excavation,
- underground 220 kV cable lines,
- ONS onshore substations,
- 400 kV underground cable lines.

The rational alternative was developed as a safeguard for the implementation of the planned Project and complies with the requirement of the Act of October 3, 2008 on Disclosure of Information on the Environment and its Protection [...] (Journal of Laws 2022.1029 t.j.). The rational alternative option was considered to be:

- western variant of ECI landfall using HDD guided drilling or HDD guided drilling combined with offshore excavation
- underground 220 kV cable lines,
- ONS onshore substations,
- 400 kV overhead power line.

The Investor's variant differs from the alternative variant in the location of the cable exit to the shore and the technology of power exit from the ONS: underground 400 kV cables in the Investor's variant, and 400 kV overhead line in the alternative variant. In the proposed variant (Investor's), as a result of the analyses, the considered shore crossing technologies were limited to horizontal directional drilling (HDD) and horizontal directional drilling (HDD) combined with deeper marine excavation. In the western (alternative) variant, due to site location constraints (the presence of a closed military training ground) and the associated necessary drill length, it is not possible at this stage to exclude the use of two additional trenchless shore crossing technologies: microtunnel or Direct Pipe (DP). The length of the entire IP, the location of the ONS and the end point, which is the PSE Wierzbięcino substation, are the same for both variants.

The following table (table 15.2) summarizes the comparison of the results of the significance of impacts on individual components in the land part, both during the construction and operation phases.

Table 15.2. *Comparison of the results of the significance of impacts of the analyzed variants of the planned Project by component*

Component		INVESTOR VARIANT		ALTERNATIVE VARIANT		ENVIRONMENTALLY PREFERABLE OPTION – ONSHORE PART	
		Construction phase	Operation phase	Construction phase	Operation phase	Construction phase	Operation phase
Land surface		medium	neutral	significant	significant	**INVESTOR**	**INVESTOR**
Geological structure and deposits		non-significant	neutral	non-significant	neutral	THE SAME	THE SAME
Soils		medium	medium	medium	medium	THE SAME	THE SAME
Surface water		medium	non-significant	medium	non-significant	THE SAME	THE SAME
Groundwater		medium	neutral	medium	neutral	THE SAME	THE SAME
Vegetation and natural habitats		medium	medium	significant	medium	**INVESTOR**	THE SAME
Forests		medium	medium	significant	medium	**INVESTOR**	THE SAME
Biota of Macromycetes and lichens		medium	non-significant	medium	medium	THE SAME	**INVESTOR**
Fauna of invertebrates		non-significant	non-significant	non-significant	non-significant	THE SAME	THE SAME
Ichthyofauna		neutral	-	neutral	-	THE SAME	-
Herpetofauna		medium	non-significant	medium	non-significant	THE SAME	THE SAME
Birds		medium	non-significant	medium	significant	THE SAME	**INVESTOR**
Land mammals		non-significant	non-significant	non-significant	non-significant	THE SAME	THE SAME
Bats		medium	non-significant	medium	medium	**INVESTOR**	**I INVESTOR**
Protected areas	**PLA**	medium	medium	significant	significant	**INVESTOR**	
	Nature 2000	-	neutral	-	**-**	THE SAME	
Ecological corridors		non-significant	neutral	medium	significant	**INVESTOR**	**INVESTOR**
Biodiversity		medium	neutral	significant	medium	**INVESTOR**	**INVESTOR**
Landscape		medium	medium	significant	significant	**INVESTOR**	**INVESTOR**
Monuments		agreed with the Pomorskie Voivodeship Office for the Protection of Monuments and the Office of Municipality of Ustka	neutral	agreed with the Pomorskie Voivodeship Office for the Protection of Monuments and the Office of Municipality of Ustka	neutral	-	THE SAME
The climate and the cleanliness of the atmosphere		non-significant	**positive**	non-significant	**positive**	THE SAME	THE SAME
The acoustic climate		non-significant	medium	non-significant	significant	THE SAME	**INVESTOR**
PEM		-	neutral	-	neutral	-	THE SAME
Thermals		-	neutral	-	neutral	-	THE SAME
Health and life of people		non-significant	non-significant	non-significant	medium	THE SAME	**INVESTOR**
Material goods		non-significant	neutral	non-significant	neutral	THE SAME	THE SAME

Source: in-house study

During the construction phase of the Investor's variant, changes of a short-term, reversible nature have been identified for the most part, which are within the boundaries of the ED, and the significance of the impacts is moderate at worst. Impacts of local scope relate to surface water and are associated with the IP's passage through the Lędowska Stream, whose waters flow into Lake Modła. This is an ecosystem that is particularly sensitive to changes in water relations and individual elements of the hydrographic network and is protected as a Natura 2000 habitat area and nature reserve. Also in the case of groundwater, there may be impacts of a local nature, limited to small areas. However, due to the relatively short period of work during excavation, it is expected that no long-term changes in the aquatic environment will occur.

In addition, it is as a result of the impact assessment that moderate impact was classified for soils, due to the permanent occupation of the land for ONS stations with a total area of up to 16 hectares and thus the exclusion of soils of high quality class from agricultural use. In the case of forests, negative impacts will mainly concern secondary succession in the deforested area and, consequently, increased pressure of non-forest species (including invasive species) on the remaining forest phytocoenoses. Negative impacts on the landscape and the Protected Landscape Area Pas Pobrzeza na Zachodnie od Ustki will primarily concern the emergence of a deforested area about 10-31 m wide over a length of about 1.5 km. However, they will be limited by the land use associated with the Naval Center, which has been operating here for years, and the industrial and agricultural landscape in the surrounding area.

The planned Project in the operation phase will be a source of noise from the ONS stations. However, its operation will not result in exceeding the permissible sound level set for the nighttime (40 dB) as well as for the daytime (50 dB), both in the areas of actual land use and those designated for residential development in the MPZP[626]. These will be indirect, long-term, permanent and local impacts.

In summary, the implementation and operation of the planned Project will not have a significant impact on the environment, both during the construction and operation phases, which is a virtually maintenance-free process, limited to maintenance and repair activities, and is primarily associated with the operation of the ONS station and the use of access roads. Impacts associated with the operation phase will be long-term but will be limited to the extent within the boundaries of the ONS. To reduce impacts, a number of measures have been proposed to minimize the environmental impact of the planned Project (Chapter 16).

In the case of construction of the alternative, significant activities have been identified, mainly due to the planned foundation of the exit chamber of the trenchless passage in the area of mixed forest and dune forest habitat (2180), in an untransformed area with significant differences in elevation. Construction in this area may intensify aeolian processes, which may be local in nature. Activities planned in the area of the western landfall of the cables are classified as significant for components such as land surface, vegetation and habitats, forests and biodiversity. Also with regard to the landscape and the Protected Landscape Area of the Belt of the Coast west of Ustka, the impacts will be significant.

Significant impacts of the operational phase of the alternative primarily concern impacts caused by the 400 kV overhead line andthere will be significant impacts. Birds are the group most vulnerable to potential collisions with overhead power infrastructure. Bird migration studies have indicated that 239 bird species fly over the ECI corridor, including species with increased vulnerability to collisions with power lines. In this aspect, a high collision rate is forecast for birds for which the line will be an obstacle. The creation of a deforested area with dominant overhead line and 4-track poles will affect the eastern Atlantic migratory route of birds - one of the more important migration routes in central Europe, which poses a threat of high mortality of migratory species with the planned high-voltage line. These impacts were considered significant. In addition, the 400 kV overhead line will be a new linear landscape feature in the mid-forest and in the agricultural-industrial and forest surroundings. The interference with the landscape will be significant, with a supra-local scope. The tall power poles and the planned ONS will be visible from a long distance and will be a landscape dominant in the area.

[626] *Uchwała nr XL.514.2022 Rady Gminy Ustka z dnia 19 maja 2022 r. w sprawie uchwalenia miejscowego planu zagospodarowania przestrzennego dla obszaru obejmującego obręb geodezyjny Pęplino, gmina Ustka*

The impacts of the decommissioning phase of both alternatives will be a reverse construction process, with the same logistical layout.

In order to perform a reliable environmental impact assessment, calculations of noise levels in the vicinity of the 400 kV double-track overhead line were prepared, which showed that the noise limit values were exceeded.

As practice indicates, gaining public acceptance for the construction of overhead lines is a very difficult process. These concerns are mainly related to PEM emissions, noise, as well as negative impacts on the landscape. In this aspect, in the existing technical-economic-social conditions, the construction of underground cable lines is increasingly the optimal choice. The progressive development of power cable technology, such as the use of heavy-duty cross-linked polyethylene (XLPE) insulation, has significantly reduced the failure rate of underground cable lines and thus facilitated the decision to build this type of power lines.

The analysis of environmental data and the existing use of the area intended for the construction of the ECI of the MFW Bałtyk II and MFW Bałtyk III showed the possibility of implementing the Project in the Investor's variant. The implementation of this variant, as shown in the identification of impacts in Chapter 10, a synthetic summary of which is provided in the table (table 15.2), will be more beneficial for the environment compared to the implementation of the alternative variant.

Summarizing the analysis of impacts, it can be concluded that due to the lower threat to the environment, including natural values and people, the Investor's variant is the more beneficial for the environment.

16. PROPOSAL FOR MINIMISING/MITIGATION MEASURES

This chapter includes proposed mitigation measures for the design, construction, and operational phases for those elements of the marine and terrestrial environment that require their application to mitigate or eliminate the potential negative impact of the Project, which have been identified and analysed in Chapters 9 and 10 of this Report.

16.1 MARITIME AREA

Proposed actions to reduce the negative impact (moderate and significant impact) of the ECI on the marine environment and a set of actions aimed at minimising and/or eliminating impact on phytobenthos, macrozoobenthos, ichthyofauna, birds, marine mammals are indicated below.

16.1.1 Recommendations for the design phase

*Recommendations for the detailed routing of connection cables from the offshore wind farm **MFW Bałtyk II:***

- as far as possible, avoid large boulders and clusters of stones in places where valuable phytobenthic communities have been found (vegetation cover in the range of 70-90% and the presence of protected species), i.e.:

Localization:	Geographical coordinates:
Stacja IPZ_p01	54°57'38.104"N, 16°55'41.638"E
Stacja IPZ_p06	54°58'7.392"N, 16°55'34.279"E
Stacja IPZ_p09	54°58'56.642"N, 16°55'1.805"E

- as far as possible, avoid the locations of mussel assemblages i.e. boulders and clusters of stones in sections:

Localization::	Geographical coordinates:
from OSS to 11BII	55°5'30.988"N, 16°53'4.19"E - 54°56'51.845"N, 16°55'34.337"E
from 26 to 28	54°39'2.667"N, 16°51'41.412"E - 54°37'59.353"N, 16°51'20.792"E

- in the habitat crossing section *1110 Piaszczyste ławice podmorskie*

Localization::	Geographical coordinates:
from 9 BII to 12 BII	54°57'55.83"N, 16°55'24.494"E - 54°56'19.839"N, 16°55'39.258"E

lay the cable in a trench, do not use alternative methods to protect the cable (e.g. stone bedding, concrete mattresses) to avoid altering the nature of the habitat.

Recommendations for the detailed routing of connection cables from the offshore wind farm MFW Bałtyk III:

- if possible, avoid the sites of mussel communities i.e. boulders and clusters of stones in sections:

Localization::	Geographical coordinates:
0BIII-4BIII	54°56'47.484"N, 17°17'56.025"E - 54°55'59.654"N, 17°14'31.537"E
8 BIII – 12 BIII	54°55'23.337"N, 17°10'55.829"E - 54°54'47.339"N, 17°7'20.013"E
26-28	54°39'2.667"N, 16°51'41.412"E - 54°37'59.353"N, 16°51'20.792"E

Recommendations for the detailed routing of the connector cables between the offshore wind farms MFW Bałtyk II and MFW Bałtyk III:

- if possible, avoid the sites of mussel communities i.e. boulders and clusters of stones in sections:

Localization - the ECI squares:	Geographical coordinates:
29	55°1'41.2"N, 16°52'29.051"E - 55°1' 0.439"N, 16°54'22.833"E
37	55°1'20.439"N, 16°54'22.833"E - 55°0'59.614"N, 16°56'16.579"E
46	55°0'59.614"N, 16°56'16.579"E - 55°0'38.769"N, 16°58'10.293"E

16.1.2 Recommendations for the construction phase

The connection from the offshore wind farm MFW Bałtyk II:

- restrictions on the timing of works:
  - for the section km 25,3 ECI corridor (54°39'23.891"N, 16°51'47.604"E) to km 35 ECI corridor (54°34'47.831"N, 16°48'22.059"E) (4 Nm offshore), it is recommended to conduct works related to cable burial/dredging and dredger/refuller operations, including spoil disposal (excluding HDD drilling works), outside the Atlantic salmon and river lamprey spawning migration period from 15 September to 15 November and from 1 March to 15 April,
  - within the boundaries of the Ławica Słupska Natura 2000 area, works related to the implementation of the planned Project should be carried out outside the period of bird migration falling from October 1 to April 30, with the exception of a situation in which ornithological surveillance confirms a delay in migration; or its earlier termination;
- in the section from 0,9 (54°52'25.148"N, 16°55'36.652"E) to 9 (54°48'9.849"N, 16°54'21.643"E), due to the passage of the TSS Ławica Słupska shipping route, it is recommended to develop and implement a navigation safety plan in accordance with Regulation from 18th of September 2011 about marine safety.

The connection from the offshore wind farm MFW Bałtyk III:

- restrictions on the timing of works:
  - for the section from 25,3 (54°39'23.891"N, 16°51'47.604"E) to km 35 (54°34'47.831"N, 16°48'22.059"E) (4 Nm offshore), it is recommended to conduct works related to cable burial/dredging and dredger/refuller operations, including spoil disposal (excluding HDD drilling works), outside the Atlantic salmon and river lamprey spawning migration period from 15 September to 15 November and from 1 March to 15 April
  - within the Ławica Słupska Natura 2000 site, it is recommended to carry out cable laying work outside the bird migration period from 1 October to 30 April, except when ornithological surveillance confirms the delay of migration, or its early termination;
- In the section from 0,9 (54°52'25.148"N, 16°55'36.652"E) to 9 (54°48'9.849"N, 16°54'21.643"E), due to the passage of the TSS Ławica Słupska shipping route, it is recommended to develop and implement a navigation safety plan in accordance with Regulation from 18th of September 2011 about marine safety.

The connector between the offshore wind farms MFW Bałtyk II and MFW Bałtyk III:

- restrictions on the timing of works:

- works related to the implementation of the planned Project within the area of Ławica Słupska Natura 2000, conduct outside the period of migration and wintering of birds falling from October 1 to April 30, except when ornithological surveillance confirms the delay of migration, or its early termination.

Recommendations addressed to all cable sections:

- when excavating a trench (or other works generating noise and/or turbidity in the water), to use a soft start procedure consisting of starting the works with little and increasing underwater noise each time (e.g. starting underwater equipment initially at idle run and gradually increasing power), allowing fish and mammals to escape from the area directly affected by the seabed intervention works and avoiding direct mechanical impact,
- to conduct the construction work using modern vessels with internal combustion engines that meet modern emission standards,
- to use modern machines with minimum sound power levels,
- to apply rational coordination that limit the movement of vessels, thus reducing noise emissions and atmospheric emissions from fuel combustion,
- to conduct the construction work in such a way as to minimize the amount of construction waste, materials used during the construction work will be used rationally; the construction work should be carried out with care.

Measures minimize the impact on habitats and species which are the subject of protection of Natura 2000 site PLC990001 Ławica Słupska

The connection from the offshore wind farm MFW Bałtyk II, MFW Bałtyk III and connector:

- eliminating the possibility of impact on the subjects of protection (migrating and wintering birds) by conducting works within the Natura 2000 area outside the bird migration period from 1 October to 30 April except when ornithological surveillance confirms the delay of migration, or its early termination.

Measures to minimize the impact on the objects of protection of the Natura 2000 area PLB990002 Przybrzeżne wody Bałtyku:

The connection from the offshore wind farm MFW Bałtyk II, MFW Bałtyk III:

- limiting the possibility of impact on the subjects of protection (migrating and wintering birds) by increasing the work rate during the period when bird numbers are at their lowest in the area of Przybrzeżne wody Bałtyku, i.e between 1 May and 30 September

Measures to minimize the impact on the objects of protection of the Natura 2000 PLH220052 Dolina Słupi site:

The connection from the offshore wind farm MFW Bałtyk II, MFW Bałtyk III:

- eliminating the possibility of impact on the objects of protection (bi-environmental species entering the Slupia River for spawning - i.e. Atlantic salmon and river lamprey) by carrying out works related to cable burial/dredging and dredger/refuller operations, including spoil disposal (excluding HDD drilling works), outside the protection period for migration in the sea, falling from 15 September to 15 November and from 1 March to 15 April, in the coastal zone with a width of 4 nautical miles;

Measures to minimize the impact on ichthyofauna:

- a 'soft start' procedure should be applied prior to the commencement of construction work by starting the work with little and increasing underwater noise (e.g., starting underwater equipment initially at idle run and gradually increasing power), allowing fish to escape from the area directly affected by the seabed intervention works and avoiding direct mechanical impact,
- as the ECI route passes through the migration routes of the bi-environmental species, the Atlantic salmon and the river lamprey, the works related to cable burial/dredging and dredger/refuller operations, including spoil disposal (excluding HDD drilling works) must be conducted outside the protective period for migration at sea, which is from 15 September to 15 November and from 1 March to 15 April, in a coastal zone of 4 nautical miles.

Measures to minimize the impact on <u>birds:</u>

- within the area of Natura 2000 sites Ławica Słupska works should be planned outside migration periods, between 1 October and 30 April, except when ornithological surveillance confirms the delay of migration, or its early termination;
- within the area of Natura 2000 site Przybrzeżne wody Bałtyku, it is recommended to intensify the work rate during the period when bird numbers are at their lowest, i.e. from 1 May to 30 September;
- if work is conducted after dark, sources of intense light directed upwards must be limited to what is necessary according to current legislation and occupational safety standards, particularly during bird migration periods (March to May and September to November).

Measures to minimize the impact on <u>marine mammals:</u>

- a 'soft start' procedure should be applied prior to the commencement of construction work by starting the work with little and increasing underwater noise (e.g., starting underwater equipment initially at idle run), allowing fish to escape from the area of the works in progress.

Measures to mitigate the impact on <u>cultural heritage:</u>

- If archaeological monuments located in deeper bottom structures are encountered, proceed in accordance with the provisions of Article 32(1)(1)-(3) and (10) of the Act of 23 July 2003 on the protection and care of historical monuments; in the event of encountering:
  - stop any work that might damage or destroy the discovered object,
  - secure the object using available means,
  - notify the relevant conservation officer of the situation, and, if this is not possible, the mayor of the municipality of Ustka.
- Upon completion of the inspection of the objects lying in the pit, the provincial conservator of historical monuments will decide:
  - to continue the interrupted works if the object is not a monument,
  - to continue the interrupted works, if the discovered object is a monument, and the continuation of the works will not lead to its destruction or damage,
  - on further stopping the works and carrying out, at the expense of the organisational unit financing these works, archaeological research to the necessary extent.
- Upon completion of the archaeological research, the provincial conservator of monuments issues a decision allowing the continuation of the interrupted works.

16.1.3 Recommendations for the operation phase

During the operation phase, the impact of the planned Project on all biotic components of the marine environment has been classified as insignificant. Therefore, no minimising measures are foreseen.

16.2. TERRESTRIAL ENVIRONMENT

The most important natural conditions targeted by the minimization measures are shown graphically in Figure 16.4 - Figure 16.7.

16.2.1 Recommendation for the design phase:

- To design trenchless crossings:
  - within the technical zone established by the order of the Director of the Maritime Office,
  - at the point of crossing of Struga Lędowska (km 37.2 of the ECI corridor- coordinates: 54°33'39.222"N, 16°48'14.885"E),
  - at points of conflict with major roads and railways: provincial road nr 203, local railway line to the Naval Center (km 36.5 of the ECI corridor- coordinates: 54°34'0.027"N, 16°48'20.093"E).
- At the stage of detailed routing of cable routes, as far as technically possible and as far as the availability of land will allow an amphibian breeding habitat (forestpond) at km: 43.6 of the ECI corridor (54°32'6.457"N, 16°53'12.721"E), should be bypassed and the construction site should be limited as much as possible,
- At the stage of detailed routing of cable routes, as far as technically possible and the availability of land will allow, a bat wintering site (complex of the 9th Fixed Artillery Battery in Lędów (gun

emplacement No. 504 - cannon stand No. 504) around km 35.2 of the ECI corridor, coordinates: 54°34'39.792"N, 16°48'20.426"E), should be bypassed.
- The construction site of the trenchless cable outlet, located within the complex of the 9th Battery of Fixed Artillery in Lędów, should be designed in such a way as to avoid interference with the buildings under conservation protection (entered in the provincial register of monuments, e.g. gun emplacement No. 504 - cannon stan No. 4); the conditions of the works should be agreed upon with the Pomeranian Provincial Office for the Protection of Monuments (delegation in Słupsk),
- Agree the conditions for carrying out works within the historic railway line - "Route of the rolled-up tracks", should be agreed up with the Office of the Municipality of Ustka; in the case of an open trench crossing, the construction strip to 22 m should be narrowed as much as possible.

16.2.2 Recommendations for the construction phase:

Measures to minimise impact <u>on the land surface</u>:

- The exclusion of any interference within Lędowskie Wydmy and to the north of the dunes (i.e. north of the border of the technical zone established by the order of the Director of the Maritime Office in Gdynia excluding the transformed fragment of the site described by the coordinates: 54°34'41.855" N, 16°48'25.011"E; 54°34'42.203"N, 16°48'24.858"E; 54°34'41.75"N, 16°48'19.797"E; 54°34'41.418"N, 16°48'19.864"E;), including the prohibition of:
  - vehicle and machine traffic,
  - the construction of temporary roads, yards, construction sites, etc.,
  - laying of temporary pipelines (e.g., for water intake/discharge) across Wydmy Lędowskie (along the existing path leading to the beach entrance).

Measures to reduce the impact on <u>soils:</u>

- Soil stockpile divided into humus and bedrock, together with proper restoration of the soil profile. To protect the humus from contamination, temporary covering with plastic sheeting is recommended (to prevent weeds); once the excavation is closed, restore the soil profile, and spread the humus with the correct compaction factor, after cleaning it first.
- Management of any surplus earth masses in accordance with the Waste Act of 14 December 2012 (Journal of Laws 2022.699 consolidated text, as amended) and the Regulation of the Minister of the Environment of 10 November 2015 on the list of types of waste which individuals or organisational units which are not entrepreneurs may subject to recovery for their own needs, and the permitted methods of their recovery (Journal of Laws 2016.93).
- On hydrogenic soils, it is recommended:

No.	Section of the ECI corridor on hydrogenic soils	Geographical coordinates of the section	The nearest watercourse
1.	36,9 - 37,6	from 54°33'47.498"N, 16°48'14.874"E to 54°33'30.64"N, 16°48'27.37"E	Struga Lędowska
2.	38,8 – 39,3	od 54°33'5.361"N, 16°49'22.088"E do 54°32'57.908"N, 16°49'39.311"E	Drainage ditch

  - to narrow the work strip,
  - to limit the time that the excavation is open as much as possible,
  - to use methods which have the least impact on the water table in the vicinity, i.e., the use of needle-filters or sheet piling, if excavations must be dewatered,
  - to distribute (disperse) water from the dewatering of the excavation to the ground after purification (sedimentation tank).
  - It is prohibited to organise storage yards and back-up facilities at the construction site on hydrogenic soils.

Measures to minimise the impact on <u>surface water:</u>

- Prohibition of water abstraction for drilling fluid from the Lędowska Struga watercourse, the Modła Lake and smaller watercourses and ditches flowing into the Modła Lake along the ECI corridor from

36.9 km to 37.5 km (geographical coordinates: 54°33'48.468"N, 16°48'14.579"E - 54°33'31.283"N, 16°48'22.974"E).

- Prohibition of water discharge (e.g., from dewatering of excavations or drilling fluid) into the Lędowska Struga watercourse, the Modła Lake and smaller watercourses and ditches flowing into the Modła Lake along the section of the ECI corridor from 36.9 km to 37.5 km (geographical coordinates: 54°33'48.468"N, 16°48'14.579"E - 54°33'31.283"N, 16°48'22.974"E).
- Drilling mud generated after the drilling process should be collected by a specialized company and managed off-site in accordance with the Law on Waste, it is recommended to reuse the mud on other drillings within the construction site if possible.

Measures to minimise impacts on <u>vegetation cover, mosses and lichens:</u>

- As a result of the construction of the planned Project, protected vascular plant species inventoried within the boundaries of the construction corridor may be destroyed. In the case of selected vascular plant species, it is possible to implement minimization measures, consisting of transplanting specimens with an appropriate portion of the substrate (metaplanting), outside the construction corridor of direct impacts with natural supervision. In order to reduce the negative impact on protected species of vascular plants, it is recommended to relocate them, including after prior. This requires in advance a so-called derogation decision for relocation, i.e., an exemption from the prohibitions issued by the RDOŚ for the following protected plant species which applies to species of families:
  - *Orchidaceae* (the broad-leaved buckthorn),
  - *Caprifoliaceae* (the Pomeranian honeysuckle).

Detailed data on the number and distribution of species eligible for translocation are provided below in table 16.2.1. and shown in figures 16.1, 16.2 and 16.3.

Replanting should be done to patches that are identical or similar in habitat (under the supervision of a botanist), optimally between April 15 and May 31 (or any other period indicated by a botanist). The exact date will be indicated by supervision in relation to the relevant phenological period of early or late spring. In general, plants should be just after the optimum of flowering, at a time when the leaves on deciduous trees and shrubs will already be developed.

For the remaining protected vascular plant species identified within the construction corridor, it will be necessary to remove, those that cannot be replanted. This applies to the species listed in table 16.1. For the destruction of the following species, it is necessary to obtain a so-called derogation decision for the destruction of the species, i.e. permits from the RDEP for derogations from prohibitions on protected plant species.

Table 16.1. *Species of vascular plants under partial protection at risk of destruction as a result of the planned Project.*

No.	Approximate km of ECI corridor	Geographical coordinates of the location of the sites (lat. N, long. E)	Species	Type of impact	Minimisation measures/ derogations
1	35 to 36.5	Three patches of the species' sites along the section of the ECI corridor from 54°34'44.588''N, 16°48'23.158''E to 54°34'0.754"N, 16°48'21.637''E	Black crowberry Empetrum nigrum	Destruction of two sites of the species due to felling in the area of landfall of cables and excavations One patch of the species' sites will not be destroyed by the trenchless passage of the the Naval Centre in Ustka	Derogation for destruction of two patches
2.	35 to 35.1	One patch of a species site in the coastal zone along the ECI corridor section from 54°34'46.136"N, 16°48'22.657"E to 54°34'42.904"N, 16°48' 3.738"E	Rusty-red buckthorn Epipactis atrorubens cordyceps	The species' stand patch will not be destroyed - planned HDD steerable drilling (cable exit from sea to land)	

No.	Approximate km of ECI corridor	Geographical coordinates of the location of the sites (lat. N, long. E)	Species	Type of impact	Minimisation measures/ derogations
3.	35,1 to 35,4, 36,2 to 36,9	Location of patches of the species' sites: from 54°34'43.236"N, 16°48'23.616"E to 54°34'31.536"N, 16°48'27.583"E; from 54°34'8.26"N, 16°48'27.85"E to 54°33'48.373"N, 16°48'14.62"E	Pomeranian honeysuckle *Lonicera periclymenum*	Destruction of several sites of the species in connection with the construction site and construction strip (Figures 16.2 and 16.3).	Metaplantation as replacement habitat becomes available
4.	35.7 to 36.4	Sedge sites were located in the area of the Naval Centre in Ustka with the species' positions indicated below: 54°34'13.51"N, 16°48'35.606"E; 54°34'13.276"N, 16°48'35.895"E; 54°34'1.251"N, 16°48'27.12"E	Sand sedge *Carex arenaria*	Trenchless methods (in an area of the Naval Centre in Ustka) three sites will be destroyed as a result of the excavations	Trenchless methods (in an area of the Naval Centre in Ustka) derogations for destruction approx. 3 sites of the species
5.	44,6	54°31'42.612"N, 16°53'39.419"E	*Callitriche verna*	Destruction of species' sites due to excavation works	Derogations must be obtained for the destruction
6.	46.5	54°30'47.777"N, 16°53'48.861"E	*Callitriche hamulata*	Destruction of one species' site due to excavation works	Derogations for the destruction of species must be obtained
7.	47.6	Single sites of the species and one patch of sites of the species occur in the vicinity of the PSE Wierzbięcino station; the locations of the single sites are listed below: 54°30'13.482"N, 16°53'30.893"E; 54°30'12.929"N, 16°53'30.346"E; 54°30'12.804"N, 16°53'29.352"E; 54°30'12.434"N, 16°53'29.349"E, and a patch of species sites: from 54°30'12.684''N, 16°53'38.587''E to 54°30'12.357''N, 16°53'39.048''E	Broad-leaved buckthorn *Epipactis helleborine*	The destruction of sites (to approx.. 30 species will occur as a result of the excavation and entrance of the Wierzbięcino PSE station (Figure 16.2,Figure 16.3). It has been suggested that specimens will be relocated to substitute habitats	Replanting

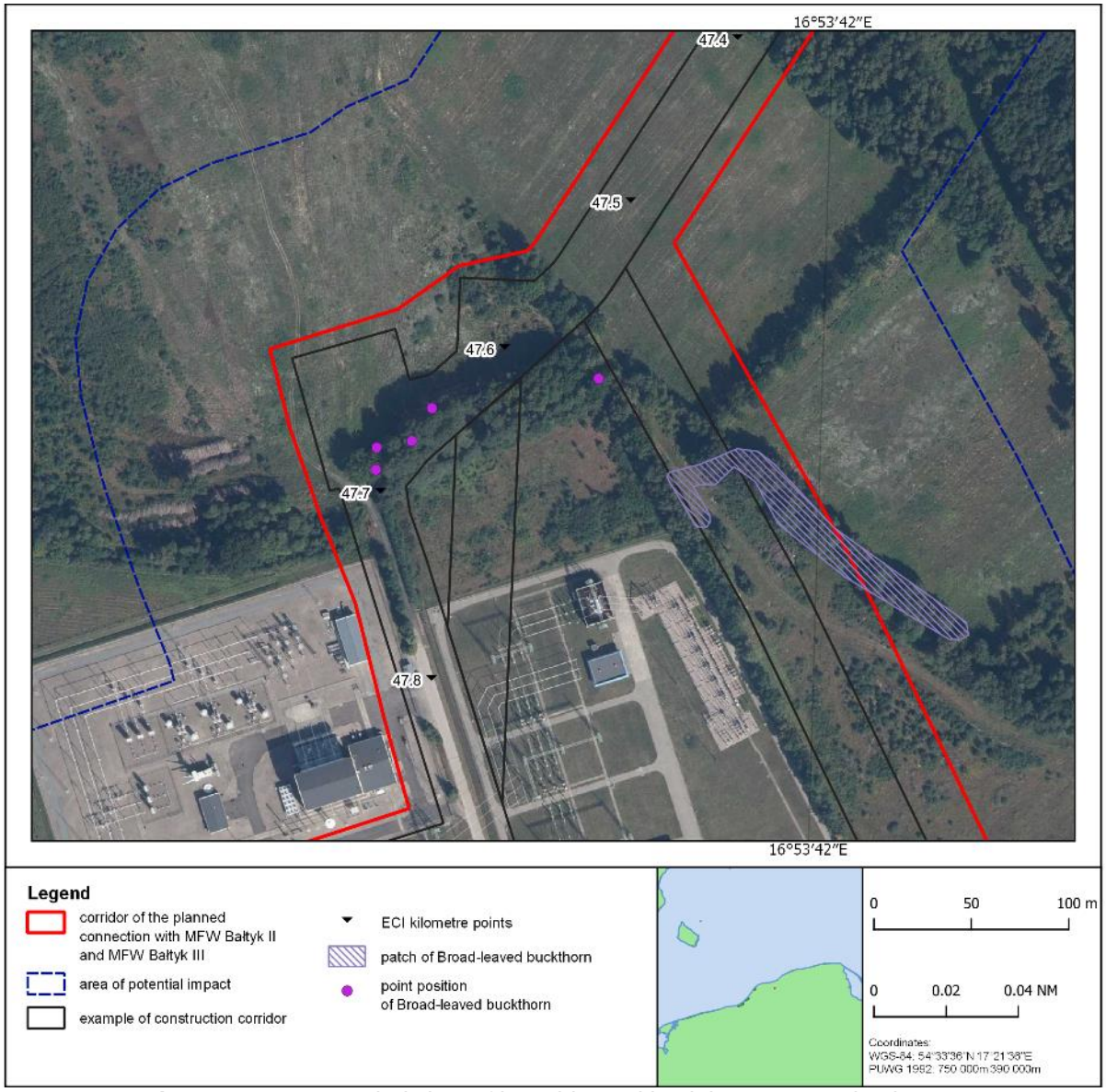


Figure 16.1. *Inventoried sites of broad-leaved buckthorn – metaplanting*

Source: In-house study

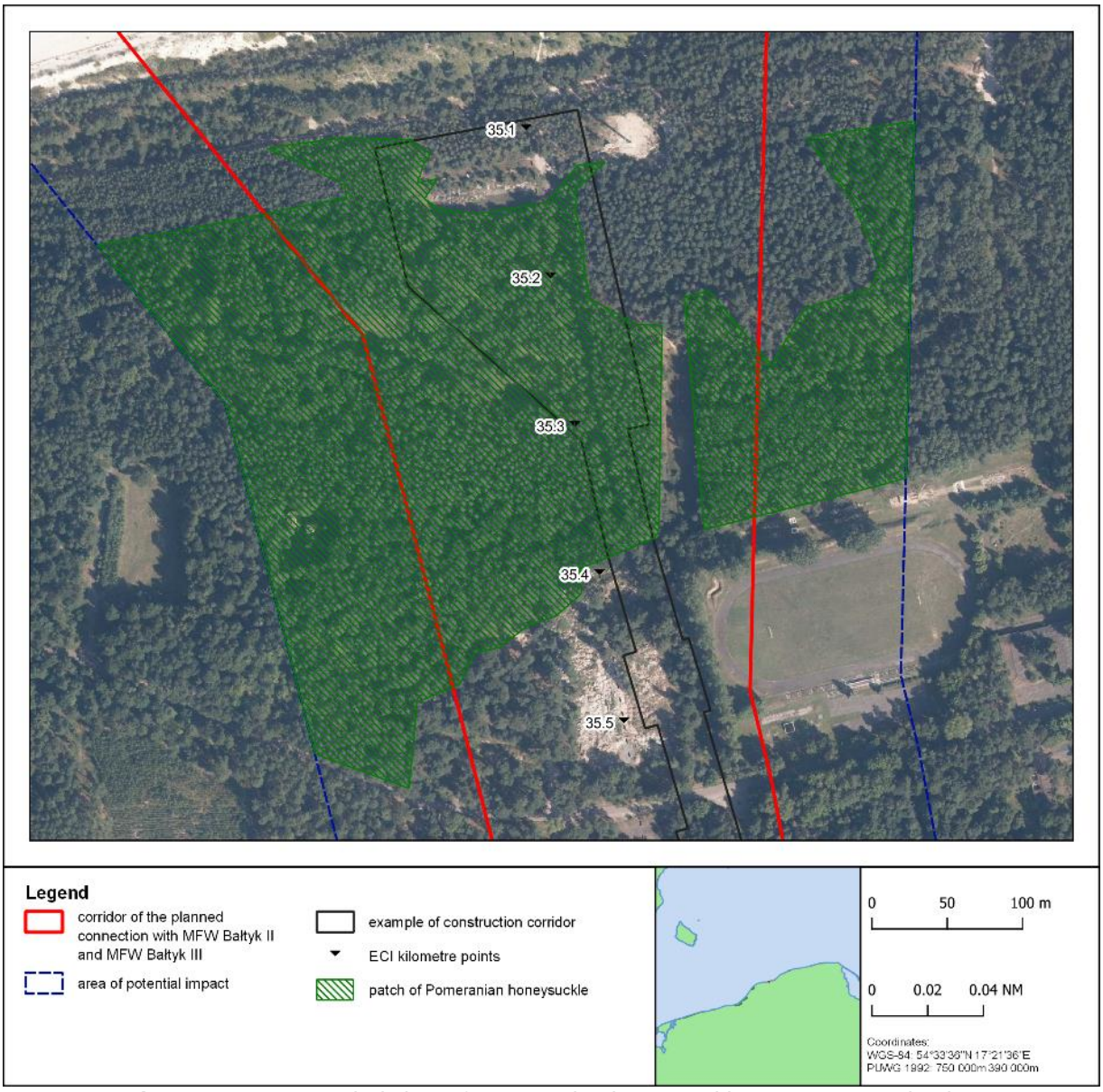


Figure 16.2. *Inventoried sites of Pomeranian honeysuckle part 1 – metaplanting*

Source: In-house study

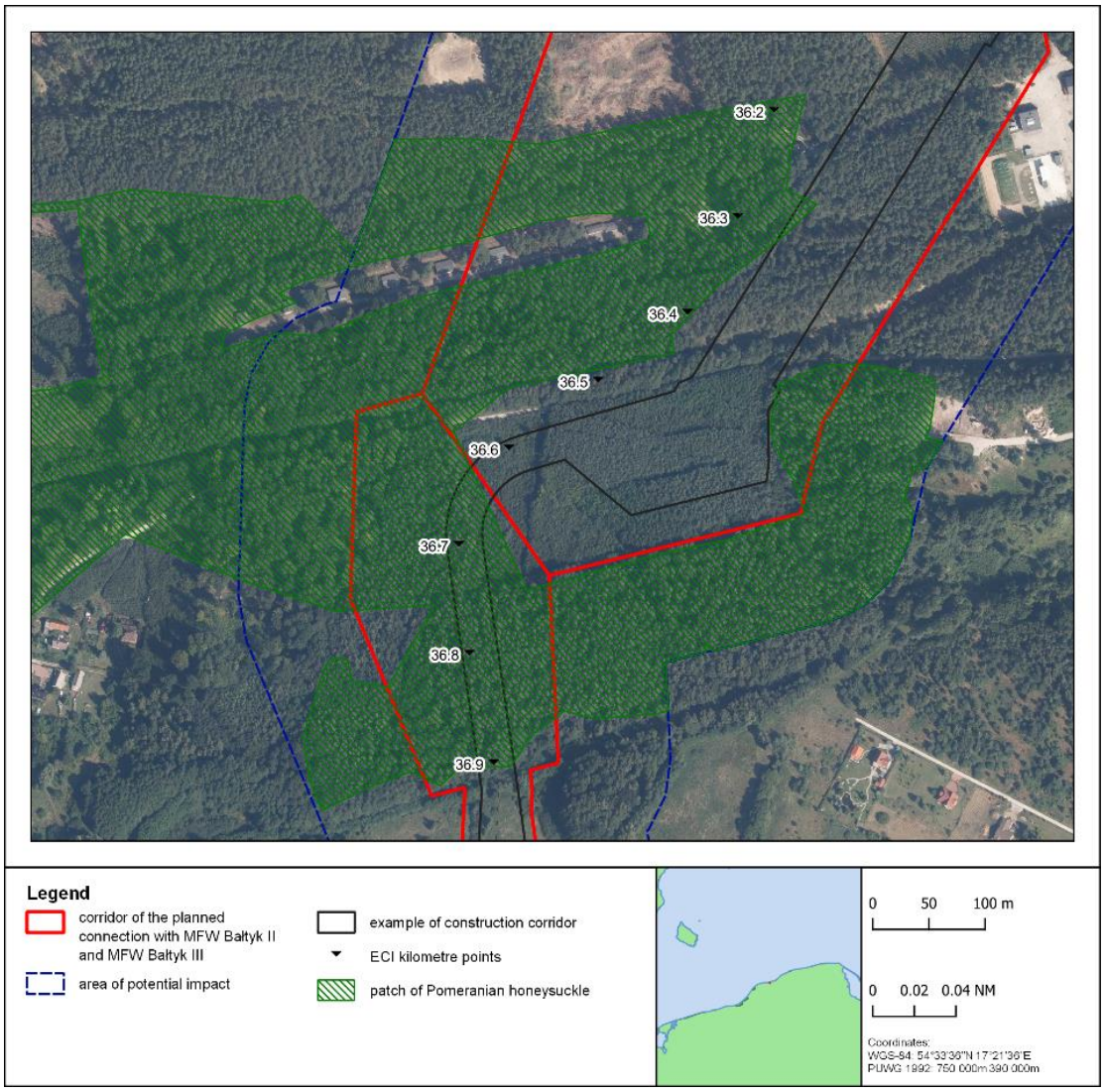


Figure 16.3. *Inventoried sites of Pomeranian honeysuckle part 2 – metaplanting*

Source: In-house study

- The cutting of trees in the construction corridor and earthworks associated with the removal of the topsoil (including the construction of a trench and a technological road) will result in the destruction of protected species of bryophytes and lichens (protected species, but quite common). For the destruction of sites, it will be necessary to obtain a derogation decision, i.e. a permit from the RDOŚ for derogations from prohibitions on protected lichen species.

Table 16.2. *Protected bryophyte and lichen species and habitats at risk of destruction as a result of the planned Project*

No.	Approximate km of ECI corridor	Geographical coordinates of the sites (lat. N, long. E)	Species/habitat within the construction corridor	Type of impact	Derogations /Minimising measures
Bryophytes					
1.	35	54°34'42.339"N, 16°48'20.494"E	Gray reindeer lichen *Cladonia rangiferina*	HDD guided drilling makes it possible to preserve the position	
2.	35,5 – 35,9 47,2	54°34'23.329"N, 16°48' 31.164"E; 54°34'13.098"N, 16°48'35.777"E; 54°30'21.451"N, 16°53'41.033"E; 54°30'23.459"N, 16°53'42.995"E; 54°34'23.093"N, 16°48'32.014"E	Neat feathermoss *Pseudoscleropodium purum*	Destruction of species sites due to excavation work	Derogations for the destruction of species must be obtained
3.	35,7 36-36,1	54°30'20.132"N, 16°53'40.628"E; 54°30'21.983"N, 16°53'40.745"E;	Red-stemmed feathermoss	Destruction of stands of the species due to the location of the	

No.	Approximate km of ECI corridor	Geographical coordinates of the sites (lat. N, long. E)	Species/habitat within the construction corridor	Type of impact	Derogations /Minimising measures
	47,3-47,4	54°34'13.163"N, 16°48'35.77"E; 54°34'10.961"N, 16°48'37.278"E; 54°34'23.093"N, 16°48'31.937"E;	*Pleurozium schreberi*	construction site of the trenchless passage under the site of the Naval Centre and the implementation of excavations -. obtain derogation for destruction	
4.	36-36,1	A patch of the species' positions: From 54°34'14.392"N, 16°48'29.402"E to 54°34'10.623"N, 16°48'29.089"E	Green reindeer lichen *Cladonia arbuscula*	HDD steerable drilling and trenchless passage under the site of the Naval Center in Ustka	If destruction is necessary, derogations for destruction must be obtained
5.	43,7 46,1 - 46,8 47,3-47,4 47,6	54°30'43.835"N, 16°53'49.98"E; 54°30'44.124"N, 16°53'49.726"E; 54°30'37.999"N, 16°53'53.18"E; 54°30'37.573"N, 16°53'53.022"E; 54°30'37.766"N, 16°53'54.017"E; 54°30'13.623"N, 16°53'31.907"E; 54°30'20.97"N, 16°53'40.415"E; 54°30'21.313"N, 16°53'41.239"E; 54°30'21.506"N, 16°53'41.527"E; 54°30'15.381"N, 16°53'34.283"E; 54°32'5.945"N, 16°53'14.515"E; 54°30'20.325"N, 16°53'40.182"E; 54°30'20.833"N, 16°53'40.339"E; 54°30'51.168"N, 16°53'47.496"E; 54°30'57.541"N, 16°53'42.853"E; 54°30'57.816"N, 16°53'44.178"E; 54°30'57.747"N, 16°53'42.784"E; 54°30'14.887"N, 16°53'34.657"E; 54°30'15.117"N, 16°53'34.28"E; 54°30'15.582"N, 16°53'33.218"E; 54°30'15.106"N, 16°53'34.869"E	Crisped pincushion moss *Ulota crispa*	Destruction of species' sites due to excavation works	Derogations for the destruction of species must be obtained
6.	46,5	54°30'47.123"N, 16°53'49.601"E;	Pin cushion moss *Leucobryum glaucum*	Destruction of species sites due to excavation work	
7.	46,5 46,8 47,6-47,7	54°30'44.124"N, 16°53'49.726"E; 54°30'37.628"N, 16°53'53.908"E; 54°30'12.964"N, 16°53'30.095"E; 54°30'13.609"N, 16°53'31.825"E; 54°30'15.381"N, 16°53'34.283"E; 54°30'15.117"N, 16°53'34.28"E; 54°30'15.582"N, 16°53'33.218"E	Dilated scalewort, *Frullania dilatata*	Destruction of the species' sites due to the excavation and entry of the PSE station	Derogations for the destruction of species must be obtained
8.	47,3	54°30'21.451"N, 16°53'41.006"E	Common Tamarisk-moss *Thuidium tamariscinum*	Destruction of species' sites due to excavation works	Derogations for the destruction of species must be obtained
9.	47,5 – 47,7	54°30'13.307"N, 16°53'30.85"E; 54°30'14.378"N, 16°53'33.94"E; 54°30'13.857"N, 16°53'32.663"E; 54°30'18.416"N, 16°53'37.339"E; 54°30'15.257"N, 16°53'33.912"E	The springy turf-moss *Rhytidiadelphus squarrosus*	Destruction of species' sites due to excavation works	Derogations for the destruction of species must be obtained
Clustered fungi (lichens)					
10.	44,4-44,5 46,1 47,3-47,6	54°30'15.431"N, 16°53'33.498"E; 54°30'15.582"N, 16°53'33.218"E; 54°30'15.621"N, 16°53'34.203"E; 54°30'20.97"N, 16°53'40.346"E; 54°30'15.106"N, 16°53'34.869"E; 54°31'47.364"N, 16°53'39.605"E; 54°31'48.71"N, 16°53'40.253"E; 54°31'48.909"N, 16°53'40.502"E; 54°31'47.68"N, 16°53'39.811"E	Valley oakmoss lichen *Evernia prunastri*	HDD drilling, destruction of species sites due to tree felling	Derogations for the destruction of species must be obtained

No.	Approximate km of ECI corridor	Geographical coordinates of the sites (lat. N, long. E)	Species/habitat within the construction corridor	Type of impact	Derogations /Minimising measures
11.	47,6	54°30'15.106"N, 16°53'34.869"E	Ridged ramalina lichen *Ramalina fraxinea*	destruction of species sites due to tree felling	Derogations for the destruction of species must be obtained
12.	47,6	54°30'15.431"N, 16°53'33.498"E; 54°30'15.106"N, 16°53'34.869"E; 54°30'14.887"N, 16°53'34.657"E	Dotted ramalina lichen *Ramalina farinacea*	destruction of species sites due to tree felling	Derogations for the destruction of species must be obtained

- As a result of the Derogations of the planned Project, fragments of protected habitats within the construction strip will be destroyed (table 16.3), the following habitats cannot be bypassed. For some habitats it will be possible to reduce interference as a result of trenchless cable construction.

Table 16.3. *Habitats likely to be damaged by the planned Project*

No.	Approximate km of ECI corridor	Geographical coordinates of the sites (lat. N, long. E)	Species/habitat within the construction corridor	Type of impact	Derogations/Minimising measures
1.	36	from 54°33'53.177"N, 16°48'12.423"E to 54°33'48.411"N, 16°48'14.659"E	Acidophilous oak woods *Quercion robori-petraeae*	Destruction in connection with excavation work	Derogations for the destruction of species must be obtained
2.	36	from 54°34'10.739"N, 16°48'29.149"E to 54°34'18.467"N, 16°48'29.684"E	Dry heaths *Calluno-Genistion, Pohlio-Callunion, Calluno-Arctostaphylion*	Destruction in connection with excavation work	A derogation for destruction should be obtained, and it is recommended that the turf be removed and stored in the corridor of works and re-established after completion of the construction works in the same place; this measure will enable the heathland to recover spontaneously; this measure does not require any additional treatment to improve its suitability
3.	35 to 37	from 54°34'0.598"N, 16°48'21.307"E to 54°34'41.043"N, 16°48'24.36"E;	Mixed forests and coniferous forests on coastal dunes (coastal crowberry forest) *mostly Empetro nigri-Pinetum*	Destruction of species due to felling in the area of landfall of cables and implementation of excavations	Derogations for the destruction of species must be obtained
4.	43,2 do 46,8	from 54°30'37.113"N, 16°53'54.169"E, to 54°31'44.217"N, 16°53'38.862"E; from 54°31'40.798"N, 16°53'38.641"E to 54°30'53.327"N, 16°53'46.006"E	Fertile beech forests *Galio odorati-Fagetum*	Destruction in connection with excavation work	Derogations for the destruction of species must be obtained

Measures to minimize the impact on <u>entomofauna:</u>

- Keep the construction area clean so as not to create traps for entomofauna (e.g., bottles, containers, etc.).

Measures to minimize impacts <u>on herpetofauna</u>:

- If it is necessary to destroy amphibian breeding habitats at km 43.6 and km 47.2-47.3 , this should be done between 16 October and 28 February. In the case of a different date, it will be necessary to catch herpetofauna specimens and move them to substitute habitats. Carry out activities under supervision of a herpetologist
- Setting up temporary protective fencing, i.e., during the migration and breeding period for amphibians and reptiles (1 March to 15 October) on both sides of the construction corridor, around open excavation.
- Fences should be placed on both sides of the excavation and access roads in the form of fences made of mesh with a mesh diameter of no more than 10 mm or plastic sheeting, with a height of 50 cm, together with an overhang, i.e. a bend of 5 cm of the upper part of the fence towards the outside of the construction corridor, mounted on a frame to ensure a permanent slope. Such fences should be dug into the ground to a depth of min. 10 cm. The effectiveness of the solutions used should be monitored at the construction stage by herpetological supervision.
- In spring (from March 1 to April 30) and autumn (from August 15 to October 15) in areas of intense amphibian migration on animal migration routes, in addition to protective fencing, use a system of buckets dug into the ground, with a wall height of 30-40 cm, distributed along the fence, every 10 m (keep the buckets dry and transfer the specimens collected in them 1-3 times a day to alternate habitats). Decide on the number of buckets, their locations and the frequency of inspection, together with the herpetologist from the wildlife surveillance.
- The construction area in the period from March 1 to October 15 should be constantly inspected by herpetological supervision (tightness of fences, confirmation of migration periods, inspection of buckets and frequency of trapping amphibians and reptiles).

Measures to minimise impact on <u>birds:</u>

- Tree and shrub felling in forest areas outside the bird breeding season, i.e., outside the period from March 1 to August 31 (confirmed by an ornithologist, as breeding periods may start later or end sooner).
- Cutting of individual trees and shrubs can be carried out throughout the year under the supervision of an ornithologist, who will make a field verification and confirm the absence of breeding.
- For the destruction of breeding grounds and scaring of bird species inventoried in the area of the planned Project, it is necessary to obtain the so-called derogation decision, i.e. permits from the RDOŚ for derogations from prohibitions on wildlife species. Bird species for which a derogation decision should be obtained are presented in table 16.2.

Table 16.4. *Protected bird species at risk of destruction as a result of the planned Project*

No.	Approximate km of ECI corridor	Geographical coordinates (lat. N, long. E)	English name	Protection status	Type of impact	Mitigating actions
1.	35 to 36	ONS: 54°32'27.517"N, 16°52'10.77"E	red-backed shrike *Lanius collurio*	AX; DP I	Potential removal of 2 sites, crowding	Conducting tree and shrub cutting outside the bird breeding season, i.e. outside the period from March 1 to August 31. It will be necessary to obtain a derogation decision for destroying stands and frightening the species.
2.	38 do 40	In construction corridor: 54°33'25.112"N, 16°48'49.013"E	western yellow wagtail *Motacilla flava*	AX	Removal of 1 post, potential removal of 1 post	
3.	39 do 39,2; 42 do 42,9 oraz 47,5 do 47,5	In construction corridor: 54°30'16.083"N, 16°53'35.325"E; 54°33'0.792"N, 16°49'30.147"E	whinchat *Saxicola rubetra*	AX	Removal of 2 post, potential removal of 2 post, crowding	

No.	Approximate km of ECI corridor	Geographical coordinates (lat. N, long. E)	English name	Protection status	Type of impact	Mitigating actions
4.	42 do 43 oraz 47,6	ONS: 54°32'27.904"N, 16°52'9.527"E; 54°32'19.517"N, 16°52'11.06"E	corn bunting *Emberiza calandra*	AX	Potential removal of 4 sites, crowding	
5.	35 do 36	54°34'33.079"N, 16°48'20.588"E	dzięcioł czarny Dryocopus martius	OŚ, DP. I	Potencjalna likwidacja 1 stanowiska, płoszenie	
6.	47,6	54°30'14.362"N, 16°53'38.052"E	lerka Lullula arborea	OŚ, DP. I	Potencjalna likwidacja 1 stanowiska, płoszenie	
7.	36 do 37	54°33'53.897"N, 16°48'8.8"E 54°33'50.196"N, 16°48'9.778"E	muchołówka mała Ficedula parva	OŚ, DP. I	Potencjalna likwidacja 2 stanowiska, płoszenie	
8.	35 do 36 oraz 47,6	54°34'28.149"N, 16°48'27.275"E 54°34'28.539"N, 16°48'33.59"E 54°30'14.206"N, 16°53'34.908"E	pleszka Phoenicurus phoenicurus	OŚ	Potencjalna likwidacja 3 stanowisk, płoszenie	
9.	36 do 37	54°33'59.977"N, 16°48'15.998"E	puszczyk Strix aluco	OŚ	Potencjalna likwidacja 1 stanowiska, płoszenie	
10.	47,2	54°30'25.718"N, 16°53'41.192"E	Żuraw Grus grus	OŚ, DP. I	Potencjalna likwidacja 1 stanowiska, płoszenie	

Explanations: OCz - species under partial protection; AX - species under strict protection; DS. I / IV / V - species included in Annex I / IV / V of the Habitats Directive; Ł - game species (Regulation of the Minister of Environment of March 11, 2005 on establishing the list of game species (Journal of Laws No. 45, item 433, as amended))

Source: In-house study based on data from Final Report on the Nature Inventory of the Connection Infrastructure of the Offshore Wind Farm MFW Bałtyk III and the Offshore Wind Farm MFW Bałtyk

- At the stage of construction, measures should be taken to minimize and prevent nesting of shorebird swallows Riparia riparia, consisting of protection during the breeding season (from April 1 to August 31) and avoiding the creation of steep earth slopes, readily used by shorebirds for nesting. Use beveling of earth and sand piles at a ratio of min. 1:3. In the event that the sandpiper digs a nesting burrow, stop earthworks in this places; protect the area (fence temporarily) and wait until the end of the period of hatching and rearing chicks. All earthworks and protective measures for this bird species should be carried out under the supervision of a naturalist - an ornithologist. It is permissible to cover steep slopes, before settlement by birds, with dense netting (mesh size not larger than 2 x 2 cm) in places of their potential nesting, (e.g.: steep slopes of excavations, embankments, piles of earth, sand, etc.).
- In the case of felling trees with the destruction of habitats of birds inhabiting hollows, compensatory measures will be necessary, consisting in hanging nesting boxes in the adjacent forest areas and plantings. Types and numbers of boxes are shown in (table 16.5). The locations of the nesting boxes to be hung should be agreed with the local forest supervisor and with the nature supervisor - ornithologist. The boxes used should be diversified typologically, in the ratio: 40% type A, 40% type B and 15% type D, 5% type E (table 16.5).

- The boxes can be hung all year round. The height of the suspension should prevent penetration of the boxes by humans and predators, such as cats, martens and corvids. Birds usually do not show a preference when it comes to the exposure of the opening to the sides of the world. Nevertheless, it is advisable to post so that the opening of the box is contained in an angle between N and SE. In this range, the shed is least exposed to winds and direct sunlight. In a dense forest this is less important than at the edge of the forest. There should be no branches adjacent to the shed that can make it easy for small mammals to get inside (e.g. pilchas, mice). An additional condition should be the avoidance of those parts of the trunk where water usually runs off in heavy rainfall.

Table 16.5. *Types of nest boxes indicating the species of birds that inhabit them*

No.	Booth type	Bird species	Number of stalls	Hole diameter [mm]	Hole to bottom distance [mm]	Bottom width [mm]	Min. board thickness [mm]
1.	A	great tit, eurasian blue tit, coal tit, crested tit, willow tit, marsh tit, european pied flycatcher, collared flycatcher, common redstart, eurasian tree sparrow, sparrow	9	28-33	210	110	20
2.	B	common starling , great tit, common redstart, eurasian nuthatch, eurasian wryneck, eurasian tree sparrow, sparrow	9	47	260	140	20
3.	D	stock dove, european roller, eurasian nuthatch, eurasian hoopoe, boreal owl , mandarin duck, common starling, common redstart	4	85	270	170	20
4.	E	tawny owl, mallard , common goldeneye, common merganser, western jackdaw, eurasian jay	1	150	400	295	20

Source: In-house study based on Mikusek, 2012.

Measures to minimizes the impact on chiropterofauna:

- Felling trees from forested areas at the bats breeding site, i.e. km 46 to 46.8 (coordinates: from 54°31'1.738"N, 16°53'41.617"E to 54°30'57.029"N, 16°53'44.129"E; from 54 30'47.207" N, 16°53'49.122"E to 54°30'44.381"N, 16°53'50.564"E; from 54°30'39.505"N, 16°53'53.034"E to 54°30'37.207"N,16°53'54.129"E) should be carried out outside the period of reproduction and peak activity, i.e. outside the period of June 1 - September 15, and under environmental supervision – by a chiropterologist.
- In the section of the IP corridor indicated above, felling is possible during the breeding and peak activity period of bats, if the nature surveillance inspects all trees in this section and excludes the presence of breeding habitat in the trees indicated for felling.
- In order to compensate for the habitat lost by cutting down trees, 10 bat boxes (4 boxes for every 1 hectare of forest) of the Stratmann type made of wood or sawdust concrete should be hung in close proximity to each other, at a height of 4-5 m above the ground, and care should be taken that the entrance to the box is free, not obstructed by branches. The boxes should be placed both in the interior of the forest and at its edge, in the immediate vicinity of the planned Project. The location of the boxes should be indicated by an expert chiropterologist.

Measures to limit the impact of the construction <u>on the Natura 2000 site PLH220024 Przymorskie Błota:</u>

- The extraction of water necessary for drilling fluid (in connection with the planned trenchless HDD crossing) and the discharge of drilling fluid to:
  - Struga Lędowska,
  - Modła Lake,

  - smaller watercourses crossed by the ECI corridor in the 36.9 km to 37.5 km of the ECI corridor (geographic coordinates: from 54°33'48.468"N, 16°48'14.579"E to 54°33'31.283"N, 16°48'22.974"E).
- Maximum limitation of drainage of the entrance and exit chambers of the trenchless passage under the Struga Lędowska (e.g., through the use of sheet piling).
- Environmental supervision should be carried out during the construction phase, which should include inspections of water intake associated with HDD drilling and how drilling mud is handled.

Measures to reduce the impact of excavation dewatering <u>on water:</u>

- Water from trench dewatering (except for section 36.9 km to 37.5 km) should be spread (dispersed) on neighbouring land where possible, with the landowner's permission (recommended in drought conditions) or received by external parties,
- In the case of dewatering by the needle-filter method, waters that do not contain large amounts of suspended solids can be discharged into receivers, i.e. ditches, watercourses (except for the section from 36.9 km to 37.5 km of the ECI corridor - coordinates from 54°33'48.468"N, 16°48'14.579"E to 54°33'31.283"N, 16°48'22.974"E). If pumps will be used, then the waters should be treated from suspended solids.

Measures to reduce the impact of the construction <u>on people:</u>

- Construction works, in the area of close residential development of Lędowo, Pęplin and Gajki i.e. km: 37.7-38.2; 44.9-45.4; 45.6-46.1 of the ECI corridor (coordinates: from 54°33'28.981"N, 16°48'33.29"E to 54°33'22.159"N, 16°48'58.515"E; from 54°31'20.285"N, 16°53'32.843"E to 54°31'14.102"N, 16°53'35.531"E; from 54°31'34.661"N, 16°53'35. 895"E to 54°30'58.506"N, 16°53'43.355"E), conduct only during daytime hours, excluding Sundays and holidays (except for work that must be performed continuously, such as drilling).
- To limit intensive transport through villages with tourist functions: Lędowo, Duninowo and Modlinek in the period July - August (ensuring traffic flow, aiming to reduce vibrations and noise as much as possible).
- To ensure smooth access to MOWI S.A with consideration of work shifts. It applies to the access road to MOWI S.A (road number: D 101202G-1) and provincial road 203.
- Agreement with the owners of MOWI S.A. (the ECI km: 40.7), and the printing company Poliart (the ECI km: 42.5) is recommended. They should be also informed about the construction works in their vicinity to avoid potential conflicts related to the construction phase.

Measures to reduce the environmental <u>impact of the construction and operation of ONS substations:</u>

- ONS substations should be fitted with a drainage systems,
- Transformers should be equipped with oil sumps linked to a rainwater treatment system (oil separation).
- For batteries, trays or cuvettes should be used to capture the electrolyte in the event of leakage.
- Substations should be equipped with hand-held kits of sorbents and agents for dealing with spills and leaks of hazardous substances appropriate to the size of the facility and the amount of apparatus containing such substances.
- Social and domestic wastewater should be discharged to a sanitary sewer or septic tank.

Site preparation phase - <u>general recommendations</u>:

- To protect the trunks of trees, not to be cut down, with lichen by surrounding the old trees with netting or tape to ensure that the Project does not encroach on the old tree habitat.
- To limit the movement of construction machinery only to existing roads and temporary access and process roads along the construction corridor.
- To secure the trunks of trees adjacent to the construction site with formwork under which drainage pipes or straw mats are used to cover the trunk.
- To ensure that construction and transport equipment is in good working order and that work in the construction area is planned appropriately (work during daylight hours, keeping vehicle engines work to a minimum),

- During construction, checks on the condition of the equipment used to the construction work should be conducted to prevent oil and grease leaks.
- Any spillages of oil-based substances from equipment and machinery working on the site must be dealt with immediately, and the contaminated soil removed and disposed of.
- The storage areas for waste must be designated on the site, and containers and bins for the selective collection of waste must be provided. Hazardous waste should be collected in labelled, closed and sealed containers.
- A suitable storage area for waste must be provided to limit the impact of the weather and to limit access by third parties - in a separate location with access provided for waste collection companies and ensuring that waste is systematically removed from the construction site to waste disposal or recovery companies.
- Naturalist supervision should be provided during the construction phase in the field, consisting of a botanist, a herpetologist, an ornithologist, an entomologist, and a chiropterologist.
- Construction facilities must be located outside wetlands.
- To secure the back-up facilities to prevent harmful substances leaking into the soil and to equip the station with an adequate quantity of sorbents to deal with possible spills and leaks of oil and petroleum-based substances.
- The facilities should be equipped with portable sanitary facilities, with leak-proof tanks that are systematically emptied by specialist companies.

16.2.3. Recommendations for the operation phase

- Botanical inspection of the technology corridor in forest areas (i.e., the area where afforestation cannot be reintroduced) for the expansion of invasive plant species.
- Monitoring should be carried out at a frequency of once a year for three consecutive growing seasons. In case of an outbreak of invasive plants (mainly *Conyza canadensis, Solidago canadensis, Solidago gigantea, Heracleum sosnowskyi, H mantegazzianum, Impatiens glandulifera, Reynoutria japonica, Reynoutria sachalinensis, Acer negundo, Prunus serotina, Quercus rubra, Robinia pseudoacacia*) the plants and their seedlings should be uprooted and then disposed of in a manner appropriate for bio-waste in the municipality. An outbreak of invasive plants is considered a grouping of more than 10 individuals in an area of 10 m^2.
- Prohibit the control of shrub and woody vegetation formed as self-sowing along the course of the planned Project with total herbicides, causing the destruction of all plants, including those providing concealment especially for fauna and avifauna.

The use of annual mowing of grasses and herbaceous vegetation in the technology corridor (outside the arable land) from August 1 to September 30, which will prevent the strong growth of shrub and woody vegetation and promote the maintenance of a belt of melliferous plants and "weeds" that are hiding places not only for reptiles, but also for invertebrates, small mammals and birds. Part of the mowed biomass, such as 25%, can be left in place as hiding places for reptiles and entomofauna and other small vertebrates.

Natural conditions of the course of the connection to MFW Bałtyk II and MFW Bałtyk III
scale
1:10 000

Legend

- corridor of the planned connection with MFW Bałtyk II and MFW Bałtyk III
- area of potential impact
- IP corridor kilometre points adopted for the purposes of this Report

Nature Protection:

- Nature Reserve
- buffer zone of the Nature Reserve
- Natura 2000 Birds Directive Sites
- Natura 2000 Habitats Directive Sites

Environmental conditions:

- Historic railroad "Trail of the rolled-up tracks"
- local railroad line to the Naval Center
- Struga Lędowska (Węda)
- small watercourses and ditches in the area Struga Lędowska (Wędy)
- Modła lake
- hydrogenic soils
- conservation protection - cannon-battery No. 4 (bat wintering site)

Bird habitats proposed for bypass:

- common beech
- oak
- pedunculate oak
- black alder
- scots pine

Nature inventory

Habitats:

- Acidophilous oak woods (Quercion robori-petraeae)
- Mixed forests and coniferous forests on coastal dunes
- Dry heaths (Calluno-Genistion, Pohlio-Callunion, Calluno-Arctostaphylion)
- Fertile beech forests (Dentario glandulosae-Fagenion, Galio odorati-Fagenion)

Vascular plants:

- Broad-leaved helleborine (EpiHel)
- Callitriche hamulata (CalHam)
- Callitriche verna (CalVer)
- Sand sedge (CarAre)
- Black crowberry (EmpNig)
- Rusty-red buckthorn, Sand sedge (EpiAtr, CarAre)
- Broad-leaved buckthorn (EpiHel)
- Pomeranian honeysuckle (LonPer)

Bryophytes:

- Pin cushion moss (LeuGla)
- Neat feathermoss (PsePur)
- Springy turf-moss (RhySqu)
- Dilated scalewort(FruDil)
- Crisped pincushion moss (UloCri)
- Red-stemmed feathermoss (PleSch)
- Neat feathermoss (ThuTam)

Lichens:

- Valley oakmoss lichen (EvePru)
- Ridged ramalina lichen (RamFra)
- Dotted ramalina lichen (RamFar)
- green reindeer lichen
- green reindeer lichen, gray reindeer lichen

Amphibians:

- existing and potential amphibian breeding sites

Birds:

- Northern lapwing (DryMar)
- Red-backed shrike (LanCol)
- Woodlark (LulArb)
- Red-breasted flycatcher (FicPar)
- Common redstart (PhoPho)
- Western yellow wagtail (MotFla)
- Whinchat (SaxRub)
- Corn bunting (EmbCal)
- Tawny owl (StrAlu)
- Common crane (GruGru)

Bats:

- bat breeding habitat

Figure 16.4 *Legend to map sheets 1-3 with the most important natural conditions*

Source: own elaboration

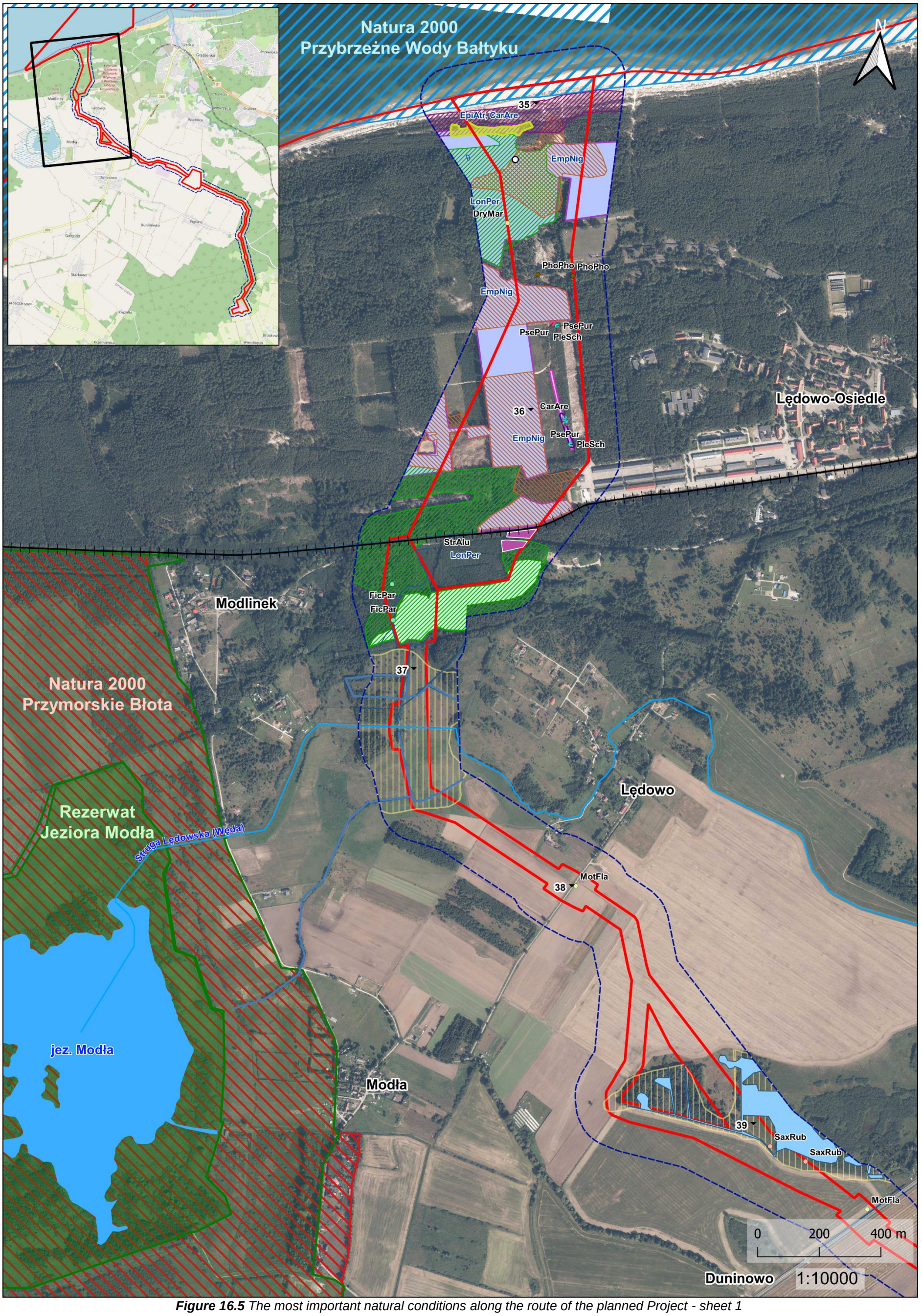


Figure 16.5 *The most important natural conditions along the route of the planned Project - sheet 1*

Source: own elaboration based on data from the Final Report of the Natural Inventory of the Offshore Wind Farm Baltic III Connection Infrastructure and the Offshore Wind Farm Baltic II Connection Infrastructure

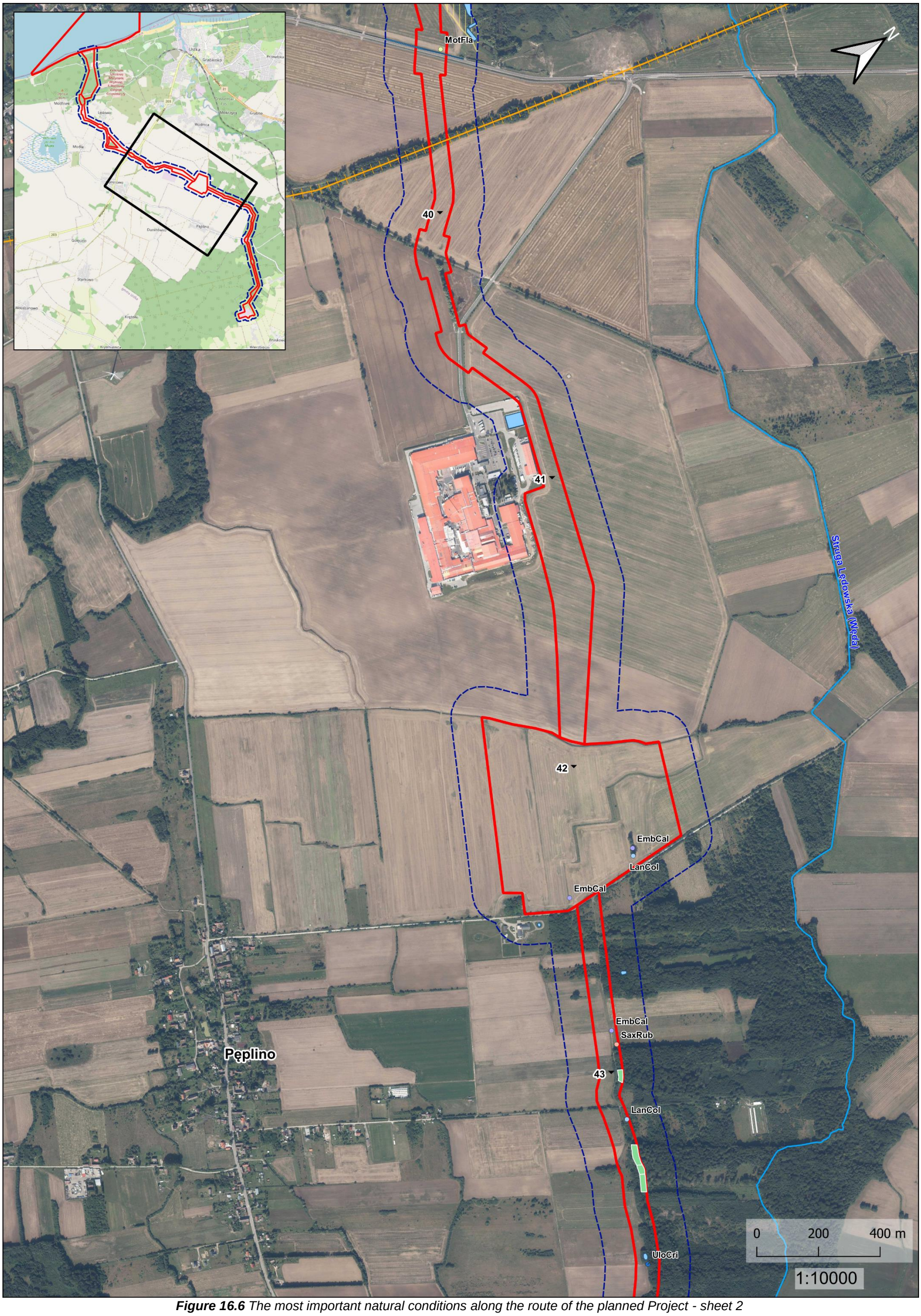


Figure 16.6 *The most important natural conditions along the route of the planned Project - sheet 2*

Source: own elaboration based on data from the Final Report of the Natural Inventory of the Offshore Wind Farm Baltic III Connection Infrastructure and the Offshore Wind Farm Baltic II Connection Infrastructure

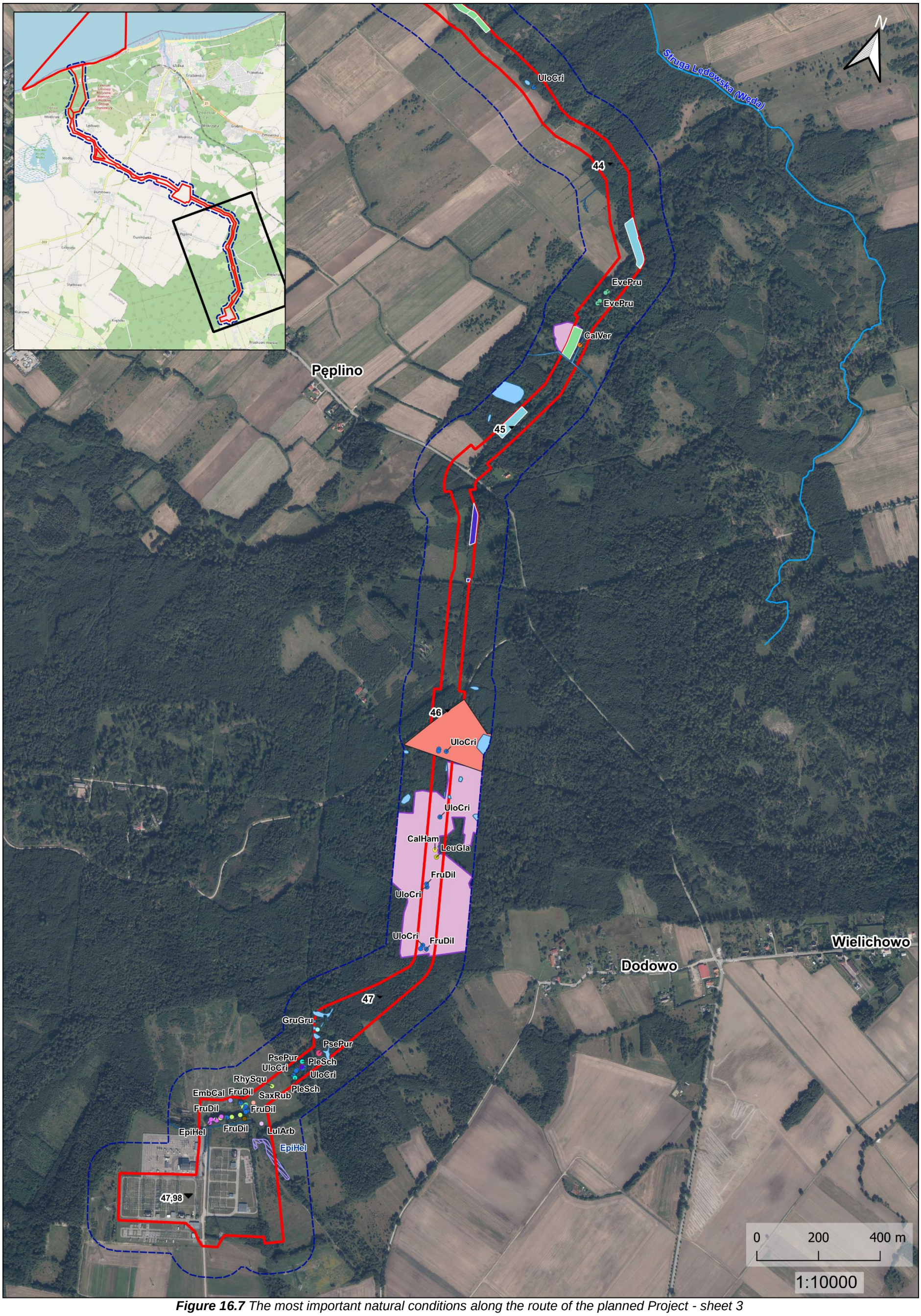


Figure 16.7 *The most important natural conditions along the route of the planned Project - sheet 3*

Source: own elaboration based on data from the Final Report of the Natural Inventory of the Offshore Wind Farm Baltic III Connection Infrastructure and the Offshore Wind Farm Baltic II Connection Infrastructure

17. PROPOSAL FOR MONITORING

17.1. Construction phase

The planned Project will cause impacts of moderate nature that may occur primarily during the construction phase. The possibility of negative significant cumulative impacts on the migration corridor of bi-environmental species (including Atlantic salmon). has also been identified. To minimise the identified impacts, a number of measures have been proposed to eliminate and minimise the possibility of impacts occurring. Monitoring of the way in which the measures are applied during construction has been proposed in order to implement them correctly.

To ensure the correct implementation of the nature conservation mitigation measures, the construction phase will need to be monitored to ensure compliance with the proposed measures. Monitoring of the construction phase should be carried out by an environmental supervisor in the form of a surveillance coordinator with specialists in ichthyology, herpetology, ornithology, botany, teriology and chiropterology.

The role of monitoring is to control the timing of the works in terms of the environmental restrictions contained in the environmental decision and to verify in the field the natural conditions, which may change from year to year. In addition, the deadlines for restrictions written "on a fixed basis" into the environmental decision can be verified depending on the specifics of a given year. For example intensive amphibian migrations occur only on several days a year, while the decision specifies the maximum possible range of migration occurrence and it is worth adjusting activities related to setting and control of hunting traps, to the specifics of given weather conditions in a given year.

In addition, it is the role of the supervisor to document such situations, and to prepare monthly reports providing general information on the nature of the work carried out during the month and the environmental protection measures taken, including photographic documentation and an assessment of whether the measure was effective and/or whether minimisation measures can be selected even better in the future.

As time constraints have been introduced for the construction phase works, it will be primarily necessary to monitor the timing of the works taking into account:

- offshore:
  - the exclusion of the birds migration and wintering period from works within the Ławica Słupska Natura 2000 area (1 October - 30 April),
  - the exclusion of the bi-environmental species migration period (15 September - 15 November) at the section from the shore up to 4 Mm from cable burial/dredging works and dredger/refuller operations, including spoil disposal;
- onshore:
  - tree felling in forest areas outside the bird breeding season (i.e. from 1 March to 31 August),
  - felling of trees in the place of identified breeding habitats for bats - a section of approx. 800 m - in the period from 1 June to 15 September,
  - removal of ponds - amphibian breeding habitats during the amphibian wintering period, i.e. from 16 October to 28 February,
  - transplanting broad-leaved buckthorn, and Pomeranian honeysuckle into substitute habitats between 15 April and 31 May - the optimum period, or at any other time indicated by a botanist.

All of the above-mentioned deadlines can be adjusted by specialists in the relevant natural area, as these are timeframes which can change from year to year. The possibility of adjusting the deadlines on the one hand ensures proper protection of natural resources and on the other hand does not create situations, of unnecessary downtime in the work schedule.

In addition, the tasks of environmental supervision should include:

- Adjacent to the Natura 2000 Przymorskie Błota site:
  - controlling of water intake’s source for drilling mud and the handling of water from trench and chamber dewatering and drilling mud, including a prohibition of the abstraction and discharge of water into the Lędowska Struga and other watercourses and ditches flowing into the Modła lake;

  - controlling the location of storage yards and temporary construction facilities outside the wetlands in the vicinity of the Modła lake.
- In other areas, control over:
  - the use of the "soft start" method for offshore works,
  - the prohibition to go beyond the construction corridor of the Maritime Office, outside the existing transformed area,
  - the carrying out of soil deposition with the division into humus and bedrock and the protection of humus,
  - the method of replanting protected vascular plants (metaplanting),
  - the cleanliness of the construction site in terms of entomological traps,
  - the method of draining water from excavation dewatering, with a view to limiting the amount of suspended matter discharged into water and the ground,
  - the timing and method of setting up temporary fences for amphibian control buckets,
  - the method of fencing off trees and shrub clusters which are adjacent to the construction strip and which are not to be felled,
  - unscheduled felling of individual trees and shrubs under the supervision of an ornithologist,
  - places for hanging nest boxes and bat boxes,
  - the protection of slopes against colonisation by sand martins,
  - carry out works in the vicinity of residential buildings during daytime on working days,
  - locate construction and storage yards on paved areas, outside the Lędowskie Wydmy, wetlands, protected areas and outside acoustically sensitive areas.

17.2 Operating phase

As a result of the environmental impact assessment and analyses carried out, the authors of the EIA Report recommend monitoring measures for the onshore section:

- nature monitoring, including checks within the technology corridor in forest areas (i.e. land that cannot be reafforested):
  - for the expansion of invasive plant species, monitoring should be carried out at a frequency of once a year for three consecutive growing seasons. In case of an outbreak of invasive plants (mainly *Conyza canadensis, Solidago canadensis, Solidago gigantea, Heracleum sosnowskyi, H mantegazzianum, Impatiens glandulifera, Reynoutria japonica, Reynoutria sachalinensis, Acer negundo, Prunus serotina, Quercus rubra, Robinia pseudoacacia*) plants and their seedlings should be uprooted and then disposed of in a manner appropriate to the bio-waste in the municipality. An outbreak of invasive plants is considered to be a grouping of more than 10 individuals in an area of 10 m^2;
  - with regard to the manner of combating shrub and tree vegetation created as self-sown vegetation along the course of the planned Project (exclusion of the use of total herbicides causing the destruction of all plants, including those constituting hiding places especially for fauna and avifauna);
  - the annual mowing of grasses and herbaceous vegetation in the period from 1 August to 30 September, which will prevent a strong growth of shrubs and trees and leaving part of the mown biomass (about 25%) on site as a hiding place for reptiles and entomofauna and other small vertebrates;
  - for roosting of bats and birds in the first and third year after completion of the construction works; check after the breeding season (clean the roosts on occasion);
- taking measurements of the magnetic component of the field over the cable ducts; the measurements should be made before the facility is put into use (in the commissioning period) in accordance with the requirements specified in the Regulation of the Minister of Climate of 17 February 2020 on ways of verifying compliance with the permissible levels of electromagnetic fields in the environment (Dz.U.2022.2630 consolidated text, as amended);
- performing noise measurements from the LSE station. Measurements prior to the commencement of use of the facility (during the start-up period) in accordance with the requirements specified in the Regulation of the Minister of the Environment of 30 October 2014 on the requirements for conducting

measurements of the volume of emissions and measurements of the amount of water taken (Journal of Laws 2019.2286 as amended).

18. POST-IMPLEMENTATION ANALYSIS

A post-implementation analysis is recommended to verify the effectiveness of the minimisation measures adopted in this report for the construction and operational phases.

The post-implementation analysis should be carried out about 3 years after the building and commissioning phase will be finished and should include:

- results of monitoring the effectiveness of metaplanting of the Pomeranian honeysuckle and the Broad-leaved buckthorn (photographic documentation of transplantations, map and coordinates of metaplanting locations and documentation of effectiveness, according to a botanist's guidelines),
- place and date of hanging bird nesting boxes and bat boxes (photographic documentation, location maps, coordinates of locations and results of monitoring of bird/bat occupation of boxes),
- possibly: conclusions from the environmental monitoring carried out during construction, which may be useful for other EIA reports indicating e.g. whether the proposed measures were effective and whether they needed to be modified (e.g. concerning the migration times of amphibians, the presence of protected species in the construction strip, etc.);
- the results of the monitoring proposed in the operational phase in forest areas together with the obtained results and possible recommendations for further use (including information on the expansion of invasive species and their removal, information on how to remove seedlings, photographic documentation and timing of annual grass mowing).

19. THE BEST ENVIRONMENTAL OPTION

In the case of the implementation of the Project entitled External Connection Infrastructure of the MFW Bałtyk II and MFW Bałtyk III, the possibility of variants is determined by the starting and ending points of the planned Project, which were determined at the stage prior to obtaining the environmental decision. The starting point of the planned Project is determined by the location of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III, which were approved by the issued PSzW decisions, and the end point is determined by the conditions for connection to the NPS issued by PSE S.A. and the signed connection agreement.

Due to the decisions and conditions obtained, as well as the applicable findings of the POM Plan, the possibility of variants in the offshore part was limited. The variants in the onshore part include the western exit of the cables to land (location variant) and the connection of the ONS substation with the PSE S. A. substation by a 400 kV overhead line (technology variant).

The Investor's variant was considered the most environmentally favorable because:

- according to the impact assessment performed for both variants, the eastern exit of the cables to land was considered less intrusive to the environmental conditions identified here. The existing investment in the surrounding area (the Naval Center), the partially paved road and the transformation of the area facilitate the location of the connection infrastructure. Such a location is far more environmentally favorable than the transformation of natural habitats of mixed forest and forest in the dunes, in an untransformed area with significant differences in elevation;
- the foundation of underground cable lines will have far less environmental impact than the variant overhead line. The permissible value of magnetic field strength will not be exceeded, and the thermal impacts of the cables introduce insignificant temperature changes near the ground surface;
- the route of the ECI passes through forest and agricultural land and will not cause environmental impacts or restrictions on agricultural use after construction;
- the ECI route does not pose a threat to natural values and biodiversity.

The Investor's variant can be considered the most environmentally favorable, assuming the application of the measures proposed in this Report to minimize the potential negative impact of the construction and operation phases, both in the offshore and onshore portions. The following is a reassessment of

the significance of impacts, taking into account all the measures to minimize/eliminate potential negative impacts, as indicated in Chapter 16 of this Report.

Offshore part

Impacts of moderate character concern biotic components i.e.: betnoecious organisms, ichthyofauna, birds, marine mammals and thus related migration corridors and biodiversity. It also includes Natura 2000 protected area (PLC990001 Słupska Ławica) and the objects of conservation occurring in these areas. Significant impacts concern the Natura 2000 protected area PLH220052 Dolina Słupi and bi-environmental fish that enter the Słupia River to spawn, using the migration corridor that runs in the coastal zone, which is in the direct range of construction works.

Taking into account minimising measures already in the design phase, in the context of valuable phytobenthos and macrozoobenthos habitats (Chapter 16), by bypassing them, using a stone erratic/concrete mattress or the least intrusive method on the seabed will allow to limit the loss of the above mentioned habitats.

During the construction phase in the case of the Natura 2000 protected areas PLC990001 Ławica Słupska, taking into account the migration and wintering periods of birds will minimise the impact on the objects of protection in the above mentioned areas, and planning the works outside the protection period for migration in the sea in the coastal zone will eliminate the impact on the PLH220052 Dolina Słupi area and interference with the migration routes of bi-environmental fish. In addition, the application of a soft start procedure will allow fish and mammals to escape from the area directly affected by the seabed intervention works and avoid mechanical impact.

Table 19.1. *Assessment of the significance of moderate and significant impacts after consideration of mitigation measures*

Component		IMPACTS - OFFSHORE PART	
		Design phase/ Construction phase	**Application of minimisation measures**
Phytobenthos		moderate	insignificant
Macrozoobenthos		moderate	insignificant
Ichthyofauna		moderate / significant	insignificant
Marine mammals		moderate	insignificant
Sea birds		moderate	insignificant
Natura 2000	**PLC990001 Ławica Słupska**	moderate	insignificant
	PLH220052 Dolina Słupi	significant	no
Ecological corridors		significant	insignificant
Biodiversity		moderate	insignificant

Source: In house-study

In summary, the application of the recommended mitigation measures will reduce the threat to the environment and its natural values, and will furthermore preserve the coherence of the Natura 2000 network in the area of the planned Project.

Onshore part

The table below shows the components for which the assessment carried out showed moderate impacts, for which the introduction of minimisation measures will effectively reduce the impacts of the construction phase of the planned Project.

Table 19.2. *Assessment of the significance of moderate and significant impacts*

Component	IMPACTS – ONSHORE PART	
	Design phase/ Construction phase	Application of minimisation measures
Land surface	moderate	insignificant
Soils	moderate	insignificant
Surface water	moderate	insignificant
Groundwater	moderate	insignificant
Fungal and lichen biota	moderate	insignificant
Herpetofauna	moderate	insignificant
Bats	moderate	insignificant
Protected areas - ecological sites	moderate	insignificant
Biodiversity	moderate	insignificant
Landscape	moderate	insignificant

Source: In house-study

With regard to the ground surface, the moderate assessment is influenced primarily by the presence of a dune in close proximity to the planned construction works at the cable landfall. The Lędowskig dunes are characterised by their high sensitivity and are very susceptible to change. Impacts on the dune can be significantly reduced by prohibiting the movement of construction vehicles and machinery on the dune north of the cable landfall and ensuring that the vegetation on the dune surface is in good condition after the construction phase. These impacts will then be insignificant.

Negative impacts on soils during the construction phase will mainly relate to changes in soil structure, disturbance of soil profile, alteration of water relations, compaction and potential contamination. However, as shown in the assessment, these will be reversible impacts, as properly performed soil deposition with the division into humus and bedrock together with the correct restoration of the soil profile should not result in a long-term reduction of soil fertility. Then they will be insignificant impacts.

In the case of surface water, the negative impacts of the construction phase will mainly concern the crossing of watercourses and ditches, water abstraction for drilling mud, and land levelling and hardening. Negative impacts on groundwater during the construction phase will primarily relate to temporary dewatering of excavations. In order to limit these impacts, the abstraction of water necessary for the drilling mud from Lake Modła and the discharge of water into this lake and the adjacent watercourses, i.e. from 36.9 km to 37.5 km, is prohibited. With such measures in place, construction phase impacts will be insignificant.

Negative impacts on the biota of macrofungi and lichens during the construction phase will mainly relate to temporary transformation and land occupation. These impacts can be reduced by protecting the trunks of trees on which they occur, enclosing old trees with netting or tape to ensure that the project does not encroach on the habitats of old trees. In the case of protection of aboveground lichens, it is required to limit the construction area to the smallest possible surface, and soil from the excavation should be placed on a protective film spread on the surface. Then there will be insignificant impacts.

The implementation of the planned Project during the construction phase may have a negative impact on herpetofauna due to destruction breeding sites and habitat fragmentation. These impacts will be reduced with mitigation and compensation measures, including the use of herpetological fencing during migration and breeding. They will then be insignificant impacts.

Negative impacts on bats will also include destruction of habitats and hibernation sites. The implementation of the planned Project, provided that minimising measures are applied, will not have a negative impact on any of the identified protected, rare and endangered bat species and their habitats as well as on the status of their populations both at the national and regional scale.

As for the impacts of the operation phase, the moderate impacts relate to noise emissions from the LSE station. As shown by the calculations of noise emissions from the LSE station, the operation of the station will not cause exceedance of the permissible sound level set for the night time (40 dB) as well as for the day time (50 dB), both in the areas of actual land use and those designated for residential development in the MPZP[627].

20. ANALYSIS OF POSSIBLE SOCIAL CONFLICTS

The planned implementation of two independent sets of power output facilities from the two offshore wind farms MFW Bałtyk II and MFW Bałtyk III, is in line with the EU's goals on climate change mitigation (United Nations Framework Convention on Climate Change, EU Policies). With no negative impacts of the planned Project in the operation phase and spatially and temporally limited negative impacts of the construction phase, it can be assumed that the implementation of the planned Project is characterized by low conflictogenicity. Offshore wind energy is a sector that represents an opportunity of great development for the Polish economy, especially for the Pomeranian region.

Offshore part

Potential social conflicts may arise due to limited stakeholder access to assets located in marine areas along the cable corridor route or restrictions related to the use of marine space in the area of the planned Project.

According to the POM plan, the planned Project will pass through areas where utility functions are allowed, such as:

- aquaculture,
- scientific research,
- cultural heritage,
- technical infrastructure,
- national defense and security,
- coastal protection,
- exploration, recognition of mineral deposits and extraction of minerals from deposits,
- fishing,
- artificial islands and structures,
- transportation,
- tourism, sports and recreation.

Given the above-mentioned utility functions of the areas located along the route of the planned Project, social conflicts can potentially be expected due to community concerns about the occurrence of:

- restrictions on the conduct of military activities,
- restrictions on access to fishing areas,
- restrictions on access to sand deposits,
- impediments to ship traffic on shipping routes, including restrictions on access to the port of Ustka,
- collision with existing technical infrastructure,
- negative impact of the planned Project on the marine environment and cultural areas/goods.

As part of the work on the EIA Report, an assessment of the impact of the planned Project on the above-mentioned marine uses was conducted (Chapter 9). As a result of the assessment, there was no risk of significant impacts of the planned Project on any of the above-mentioned use areas. The assessment of the impact of the planned Project on existing forms and uses of marine space and

[627] *Uchwała nr XL.514.2022 Rady Gminy Ustka z dnia 19 maja 2022 r. w sprawie uchwalenia miejscowego planu zagospodarowania przestrzennego dla obszaru obejmującego obręb geodezyjny Pęplino, gmina Ustka*

resources did not reveal long-term significant impacts. During the construction and decommissioning phases of the planned Project, no impact of more than moderate significance was found, and during the operation phase none of more than insignificant significance. The above allows us to believe that there are no substantive grounds forprotests from the public.

Onshore part

The planned execution of two independent sets of power connection facilities from two offshore wind farms MFW Bałtyk II and MFW Bałtyk III is perceived positively by the majority of the society as an activity that contributes to the reduction of the effects of climate change. It can be assumed, based on practically no negative impact of the planned Project in the operation phase and spatially and temporally limited negative impact of the construction phase, that the execution of the planned Project is characterised by a low risk of a conflict. Offshore wind energy is a sector that represents an opportunity of great development for the Polish economy, in particular for the Pomeranian region.

Onshore, the planned Project is located mainly in forest and agricultural areas. Out of residential areas, only the village of Modlinek is located in the area of potential impact of the alternative variant. The onshore part is located on closed military areas and within the boundaries of the protected landscape area. Potential conflicts due to the location in the onshore area may relate to:

- the lack of consent from the Naval Training Centre to run the infrastructure through closed areas (HDD drilling through part of the closed areas is planned. This method will reduce the conflict),
- the protest of owners of land intended for the construction of connection infrastructure and ONSs and the area of potential impact of the planned Project,
- the protest of local residents against electromagnetic field and noise emissions from substations during the functioning phase and increased traffic and noise during the construction phase,
- the protest of environmental organisations or residents against the location of the planned Project in the area of the Protected Landscape Area Pas Pobrzeże na Zachód od Ustki,
- potential negative public attitudes towards local constraints.

Possible public interest may also be related to the collision of the analysed corridor for connection infrastructure with objects such as monuments, protected habitats and plant species, residential development, and other material assets that will be in the immediate vicinity of the construction site.

An important aspect of the Project's conflict analysis is to identify the area where the Project is to be implemented, as well as to provide relevant information to the local community at the earliest possible stage. The execution of the ECI of the MFW Bałtyk II and MFW Bałtyk III may cause the public's fears concerning the nuisance of the construction or concerns about various threats related to the passage of the investment through private areas.

As part of the work on the EIA Report, field inspections of the route of the planned infrastructure were carried out, which are summarised in the Field Inspetcion Cards (Chapter 6). The cards identified the most important areas of possible conflicts of the planned Project with existing land use. During the field visits, potential conflicts were identified with the support of the municipal offices, including the investments planned by the offices.

In order to provide information to the public and counteract possible conflict situations, the Investor carried out more than a year-long education and information campaign on the MFW Bałtyk II and MFW Bałtyk III project in 2015-2016. The aim of the campaign was to familiarise all stakeholders, in particular local communities and users of the Baltic Sea, with the offshore wind farm projects and to raise awareness of the potential environmental impact of the investments and mitigation measures to reduce or eliminate this impact. The campaign included a number of activities such as meetings with representatives of local authorities and maritime administration, consultations with representatives of the fishing community, open days for local residents, a regional knowledge competition in primary and secondary schools, and the launch of a website for both projects (http://www.baltyk2.pl/ and http://www.baltyk3.pl/). An information campaign was also conducted in the local media. As a result of the information campaign and due to the temporary and local impact of the planned Project, conflict being a low risk is confirmed for the planned Project by the issuance of the environmental decision (for

the previous version of the Project of the connection of the MFW Bałtyk II and MFW Bałtyk III). No comments and applications were submitted during the public participation procedure.

The Investor declares a policy of benevolence [628] including, among others, social investment, donations, sponsorship, all of which is expected to have a positive impact on the life of local communities and the environment. Social projects include educational activities related to environmental protection and offshore wind energy. A dialogue with local residents and other interested parties was conducted during the planning of the Project. This dialogue continues and periodic meetings are held with stakeholders and the community. A virtual exhibition was created on the websites of the MFW Bałtyk II and MFW Bałtyk III, which contains information about the Project, including answers to the most frequently asked questions related to the construction of these types of investments. There is also a grievance mechanism for public objections.

In the rural municipalities of Słupsk and Ustka, meetings with residents and local authorities on the ECI of the MFW Bałtyk II and MFW Bałtyk III have been organised as part of the current procedure, and further meetings are planned (based on information from the Investor).

One-on-one, face-to-face meetings with local authorities, initiated by telephone calls and correspondence (email) requesting them, were held on the following days:

- 27.04.2022: mayor of Słupsk municipality + employee of the planning department of Słupsk municipality (presentation of the team, basic information on: the project and its progress, a planned information campaign for landowners regarding the establishment of transmission easement agreements and a planned geological survey campaign),
- 27.04.2022: the mayor of Lędów + landowners from the municipality + employee of the planning department of the municipality of Ustka (presentation of the team, basic information on: the Project and its progress, the planned information campaign for landowners regarding the establishment of transmission easement agreements and the planned geological survey campaign),
- 13.05.2022: the mayor of the municipality of Ustka (presentation of the team, basic information on: the Project and its progress, the planned information campaign for landowners regarding the establishment of transmission easement agreements and the planned geological survey campaign)
- 13.05.2022 r.: Secretary of the City of Ustka and Head of the Department of Communal Infrastructure and Environmental Protection of the City Hall in Ustka. A presentation of the team, basic information on: the Project and its progress, the planned information campaign for landowners regarding the establishment of transmission easement agreements and the planned geological survey campaign on behalf of the JV, on behalf of Polenergia only: the refugee situation in Ustka and the planned waste collection campaign in forests and on cycle paths on the municipal beach in Ustka - implemented with the consent of the city authorities locally on 18 May 2022.),
- 21.06.2022 Duninowo village leader - during a working meeting with landowners (team presentation, basic information on the Project).

All village authorities have been contacted by phone or email (Pęplino, Bruskowo Wielkie, Bruskowo Małe and Wierzbięcino), and a dialogue with all of them is planned when the village leaders are available. The Investor is in regular contact and cooperates with all village authorities to support open communication on the activities. Information about the activities (e.g. planned meetings), in consultation with the municipal and village authorities, are distributed through media such as municipal websites or municipal and village boards.

Stakeholder meetings were held on:

- **27.10.2021**: Information meeting on the assumptions of the offshore wind farm projects MFW Bałtyk II and MFW Bałtyk III implementation together with a set of power connection facilities.
  The meeting took place at the Mercure Hotel in Gdansk. External stakeholders included those involved in the building permit process (and all relevant supplementary permits), including representation of the municipalities of Ustka and Słupsk (representatives of the planning

[628] www.baltyk2.pl/

departments of these municipalities were present). The PROJMORS building permit consultant was an internal stakeholder. The Investor was represented by the Local content, permitting, technical and stakeholder management teams on the part of Polenergia and the twin units at Equinor, as well as representation from the team developing the O&M Base in Łeba. The meeting took the form of a formal one-day news conference and gathered around 60 participants from over 40 institutions. The participants were informed about the progress of projects, basic information about the process of preparation, construction, operation and decommissioning of offshore wind farms, as well as plans for the construction of an O&M base in Łeba. A new advisor, PROJMORS, was introduced to the administration as a company supporting the process of obtaining construction permits on behalf of the Investor. Participants expressed the need for further education and highlighted both the very good knowledge level of procedures and legal frameworks and the insufficient access to data and experience in MFW implementation was raised.

It is planned to continue the relationship with the target group (at municipal and village level) and PROJMORS together with the Investor through working contacts in the permitting process, in the form of correspondence, phone calls and face-to-face meetings (at national and provincial level), in addition, continued education towards this group is considered (e.g. in the form of a series of webinars and possible further meetings, if applicable).

- **April and May 2022:** Supporting geotechnical surveys and clearing the site of UXO (explosive and hazardous items).

  The geotechnical surveys/exploration and UXO removal carried out in the landfall cable area attracted of a lot of interest among local residents and tourists by the presence of the survey team and unusual equipment in the field. Brief information on the nature, purpose and significance of the geotechnical investigation was prepared for the local public, including third parties. It was in the form of a board notice displayed in a prominent location of the works and short leaflets available to interested parties. Information on the purpose and importance of the works for widely understood safety was provided and the contractor's Health and Safety mechanisms were supported through the display of printed information.

- **21.06.2022:** Working meeting for landowners at the CK Ustka community centre in Duninowo.

  Participants were private landowners from the municipalities of Ustka and Słupsk who had been invited in advance (by phone, letter and email); in addition, the local authorities of both municipalities were also informed. Prior to the meeting, all 19 private owners and 7 administrative units were informed by phone and invited by letter.

  The mayor of Duninowo was present at the meeting. The local authorities informed about the event on their websites and on the commune and village boards, using materials previously prepared by the Investor. The meeting took a working/workshop form and brought together 7 participants + 4 representatives of the Investor (3 from Polenergia and 1 from Equinor).

  During the meeting, the rules for signing agreements establishing transmission easements with landowners were discussed. The recommended method is to be transparent, the same for all and known to the public. Basic information on the geological survey campaign planned within the land cable route was also provided. The manner of formal and preferred by the Investor establishment of transmission easement, the prerogative to obtain a civil agreement (as a more preferred form of cooperation than the use of the provisions of the so-called Transmission Act for private owners - for institutional owners, work under the above-mentioned Act is often recommended, expected and the only possible form of procedure) were discussed, and information on the implementation of the planned geological survey campaign was provided. The meeting formula is planned to be further developed as cyclical meetings on a quarterly basis. The next meeting is planned in September/October this year.
- **13-14 July 2022**: field meetings of the Investor's representation and the ENPROM geological survey subcontractor with representatives of institutional landowners along the cable route of the Project.

During August-October 2022, geological surveys were carried out, preceded by activities to obtain permission to access selected plots of land for the purposes of this campaign. The addressees of the activity are the private owners of the cable route parcels where the location of the campaign survey points has been determined. Materials to support the ENPROM subcontractor in gaining access to the parcel for geological surveys have been prepared: an internal instruction for the contractor and a letter of recommendation for the landowners, which ENPROM staff will be able to present to the parcel owners as representation of the Investor. For the purpose of promoting access to the plots where geological surveys are planned, such information was provided to the landowners of these plots by telephone and at the meeting. The contractor has a recommendation document signed with project logos.

Activities related to the analysis of possible social conflicts and education about offshore wind energy aim to prevent conflicts. The Investor is preparing plans for related activities:

- It is planned to continue working meetings and workshops carried out locally in the village centres in Duninowo, Pęplino (Ustka municipality - the village of Lędowo does not have such a centre) and in Bruskowo Wielkie (currently under renovation) and Bruskowo Małe/Wierzbięcino.
- It is planned to initiate a dialogue with the fishing community (depending on the progress of the work on guidelines and good practices for the coexistence of fishing and offshore wind farms in the Baltic Sea conducted as part of the continuation of the work on the Polish Offshore Wind Sector Deal, led by the Ministry of Climate and Environment) - in the second half of 2022 or early 2023.
- It is planned to reach out to schools in the region with an educational programme about offshore wind farms and their benefits for local communities, the economy and career opportunities in the sector from October 2022, on the basis of the educational experience carried out this year for secondary school students in Gdansk and primary schools in Rumia.
- Maintaining relations with local authorities through face-to-face meetings and keeping them informed and supporting their active participation in the Company's local activities, as well as getting involved in initiatives carried out locally by the social party and local government.
- As part of the implementation of the 5 Flagship Programmes, which will be assisted by an external consultant (contractor selection closure procedure underway), a number of activities for local communities are planned, including: an education and information campaign, a campaign to support local suppliers, a website and other IT tools to support the distribution of knowledge about the Project, various forms of community contributions including initiatives similar to civic funds, and information meetings with various stakeholder groups.

Possible areas of social conflict and ways of their prevention undertake by the Investor, are shown in the table (table 20.1) below.

Table 20.1. *Areas of possible social conflicts related to the location of the ECI of the MFW Bałtyk II and Bałtyk III and mesures undertake by the Investor*

Area of conflict	**Measures to prevent or reduce the risk of conflict underatake by the Investor**
Design phase	
Residents' concerns about the negative impact of cable lines and substations on health	• meeting the existing regulations regarding noise and the levels of EMF by the Investor means that the facilities will not have a negative impact on the health of the community • the Investor held a series of information meetings to explain in detail the impact of the cable line and substationorganised project-level grievance mechanism •
Concerns about negative environmental impact	• onshore, the planned Project passes through only one form of nature conservation – the Protected Landscape Area, the routing of the underground cable line will reduce the impact on the landscape • an area outside the onshore Natura 2000 sites was chosen for the location of the Project in order to avoid the most environmentally valuable areas in the municipality

Area of conflict	Measures to prevent or reduce the risk of conflict underatake by the Investor
Design phase	
	• one corridor for both cable lines from the MFW BII and MFW BIII has been determined, which will significantly reduce the impact of the investment to one strip of land • organising meetings with environmental NGOs • organisation of information meetings
Concerns of residents about the decline in value of land adjacent to the Project	• the Project site and the area of potential impact are outside areas of high tourist activity • the Project area covers mainly forest and agricultural land • organisation of information meetings
Failure to inform residents or misinformation about the Project	• information on the Project in local media • regular meetings with local government representatives to report on the progress of the Project • presentation of the Project at meetings with communities in the areas directly affected by the Project or adjacent to it • providing answers to ongoing questions about the Project • running a website with up-to-date information on the Project and the possibility to contact • conducting in 2015-2016 an education and information campaign on the MFW Bałtyk II and MFW Bałtyk III projects • Inform local communities about the benefits for them r.g jobs and training
Owners of land where the Project is planned may not agree to the development on their property	• a reliable method of valuing property (valuation reports) • professionally conducted negotiations
Construction phase	
Nuisance to local residents due to the cable line and substation construction and clearing of forest areas	• residents will be kept informed of the planned works and any inconvenience associated with them through the municipality's website and village leaders • the Investor will inform the local authorities and mayors of the areas of the investment about the rules of execution, dates and other details of the works ahead of time • organised project-level grievance mechanism
Operation phase	
Permanent vicinity of electricity infrastructure changing the landscape of the village	• there are no residential buildings in the close vicinity of the substations, the closest are two industrial facilities - the MOWI plant and the printing plant

Source: In house-study

The offshore wind energy sector is developing intensively in the coastal area. The education system is also adapting to the development of the new offshore industry. The investor is committed to promoting and educating in this area. As part of the activities of Pomorskie Centrum Kompetencji Morskiej Energetyki Odnawialnej (Pomeranian Centre of Competence for Offshore Renewable Energy), in cooperation with Polenergia and Equinor, an offshore education programme was launched for eighth-grade primary school students in Rumia. The programme was conducted by the municipal company Rumia Invest Park. The company is the originator of the Pomeranian Centre of Competence for Offshore Renewable Energy, which is intended to be a hub for the education and development of future personnel in the offshore sector. The programme aims to familiarise young people with the offshore wind energy sector, provide information on the potential associated with it and encourage them to choose a career path related to it. Meetings held so far show that interest among students is high, which gives a good

chance for the Polish workforce to prevail in the industry for decades to come.[629] Equinor and Polenergia, which are the Investors in the planned Project, on 19 October 2022 signed a letter of intent to cooperate with a competence centre aimed at strengthening the labour market necessary for the effective development of offshore wind projects in the Baltic Sea[630].

Similarly, higher education is opening up to the offshore industry. The Gdansk University of Technology, in addition to the ongoing postgraduate studies in Offshore Wind Energy at the Faculty of Mechanical Engineering and Shipbuilding, is opening a specialisation in offshore studies at the Faculty of Ocean Engineering in 2022. This is the first such specialisation in Poland.[631]

As part of the environmental impact assessment procedure, a proper public consultation will be carried out, during which the EIA Report will be made public and the possibility to submit comments and applications to the Report within 30 days. Owners of land plots within the boundaries of the application and within the area of potential impact have the right to broader participation in the procedure as a party to the proceedings, which gives them effective tools to secure their property rights. Likewise, environmental organisations that come forward to participate in the EIA procedure can act as a party.

All owners of plots of land through which the planned Project will pass must agree to make their plots available for the construction of the ECI before obtaining a building permit. Submission of information on the Investor's disposition of the land on which the Project is to be executed is an obligatory element of the application for the construction permit. It is also a procedure which fully secures the rights of the owners of the properties which will be crossed by the planned Project.

21. COMPARISON OF THE TECHNOLOGY USED WITH A TECHNOLOGY COMPLYING WITH THE REQUIREMENTS OF ART. 143 OF THE ENVIRONMENTAL PROTECTION ACT

In accordance with Article 66 (1) point. 11 of the EIA Act, if the planned project is connected with the use of an installation, the environmental impact report should include a comparison of the proposed technology with the technology meeting the requirements referred to in Article 143 of the Act of 27 April 2001. Environmental Protection Law (Journal of Laws 2021.1973 consolidated text).

Technologies used in newly commissioned or substantially modified installations should meet the following requirements:

- the use of substances with low environmental hazard potential,
- efficient use of energy,
- ensuring rational use of water, raw materials, materials and fuels,
- the use of low- and zero-waste technologies and waste recovery,
- limiting the volume and extent of emissions
- using comparable processes and methods effectively applied on an industrial scale,
- scientific and technological progress.

As concluded earlier in this Report, the substances used during the construction and operation of the planned Project will not cause serious environmental hazards and their selection will be in accordance with the highest standards and norms for this type of installation.

Among the most hazardous substances used during the construction and operation of onshore substations are:

- insulation/calibration gas SF_6[632] ,
- mineral oil,
- ester oil (synthetic).

[629] *Konopka A., 2022*
[630] *Rapacka P., 2022*
[631] *pg.edu.pl, accessed on: 7 July 2022*
[632] SF_6 - sulphur hexafluoride

Insulation gas (SF_6)

Insulation gas (SF_6) is one of the most important media used in the electrical power industry. It is non-flammable, non-toxic and very chemically stable. It is also one of the greenhouse gases with a very high GWP[633]. Therefore, it is only safe in its original state. When unsealed, gas decomposition products and secondary chemical reactions occur in the atmosphere. Prevention of SF_6 isolation gas emissions to the atmosphere will be achieved by selecting automatic gas density control and qualified personnel operating the station.

Mineral oil

The primary function of transformer oil is to dissipate heat from the transformer and provide good electrical insulation. Due to its relatively low flash point and flame point, it is a flammable medium. Mineral oils are subject to slow biological decomposition. If spilled, they cause contamination of soil layers saturated with it, and pollution of water bodies[634]. In case of emergency unsealing from the transformers will be collected in sumps under the transformers to prevent release into the soil and water bodies.

Mineral oil can ignite in the event of transformer failure and release contaminants. Mineral oils emit carbon monoxide and carbon dioxide during combustion. The operation of substations will be based on legislation, standards and technical documents created to mitigate risks. including in the event of their occurrence.

Ester oil (synthetic)

Synthetic esters have a higher viscosity index than mineral oils. The high thermal conductivity coefficient that characterises this oil results in a high heat dissipation capacity from the transformer windings to the surrounding atmosphere. Synthetic oils are fully miscible with mineral transformer oil. They are readily biodegradable and pose no risk to the environment, especially water. The disadvantage of synthetic oils is their high solubility in water[635].

In the case of the planned Project, the Investor will implement two connections - from the MFW Bałtyk II and the MFW Bałtyk III. The execution of the both connections at the same time ensures the optimisation of use of raw materials, materials, fuels and energy associated with the construction process. The construction of the connections separately would result in the re-organisation of the construction facilities through: land occupation, re-use of construction machinery, employment of personnel and consumption of utilities and generation of waste.

The transmission of electricity cable infrastructure is a widely used solution worldwide. It is characterised by high reliability, a minimum failure rate and emission-free operation. The technical solutions applied during the implementation of the Project will be the best available techniques and technologies currently used in the world, characterised by safety and high efficiency. The adopted technologies and materials, which will be used during the construction of the planned Project, will correspond to the world and European requirements and standards. They will meet all safety requirements.

The Connection Infrastructure cables will be protected with anti-corrosion coatings and flame retardant coatings, so they will not pose a threat to the soil and water environment.

The use of modern technical solutions, including cables with low leakage currents, will ensure rational energy consumption during the operation phase.

The operation of the cable line during the operation phase will be a source of heat emission and magnetic fields. Overland Power Substations under normal operating conditions will be a source of: noise and electromagnetic fields and negligible emissions of gases and dust into the atmosphere from maintenance and repair work (e.g. welding, painting, grinding). The equipment operated at substations (bobbin, transformers, switching equipment) is a source of electromagnetic fields with relatively low

[633] GWP - Global Warming Potential
[634] A. Antosz, 2010.
[635] *A. Antosz, 2010.*

levels of individual components. Given the considerable distances of at least several metres between the aforementioned equipment and the substation fence, the electric and magnetic field strengths outside the fenced area will be negligibly small. The operation of the underground power line will not generate waste apart from small quantities associated with maintenance or fault clearing work.

22. RESTRICTED USE AREA

In accordance with Article 135 of the Act of April 27, 2001. Environmental Protection Law (Dz.U.2022.2556 consolidated text as amended) "*If from the ecological review or from the environmental impact assessment of the project required by the provisions of the Act of October 3, 2008. on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments, or from the post-completion analysis, it follows that, despite the application of available technical, technological and organizational solutions, environmental quality standards outside the site of a plant or other facility cannot be met, a limited use area is created for a sewage treatment plant, a municipal waste landfill, a composting plant, a communication route, an airport, a power line and a substation, gas network facilities and radio communication, radio navigation and radiolocation installations*."

The power substations (ONS) listed in Article 135 paragraph will be implemented as part of the planned Project, so they may require the establishment of a restricted use area (RUA)

The legitimacy of establishing an RUA should only be considered if environmental quality standards are not met outside the area where the proposed cable lines will run and where ONS stations will be built.

Performed calculations of the distribution of magnetic field associated with work from underground cable lines clearly indicate that even at the maximum load of individual cable lines, and consequently the entire cable line, the permissible value of magnetic field intensity (60 A/m) established by the Decree of the Minister of Health of December 17, 2019 on permissible levels of electromagnetic fields in the environment (Journal of Laws 2022.2630 consolidated text as amended), will not be exceeded above ground level, particularly at a height of 2.0 m above sea level. This means that the public's residence (environmental exposure) even directly above the cable string will be permitted without any time restrictions (Section 10.11.1 and Appendix 5 Volume IV).

The area of the ONS substation is covered by the provisions of the local spatial development plan in accordance with Resolution No. XLV.564.2018 of the Ustka Municipality Council of October 26, 2018 on the adoption of a local spatial development plan for part of the area located within the geodesic area of Pęplino, Ustka municipality, and constitutes an area for the location of electrical power equipment, for which no requirements with respect to the permissible noise level have been specified.

The results of calculations of noise level distribution in the vicinity of the planned ONS stations indicate that:

- after construction and commissioning, the functioning LSE stations, all of whose noise source equipment will operate continuously (24 h/day) at maximum acoustic power, will not cause exceedance of the permissible sound level set for the night time (40 dB) and day time (50 dB) in the area of the nearest existing protected development;
- the forest area located in the vicinity of the station (from the northeast), designated for residential development in the MPZP, will not be within the range of above-normal noise both at night and during the day.

If it is necessary to verify the design assumptions for the planned stations adopted at this stage, the Investor ensures that the stations will be designed in such a way as to comply with the permissible sound level values referred to above.

23. IDENTIFICATION OF DIFFICULTIES DUE TO TECHNICAL OR SCIENTIFIC DEFICIENCIES

The current state of engineering knowledge related to the laying of cable lines (under the seabed and on land) and the relevant materials and technologies, as well as advances in devices for securing the operation of cable infrastructure, should be considered sufficient to assess the impact on the environment, so in preparing this Report there were no difficulties that could result from shortcomings in technology.

In order to recognize the natural values of the area covered by the application for an environmental decision, including carrying out a natural valorization, the Investor conducted annual surveys of the marine and terrestrial environment, with the results of the surveys referred both to the results of the PMŚ and to the literature.

A special source of knowledge about the marine environment were the results of surveys conducted by other Investors in the vicinity of the planned Project, which made it possible to look at the natural conditions in a broader context, which was particularly important in the case of mobile species, such as marine mammals and fish. In order to get a more complete overview of the marine environment in the area of the planned Project, the results of the surveys were used in the Report:

- within the Baltica 2 offshore wind farm located between Bałtyk II and Bałtyk III (data from 2016-2017)[636];
- within the FEW Baltic II offshore wind farm located to the west of the MFW Bałtyk II (data from 2017-2018)[637];
- in the corridor of the FEW Baltic II cable power connection, directly adjacent to the Project, carried out in 2017-2018[638].

This made it possible to obtain a comprehensive and cross-sectional view of the environmental assets in the marine area and to target minimization measures for potential risks associated with the laying of marine cables.

In the case of the terrestrial environment, a full annual natural inventory was conducted in 2021 - 2022 of all biotic components, which made it possible to identify naturally valuable sections of the ECI corridor and address appropriate minimization measures. For the terrestrial environment, no difficulties were encountered in assessing the natural values of the ECI corridor and predicting impacts.

Despite the best efforts made in the preparation of this EIA Report, some limitations can be pointed out regarding the forecasting of the impact of the planned Project on selected components of the marine environment. This mainly concerns in situ data on the impact on fish, marine mammals and benthic organisms, heat emissions and magnetic fields generated by the operation of undersea cables, and the impact of noise generated during the construction phase on marine mammals and fish. Responses to the above-mentioned impacts are still in the research and observation phase, and most of the research being carried out is taking place under laboratory conditions, where the response of organisms may differ from their behavior in the natural environment. However, the above-mentioned impacts, regardless of the difficulties in predicting them, will not be significant, which is due to the local nature of these impacts and their low (or temporary during construction) intensity.

Another aspect relates to issues related to the burial of cables in the seabed and the amount of bottom sediment which goes into the water as a result of this process. There is little information in the literature on this subject, and most of it deals mainly with non-cohesive sediments, leaving out cohesive sediments, which cause more turbidity in the water. Recognizing this issue is further complicated by the fact that many different methods of sinking linear infrastructure into the seabed are used in practice. The conservative approach that the Investor has taken, taking into account the rather large amounts of sediment that can move into the water during construction works and the least favorable

[636] *EIA Report of the Baltica Offshore Wind Farm, 2017, appendix 1. Report on the inventory of abiotic and biotic resources of the OWF area*
[637] *EIA Report of FEW Baltic II Offshore Wind Farm, 2019,Vol. II. Appendix 3 Results of monitoring of ichthyofauna and ichthyoplankton*
[638] *EIA of the project entitled "FEW BALTIC II Connection Infrastructure", EKOZAPAS, 08 2022 (Volume II A. Environmental conditions in the offshore part)*

hydrometeorological conditions, has made it possible to take into account the wide range of potential impacts that can occur in the most negative scenario. Such an approach, with the simultaneous high uncertainty in the prediction of natural processes, allowed the formulation of appropriate minimization measures.

In conclusion, despite the gaps in contemporary knowledge, in the context of predicting impacts related to submarine noise emissions and the spread of suspended sediment during the laying of submarine cables (during the construction phase) and the emission of heat and magnetic fields (during the operation phase), the available natural, PMS and literature data, as well as the application of the precautionary principle, made it possible to formulate potential environmental impacts and address minimization measures that ensure the protection of the most valuable parts of the marine ecosystem.

24. SUMMARY AND CONCLUSIONS

This EIA Report was prepared for the Project involving the construction of connection infrastructure for offshore wind farms MFW Bałtyk II and MFW Bałtyk III. The Investors are two special purpose vehicles established for the preparation and implementation of offshore wind farm projects MFW Bałtyk II and MFW Bałtyk III. The projects are jointly implemented by the companies: Polenergia and Equinor.

Because both planned connections are located in a single corridor on land and partially share a common route in the sea, and due to the probable implementation of both connections at the same time, it was decided to apply for a single environmental decision. The place of connection of both farms to the NPS is the "Slupsk Wierzbięcino" substation.The Project is located in the marine part within the Exclusive Economic Zone, territorial sea and coastal marine waters, within the boundaries administered by the Maritime Office in Gdynia, and in the land part in the area of the municipalities of Ustka and Slupsk (Slupsk County, Pomeranian Voivodeship).

The connection of offshore wind farms MFW Bałtyk II and MFW Bałtyk III to the NPS has already been subject to an environmental impact assessment (issued in March 2019). The Investor decided to conduct the procedure for issuing the environmental decision again, because, some elements of the Project were significantly modified, including primarily within the onshore section, i.e.: the addition of a new location for the landfall of the cable lines, an increase in the area of land provided for the implementation of the LSE, the widening of the onshore corridor and a partial change in the course of the onshore corridor for the cables.The Project qualifies for the so-called second category of projects, and the necessity to prepare this EIA Report results from the decision of RDOŚ in Gdańsk of August 4, 2022 ref: RDOŚ-Gd-WOO.420.40.2022.AM.9.

The planned Project is a public purpose investment in accordance with Article 6 of the Act of August 21, 1997 on Real Estate Management (Journal of Laws 2021.1899, as amended) and Article 2 para. 5 of the Act of March 27, 2003 on spatial planning and development (Dz.U.2021.741 t.j., as amended). In addition, in accordance with Article 3a of the Law of July 24, 2015 on the preparation and implementation of strategic investments in transmission networks (Dz.U.2022.273 t.j., as amended), the planned Project is a strategic investment in transmission networks.

The planned Project consists primarily of line infrastructure, including cable lines installed under the bottom of the sea (2 lines from each wind farm) and under the ground (4 cable tracks, for a 220 kV cable line and 2 cable circuits of a 400 kV line, consisting of three conductors each), as well as the object part - i.e. 2 onshore substations (one for each connection) where the conversion of current from 220 kV to 400 kV will take place. The landfall will be between 236.5 and 237.5 km of the coastline (according to the Maritime Office's kilometerage) without disturbing the coastal zone (using the trenchless HDD method).

The route of the cables in the offshore section runs partly through an area of special natural values, i.e. Ławica Słupska, but outside the most valuable habitats of the Bank, and within the designated infrastructure corridor, in accordance with the provisions of the Spatial Development Plan for Polish Maritime Areas. Except for the section where the connection from MFW Bałtyk II crosses

Ławica Słupska and the connection from MFW Bałtyk III runs on the border of the area, the route passes through an area poor when it comes to benthic organisms.

The cable route in the land section runs outside areas of natural value, at a considerable distance from buildings. Partly these are military areas, partly agricultural and forest areas. The direct vicinity of the planned two onshore substations is the largest industrial plant in the Municipality of Ustka - the fish processing plant MOWI S.A., which employs about 4 000 workers, so it was planned in an agricultural and industrial landscape.

As a result of the environmental survey, the most valuable section of the route on land was considered to be the coastal zone, including the zonal system of dune vegetation, as well as forest sections and ecological connectors of local importance. The most valuable section of the coastal zone will be crossed using a trenchless method (HDD), which eliminates the risks associated with its destruction.

The main environmental impacts will occur during the construction phase and are associated in the marine section with periodic occupation of the seabed with a width of up to 20 m (for each of the four submarine cables), while in the onshore section they are associated with periodic occupation of land for a construction corridor with a width of about 32 m (up to about 50 - 100 m in the area of trenchless crossings) and for the construction site of the trenchless crossing of cables from sea to land (with an area of about 0.85 ha), where there will be destruction of the top layer of soil, removal of trees and shrubs. The implementation of two onshore substations will involve permanent occupation of land with a total area of about 16 hectares. The onshore construction phase will also involve periodic and local inconvenience to residents neighboring the site. Due to the considerable distance of the planned Project from residential development, this impact can be considered as insignificant.

The permanent impacts of the operation phase of the planned Project both offshore and onshore are related to minor emissions of heat and electromagnetic radiation, which are considered insignificant based on the available literature.The planned two onshore substations, on the other hand, will be a source of constant noise emissions. Noise dispersion modeling performed on the basis of preliminary conceptual assumptions showed no exceedances of permissible noise levels in relation to existing and planned residential development.

The Project will be partially implemented within the marine Natura 2000 areas: PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku. The possibility of a significant negative impact on these areas has not been identified, but following the precautionary principle, minimizing measures have been proposed, including conducting cable laying works outside the period of migration and wintering of birds, which are the objects of protection in these areas.

The possibility of a cumulative negative impact on the migration corridor (section up to 4 nautical miles from the shore) of Atlantic salmon and River lamprey ascending to the Slupia River for spawning, where these species are the subject of protection of the PLH220052 Slupia Valley area, has been identified. Accordingly, a measure has been proposed to eliminate the possibility of such an impact by excluding, in the period from September 15 to November 15 and form 1 March to 15 April, the conduct works, that can interrupt migration: these are: cable burial and dredger/refuller operations, including spoil disposal. HDD works are excluded from this obligation.

The identification of the natural, marine and terrestrial environment, based on the annual inventories carried out by the Investor and the available environmental data, made it possible to identify the most valuable natural areas and to propose minimization measures that allowed the maximum reduction of the possible environmental impact of the Project, which is primarily related to the construction phase.

Measures to minimize and eliminate possible environmental impacts have been proposed separately for the connection from offshore wind farm Baltic II and separately for the connection from offshore wind farm Bałtyk III, which will enable the Investor in the future to proceed separately with follow-up decisions to the environmental decision, including primarily the location decision and the construction permit. Since the connector between the farms is also subject of the Environmental Decision, minimizing measures were formulated for it as well.

The conducted environmental impact assessment of the Investor's variant and the alternative variant, which was considered to be the western landfall of the cables (location variant) and the 400 kV overhead line on the section from the planned onshore substations to the PSE Słupsk Wierzbięcino substation (technology variant), showed that the Investor's variant is environmentally more favorable.

In conclusion, the Investor's variant should be considered the most environmentally favorable, including the impact minimization measures proposed in this EIA Report, the proposed environmental supervision, for proper implementation during the construction phase, and monitoring of the impacts of the operation phase in terms of noise emissions and electromagnetic fields.

25. USED SOURCES AND LITERATURE

Legal acts:

1. Decyzja Parlamentu Europejskiego i Rady (UE) 2022/591z dnia 6 kwietnia 2022 r. w sprawie ogólnego unijnego programu działań w zakresie środowiska do 2030 r. (Dz.U.UE.L.2022.114.22)
2. Dyrektywa 2000/60/WE Parlamentu Europejskiego i Rady Z dnia 23 października 2000 r. ustanawiająca ramy wspólnotowego działania w dziedzinie polityki wodnej
3. Dyrektywa 2005/35/WE Parlamentu Europejskiego i Rady z dnia 7 września 2005 r. w sprawie zanieczyszczeń pochodzących ze statków oraz prowadzenia sankcji, w tym sankcji karnych, za przestępstwa związane z zanieczyszczeniami (Dz.U.UE L 255 z 30.09.2005, str. 11, z późn. zm.)
4. Dyrektywa Parlamentu Europejskiego i Rady 2008/56/WE z dnia 17 czerwca 2008 r. ustanawiająca ramy działań Wspólnoty w dziedzinie polityki środowiska morskiego
5. Dyrektywa Parlamentu Europejskiego i Rady 2009/147/WE z dnia 30 listopada 2009 r. w sprawie ochrony dzikiego ptactwa (Dyrektywa Ptasia) (Dz.U..UE L 20/7, 26.1.2010)
6. Dyrektywa Rady 92/42/EWG z dnia 21 maja 1992 r. w sprawie ochrony siedlisk przyrodniczych oraz dzikiej fauny i flory (Dyrektywa Siedliskowa) (Dz.U.UE L.1992.206.7)
7. Konwencja o różnorodności biologicznej, sporządzona w Rio de Janeiro dnia 5 czerwca 1992 r. (Dz.U. 2002 nr 184 poz. 1532)
8. Rozporządzenie Ministra Gospodarki z dnia 21 grudnia 2005 r. w sprawie zasadniczych wymagań dla urządzeń używanych na zewnątrz pomieszczeń w zakresie emisji hałasu do środowiska (Dz.U.2005.263.2202 z późn. zm.)
9. Rozporządzenie Ministra Infrastruktury z dnia 16 listopada 2022 r. w sprawie przyjęcia Planu gospodarowania wodami na obszarze dorzecza Odry (Dz.U.2023.335)
10. Rozporządzenie Ministra Infrastruktury z dnia 21 grudnia 2002 r. w sprawie portowych planów gospodarowania odpadami oraz pozostałościami ładunkowymi ze statków (Dz.U.2002 nr 236 poz. 1989)
11. Rozporządzenie Ministra Infrastruktury z dnia 25 czerwca 2021 r. w sprawie klasyfikacji stanu ekologicznego, potencjału ekologicznego i stanu chemicznego oraz sposobu klasyfikacji stanu jednolitych części wód powierzchniowych, a także środowiskowych norm jakości dla substancji priorytetowych (Dz. U. 2017 poz. 1566)
12. Rozporządzenie Ministra Infrastruktury z dnia 25 lutego 2021 r. w sprawie przyjęcia aktualizacji zestawu celów środowiskowych dla wód morskich (Dz.U.2021.569)
13. Rozporządzenie Ministra Klimatu i Środowiska z dnia 25 maja 2022 r. w sprawie szczegółowych wymagań dla elementów zespołu urządzeń służących do wyprowadzenia mocy oraz dla elementów stacji elektroenergetycznych zlokalizowanych na morzu (Dz.U.2022.1257)
14. Rozporządzenie Ministra Klimatu z dnia 17 lutego 2020 r. w sprawie sposobów sprawdzania dotrzymania dopuszczalnych poziomów pól elektromagnetycznych w środowisku (Dz.U.2022.2630 t.j.)
15. Rozporządzenie Ministra Klimatu z dnia 2 stycznia 2020 r. w sprawie katalogu odpadów (Dz.U.2020.10)
16. Rozporządzenie Ministra Klimatu z dnia 30 maja 2020 r. w sprawie sposobu ustalania wartości wskaźnika hałasu L_{DWN}. (Dz.U.2020.1018)
17. Rozporządzenie Ministra Rozwoju z dnia 29 stycznia 2016 r. w sprawie rodzajów i ilości znajdujących się w zakładzie substancji niebezpiecznych, decydujących o zaliczeniu zakładu do zakładu o zwiększonym lub dużym ryzyku wystąpienia poważnej awarii przemysłowej (Dz.U.2016.138)
18. Rozporządzenie Ministra Środowiska z dnia 10 listopada 2015 r. w sprawie listy rodzajów odpadów, które osoby fizyczne lub jednostki organizacyjne niebędące przedsiębiorcami mogą poddawać odzyskowi na potrzeby własne, oraz dopuszczalnych metod ich odzysku (Dz.U.2016.93)

19. Rozporządzenie Ministra Środowiska z dnia 14 czerwca 2007 r. w sprawie dopuszczalnych poziomów hałasu w środowisku (Dz.U.2014.112 t.j.)
20. Rozporządzenie Ministra Środowiska z dnia 16 grudnia 2016 r. w sprawie ochrony gatunkowej zwierząt (Dz.U.2016.2183 z późn. zm.)
21. Rozporządzenie Ministra Środowiska z dnia 24 sierpnia 2012 r. w sprawie poziomów niektórych substancji w powietrzu (Dz.U.2021.845 t.j.)
22. Rozporządzenie Ministra Środowiska z dnia 30 października 2014 r. w sprawie wymagań w zakresie prowadzenia pomiarów wielkości emisji oraz pomiarów ilości pobieranej wody (Dz.U. z 2019.2286 z późn. zm.)
23. Rozporządzenie Ministra Środowiska z dnia 9 października 2014 r. w sprawie ochrony gatunkowej roślin (Dz.U.2014.1409)
24. Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 1 czerwca 1998 r. w sprawie warunków technicznych, jakim powinny odpowiadać morskie budowle hydrotechniczne i ich usytuowanie (Dz.U.1998 nr 101 poz. 645)
25. Rozporządzenie Rady Ministrów z dnia 10 września 2019 r. w sprawie przedsięwzięć mogących znacząco oddziaływać na środowisko (Dz.U.2019.1839 z późn. zm.)
26. Rozporządzenie Rady Ministrów z dnia 11 grudnia 2017 r. w sprawie przyjęcia Krajowego programu ochrony wód morskich (Dz.U.2017.2469)
27. Rozporządzenie Rady Ministrów z dnia 14 kwietnia 2021 r. w sprawie przyjęcia planu zagospodarowania przestrzennego morskich wód wewnętrznych, morza terytorialnego i wyłącznej strefy ekonomicznej w skali 1:200 000 (Dz.U.2021.935 z późn. zm)
28. Uchwała Nr 259/XXIV/16 Sejmiku Województwa Pomorskiego z dnia 25 lipca 2016 r. w sprawie obszarów chronionego krajobrazu w województwie pomorskim
29. Uchwała nr 318/XXX/16 Sejmiku Województwa Pomorskiego z dnia 29 grudnia 2016 r. w sprawie uchwalenia nowego planu zagospodarowania przestrzennego województwa pomorskiego oraz stanowiącego jego część planu zagospodarowania przestrzennego obszaru metropolitalnego Trójmiasta
30. Uchwała Nr X/42/81 Wojewódzkiej Rady Narodowej w Słupsku z dnia 8 grudnia 1981 r. dotyczącej utworzenia Parku Krajobrazowego "Dolina Słupi" oraz obszarów krajobrazu chronionego
31. Uchwała nr XL.512.2022 Rady gminy Ustka z dnia 19 maja 2022 r, w sprawie uchwalenia miejscowego planu zagospodarowania przestrzennego dla obszaru obejmującego część obrębu geodezyjny Duninowo i część obrębu geodezyjnego Duninowo PGR, gmina Ustka
32. Uchwała nr XXVIII.338.2013 Rady Gminy Ustka z dnia 24 maja 2013 roku w sprawie przystąpienia do aktualizacji Studium uwarunkowań i kierunków zagospodarowania przestrzennego Gminy Ustka
33. Uchwała nr XXXII/375/09 Sejmiku Województwa Zachodniopomorskiego z dnia 15 września 2009 r. w sprawie obszarów chronionego krajobrazu
34. Uchwała Nr: 308/XXIV/20 Sejmiku Województwa Pomorskiego z dnia 28 września 2020 w sprawie programu ochrony powietrza dla strefy pomorskiej, w której został przekroczony poziom dopuszczalny pyłu zawieszonego PM10 oraz poziom docelowy benzo(a)pirenu
35. Ustawa z dnia 14 grudnia 2012 r. o odpadach (Dz.U.2022.699 t.j. z późn. zm)
36. Ustawa z dnia 16 kwietnia 2004 r. o ochronie przyrody (Dz.U.2022.916 t.j. z późn. zm.)
37. Ustawa z dnia 16 marca 1995 r. o zapobieganiu zanieczyszczaniu morza przez statki (Dz.U.2020.1955 t.j. z późn. zm.)
38. Ustawa z dnia 17 grudnia 2020 r. o promowaniu wytwarzania energii elektrycznej w morskich farmach wiatrowych (Dz.U.2022.1050 tj. z późn. zm.)
39. Ustawa z dnia 17 listopada 2021 r. o zmianie ustawy o szczególnych rozwiązaniach związanych z zapobieganiem, przeciwdziałaniem i zwalczaniem COVID-19, innych chorób zakaźnych oraz wywołanych nimi sytuacji kryzysowych oraz niektórych innych ustaw (Dz.U. 2021.2095 t.j z późn. zm.)

40. Ustawa z dnia 18 kwietnia 2002 r. o stanie klęski żywiołowej (Dz.U.2017.1897)
41. Ustawa z dnia 18 sierpnia 2011 r. o bezpieczeństwie morskim (Dz.U.2022.515 t.j. z późn. zm.)
42. Ustawa z dnia 20 lipca 2017 r. Prawo wodne (Dz.U.2022.2625 t.j. z późn. zm.)
43. Ustawa z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej (Dz.U. 2022.457 t.j. z późn. zm.)
44. Ustawa z dnia 21 sierpnia 1997 r. o gospodarce nieruchomościami (Dz.U.2021.1899 t.j. z późn. zm.)
45. Ustawa z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (Dz.U.2022.840 t.j.)
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Environmental Impact Assessment Report for:

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VOLUME III. Nature inventories

Natural inventories of the marine and terrestrial environments have been received from the Contracting Authority and do not require verification. They have been posted on Project sharepoint at the link: VOLUME III. Enviroment survey

https://statoilsrm.sharepoint.com/sites/DM-PM735ext/466619/docs/Forms/AllItems.aspx?id=%2Fsites%2FDM%2DPM735ext%2F466619%2Fdocs%2F4%5FEKO%2DKONSULT%2FEIA%20Report%2FTOM%20III%5FVolume%20III%2FVOLUME%20III%2E%20Enviroment%20survey&viewid=f8880f3b%2Dbd2a%2D4eaf%2D9658%2Df74a6a6c2626

Gdańsk, March 2023 r.

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„External Connection Infrastructure of the MFW Bałtyk II and MFW Bałtyk III'"

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REGIONALNY DYREKTOR OCHRONY ŚRODOWISKA W GDAŃSKU

Gdańsk, dnia 04 sierpnia 2022 r.

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za dowodem doręczenia

POSTANOWIENIE

Na podstawie

- art. 63 ust. 1 i 4 w zw. z art. 66 i 68 ust. 2 *ustawy z dnia 3 października 2008 r. o udostępnianiu informacji o środowisku i jego ochronie, udziale społeczeństwa w ochronie środowiska oraz o ocenach oddziaływania na środowisko (tekst jedn. Dz. U. z 2022 r., poz. 1029 ze zm.)*, dalej *ustawa ooś*,
- § 3 ust. 1 pkt 7, § 3 ust. 1 pkt 54 lit. b), § 3 ust. 1 pkt 62 oraz § 3 ust. 1 pkt 88 rozporządzenia Rady Ministrów z dnia 10 września 2019 r. w sprawie przedsięwzięć mogących znacząco oddziaływać na środowisko *(Dz. U. z 2019 r., poz. 1839 ze zm.)*,
- art. 123 *ustawy z dnia 14 czerwca 1960 r. Kodeks postępowania administracyjnego (tekst jedn. Dz. U. z 2021 r., poz. 735 ze zm.)*, dalej *Kpa*,
- art. 80 ustawy z dnia 17 grudnia 2020 r. o promowaniu wytwarzania energii elektrycznej w morskich farmach wiatrowych (*tekst jedn. Dz. U. z 2022 r. poz. 1050.)*,
- art. 3a ustawy z dnia 24 lipca 2015 r. o przygotowaniu i realizacji strategicznych inwestycji w zakresie sieci przesyłowych (*tekst jedn. Dz. U. z 2022 r., poz. 273*),

po rozpatrzeniu wniosku Inwestora: MFW Bałtyk II & Bałtyk III reprezentowanego przez p. Annę Marczak, znak MFWBII-023/2022/AM; MFWBIII-030/2022/AM z dnia 30.05.2022 r. (data wpływu 02.06.2022 r) o wydanie decyzji o środowiskowych uwarunkowaniach dla niżej wymienionego przedsięwzięcia, działając w oparciu o:

- opinię Państwowego Granicznego Inspektora Sanitarnego w Gdyni, znak SE.ZNS.80.4910.15.22 z dnia 30.06.2022 r. (wpływ 05.07.2022 r.);
- postanowienie Komendanta Wojskowego Ośrodka Medycyny Prewencyjnej w Gdyni nr 1231/22 z dnia 30.06.2022 r. (wpływ 05.07.2022 r.);
- postanowienie Dyrektora Urzędu Morskiego w Gdyni, znak INZ.8103.89.2022.MG z dnia 14.07.2022 r. (wpływ 20.07.2022 r.);
- opinię Dyrektora Państwowego Gospodarstwa Wodnego Wody Polskie, Zarząd Zlewni w Koszalinie, znak SZ.ZZŚ.2.4360.175.2022.IW z dnia 11.07.2022 r. (wpływ 19.07.2022 r.);

postanawiam

I. **stwierdzić konieczność przeprowadzenia oceny oddziaływania na środowisko dla przedsięwzięcia pn.: „Infrastruktura przesyłowa morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III"**, zlokalizowanego na obszarze morskim Rzeczypospolitej Polski – w wyłącznej strefie ekonomicznej, w morzu terytorialnym i w morskich wodach wewnętrznych oraz na lądzie – na obszarze gmin Ustka i Słupsk (powiat słupski, województwo pomorskie);

II. **określić zakres raportu o oddziaływaniu przedsięwzięcia na środowisko zgodny z art. 66 ustawy OOŚ z uwzględnieniem oceny oddziaływania na obszary Natura 2000 w trybie art. 6.3 Dyrektywy Rady 92/43/EWG** w zakresie wpływu zamierzenia na przedmioty ochrony obszarów Natura 2000: Ławica Słupska PLC990001 oraz Przybrzeżne Wody Bałtyku PLB990002 a także gatunków objętych ochroną prawną, ze szczególnym uwzględnieniem:

a) opisu planowanego przedsięwzięcia, a w szczególności: charakterystyki całego przedsięwzięcia i warunków użytkowania terenu podczas wykonywania prac jego realizacji i eksploatacji; głównych cech charakterystycznych procesów technologicznych, w tym wskazania metody zakopania kabli; przewidywanych rodzajów i ilości zanieczyszczeń, wynikających z realizacji inwestycji,;

b) analizy oddziaływania na poszczególne elementy środowiska planowanych wariantów technologicznych przedsięwzięcia;

c) charakterystyki przyrodniczej terenu przedsięwzięcia oraz terenu znajdującego się w zasięgu jego oddziaływania, z uwzględnieniem gatunków roślin, grzybów i zwierząt oraz ich siedlisk, objętych ochroną na podstawie przepisów ustawy z dnia 16 kwietnia 2004 r. o ochronie przyrody (*tekst jedn. Dz.U. z 2022 r., poz. 916*), a także gatunków i siedlisk gatunków z Załącznika I Dyrektywy PE i Rady 2009/147/WE oraz siedlisk z Załącznika I i gatunków z Załącznika II z Dyrektywy Siedliskowej 92/43/EWG, stanowiących przedmiot ochrony w obszarach Ławica Słupska PLC990001 oraz Przybrzeżne Wody Bałtyku PLB990002 wraz z przedstawieniem zagadnień w formie graficznej i kartograficznej;

d) oceny bezpośredniego i pośredniego wpływu inwestycji i zastosowanych w niej technologii na stan i zachowanie, na etapie realizacji i eksploatacji:
   - gatunków i ich siedlisk oraz siedlisk przyrodniczych, stanowiących przedmioty ochrony w obszarach Natura 2000: Ławica Słupska PLC990001 oraz Przybrzeżne Wody Bałtyku PLB990002;
   - siedlisk przyrodniczych, siedlisk gatunków objętych ochroną na mocy ww. ustawy o ochronie przyrody, występujących oraz mogących potencjalnie występować na terenie przedsięwzięcia oraz w jego w sąsiedztwie;

e) charakterystyki bezpośredniego i pośredniego oddziaływania przedsięwzięcia na środowisko, w szczególności na cele ochrony obszarów Natura 2000: Ławica Słupska PLC990001 oraz Przybrzeżne Wody Bałtyku PLB990002;

f) charakterystyki bezpośredniego i pośredniego oddziaływania przedsięwzięcia na cele ochrony obszarów Natura 2000:
   – Przymorskie Błota PLH220024, oddalony o ok 300 metrów na zachód od planowanej inwestycji,
   – PLH320068 Jezioro Wicko i Modelskie Wydmy oddalony o ok. 1,4 km na zachód od planowanej inwestycji,
   – PLH220052 Dolina Słupi oddalony o ok. 1,5 km na wschód od planowanej inwestycji;

g) oceny wpływu inwestycji (na etapie realizacji i eksploatacji) po zastosowaniu wszystkich możliwych środków łagodzących negatywne oddziaływanie wraz z oceną istotności oddziaływań dla poszczególnych przedmiotów ochrony w ww. obszarze Natura 2000, a także możliwości realizacji działań ochronnych i osiągania celów ochrony ustalonych w planach zadań ochronnych dla tych obszarów;

h) opisu układu hydrologicznego terenu objętego inwestycją oraz w zasięgu oddziaływania inwestycji wraz z analizą wpływu przedsięwzięcia na ten układ;

i) analizy skumulowanego oddziaływania przedsięwzięcia z innymi planowanymi i zrealizowanymi przedsięwzięciami o podobnym charakterze, znajdującymi się w sąsiedztwie, na poszczególne elementy środowiska, w tym na obszary Natura 2000: Ławica Słupska PLC990001 oraz Przybrzeżne Wody Bałtyku PLB990002;

j) przedstawienia propozycji monitoringu oddziaływania planowanego przedsięwzięcia na etapie jego eksploatacji, w szczególności na cele i przedmioty ochrony ww. obszarów Natura 2000 oraz ich integralność;
k) oceny oddziaływania wpływu planowanego przedsięwzięcia na Obszar Chronionego Krajobrazu Pas Pobrzeża na Zachód od Ustki;
l) inwentaryzacji drzew i krzewów przeznaczonych do wycinki;
m) analizy wpływu przedsięwzięcia na zabytki oraz turystykę i żeglarstwo;
n) przedstawienia szczegółowego opisu metod i materiałów wykorzystanych przy opracowywaniu raportu o oddziaływaniu przedsięwzięcia na środowisko;
o) analizy wpływu planowanej inwestycji na korytarze ekologiczne znajdujące się w zasięgu jej oddziaływania;
p) analizy możliwych konfliktów społecznych związanych z realizacją przedsięwzięcia – ustalenie czy wariant wybrany do realizacji jest optymalny nie tylko dla Inwestora, ale i dla właścicieli sąsiednich nieruchomości oraz określenie w jaki sposób Inwestor zamierza przeciwdziałać konfliktom społecznym w związku z planowaną inwestycją.

Ponadto ocena oddziaływania na środowisko uwzględniać ma zakres wskazany przez Dyrektora Urzędu Morskiego w Gdyni i Komendanta Wojskowego Ośrodka Medycyny Prewencyjnej, z uwzględnieniem poniższych informacji:

- Dyrektor Urzędu Morskiego w Gdyni:
  a) analizy wpływu budowy i funkcjionowania infrastruktury przyłączeniowej energii elektrycznej z morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III na formy ochrony przyrody, znajdujące się w zasięgu oddziaływania inwestycji;
  b) analizy wpływu zaplanowanych prac na strefę brzegową w miejscu lądowania kabli, w tym na procesy morfodynamiczne i litodynamiczne zachodzące w strefie brzegowej oraz na stan systemu ochrony brzegu morskiego;
  c) analizy skumulowanego oddziaływania planowanego przedsięwzięcia z innymi projektowanymi, realizowanymi i istniejącymi przedsięwzięciami w sąsiedztwie przedmiotowego zamierzenia m.in. morskie farmy wiatrowe, kable, inna infrastruktura;
  d) przedstawienie postępowania w przypadku wystąpienia w trakcie realizacji inwestycji sytuacji awaryjnych.
- Komendant Wojskowego Ośrodka Medycyny Prewencyjnej:
  a) opis planowanego przedsięwzięcia, w szczególności:
     – charakterystykę całego przedsięwzięcia i warunki użytkowania terenu w fazie budowy i eksploatacji lub użytkowania;
     – określenie przewidywanego oddziaływania na środowisko analizowanych wariantów, w tym również przypadku wystąpienia poważnej awarii przemysłowej, a także możliwego transgranicznego oddziaływania na środowisko;
  b) przedstawienie zagadnień w formie kartograficznej w skali odpowiadającej przedmiotowi i szczególności analizowanych w raporcie zagadnień oraz umożliwiającej kompleksowe przedstawienie przeprowadzonych analiz oddziaływania przedsięwzięcia na środowisko;
  c) streszczenie w języku niespecjalistycznym informacji zawartych w raporcie, w odniesieniu do każdego elementu raportu.

U Z A S A D N I E N I E

W dniu 02.06.2022 r. do Regionalnego Dyrektora Ochrony Środowiska w Gdańsku wpłynął wniosek Inwestora MFW Bałtyk II & Bałtyk III reprezentowanego przez p. Annę Marczak, znak MFWBII-023/2022/AM; MFWBIII-030/2022/AM z dnia 30.05.2022 r., o wydanie decyzji o środowiskowych uwarunkowaniach dla przedsięwzięcia pn.: **„Infrastruktura przesyłowa morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III.**

Do powyższego wniosku dołączono:

1) Kartę informacyjną przedsięwzięcia (6 egzemplarzy + wersja CD), zwanej dalej kip;
2) Mapę, w postaci papierowej oraz elektronicznej, w skali zapewniającej czytelność przedstawionych danych z zaznaczonym przewidywanym terenem, na którym będzie realizowane przedsięwzięcie, oraz z zaznaczonym przewidywanym obszarem, o którym mowa w art. 74 ust. 3a zdanie drugie, wraz z wyznaczoną odległością, o której mowa w art. 74 ust. 3a pkt 1 (tj. 100 m od granic terenu na którym przedsięwzięcie zostanie zrealizowane);
3) Mapę przedstawiającą dane sytuacyjne i wysokościowe, sporządzoną w skali umożliwiającej szczegółowe przedstawienie przebiegu granic terenu, którego dotyczy wniosek, oraz obejmującą obszar, o którym mowa w ust. 3a zdanie drugie (tj. obszar na który oddziaływać będzie przedsięwzięcie);
4) Pełnomocnictwa do reprezentowania spółki;
5) Dowód uiszczenia opłaty skarbowej za wydanie decyzji (205 zł) i pełnomocnictwa.

Ponadto w dniu 14.06.2022 r. Wnioskodawca złożył uzupełnienie do ww. wniosku (pismo znak: MFWBII-038/2022/AM; MFWBIII-045/2022/AM z dnia 14.06.2022 r.).

Przedsięwzięcie będące przedmiotem wniosku jest inwestycją realizowaną na podstawie ustawy *z dnia 24 lipca 2015 r. o przygotowaniu i realizacji strategicznych inwestycji w zakresie sieci przesyłowych (tekst jedn. Dz. U. z 2022 r., poz. 273*) oraz o promowaniu wytwarzania energii elektrycznej w morskich farmach wiatrowych (*tekst jedn. Dz. U. z 2022 r. poz. 1050.),*

Zgodnie z art. 74 ust. 1 pkt 5 oraz ust. 1a ustawy ooś, przedłożenie wraz z wnioskiem o wydanie decyzji o środowiskowych uwarunkowaniach dla przedmiotowego przedsięwzięcia, wypisu i wyrysu z miejscowego planu zagospodarowania przestrzennego oraz wypisów i wyrysów z ewidencji gruntów, nie jest wymagane. Ponadto przedmiotowe przedsięwzięcie nie należy do przedsięwzięć, dla których wymagane jest załączenie do wniosku analizy kosztów i korzyści, o której mowa w art. 10a ust. 1 ustawy z dnia 10 kwietnia 1997 r. - Prawo energetyczne (t.j. Dz. U. z 2021 r. poz. 716 ze zm.).

Przedsięwzięcie objęte wnioskiem kwalifikowane jest zgodnie z § 3 ust. 1 pkt 7, § 3 ust. 1 pkt 54 b, § 3 ust. 1 pkt 62 oraz § 3 ust. 1 pkt 88 Rozporządzenia Rady Ministrów z dnia 10 września 2019 r. w sprawie przedsięwzięć mogących znacząco oddziaływać na środowisko (Dz. U. z 2019 r., poz. 1839 z zm.), jako:

- napowietrzne linie elektroenergetyczne o napięciu znamionowym nie mniejszym niż 110kV inne niż wymienione w § 2 ust. 1 pkt 6 – jako wariant należy przyjąć realizację odcinków infrastruktury przyłączeniowej pomiędzy LSE a stacją KSE Słupsk Wierzbięcino jako napowietrznych linii elektroenergetycznych 400 kV o długości nie większej niż 6 km;
- zabudowa przemysłowa, w tym zabudowa systemami fotowoltaicznymi, lub magazynowa, wraz z towarzyszącą jej infrastrukturą, o powierzchni zabudowy nie mniejszej niż: 1 ha na obszarach innych niż wymienione w lit. a – w ramach planowanego przedsięwzięcia realizowane będą dwie stacje elektroenergetyczne na lądzie o maksymalnej powierzchni 16 ha, poza obszarami objętymi formami ochrony przyrody;
- drogi o nawierzchni twardej o całkowitej długości przedsięwzięcia powyżej 1 km inne niż wymienione w § 2 ust. 1 pkt 31 i 32 lub obiekty mostowe w ciągu drogi o nawierzchni twardej, z wyłączeniem przebudowy dróg lub obiektów mostowych, służących do obsługi stacji elektroenergetycznych i zlokalizowanych poza obszarami objętymi formami ochrony przyrody, o których mowa w art. 6 ust. 1 pkt 1-5, 8 i 9 ustawy z dnia 16 kwietnia 2004 r. o ochronie przyrody – w ramach planowanego przedsięwzięcia wykonana zostanie utwardzona droga dojazdowa do LSE o długości powyżej 1 km;

- zmiana lasu, innego gruntu o zwartej powierzchni co najmniej 0,10 ha pokrytego roślinnością leśną - drzewami i krzewami oraz runem leśnym - lub nieużytku na użytek rolny lub wylesienie mające na celu zmianę sposobu użytkowania terenu o powierzchni nie mniejszej niż 1 ha, inne niż wymienione w lit. a-d – realizacja planowanego Przedsięwzięcia na obszarze lądowym będzie wymagała trwałego wylesienia na powierzchni większej niż 1 ha.

Zgodnie z treścią art. 71 ust. 2 pkt 2 *ustawy ooś*, dla planowanych „przedsięwzięć mogących potencjalnie znacząco oddziaływać na środowisko" jest wymagane uzyskanie decyzji o środowiskowych uwarunkowaniach.

Przedsięwzięcie będące przedmiotem wniosku jest inwestycją realizowaną na obszarze morskim Rzeczypospolitej Polskiej oraz na lądzie. W związku z powyższym, stosownie do brzmienia art. 75 ust. 7 i ust. 6 ustawy ooś, organem właściwym do rozpoznania przedmiotowej sprawy, jest Regionalny Dyrektor Ochrony Środowiska w Gdańsku.

O złożeniu wniosku i wszczęciu postępowania strony zostały powiadomione pismem znak RDOŚ-Gd-WOO.420.40.2022.AM.1. z dnia 15.06.2022 r. oraz, mając na uwadze zapisy art. 74 ust. 3 ustawy ooś - zawiadomieniem znak RDOŚ-Gd-WOO.420.40.2022.AM.3. z dnia 15.06.2022 r. Informację o powyższym wniosku umieszczono w publicznie dostępnym wykazie danych *Ekoportal (http://www.ekoportal.pl)* pod numerem 207/2022, prowadzonym na podstawie art. 22 ww. *ustawy ooś*.

W dniu 23. 06. 2022 r. Inwestor przedłożył tut. organowi wniosek o zmianę zakresu wniosku z dnia 30.05.2022 r., polegającej na dodaniu do wykazu dwóch działek ewidencyjnych w granicach możliwego odziaływania planowanego przedsięwzięcia, tj. 39/5 i 39/7 obręb Duninowo PGR, gmina Ustka. Strony postępowania zostały powiadomione o tym pismem znak RDOŚ-Gd-WOO.420.40.2022.AM.6. z dnia 28.06.2022 r. oraz, mając na uwadze zapisy art. 74 ust. 3 ustawy ooś - zawiadomieniem znak RDOŚ-Gd-WOO.420.40.2022.AM.7. z dnia 15.06.2022 r. Informację o powyższym wniosku umieszczono w publicznie dostępnym wykazie danych *Ekoportal (http://www.ekoportal.pl)* pod numerem 207/2022, prowadzonym na podstawie art. 22 ww. *ustawy ooś*.

Stosownie do treści art. 59 ust. 1 pkt 2 *ustawy ooś* realizacja planowanego przedsięwzięcia mogącego potencjalnie znacząco oddziaływać na środowisko wymaga przeprowadzenia oceny oddziaływania, jeżeli obowiązek przeprowadzenia tej oceny został stwierdzony na podstawie art. 63 ust. 1.

W myśl przywołanego wyżej przepisu oraz art. 64 ust. 1 i ust. 1a *ustawy ooś*, obowiązek przeprowadzenia oceny oddziaływania przedsięwzięcia na środowisko dla planowanego przedsięwzięcia mogącego potencjalnie znacząco oddziaływać na środowisko stwierdza, w drodze postanowienia, organ właściwy do wydania decyzji o środowiskowych uwarunkowaniach:

- uwzględniając łącznie kryteria określone w art. 63 ust.1;
- po zasięgnięciu opinii: 1) organu Państwowej Inspekcji Sanitarnej, o którym mowa w art. 78, w przypadku przedsięwzięć wymagających decyzji, o których mowa w art. 72 ust. 1 pkt 1-3, 10-19 i 21-28 oraz uchwały, o której mowa w art. 72 ust. 1b; 2) dyrektora urzędu morskiego – gdy przedsięwzięcie jest realizowane na obszarze morskim, 3) organu właściwego do wydania pozwolenia zintegrowanego na podstawie ustawy z dnia 27 kwietnia 2001 r. - Prawo ochrony środowiska, jeżeli planowane przedsięwzięcie kwalifikowane jest jako instalacja, o której mowa w art. 201 ust. 1 tej ustawy; 4) organu

właściwego do wydania oceny wodnoprawnej, o której mowa w przepisach ustawy z dnia 20 lipca 2017 r. - Prawo wodne.

Zgodnie z art. 6 ustawy ooś wymogu uzgodnienia lub opiniowania nie stosuje się, jeżeli organ prowadzący postępowanie jest jednocześnie organem uzgadniającym lub opiniującym. W niniejszej sprawie organami właściwymi do opiniowania/uzgadniania są: Dyrektor Państwowego Gospodarstwa Wodnego Wody Polskie Zarządu Zlewni Wód Polskich w Koszalinie, Komendant Wojskowego Ośrodka Medycyny Prewencyjnej w Gdyni, Państwowy Graniczny Inspektor Sanitarny w Gdyni oraz Dyrektor Urzędu Morskiego w Gdyni.

W związku z powyższym tut. organ, działając na podstawie art. 64 ust. 1 pkt 2, art. 6a oraz art. 78 ust. 1 i 4 *ustawy ooś*, pismem znak RDOŚ-Gd-WOO.420.40.2022.AM.2. z dnia 15.06.2022 r., zwrócił się do Państwowego Granicznego Inspektora Sanitarnego w Gdyni, Komendanta Wojskowego Ośrodka Medycyny Prewencyjnej w Gdyni, Dyrektora Urzędu Morskiego w Gdyni oraz Dyrektor Państwowego Gospodarstwa Wodnego Wody Polskie Zarządu Zlewni Wód Polskich w Koszalinie z prośbą o opinię w sprawie konieczności przeprowadzenia oceny oddziaływania na środowisko planowanego przedsięwzięcia.

Państwowy Graniczny Inspektor Sanitarny w Gdyni w piśmie znak SE.ZNS.80.4910.15.22 z dnia 30.06.2022 r. (wpływ 05.07.2022 r.), wyraził opinię że, cyt.: *„należy przeprowadzić ocenę oddziaływania przedsięwzięcia na środowisko, a raport opracować w zakresie ustawowym"*. Opinię Państwowego Granicznego Inspektora Sanitarnego w Gdyni, uwzględniono w całości przy określaniu zakresu raportu o oddziaływaniu przedsięwzięcia na środowisko.

Komendant Wojskowego Ośrodka Medycyny Prewencyjnej w Gdyni w piśmie nr 1231/22 z dnia 30.06.2022 r. (data wpływu: fax - 05.07.2022 r. / oryginał - 14.07.2022 r.), postanowił: *„wyrazić opinię, że dla przedsięwzięcia pn. „Infrastruktura przyłączeniowa morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III" konieczne jest opracowanie raportu o oddziaływaniu na środowisko"*. Opinię Komendanta Wojskowego Ośrodka Medycyny Prewencyjnej w Gdyni, uwzględniono przy określaniu zakresu raportu o oddziaływaniu przedsięwzięcia na środowisko.

Dyrektor Urzędu Morskiego w Gdyni w piśmie znak INZ.8103.89.2022.MG z dnia 14.07.2022 r. (data wpływu 20.07.2022 r.), postanowił: *„zaopiniować przedsięwzięcie objęte wnioskiem jako wymagające przeprowadzenia oceny oddziaływania na środowisko"*. Opinię Dyrektora Urzędu Morskiego w Gdyni, uwzględniono w całości przy określaniu zakresu raportu o oddziaływaniu przedsięwzięcia na środowisko.

Dyrektor Państwowego Gospodarstwa Wodnego Wody Polskie, Zarząd Zlewni w Koszalinie, w piśmie znak SZ.ZZŚ.2.4360.175.2022.IW z dnia 11.07.2022 r. (data wpływu 19.07.2022 r.), wyraził opinię że, cyt.: *„nie stwierdzam potrzeby przeprowadzenia oceny oddziaływania na środowisko dla ww. przedsięwzięcia na stan zasobów wodnych i zagrożenie osiągnięcia celów środowiskowych"*. Uzasadniając swoje stanowisko organ wskazał, iż z uwagi na zakres i charakter planowanego przedsięwzięcia przeprowadzenie oceny oddziaływania na środowisko dla przedmiotowego przedsięwzięcia nie jest konieczne. Przedsięwzięcie nie narusza warunków określonych w rozporządzeniu nr 3/2014 Dyrektora Regionalnego Zarządu Gospodarki Wodnej w Szczecinie z dnia 3 czerwca 2014 r. w sprawie ustalenia warunków korzystania z wód regionu wodnego Dolnej Odry i Przymorza Zachodniego (Dz. Urz. Woj. Zach. 2014 r., poz. 2431; Dz. Urz. Woj. Lub. 2014 r., poz. 1139; Dz. Urz. Woj. Pom. 2014 r., poz. 2237 ze zm.). Ponadto realizacja przedsięwzięcia, w odniesieniu do osiągnięcia celów

środowiskowych, nie spowoduje istotnych zmian w funkcjonowaniu JCW, jak również nie wystąpią trwałe, negatywne zmiany, biologiczne, hydromorfologiczne oraz fizykochemiczne wód tego obszaru. Jednocześnie sposób zagospodarowania i użytkowania zlewni będzie utrzymany. Podczas realizacji przedsięwzięcia nie ulegnie zasadniczo zmiana sposobu regulacji stosunków wodnych na przedmiotowym obszarze. Przedsięwzięcie nie będzie negatywnie oddziaływać na potencjał ekologiczny i stan chemiczny wód na etapie realizacji i eksploatacji przedsięwzięcia. Jednocześnie organ stwierdził, że cel przedsięwzięcia nie narusza celu Ramowej Dyrektywy Wodnej. W związku z powyższym Dyrektor Państwowego Gospodarstwa Wodnego Wody Polskie Zarządu Zlewni w Koszalinie uznał, że przedmiotowa inwestycja, zarówno w fazie budowy jak i eksploatacji, nie będzie negatywnie oddziaływać na środowisko wodne i gruntowe, a tym samym nie nastąpi degradacja wód podziemnych i powierzchniowych spowodowana jakimikolwiek zanieczyszczeniami, jak również nie nastąpi pogorszenie potencjału ekologicznego i stanu chemicznego JCWP oraz stanu ilościowego i chemicznego JCWPd. Ponadto stwierdzając brak potrzeby przeprowadzenia oceny oddziaływania przedmiotowego przedsięwzięcia na środowisko, organ nałożył na Inwestora warunki realizacji przedsięwzięcia i wymagania, konieczne do uwzględnienia w decyzji środowiskowej.

Analizując, czy przedsięwzięcie wymaga przeprowadzenia oceny oddziaływania na środowisko, Regionalny Dyrektor Ochrony Środowiska w Gdańsku uwzględnił łącznie kryteria, o których mowa w art. 63 ust. 1 *ustawy ooś*:

1. Rodzaj i charakterystykę przedsięwzięcia, z uwzględnieniem:

a) skali przedsięwzięcia i wielkości zajmowanego terenu oraz ich wzajemnych proporcji, a także istotnych rozwiązań charakteryzujących przedsięwzięcie,

b) powiązań z innymi przedsięwzięciami, w szczególności kumulowania się oddziaływań przedsięwzięć realizowanych i zrealizowanych, dla których została wydana decyzja o środowiskowych uwarunkowaniach, znajdujących się na terenie, na którym planuje się realizację przedsięwzięcia, oraz w obszarze oddziaływania przedsięwzięcia lub których oddziaływania mieszczą się w obszarze oddziaływania planowanego przedsięwzięcia w zakresie, w jakim ich oddziaływania mogą prowadzić do skumulowania oddziaływań z planowanym przedsięwzięciem,

c) różnorodności biologicznej, wykorzystywania zasobów naturalnych, w tym gleby, wody i powierzchni ziemi,

d) emisji i występowania innych uciążliwości,

e) ocenionego w oparciu o wiedzę naukową ryzyka wystąpienia poważnych awarii lub katastrof naturalnych i budowlanych, przy uwzględnieniu używanych substancji i stosowanych technologii, w tym ryzyka związanego ze zmianą klimatu,

f) przewidywanych ilości i rodzaju wytwarzanych odpadów oraz ich wpływu na środowisko, w przypadkach gdy planuje się ich powstawanie,

g) zagrożenia dla zdrowia ludzi, w tym wynikającego z emisji.

2. Usytuowanie przedsięwzięcia, z uwzględnieniem możliwego zagrożenia dla środowiska, w szczególności przy istniejącym i planowanym użytkowaniu terenu, zdolności samooczyszczania się środowiska i odnawiania się zasobów naturalnych, walorów przyrodniczych i krajobrazowych oraz uwarunkowań miejscowych planów zagospodarowania przestrzennego – uwzględniające:

a) obszary wodno-błotne, inne obszary o płytkim zaleganiu wód podziemnych, w tym siedliska łęgowe oraz ujścia rzek,

b) obszary wybrzeży i środowisko morskie,

c) obszary górskie lub leśne,

d) obszary objęte ochroną, w tym strefy ochronne ujęć wód i obszary ochronne zbiorników wód śródlądowych,

e) obszary wymagające specjalnej ochrony ze względu na występowanie gatunków roślin, grzybów i zwierząt lub ich siedlisk lub siedlisk przyrodniczych objętych ochroną, w tym obszary Natura 2000, oraz pozostałe formy ochrony przyrody,
f) obszary, na których standardy jakości środowiska zostały przekroczone lub istnieje prawdopodobieństwo ich przekroczenia,
g) obszary o krajobrazie mającym znaczenie historyczne, kulturowe lub archeologiczne,
h) gęstość zaludnienia,
i) obszary przylegające do jezior,
j) uzdrowiska i obszary ochrony uzdrowiskowej,
k) wody i obowiązujące dla nich cele środowiskowe.

3. Rodzaj, cechy i skalę możliwego oddziaływania rozważanego w odniesieniu do kryteriów wymienionych w pkt 1 i 2 oraz w art. 62 ust. 1 pkt 1, wynikające z:

a) zasięgu oddziaływania – obszaru geograficznego i liczby ludności, na którą przedsięwzięcie może oddziaływać,
b) transgranicznego charakteru oddziaływania przedsięwzięcia na poszczególne elementy przyrodnicze,
c) charakteru, wielkości, intensywności i złożoności oddziaływania, z uwzględnieniem obciążenia istniejącej infrastruktury technicznej oraz przewidywanego momentu rozpoczęcia oddziaływania,
d) prawdopodobieństwa oddziaływania,
e) czasu trwania, częstotliwości i odwracalności oddziaływania,
f) powiązań z innymi przedsięwzięciami, w szczególności kumulowania się oddziaływań przedsięwzięć realizowanych i zrealizowanych, dla których została wydana decyzja o środowiskowych uwarunkowaniach, znajdujących się na terenie, na którym planuje się realizację przedsięwzięcia, oraz w obszarze oddziaływania przedsięwzięcia lub których oddziaływania mieszczą się w obszarze oddziaływania planowanego przedsięwzięcia – w zakresie, w jakim ich oddziaływania mogą prowadzić do skumulowania oddziaływań z planowanym przedsięwzięciem,
g) możliwości ograniczenia oddziaływania.

Biorąc powyższe pod uwagę, Regionalny Dyrektor Ochrony Środowiska w Gdańsku ustalił co następuje.

Planowane przedsięwzięcie obejmuje dwa niezależne zespoły urządzeń służących do wyprowadzenia mocy z morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III oraz opcjonalnie połączenia kablowego pomiędzy przedmiotowymi farmami wraz z infrastrukturą niezbędną do ich wykonania i obsługi. Przebieg i parametry techniczne planowanego przedsięwzięcia warunkowane są lokalizacją i parametrami farm wiatrowych, z których ma być odprowadzona wyprodukowana energia oraz miejscem i warunkami przyłączenia do KSE - zgodnie z umowami o przyłączenie do sieci przesyłowej planowanych farm, zawartymi pomiędzy Spółkami, a Polskimi Sieciami Elektroenergetycznymi S. A. (PSE S.A.).

W skład inwestycji wchodzić będą:

- część morska:
  - 2 podmorskie kable eksportowe AC (trójżyłowe) wysokiego napięcia na odcinku od morskiej stacji elektroenergetyczne na obszarze MFW Bałtyk II do brzegu o długości ok. 60 km każdy,
  - 2 podmorskie kable eksportowe AC (trójżyłowe) wysokiego napięcia na odcinku od morskiej stacji elektroenergetyczne na obszarze MFW Bałtyk III do brzegu o długości ok. 67 km każdy;

- opcjonalnie połączenie kablowe między morską farmą wiatrową MFW Bałtyk II i morską farmą wiatrową MFW Bałtyk III o długości ok. 30 km - korytarz stanowiący rezerwę pod możliwe w przyszłości ułożenie kabli eksportowych i światłowodu;

- przejście przez strefę brzegową metodą bezwykopową wszystkimi liniami kablowymi między 236,5 a 238,5 km brzegu morskiego (wg kilometrażu Urzędu Morskiego);
- część lądowa:
  - 4 podziemne linie kablowe wysokiego napięcia na odcinku od wyjścia na ląd do planowanej lądowej stacji elektroenergetycznej (po 2 linie dla każdej MFW) o długości ok. 8 km każda,
  - 2 lądowe stacje elektroenergetyczne w rejonie Pęplina o łącznej powierzchni 16 ha (po 8 ha dla każdej),
  - 2 podziemne linie kablowe wysokiego napięcia od lądowych stacji elektroenergetycznych w rejonie Pęplina do wyznaczonych punktów przyłączenia w stacji KSE Słupsk Wierzbięcino o długości ok. 6 km (dla każdej stacji jedna linia).

Ponadto elementem przedsięwzięcia jest infrastruktura niezbędna do obsługi przyłączy i morskich farm wiatrowych tj. linie światłowodowe które mogą stanowić integralną część kabli morskich; na lądzie układanych w wykopie pod kable elektroenergetyczne oraz droga dojazdowa do lądowych stacji elektroenergetycznych w rejonie Pęplina (opcjonalnie z magazynami energii).

Energia elektryczna w części morskiej będzie przesyłana 4 kablami elektroenergetycznymi trójżyłowymi (2 kable z każdej morskiej farmy wiatrowej MFW Bałtyk II i MFW Bałtyk III) w technologii przemiennoprądowej najwyższego napięcia (HVAC) o napięciu roboczym 220 kV. Ponadto liniami kablowymi połączone mogą zostać morskie stacje elektroenergetyczne farm MFW Bałtyk II i MFW Bałtyk III.

Przygotowanie dna obejmuje działania związane z oczyszczaniem i przygotowaniem tras kablowych do sprawnej i bezkolizyjnej instalacji. Działania przygotowawcze obejmują m.in: badania na obecność niewybuchów oraz broni chemicznej, ewentualną zmianę projektowanej trasy kabla lub usuwanie zidentyfikowanych niewybuchów oraz broni chemicznej, usuwanie nieaktywnych kabli (jeżeli będą kolidować z planowanym przedsięwzięciem), usuwanie głazów lub korekta przebiegu projektowanej trasy kabla, czyszczenie trasy kablowej z rożnego typu przeszkód typu sieci rybackie, luźne przewody. Powyższe działania zostaną przeprowadzone z dużym wyprzedzeniem, w stosunku do prac związanych z układaniem i zakopywaniem kabli. Wstępne rozpoznanie przeszkód naturalnych i antropogenicznych na analizowanym obszarze morskim zostało wykonane w 2015 roku przez Instytut Morski w Gdańsku. Wstępne rozpoznanie umożliwiło wskazanie kamienisk i żwirowisk na trasie IP oraz położenie kabla SwePol Link. Nie stwierdzono żadnych obiektów potencjalnie niebezpiecznych typu torpedy i miny oraz obiektów wrakowych, a obiekty antropogeniczne wytypowane przez archeologów do sprawdzenia wizyjnego przy pomocy pojazdu ROV były fragmentami zniszczonego sprzętu rybackiego.

Na obecnym etapie realizacji projektu zakłada zagłębianie kabla na głębokości nie większej niż 3 m poniżej poziomu dna morskiego, przy czym w przypadku odcinków linii kablowych narażonych na szczególne ryzyko uszkodzeń istnieje możliwość zakopania kabla na większej głębokości.

Dla odcinka wyjścia kabla z morza na ląd na etapie projektowania trajektorii linii kablowych zostaną uwzględnione wymogi zawarte w Planie Zagospodarowania Obszarów Morskich. Kable zostaną ułożone w bezpiecznej odległości od siebie, która umożliwi

zachowanie odpowiedniej przestrzeni manewrowej dla jednostek pływających, wykonujących prace serwisowe lub naprawcze.

Podmorskie kable elektroenergetyczne zostaną przetransportowane od producenta do portu stanowiącego główne zaplecze logistyczne lub bezpośrednio od producenta na morski obszar instalacji kabli. Kable dostarczane będą na specjalnie do tego przygotowanym statku CLV (ang. cable laying vessel), tzw. kablowcu.

Proces instalacji, dla każdego kabla z osobna, będzie przebiegał w etapach obejmujących:

- zwodowanie kabla z użyciem pływaków w rejonie sekcji bezwykopowej wejścia na ląd,
- przeciągniecie kabla przez sekcję bezwykopową na ląd,
- ułożenie kabla na dnie wzdłuż planowanej trasy,
- wciągnięcie kabla do morskiej stacji elektroenergetycznej (MSE),
- zakopanie kabla lub pozostawienie odcinków kabli do samoistnego zakopania oraz zabezpieczenie odcinków kabla pozostawionych na dnie morskim np. przy użyciu materiału skalnego.

Po wykonaniu inspekcji obszaru do układania kabla, na etapie sporządzania projektu budowlanego, wyznaczona zostanie trasa w kierunku miejsca wyjścia na ląd (obszar sekcji bezwykopowej). W kolejnym etapie kablowiec ustawi się na trasie korytarza na głębokości ok. 9-10 m. Statek z urządzeniem do usuwania pływaków zostanie zakotwiczony na zewnątrz sekcji bezwykopowej. Zwodowanie kabla rozpocznie się od umieszczenia go na pływakach i będzie kontynuowane do końca sekcji. W dalszej kolejności rozpocznie się przeciąganie kabla przez sekcję bezwykopową na ląd. Koniec kabla zostanie połączony z liną wciągającą, a po usunięciu pływaków opuszczony na dno do szybu końcowego przewiertu i wciągnięty na ląd. Po osiągnięciu odpowiedniej długości kabla do złącza przejściowego, statek roboczy usunie pozostałe pływaki, a kabel zostanie opuszczony na dno morskie.

Na dalszym etapie kablowiec (ang. Cable Laying Vessel; dalej: "CLV") rozpocznie układanie kabla eksportowego na trasie między odcinkiem bezwykopowym (miejsce wyjścia na ląd) a lokalizacją MSE, podczas którego monitorowane będą wszystkie ważne parametry kabla eksportowego. Po dotarciu do lokalizacji MSE, w zależności od stanu zaawansowania jej realizacji, istnieją trzy opcje związane z wciąganiem kabli eksportowych przez rury w kształcie litery J (tzw. J-tubes):

- odłożenie kabli eksportowych na dnie morskim, tzw. wet storage (brak fundamentów / MSE),
- tymczasowe wciągnięcie i mocowanie kabli eksportowych do konstrukcji fundamentu MSE (konstrukcja fundamentu MSE jest zainstalowana, brak platformy),
- całkowite wciągnięcie, podwieszenie i podłączenie do rozdzielnicy z izolacją gazową (GIS) MSE (kompletna MSE jest zainstalowana).

Ponieważ najprawdopodobniej w momencie układania kabla eksportowego nie będzie zainstalowanej ani MSE ani jej fundamentu, wciąganie kabli eksportowych odłożonych na dnie morskim będzie wykonywane przez specjalny statek wciągający, a nie przez CLV. Jeśli jednak kompletna MSE zostanie zainstalowana do czasu, gdy CLV przybędzie z kablami podmorskimi, wówczas kable eksportowe będzie można wciągnąć i podłączyć bezpośrednio z CLV.

W kolejnym etapie rozpocznie się zakopywanie i zabezpieczenie kabla, jeżeli będzie to konieczne. W tym celu zostanie zmobilizowana jednostka pływająca do prac wykopowych (TSV). Zakopanie kabla elektroenergetycznego w dnie morskim może zostać wykonane za pomocą dwóch podstawowych metod:

- SLB (ang. Simultaneous Lay and Burial) – opartej na jednoczesnym układaniu i zagłębianiu kabla w osadzie dennym,

- PLB (ang. Post Lay Burial) – opartej na zakopaniu kabla po jego wcześniejszym ułożeniu na dnie.

W przypadku metody SLB do układania kabli wykorzystywana jest jedna jednostka pływająca – kablowiec (CLV). Prędkość układania kabla regulowana jest przez prędkość zakopywania, a ta zależy od charakterystyki dna morskiego. Podczas operacji wymagany jest długi okres sprzyjających warunków pogodowych, które pozwoli na ułożenie i zakopanie całej linii kablowej. Metoda PLB wymaga wykorzystania dwóch różnych jednostek, tj. do ułożenia i do zakopania kabli. Pierwszą z nich jest kablowiec lub holowana barka kablowa, drugą – najczęściej statek serwisowy wyposażony w urządzenie do zagrzebywania kabli. Metoda ta wymaga krótszego okna pogodowego.

Na obecnym etapie w ramach przedsięwzięcia rozważane są przez Inwestora trzy metody zakopania kabla w technologii: rozmywania gruntu (water jetting), płużenia (ploughing), mechanicznego cięcia (mechanical cutting) oraz metody łączące opisane powyżej np. płużenie z rozmywaniem gruntu.

Zakres stosowalności ww. technologii determinowany jest przez warunki geologiczne dna i może być zwiększany poprzez odpowiednie wyposażenie i modyfikacje urządzeń zakopujących kabel.

Rozmywanie gruntu (*water jetting*) polega na wtłaczaniu pod powierzchnię dna, na żądaną głębokość, wody morskiej pod ciśnieniem. Rozmywanie podłoża następuje w wyniku połączenia strumieni wodnych o wysokim przepływie i niskim ciśnieniu (np. do fluidyzacji i przemieszczania osadów ziarnistych) i strumieni wodnych o niskim przepływie/ wysokim ciśnieniu (np. do cięcia i przemieszczania brył gliny). W powstałym wykopie kabel pod własnym ciężarem zapada się w sfluidyzowanym osadzie i zostaje samoczynnie zagrzebany.

Płużenie (ploughing) polega na ciągnięciu przez statek pługu, gdzie lemiesz pługa przecina dno tworząc bruzdę w osadach morskich. Pług podnosi klin gleby, tworząc tymczasowy rów, w którym umieszcza kabel na żądaną głębokość. Następnie kabel jest zasypywany materiałem, który samoistnie opada na dno siłami grawitacji po przejściu pługu.

Mechaniczne cięcie (mechanical cutting) polega na wykonaniu wykopu z wykorzystaniem samobieżnych urządzeń uzbrojonych w koła lub łańcuchy tnące, wyposażonych w czerpaki do transportowania wydobywanego materiału. Podczas kopania rowu w podłożu powstaje wąska szczelina, w którą opuszczany jest kabel. Metoda mechanicznego cięcia może wymagać dodatkowych działań związanych z zasypaniem rowu, w zależności od wymaganej głębokości przykrycia.

Inwestor rozważa zastosowanie:

- pojazdów gąsienicowych, poruszających się po dnie morskim, wyposażonych w narzędzia rozmywające i/lub przecinające, które mogą być obsługiwane i sterowane ze statku pomocniczego za pomocą kabla pępowinowego lub stanowić samobieżne pojazdy sterowane przez operatora z pokładu statku,
- mniejszych urządzeń holowanych przez statek, np. pług.

W miejscach, gdzie możliwości zakopania kabla z użyciem ww. technologii będą ograniczone, rozważa się wykorzystanie alternatywnych sposobów zabezpieczenia kabli, tj.: narzutu kamiennego, betonowych materacy.

Do tych miejsc zalicza się:

- pola głazów, otoczaków lub żwiru, lub bardzo twarde dno morskie, o niewystarczającej miąższości osadów, gdzie wykonanie wykopu może być niewykonalne lub nieekonomiczne,
- obszary o dużej mobilności osadów (pola ripplemarków, fal piaszczystych), na których duża dynamika wód może doprowadzić do odsłonięcia kabli,
- miejsce włączenia do MSE w celu ochrony kabla przed potencjalnym rozmywaniem dna w jego otoczeniu.

Ostateczny wybór technologii zakopania kabla zostanie wybrany w oparciu o:

- warunki geologiczne dna, na podstawie wyników badań geotechnicznych,
- głębokość przykrycia kabla,
- dostępność odpowiednich urządzeń do układania/zakopania linii kablowej,
- uwarunkowania ekonomiczne,
- uwarunkowania logistyczne.

Kable zostaną wyprowadzone z morza na ląd metodą bezwykopową, a rozwiązania techniczne realizacji przejścia zostaną wybrane w oparciu o wyniki badań geotechnicznych, inne uwarunkowania lokalne, w tym długość przejścia oraz dostęp do urządzeń wykonawcy robót budowlanych. Na obecnym etapie Inwestor rozważa cztery technologie wyjścia kabli na ląd:

- Horyzontalny przewiert sterowany HDD (Horizontal Directional Drilling) - metoda ta polega na wykonywaniu poziomych przewiertów kierunkowych przy pomocy specjalnej głowicy sterującej prowadzonej w kierunku zaprojektowanego punktu wyjścia. W ramach planowanego Przedsięwzięcia zakłada się, że jeden przewiert zostanie wykonany dla każdej z czterech linii kablowych oraz wykonany zostanie jeden zapasowy przewiert a także opcjonalnie również 2 dodatkowe przewierty na potrzeby przyłącza MFW Bałtyk I. Inwestor rozważa również wiercenie z barki morskiej w kierunku lądu.
- HDD + wykop morski - ze względu na znaczną długość przewiertu sterowanego w wariancie zachodnim (ok. 1500 m) Inwestor rozważa zastosowanie przewiertu sterowanego o długości ok. 1000 m, do izobaty 3-4 m i wykop o głębokości 2-3 m. W tym celu zostanie wykorzystany sprzęt do wykopów na płytkiej wodzie.
- Mikrotunel - to bezwykopowa metoda jednoetapowego przekraczania przeszkód terenowych w trakcie budowy instalacji liniowych. Polega ona na wierceniu przy użyciu specjalnie skonstruowanej głowicy wiertniczej, tunelu o żądanej średnicy, w którym sukcesywnie, w miarę postępu wiercenia, umieszczane są pierścienie betonowe stanowiące elementy konstrukcyjne tunelu. Wykonanie przewiertu wymaga budowy komory wejściowej (startowej) oraz komory odbiorczej (końcowej, wyjściowej), gdyż mikrotunelowanie odbywa się w linii prostej. Metoda mikrotunelu wymaga dużej zajętości terenu pod plac budowy. W ramach planowanego przedsięwzięcia zakłada się, że jeden tunel zostanie wywiercony dla każdej z czterech linii kablowych oraz wykonany zostanie jeden tunel zapasowy. Ponadto opcjonalnie mogą zostać wykonane 2 dodatkowe tunele dla przyłącza z MFW Bałtyk I. Inwestor rozważa również wywiercenie jednego tunelu dla wszystkich czterech linii kablowych IP MFW Bałtyk II i IP MFW Bałtyk III.
- Direct Pipe (DP) - metoda ta umożliwia wykonanie otworu wiertniczego wraz z ułożeniem rury osłonowej do instalacji infrastruktury kablowej w jednoetapowym procesie instalacji. Wprowadzenie rury osłonowej do przewiertu odbywa się bezpośrednio w trakcie wiercenia, z wykorzystaniem uprzednio przygotowanych komór (wejściowej i wyjściowej), które po zakończeniu przewiertu są likwidowane, a teren doprowadzany do stanu poprzedniego. Dodatkowo konieczny jest teren na potrzeby krótkoterminowego magazynowania rur osłonowych tuż przed ich instalacją w gruncie. Wykonanie przejścia bezwykopowego metodą DP wymaga dużej zajętości terenu pod plac budowy.

Przygotowanie placu budowy będzie wymagało wykonania wycinki drzew i krzewów znajdujących się w jego granicach. Wielkość wycinki uzależniona będzie od przyjętej technologii przejścia bezwykopowego.

Przewiduje się wykonanie jednego otworu wiertniczego dla jednego kabla. W sumie wykonanych zostanie 5 otworów wiertniczych (2 otwory dla IP MFW Bałtyk II i 2 dla IP MFW Bałtyk III oraz jeden zapasowy). Ponadto opcjonalnie mogą zostać wykonane 2 dodatkowe otwory dla przyłącza z MFW Bałtyk I.

W ramach przedmiotowego przedsięwzięcia planuje się wykonanie dwóch odseparowanych od siebie elektrycznie Lądowych Stacji Elektroenergetycznych (LSE) o łącznej powierzchni 16 ha w rejonie wsi Pęplino. Prace przygotowawcze będą polegały na przygotowaniu drogi dojazdowej, skablowaniu przechodzącej przez teren stacji istniejącej napowietrznej linii średniego napięcia, zdjęcia warstwy wierzchniej gruntu oraz ewentualnie niwelacji terenu. Nie przewiduje się konieczności wycinki drzew, ze względu na charakter terenu – głównie grunty orne i użytki zielone. Na potrzeby dojazdu do stacji oraz do terenu budowy Inwestor przewiduje wykorzystanie istniejącej drogi dojazdowej do fabryki MOWI POLAND S.A. i dalej kierując się w kierunku południowo-wschodnim zrealizować utwardzoną drogę dojazdową do terenu stacji.

Na budowę stacji elektroenergetycznych składają się prace budowlano – montażowe:

- prace ziemne, wykopy, niwelacje,
- przygotowanie dróg wewnętrznych i zaplecza socjalnego,
- wykopy pod infrastrukturę,
- budowa szalunków, fundamentów i posadzek betonowych,
- montaż stanowisk transformatorów mocy i dławików,
- montaż aparatury i połączeń wysokiego napięcia,
- zainstalowanie zbiorników paliwa do generatorów awaryjnych (jeżeli będą wymagane) oraz zbiornika na wodę do celów przeciwpożarowych,
- utwardzenie dróg i miejsc parkingowych,
- przygotowanie trawników z 20-30 cm warstwą próchnicy,
- zainstalowanie ogrodzenia i bram

Eksploatacja podmorskiej linii kablowej jest procesem bezobsługowym. Rozpoczyna się po podłączeniu kabli do morskiej stacji elektroenergetycznej i/lub przekazaniu stacji do eksploatacji. Na potrzeby eksploatacji, monitorowania i obsługi morskich farm wiatrowych wraz z zespołami urządzeń wyprowadzenia mocy zostanie zorganizowana baza obsługowo-serwisowa w Łebie. Baza będzie składać się z biura, dyspozytorni i magazynu wraz z zapleczem nadbrzeżnym.

W czasie eksploatacji kabli podmorskich okresowo prowadzone będą badania dna morskiego. Z wykorzystaniem specjalnej aparatury do badań sejsmicznych dna morskiego zostanie sprawdzony stan zakopania kabli w dnie morskim.

Energia elektryczna w części lądowej będzie przesyłana czterema podziemnymi kablami eksportowymi, z których każdy będzie składać się z 3 osobnych kabli jednożyłowych, o napięciu roboczym 220 kV pracującymi w technologii przemiennoprądowej (AC, alternating current). Izolację zastosowanych kabli stanowić będzie usieciowany polietylen (XLPE). Dokładne parametry techniczne kabli zostaną ustalone na późniejszym etapie realizacji Przedsięwzięcia.

Etap eksploatacji podziemnej linii kablowej w części lądowej jest procesem bezobsługowym. Ze względu na konieczność zapewnienia dostępu do podziemnej infrastruktury kablowej oraz zabezpieczenie przed ewentualnym uszkodzeniem kabli przez systemy korzeniowe nastąpi trwałe wyłączenie z użytkowania leśnego w pasie o szerokości od ok. 12 m do ok. 25 m zależnie od odcinka korytarza kablowego (z wyjątkiem odcinka wykonanego w technologii bezwykopowej gdzie takie wyłączenie nie jest wymagane). W tym kontekście zapewniony zostanie dostęp do muf kablowych. Stan techniczny linii kablowych na całej swojej długości będzie monitorowany poprzez zastosowanie technologii dynamicznego monitorowania stanu kabla.

Baza obsługowo-serwisowa w Łebie będzie służyć również obsłudze linii kablowych oraz lądowych stacji elektroenergetycznych. W ramach eksploatacji LSE przewiduje się

regularne przeglądy i serwis. Prace utrzymaniowo-serwisowe stacji lądowych przewidziane są kilka razy w roku.

Likwidacja to odwrócony proces budowy z tym samym układem logistycznym, przy czym dla linii kablowych przy założeniu ich usunięcia. W przypadku kabli, po uprzednim pozbawieniu napięcia i unieczynnieniu, przewiduje się dwa możliwe sposoby likwidacji, poprzez pozostawienie ich w dnie i w ziemi lub usunięcie. Ostateczna decyzja o sposobie likwidacji przedsięwzięcia zostanie podjęta po zakończeniu eksploatacji. Po wycofaniu z eksploatacji wszystkie elementy infrastruktury stacji zostaną zdemontowane.

Położenie planowanego przedsięwzięcia można scharakteryzować w podziale na części: morską i lądową, w tym miejsce wyjścia na ląd.

Część morska:
Planowane przyłącza z morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III zlokalizowane są w obrębie wyłącznej strefy ekonomicznej, morskiej strefy przyległej, morza terytorialnego i morskich wód wewnętrznych administrowanych przez Urząd Morski w Gdyni, w korytarzu infrastrukturalnym wyznaczonym w Rozporządzeniu Rady Ministrów z dnia 14 kwietnia 2021 r. w sprawie przyjęcia Planu zagospodarowania przestrzennego morskich wód wewnętrznych, morza terytorialnego i wyłącznej strefy ekonomicznej w skali 1:200 000 (Dz.U.2021.935) – dalej Plan POM. Ponadto dodatkowy odcinek pomiędzy obszarami farm MFW Bałtyk II i MFW Bałtyk III zlokalizowany jest w wyłącznej strefie ekonomicznej i morskiej strefie przyległej w korytarzu infrastrukturalnym, zgodnie z Planem POM.
Granice korytarza, wewnątrz którego zlokalizowane będzie przedsięwzięcie na morzu wyznaczają współrzędne geograficzne (w układzie WGS84), oddzielnie dla MFW Bałtyk II i dla MFW Bałtyk III wraz z planowanym łącznikiem między farmami. Miejsce styku części morskiej i lądowej wyznaczają południowe granice działek ewidencyjnych stanowiących morskie wody wewnętrzne tj.: 394 obręb Lędowo (gm. Ustka) i 2858/4 obręb Ustka (Miasto Ustka).
Ponadto planowane przedsięwzięcie zlokalizowane jest w podakwenie 36 Wody otwarte Basenu Bornholmskiego oraz 38 Polskie wody przybrzeżne Basenu Bornholmskiego zgodnie z podziałem Morza Bałtyckiego na akweny, dla których określa się stan środowiska zgodnie z HELCOM oraz Ramową Dyrektywą w sprawie Strategii Morskiej (dalej: RDSM).

Część lądowa:
Infrastruktura przyłączeniowa z MFW Bałtyk II i MFW Bałtyk III będzie wchodziła na ląd między 236,5 a 238,5 km brzegu morskiego (wg kilometrażu Urzędu Morskiego), przekraczając pas nadbrzeżny ustanowiony zarządzeniem Dyrektora Urzędu Morskiego w Gdyni zgodnie z ustawą z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej (Dz.U.2022.457 t.j.), składający się z:

- pasa technicznego - stanowiącego strefę wzajemnego bezpośredniego oddziaływania morza i lądu przeznaczonego do utrzymania brzegu w stanie zgodnym z wymogami bezpieczeństwa i ochrony środowiska,
- pasa ochronnego – obejmującego obszar, w którym działalność człowieka wywiera bezpośredni wpływ na stan pasa technicznego.

Lądowy korytarz przebiega na terenie gminy Ustka i gminy Słupsk (powiat słupski, woj. pomorskie) na odcinku maksymalnie do 14 km długości i szerokości do ok. 60 m (z lokalnymi poszerzeniami w rejonie wyjścia infrastruktury przyłączeniowej na ląd oraz miejsc, gdzie przeszkody terenowe będą przekraczane metodą bezwykopową. W rejonie przejść bezwykopowych, celem umożliwienia lokalizacji niezbędnych placów budowy, korytarz lądowy poszerzony został do ok. 100 m. Faktyczna zajętość terenu pod pas budowlano – montażowy

kabli będzie wynosiła 30-32 m, w wyjątkiem wspomnianych obszarów realizacji przejść bezwykopowych. Trasa podziemnej linii kablowej będzie prowadziła częściowo przez lasy administrowane przez RDLP w Szczecinku w granicach Nadleśnictwa Ustka, leśnictwa Modlinek i Pęplino, przez tereny zamknięte w resorcie obrony narodowej oraz przez tereny rolne.

Do infrastruktury przyłączeniowej z morskich farm wiatrowych MFW Bałtyk II i Bałtyk III należą również dwie lądowe stacje elektroenergetyczne zlokalizowane w rejonie wsi Pelplino na działkach nr 148/3 i 148/4, obręb Pęplino, gmina Ustka.

Odcinek łączący LSE ze stacją PSE S.A. Słupsk Wierzbięciono będzie stanowiła podziemna linia elektroenergetyczna o długości ok. 6 km. Punkt końcowy planowanej inwestycji stanowią zaciski prądowe na stacji PSE S.A. Słupsk Wierzbięcino.

Część morska – współrzędne geograficzne wyznaczające granice przedsięwzięcia

Przyłącze z morskiej farmy wiatrowej **MFW BAŁTYK II**

ID Punktu	Długość geograficzna (WGS84) [° ' "]	Szerokość geograficzna (WGS84) [° ' "]
1	16° 46' 37.71"	54° 34' 18.26"
2	16° 50' 42.69"	54° 37' 16.55"
3	16° 54' 47.93"	54° 51' 15.68"
4	16° 55' 19.40"	54° 53' 03.38"
5	16° 55' 33.72"	54° 53' 52.36"
6	16° 54' 53.92"	54° 58' 11.06"
7	16° 51' 10.79"	55° 01' 28.14"
8	16° 50' 26.36"	55° 02' 07.46"
9	16° 49' 58.84"	55° 05' 06.17"
10	16° 52' 02.38"	55° 06' 08.48"
11	16° 53' 51.03"	55° 05' 16.42"
12	16° 53' 13.82"	55° 04' 32.87"
13	16° 51' 55.53"	55° 03' 55.94"
14	16° 52' 10.10"	55° 01' 59.95"
15	16° 51' 49.78"	55° 02' 03.66"
16	16° 51' 35.53"	55° 02' 06.26"
17	16° 52' 37.93"	55° 01' 15.10"
18	16° 55' 49.46"	54° 58' 20.84"
19	16° 56' 30.13"	54° 53' 51.31"
20	16° 56' 19.31"	54° 53' 14.07"
21	16° 56' 08.91"	54° 52' 38.20"
22	16° 55' 50.33"	54° 51' 34.78"
23	16° 51' 50.95"	54° 37' 58.37"
24	16° 51' 12.00"	54° 37' 42.00"
25	16° 51' 10.03"	54° 36' 45.53"
26	16° 49' 54.99"	54° 35' 54.71"
27	16° 49' 56.12"	54° 35' 09.55"
Pomiędzy punktami 1 i 27 przebieg po granicy wyznaczonej linią brzegu, o której mowa w art. 220 ustawy z dnia 20 lipca 2017 r. – Prawo wodne (Dz.U. z 2021 r. poz. 2233 z późn. zm.)		

Przyłącze z morskiej farmy wiatrowej **MFW BAŁTYK III razem z łącznikiem** między farmami MFW Bałtyk II i MFW Bałtyk III:

ID Punktu	Długość geograficzna (WGS84) [° ' "]	Szerokość geograficzna (WGS84) [° ' "]
1'	16° 46' 37.71"	54° 34' 18.26"
2'	16° 50' 42.69"	54° 37' 16.55"
3'	16° 54' 47.93"	54° 51' 15.68"
4'	16° 55' 19.40"	54° 53' 03.38"
5'	16° 56' 19.31"	54° 53' 14.07"
6'	17° 07' 32.02"	54° 55' 06.32"
7'	17° 13' 28.70"	54° 56' 05.43"
8'	17° 16' 57.43"	54° 56' 42.42"

ID Punktu	Długość geograficzna (WGS84) [° ' "]	Szerokość geograficzna (WGS84) [° ' "]
9'	17° 15' 51.80"	54° 58' 50.80"
10'	17° 11' 28.64"	54° 58' 10.42"
11'	17° 10' 40.12"	54° 58' 00.56"
12'	17° 07' 31.85"	54° 58' 36.18"
13'	16° 52' 37.93"	55° 01' 15.10"
14'	16° 51' 10.79"	55° 01' 28.14"
15'	16° 50' 26.36"	55° 02' 07.46"
16'	16° 49' 58.84"	55° 05' 06.17"
17'	16° 52' 02.38"	55° 06' 08.48"
18'	16° 53' 51.03"	55° 05' 16.42"
19'	16° 53' 13.82"	55° 04' 32.87"
20'	16° 51' 55.53"	55° 03' 55.94"
21'	16° 52' 10.10"	55° 01' 59.95"
22'	16° 51' 49.78"	55° 02' 03.66"
23'	16° 51' 35.53"	55° 02' 06.26"
24'	17° 07' 49.15"	54° 59' 07.13"
25'	17° 10' 39.67"	54° 58' 34.43"
26'	17° 11' 14.79"	54° 58' 41.50"
27'	17° 15' 36.56"	54° 59' 21.89"
28'	17° 16' 20.04"	54° 59' 28.69"
29'	17° 19' 43.45"	55° 00' 20.72"
30'	17° 23' 38.22"	55° 00' 49.09"
31'	17° 24' 22.30"	54° 59' 03.73"
32'	17° 23' 33.54"	54° 57' 50.51"
33'	17° 22' 39.89"	54° 57' 32.87"
34'	17° 20' 19.87"	54° 56' 57.93"
35'	17° 18' 57.51"	54° 56' 52.93"
36'	17° 17' 50.31"	54° 56' 27.65"
37'	17° 17' 40.57"	54° 56' 47.38"
38'	17° 17' 55.01"	54° 56' 18.14"
39'	17° 13' 43.61"	54° 55' 34.40"
40'	17° 03' 14.58"	54° 53' 49.40"
41'	16° 56' 08.91"	54° 52' 38.20"
42'	16° 55' 50.33"	54° 51' 34.78"
43'	16° 51' 50.95"	54° 37' 58.37"
44'	16° 51' 12.00"	54° 37' 42.00"
45'	16° 51' 10.03"	54° 36' 45.53"
46'	16° 49' 54.99"	54° 35' 54.71"
47'	16° 49' 56.12"	54° 35' 09.55"
Pomiędzy punktami 1' i 47' przebieg po granicy wyznaczonej linią brzegu, o której mowa w art. 220 ustawy z dnia 20 lipca 2017 r. – Prawo wodne (Dz.U. z 2021 r. poz. 2233 z późn. zm.)		

Ponadto część morską przedsięwzięcia stanowią **działki ewidencyjne stanowiące morskie wody wewnętrzne:**

Nr działki	Obręb	Gmina	Powiat
394	Lędowo	Ustka	słupski
2858/4	Ustka	Ustka	słupski

2. Część lądowa – działki ewidencyjne w granicach planowanego Przedsięwzięcia Nr działki	Obręb	Gmina	Powiat
295/2	Bruskowo Leśnictwo	Słupsk	słupski
296	Bruskowo Leśnictwo	Słupsk	słupski
306/2	Bruskowo Leśnictwo	Słupsk	słupski
306/3	Bruskowo Leśnictwo	Słupsk	słupski
307/2	Bruskowo Leśnictwo	Słupsk	słupski
321	Bruskowo Leśnictwo	Słupsk	słupski
322	Bruskowo Leśnictwo	Słupsk	słupski
323/3	Bruskowo Leśnictwo	Słupsk	słupski
334	Bruskowo Leśnictwo	Słupsk	słupski
353	Bruskowo Leśnictwo	Słupsk	słupski
102/1	Bruskowo Małe	Słupsk	słupski
102/3	Bruskowo Małe	Słupsk	słupski

2. Część lądowa – działki ewidencyjne w granicach planowanego Przedsięwzięcia Nr działki	Obręb	Gmina	Powiat
102/4	Bruskowo Małe	Słupsk	słupski
102/5	Bruskowo Małe	Słupsk	słupski
102/6	Bruskowo Małe	Słupsk	słupski
102/7	Bruskowo Małe	Słupsk	słupski
103	Bruskowo Małe	Słupsk	słupski
104/1	Bruskowo Małe	Słupsk	słupski
104/2	Bruskowo Małe	Słupsk	słupski
104/3	Bruskowo Małe	Słupsk	słupski
105	Bruskowo Małe	Słupsk	słupski
106/1	Bruskowo Małe	Słupsk	słupski
106/2	Bruskowo Małe	Słupsk	słupski
107/2	Bruskowo Małe	Słupsk	słupski
107/3	Bruskowo Małe	Słupsk	słupski
108/4	Bruskowo Małe	Słupsk	słupski
108/6	Bruskowo Małe	Słupsk	słupski
147	Bruskowo Małe	Słupsk	słupski
148	Bruskowo Małe	Słupsk	słupski
158/2	Bruskowo Wielkie	Słupsk	słupski
158/3	Bruskowo Wielkie	Słupsk	słupski
163/3	Bruskowo Wielkie	Słupsk	słupski
163/4	Bruskowo Wielkie	Słupsk	słupski
164/19	Bruskowo Wielkie	Słupsk	słupski
273	Bruskowo Wielkie	Słupsk	słupski
274	Bruskowo Wielkie	Słupsk	słupski
275	Bruskowo Wielkie	Słupsk	słupski
234/1	Wielichowo	Słupsk	słupski
325	Wielichowo	Słupsk	słupski
14/1	Duninowo PGR	Ustka	słupski
24/7	Duninowo PGR	Ustka	słupski
24/8	Duninowo PGR	Ustka	słupski
25/2	Duninowo PGR	Ustka	słupski
25/3	Duninowo PGR	Ustka	słupski
25/7	Duninowo PGR	Ustka	słupski
28/6	Duninowo PGR	Ustka	słupski
29/4	Duninowo PGR	Ustka	słupski
32	Duninowo PGR	Ustka	słupski
33	Duninowo PGR	Ustka	słupski
6/14	Duninowo PGR	Ustka	słupski
6/21	Duninowo PGR	Ustka	słupski
6/3	Duninowo PGR	Ustka	słupski
7	Duninowo PGR	Ustka	słupski
77	Duninowo PGR	Ustka	słupski
78/10	Duninowo PGR	Ustka	słupski
79/10	Duninowo PGR	Ustka	słupski
79/7	Duninowo PGR	Ustka	słupski
79/8	Duninowo PGR	Ustka	słupski
80	Duninowo PGR	Ustka	słupski
79/5	Duninowo PGR	Ustka	słupski
79/9	Duninowo PGR	Ustka	słupski
113/2	Lędowo	Ustka	słupski
113/3	Lędowo	Ustka	słupski
114/3	Lędowo	Ustka	słupski
115/5	Lędowo	Ustka	słupski
116/4	Lędowo	Ustka	słupski
117/5	Lędowo	Ustka	słupski
118/13	Lędowo	Ustka	słupski
118/14	Lędowo	Ustka	słupski
119/5	Lędowo	Ustka	słupski
119/6	Lędowo	Ustka	słupski
119/7	Lędowo	Ustka	słupski
120/1	Lędowo	Ustka	słupski
120/3	Lędowo	Ustka	słupski
121/3	Lędowo	Ustka	słupski
121/5	Lędowo	Ustka	słupski
122/3	Lędowo	Ustka	słupski
155/1	Lędowo	Ustka	słupski
155/2	Lędowo	Ustka	słupski
156	Lędowo	Ustka	słupski
158	Lędowo	Ustka	słupski
160	Lędowo	Ustka	słupski
162/1	Lędowo	Ustka	słupski
162/2	Lędowo	Ustka	słupski
171	Lędowo	Ustka	słupski
173	Lędowo	Ustka	słupski
174	Lędowo	Ustka	słupski
176	Lędowo	Ustka	słupski
177	Lędowo	Ustka	słupski
178	Lędowo	Ustka	słupski
179	Lędowo	Ustka	słupski
180	Lędowo	Ustka	słupski
190	Lędowo	Ustka	słupski

2. Część lądowa – działki ewidencyjne w granicach planowanego Przedsięwzięcia Nr działki	Obręb	Gmina	Powiat
206	Lędowo	Ustka	słupski
207	Lędowo	Ustka	słupski
208	Lędowo	Ustka	słupski
211/1	Lędowo	Ustka	słupski
226	Lędowo	Ustka	słupski
233	Lędowo	Ustka	słupski
237/2	Lędowo	Ustka	słupski
238	Lędowo	Ustka	słupski
239	Lędowo	Ustka	słupski
248	Lędowo	Ustka	słupski
249	Lędowo	Ustka	słupski
26/1	Lędowo	Ustka	słupski
264	Lędowo	Ustka	słupski
297	Lędowo	Ustka	słupski
298/1	Lędowo	Ustka	słupski
303/1	Lędowo	Ustka	słupski
308/2	Lędowo	Ustka	słupski
315	Lędowo	Ustka	słupski
318	Lędowo	Ustka	słupski
321	Lędowo	Ustka	słupski
322	Lędowo	Ustka	słupski
323	Lędowo	Ustka	słupski
329	Lędowo	Ustka	słupski
332	Lędowo	Ustka	słupski
334	Lędowo	Ustka	słupski
336	Lędowo	Ustka	słupski
357/11	Lędowo	Ustka	słupski
357/24	Lędowo	Ustka	słupski
357/30	Lędowo	Ustka	słupski
357/31	Lędowo	Ustka	słupski
357/8	Lędowo	Ustka	słupski
358/105	Lędowo	Ustka	słupski
358/131	Lędowo	Ustka	słupski
358/132	Lędowo	Ustka	słupski
358/86	Lędowo	Ustka	słupski
359	Lędowo	Ustka	słupski
363	Lędowo	Ustka	słupski
64	Lędowo	Ustka	słupski
89/4	Lędowo	Ustka	słupski
89/5	Lędowo	Ustka	słupski
90/6	Lędowo	Ustka	słupski
90/7	Lędowo	Ustka	słupski
90/8	Lędowo	Ustka	słupski
92/5	Lędowo	Ustka	słupski
92/7	Lędowo	Ustka	słupski
93/1	Lędowo	Ustka	słupski
93/3	Lędowo	Ustka	słupski
94/3	Lędowo	Ustka	słupski
94/4	Lędowo	Ustka	słupski
94/5	Lędowo	Ustka	słupski
95/4	Lędowo	Ustka	słupski
95/5	Lędowo	Ustka	słupski
95/7	Lędowo	Ustka	słupski
95/8	Lędowo	Ustka	słupski
237/1	Lędowo	Ustka	słupski
148/3	Pęplino	Ustka	słupski
148/4	Pęplino	Ustka	słupski
149/2	Pęplino	Ustka	słupski
170	Pęplino	Ustka	słupski
181	Pęplino	Ustka	słupski
183/2	Pęplino	Ustka	słupski
185/2	Pęplino	Ustka	słupski
186	Pęplino	Ustka	słupski
187	Pęplino	Ustka	słupski
188	Pęplino	Ustka	słupski
189	Pęplino	Ustka	słupski
190	Pęplino	Ustka	słupski
191	Pęplino	Ustka	słupski
192	Pęplino	Ustka	słupski
193	Pęplino	Ustka	słupski
194	Pęplino	Ustka	słupski
195	Pęplino	Ustka	słupski
201/2	Pęplino	Ustka	słupski
202/3	Pęplino	Ustka	słupski
203/2	Pęplino	Ustka	słupski
205/2	Pęplino	Ustka	słupski
206/2	Pęplino	Ustka	słupski
207/4	Pęplino	Ustka	słupski
208/4	Pęplino	Ustka	słupski
209/4	Pęplino	Ustka	słupski
210/2	Pęplino	Ustka	słupski

2. Część lądowa – działki ewidencyjne w granicach planowanego Przedsięwzięcia Nr działki	Obręb	Gmina	Powiat
211/3	Pęplino	Ustka	słupski
212/1	Pęplino	Ustka	słupski
213/4	Pęplino	Ustka	słupski
214/2	Pęplino	Ustka	słupski
215/2	Pęplino	Ustka	słupski
217/1	Pęplino	Ustka	słupski
218/2	Pęplino	Ustka	słupski
219/2	Pęplino	Ustka	słupski
220/2	Pęplino	Ustka	słupski
222/2	Pęplino	Ustka	słupski
223/2	Pęplino	Ustka	słupski
224/7	Pęplino	Ustka	słupski
224/8	Pęplino	Ustka	słupski
225	Pęplino	Ustka	słupski
226	Pęplino	Ustka	słupski
227	Pęplino	Ustka	słupski
228	Pęplino	Ustka	słupski
229	Pęplino	Ustka	słupski
230	Pęplino	Ustka	słupski
231	Pęplino	Ustka	słupski
233	Pęplino	Ustka	słupski
234	Pęplino	Ustka	słupski
235	Pęplino	Ustka	słupski
236/1	Pęplino	Ustka	słupski
236/2	Pęplino	Ustka	słupski
237	Pęplino	Ustka	słupski
238	Pęplino	Ustka	słupski
239	Pęplino	Ustka	słupski
240/4	Pęplino	Ustka	słupski
274/1	Pęplino	Ustka	słupski
276/3	Pęplino	Ustka	słupski
277	Pęplino	Ustka	słupski
278	Pęplino	Ustka	słupski
279	Pęplino	Ustka	słupski
280	Pęplino	Ustka	słupski
283/1	Pęplino	Ustka	słupski
283/3	Pęplino	Ustka	słupski
284	Pęplino	Ustka	słupski
285/1	Pęplino	Ustka	słupski
285/2	Pęplino	Ustka	słupski
292/10	Pęplino	Ustka	słupski
292/11	Pęplino	Ustka	słupski
292/12	Pęplino	Ustka	słupski
292/14	Pęplino	Ustka	słupski
292/15	Pęplino	Ustka	słupski
292/18	Pęplino	Ustka	słupski
292/2	Pęplino	Ustka	słupski
292/3	Pęplino	Ustka	słupski
292/8	Pęplino	Ustka	słupski
292/9	Pęplino	Ustka	słupski
295/4	Pęplino	Ustka	słupski

Dla projektu MFW Bałtyk II Inwestor uzyskał dotychczas:

- pozwolenie na wznoszenie i wykorzystywanie sztucznych wysp, konstrukcji i urządzeń wodnych w polskich obszarach morskich (PSZW) dla przedsięwzięcia MFW Bałtyk Środkowy II (obecnie morska farma wiatrowa MFW Bałtyk II), wydane przez Ministra Transportu, Budownictwa i Gospodarki Morskiej decyzją nr MFW/2/2013 z 15 stycznia 2013 roku, zmienioną decyzją MFW/2a/13 z 29 kwietnia 2013 r.;
- warunki przyłączenia wydane przez PSE S.A. – sformułowane w Umowie nr DS/MFW10/2021/BAŁTYK ŚRODKOWY II o przyłączenie do sieci przesyłowej morskiej farmy wiatrowej Bałtyk Środkowy II z dnia 31 stycznia 2013 r (do stacji Słupsk – Wierzbięcino);
- decyzję o środowiskowych uwarunkowaniach dla przedsięwzięcia pn.: „Budowa morskiej farmy wiatrowej Polenergia Bałtyk II" z dnia 27 marca 2017 r. znak: RDOŚ-Gd-WOO.4211.26.2015.KSZ.20 wydaną przez RDOŚ w Gdańsku, zmienioną decyzją RDOŚ w Gdańsku z dnia 26 października 2021 r. znak: RDOŚ-Gd.WOO.420.3.2021.KSZ.14 zpo.

Dla projektu MFW Bałtyk III Inwestor uzyskał dotychczas:

- pozwolenie na wznoszenie i wykorzystywanie sztucznych wysp, konstrukcji i urządzeń wodnych w polskich obszarach morskich dla przedsięwzięcia MFW Bałtyk Środkowy III (obecnie morska farma wiatrowa MFW Bałtyk III), wydane przez Ministra Transportu, Budownictwa i Gospodarki Morskiej decyzją nr MFW/2/2012 z 30 marca 2012 roku;
- warunki przyłączenia do sieci wydane przez PSE S.A. w Umowie nr DS/MFW/2012/BAŁTYK III o przyłączenie do sieci przesyłowej morskiej farmy wiatrowej Bałtyk Środkowy z dnia 7 sierpnia 2014 r (do stacji Słupsk – Wierzbięciono);
- decyzję o środowiskowych uwarunkowaniach dla przedsięwzięcia pn.: „Budowa morskiej farmy wiatrowej Bałtyk Środkowy III" z dnia 7 lipca 2016 r. znak: RDOŚ-Gd-WOO.4211.12.2015.KP.22 wydaną przez RDOŚ w Gdańsku.

Ponadto dla korytarza, w którym układane będą podmorskie kable eksportowe z morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III Inwestor uzyskał:

- Decyzję Dyrektora Urzędu Morskiego w Słupsku nr 4/14 z dnia 19 marca 2014 r. w sprawie pozwolenia na ułożenie i utrzymanie w granicach morza terytorialnego kabli podmorskich będących częścią morskiej infrastruktury przesyłowej energii elektrycznej z MFW Bałtyk Środkowy II i MFW Bałtyk Środkowy III do lądowej stacji elektroenergetycznej KSE Słupsk Wierzbięcino;
- Decyzję Ministra Transportu, Budownictwa i Gospodarki Morskiej z dnia 19 lipca 2013 r. znak: GT7/pb/62/14823/decyzja/2013 uzgadniającą lokalizację układania i sposobów utrzymywania podmorskich kabli w wyłącznie strefie ekonomicznej dla przedsięwzięcia „Infrastruktura przyłączeniowa zewnętrzna morskiej farmy wiatrowej.

Przedsięwzięcie będzie realizowane w dwóch różnych przyrodniczo i funkcjonalnie obszarach: morskim i lądowym.

Faza budowy

Na obszarze morskim linie kablowe poprowadzone zostaną od MSE na obszarze MFW Bałtyk II oraz od MSE na obszarze MFW Bałtyk III, następnie korytarze z obu farm będą łączyły się poniżej Ławicy Słupskiej i poprowadzone będą w jednym korytarzu do wejścia na ląd na za zachód od Ustki. Przedsięwzięcie w części morskiej zlokalizowane zostanie w korytarzu o szerokości ok. 1000 m (z wyjątkiem części południowej, gdzie korytarz rozszerza się w kierunku linii brzegowej). Prace budowlane obejmą korytarz o długości ok. 60 km dla IP MFW Bałtyk II oraz ok. 67 km IP MFW Bałtyk III oraz opcjonalnie 30 km łącznika IP między MFW Bałtyk II a MFW Bałtyk III. W części wspólnej korytarza zostaną ułożone 4 linie kablowe, na pozostałych odcinkach, dla poszczególnej infrastruktury przyłączeniowej po 2 linie. Szerokość pasa bezpośrednio związanego z technologią układania kabli wynosi ok. 10 m dla każdej z linii kablowych, przy czym średnia szerokość wykopu pod jeden kabel wynosi jedynie ok. 1 m. Docelowa wartość zostanie doprecyzowana po wyborze technologii zakopywania kabli w dnie morskim i wariantu wejścia na ląd.

W części lądowej planowane linie wyprowadzenia mocy z morskich farm wiatrowych MFW Bałtyk II i MFW Bałtyk III prowadzone będą w jednym korytarzu, do wyznaczonych punktów przyłączenia w stacji PSE S.A. Słupsk Wierzbięcino. Na potrzeby realizacji linii kablowych na lądzie wyznaczono jeden korytarz kablowy o szerokości ok. 60 m, w którym zawarty będzie wspólny dla wszystkich kabli pas budowlano – montażowy o szerokości do 30-32 m. W korytarzu tym warstwa wierzchniej warstwy ziemi zostanie zdjęta, a drzewa i krzewy zostaną usunięte. W miejscach, gdzie planowane są mniejsze przejścia bezwykopowe (przykładowo: Struga Lędowska, przejście przez drogę wojewódzką i linię kolejową) szerokość zajętości terenu została zwiększona do 50 m, aby zapewnić odpowiednie miejsce na organizację placu budowy. Place budowy dla przejść bezwykopowych zostaną zlokalizowane wewnątrz korytarza o szerokości 100 m. Maksymalna zajętość terenu pod plac budowy na potrzeby wyjścia na ląd infrastruktury przyłączeniowej szacowana jest na ok. 3,3 ha.

Faza eksploatacji

W przypadku odcinka podmorskiego, planuje się zakopanie kabla, co maksymalnie ograniczy możliwość kolizji i konieczność wprowadzania ograniczeń w użytkowaniu akwenu. W odniesieniu do podziemnych linii kablowych trwałe zajęcie terenu wynosić będzie w zależności od odcinka korytarza kablowego od ok. 12 m do ok. 25 m pod pas techniczny stały, w celu umożliwienia inspekcji i napraw wzdłuż linii kablowych. W bezpośrednim sąsiedztwie kabli – ok. 2 – 3 m od kabla nie będzie można sadzić drzew w związku z ryzykiem uszkodzenia kabli przez systemy korzeniowe i ewentualną awarię. Planowane jest także zajęcie terenu na potrzeby stanowisk mufowych - konstrukcji podziemnych stanowiących zabezpieczanie i zapewniających dostęp do muf morsko lądowych, łączących kable morskie z lądowymi. Możliwe, że obszar ten będzie wymagał ogrodzenia i kontroli dostępu - zostanie to przesądzone na etapie projektu budowlanego. Ponadto trwałego zajęcia terenu wymaga realizacja lądowych stacji elektroenergetycznych. Trwałe przekształcenie terenu obejmie przede wszystkim miejsce lokalizacji planowanych LSE – łącznie ok. 16 ha gruntów rolnych na glebach średniej i słabej jakości (klasy IVa, IVb i V).

Planowane przedsięwzięcie zrealizowane zostanie wewnątrz korytarza, którego powierzchnia w części morskiej wynosi ok. 174,63 km^2, a w części lądowej - ok. 2,34 km^2. Korytarz, w którym realizowane będzie przedsięwzięcie nie jest tożsamy z obszarem przedsięwzięcia. Przewidywana powierzchnia, która ulegnie przekształceniu na etapie budowy i eksploatacji przedsięwzięcia będzie znacząco mniejsza od powierzchni korytarza. Powodem objęcia wnioskiem obszaru większego niż obszar niezbędny do budowy i funkcjonowania przedsięwzięcia jest zapewnienie na etapie projektowania możliwości optymalizacji lokalizacji przedsięwzięcia i rozwiązań technicznych, np. w związku z koniecznością ominięcia zidentyfikowanych przeszkód terenowych lub uwzględnienia wymogów wynikających z uzyskanych decyzji i pozwoleń.

W fazie budowy pracami objęte zostaną pas robót budowlanych wzdłuż ostatecznie przyjętej trasy kabli oraz place budowy pod wybraną technologię przejścia bezwykopowego linii kablowych z morza na ląd i LSE wraz z drogą dojazdową. Na lądzie wzdłuż trasy kabli szerokość pasa robót budowlanych łącznie dla obu przyłączy wyniesie ok. 30-32 m, a w miejscach ewentualnych przejść bezwykopowych - ok. 50 m.

W fazie funkcjonowania zajętość terenu będzie znacząco mniejsza niż w fazie budowy i obejmie jedynie bezpośrednie otoczenie trasy kablowej, gdzie wprowadza się pewne ograniczenia w celu ochrony kabli przed uszkodzeniami, oraz obszar LSE wraz z drogą dojazdową. W przypadku lądu wzdłuż trasy kabli będzie to łącznie dla obu przyłączy pas o szerokości ok. 12 m do 25 m w zależności od odcinka korytarza kablowego.

Rejon przeznaczony pod realizację inwestycji w części morskiej leży w granicach obszarów europejskiej sieci Natura 2000:

1. PLB990002 Przybrzeżne Wody Bałtyku,
2. PLC990001 Ławica Słupska.

Inne najbliżej położone obszary Natura 2000 to:

1. Przymorskie Błota PLH220024, oddalony o ok 300 metrów na zachód od planowanej inwestycji,
2. PLH320068 Jezioro Wicko i Modelskie Wydmy oddalony o ok. 1,4 km na zachód od planowanej inwestycji,
3. PLH220052 Dolina Słupi oddalony o ok. 1,5 km na wschód od planowanej inwestycji.

Planowany kabel w części morskiej przebiega przez obszar Natura 2000 PLB990002 Przybrzeżne Wody Bałtyku. Zgodnie ze Standardowym Formularzem Danych (aktualizacja: marzec 2022 r.) przedmiotami ochrony w obszarze Natura 2000 Przybrzeżne wody Bałtyku PLB990002 są gatunki: alka (*Alca torda*), nurnik (*Cepphus grylle*), lodówka (*Clangula hyemalis*), mewa srebrzysta (*Larus argentatus*), uhla (*Melanitta fusca*) oraz markaczka (*Melanitta nigra*). Dla obszaru Natura 2000 Przybrzeżne wody Bałtyku PLB990002 nie został ustanowiony plan zadań ochronnych. Należy jednak podkreślić, że trwają obecnie prace nad ustanowieniem planu zadań ochronnych dla ww. obszaru Natura 2000. Planowane przedsięwzięcie przekracza chroniony obszar wzdłuż osi północ-południe, na długości ok. 20 km.

Zgodnie z zapisami Standardowego Formularza Danych, obszar Natura 2000 Ławica Słupska PLC990001 stanowi obszar zimowania nurnika (*Cepphus grylle*) i lodówki (*Clangula hyemalis*) oraz teren, na którym występują dwa typy siedlisk przyrodniczych: 1110 Piaszczyste ławice podmorskie i 1170 Skaliste i kamieniste dno morskie, rafy. Dla obszaru Natura 2000 Ławica Słupska PLC990001 został przygotowany projekt planu ochrony. Zgodnie z projektem planu ochrony dla Ławicy Słupskiej PLC990001 zidentyfikowano następujące zagrożenia, które może spowodować realizacja prac związanych z realizacją infrastruktury przyłączeniowej FEW Baltic II: Zagrożenie H03.01 Wycieki ropy dla siedliska nr 1110, 1170 oraz lodówki, uhli i nurnika, zagrożenie dla nurnika, lodówki oraz uhli o kodzie D03.02 Szlaki żeglugowe, porty, konstrukcje morskie.

Planowane przedsięwzięcie przekracza Ławicę Słupską wzdłuż osi północ-południe, na odcinku ok. 20 km (IP MFW Bałtyk II) oraz wzdłuż osi zachód-wschód, przechodząc wzdłuż północnej i południowej granicy obszaru na dystansie ok. 30 km (IP MFW Bałtyk III plus łącznik). Zgodnie z KIP, planowane przedsięwzięcie nie ingeruje w siedlisko 1170 *Skaliste i kamieniste dno morskie, rafy.* Przekracza natomiast siedlisko 1110 *Piaszczyste ławice podmorskie* i będzie w nie ingerować na powierzchni mniejszej niż 0,05% całej powierzchni siedliska zinwentaryzowanego na Ławicy Słupskiej.

Na podstawie przedłożonych informacji nie można wykluczyć oddziaływania bezpośredniego i pośredniego na gatunki chronione w ww. obszarach Natura 2000 i ich siedliska oraz siedlisk przyrodniczych.

Tym samym jest konieczne przeprowadzenie oceny w trybie art. 6.3 Dyrektywy Siedliskowej.

Układanie linii kablowych na obszarze morskim będzie miało wpływ na poruszenie się osadów dennych oraz uwolnienie związków biogennych z dna morskiego. Ilość powstałej zawiesiny zależeć będzie od technologii układania linii kablowych, głębokości wody oraz rodzaju osadów dennych. Naruszenie dna morskiego podczas realizacji przedsięwzięcia spowoduje fizyczne uszkodzenie naturalnych zbiorowisk bentosu. Realizacja morskich farm wiatrowych oraz ich przyłączy może skutkować wystąpieniem oddziaływań skumulowanych na środowisko, szczególnie w zakresie wpływu na dno morskie oraz organizmy z nim związane.

W rejonie inwestycji podczas budowy i eksploatacji może dojść do incydentalnych zdarzeń lub wypadków, w wyniku których mogą powstać rozlewy np. substancji ropopochodnych, głównie olejów napędowych, hydraulicznych i smarowych ze statków, które mogą mieć wpływ na środowisko morskie. Rozlewy olejowe w obrębie otwartych wód morskich, jak i w pobliżu brzegu, mogą stanowić problem o długotrwałych skutkach dla fauny, flory, rybołówstwa i plaż objętych skażeniem.

Planowana inwestycja w obszarze lądowym przechodzi przez Obszar Chronionego Krajobrazu Pas Pobrzeża na Zachód od Ustki, na odcinku ok. 2 km, gdzie obowiązują przepisy uchwały nr 259/XXIV/16 Sejmiku Województwa Pomorskiego z dnia 25 lipca 2016 r. w sprawie obszarów chronionego krajobrazu w województwie pomorskim (*Dz. U. Woj. Pom. z 2016 r., poz. 2942*).
Tut. organ uznał, że ze względu na zakres oraz zasięg planowanej inwestycji planowane przedsięwzięcie może oddziaływać na ekosystemy terenów chronionych w ww. Obszarze Chronionego Krajobrazu.
Biorąc pod uwagę charakter, skalę oraz położenie przedsięwzięcia, nie można wykluczyć jego oddziaływania na środowisko przyrodnicze obszaru, gdzie realizowane będzie zamierzenie.
Podkreślić należy, że przedmiotowy teren zlokalizowany jest w granicach korytarza ekologicznego Pobrzeże Słowińskie KPn-20A. Zatem realizacja przedsięwzięcia pośrednio może wpłynąć także na ciągłość i drożność tego korytarza.

Akwen objęty wnioskiem o wydanie decyzji środowiskowej obejmuje strefę dna rozciągającą się od północnej i północno-wschodniej krawędzi Ławicy Słupskiej, poprzez wschodnią część Ławicy do brzegu w rejonie Ustki.

Maksymalny zasięg występowania makroglonów w wodach Bałtyku przytwierdzonych do dna twardego (otoczaki, głazy, gliny) wynosi 22 m, natomiast roślin zakorzenionych w dnie miękkim (piasek, żwir) – 10 m. Badania zbiorowisk bentosowych na potrzeby inwestycji wykazały brak udziału roślin naczyniowych w strefie przybrzeżnej o głębokości 0-13 m. Obecna tu duża dynamika wód i podłoże piaszczyste utrudniają zakorzenianie się roślinom w dnie. Makroglony występują na dnie twardym (otoczaki, głazy, gliny), maksymalnie do głębokości 25 m.

Badania wykazały, że w akwenie, gdzie planowana jest realizacja Przedsięwzięcia występuje uboga struktura jakościowa i ilościowa fitobentosu, typowa dla rejonów wód otwartych Bałtyku o głębokościach ok. 20 m. Rośliny przytwierdzone były przeważnie do zalegających na dnie piaszczystym otoczaków i głazów, których powierzchnia bardzo często porośnięta była zwartymi koloniami omułka i pąkli. Jedynie w niewielkim rejonie (stanowiącym ok. 1% obszaru IP), znajdującym się na głębokościach 15-21 m, biegnącym na wysokości centralnej i północnej części Ławicy Słupskiej makroglony tworzyły niewielkie zbiorowiska (pokrycie dna 40-90%). Fitobentos reprezentowany był przez gatunki dotychczas notowane w polskich obszarach morskich, tj.: brunatnice – pospolite *Pylaiella littoralis* i *Ectocarpus siliculosus*, rzadkie *Sphacelaria cirrosa* oraz krasnorosty – pospolite *Polysiphonia fucoides*, rzadkie *Coccotylus truncatus*, *Rhodomela confervoides* i objęte ochroną ścisłą *Furcellaria lumbricalis* i *Ceramium diaphanum*. Gatunek *Furcellaria lumbricalis* wstępował w trzech lokalizacjach, łącznie odnotowano 3 okazy, natomiast *Ceramium diaphanum* stwierdzono na dwóch stacjach w postaci szczątków plechy.
Planowane trasy kablowe z MFW Bałtyk II i MFW Bałtyk III wychodzą na ląd na zachód od Ustki (w dwóch wariantach lokalizacyjnych) i rozcina w poprzek mezoregiony: Wybrzeże Koszalińskie i Równinę Słupską, przecinając tym samym strefowy układ fitocenoz charakterystyczny dla polskiego brzegu Bałtyku.

W części północnej korytarza lądowego rozważane są dwie alternatywne lokalizacje wyjścia kabli na ląd: zachodni i wschodni nieco różniące się od siebie stopniem szerokości poszczególnych fitocenoz wydmowych. Na obu wariantach korytarza pas wydm białych (siedlisko 2120) jest wąski, mający charakter wału nadbrzeżnego na którym akumulowany jest piasek nawiewany z plaży. Wydma biała porośnięta jest przez psammofilne trawy budując fitocenozę *Elymo-Ammophiletum*, głownie piaskownicy zwyczajnej (*Ammophila arenaria*) rzadziej wydmuchrzycy piaskowej (*Lelymus arenarius*). W miejscach mniej narażonych na zasypywanie występują takie gatunki, jak groszek nadmorski (*Lathyrus japonicus - CzL 2016 NT*) oraz turzyca piaskowa (*Carex arenaria - OCZ*). Obecność wydm szarych (siedlisko 2130)

jest zróżnicowana pod względem szerokości. W większości jest on stosunkowo wąski rozszerzając się znacznie we wschodniej części korytarza we wschodnim wariancie. Pas wydm szarych jest tu szeroki, w miejscach ustabilizowanych porośnięty roślinnością *Helichryso-Jasionetum typicum* o dominującej turzycy piaskowej (*Carex arenaria - OCZ*). Na pozostałej części korytarza planowanej inwestycji, w obu rozważanych wariantach płaty siedliska wydmy szarej są wąskie, wykształcają się na terenie o różnej konfiguracji, pokrywają obniżenia na zapleczu wydm białych oraz bardziej zaciszne obniżenia tuż przed borem nadmorskim. Pokrycie warstwą zielną jest zróżnicowane i związane przede wszystkim z wpływem antropopresji. Na płatach siedliska notowano występowanie gatunku lnicy wonnej (*Linaria odora - OS*), endemitu regionu bałtyckiego, objętego ochroną ścisłą, umieszczonego na polskiej czerwonej liście (Kazimierczakowa i in. 2016) w kategorii EN (zagrożony), ponadto objętego ochroną na mocy Dyrektywy Rady 92/43/EWG z dnia 21 maja 1992 r. w sprawie ochrony siedlisk przyrodniczych oraz dzikiej fauny i flory (Dyrektywa Siedliskowa), kod 2216. Na płatach siedliska wydmy szarej notowano tu także stanowiska kruszczyka rdzawoczerwonego (*Epipactis atrorubens OCZ*).

Na zapleczu wydm podobnie jak wzdłuż całego wybrzeża Bałtyku występują szerokie obszary lasów mieszanych i borów na wydmach nadmorskich (siedlisko 2180). Są to właściwie wykształcone fitocenozy z dużym udziałem roślin z rodziny wrzosowatych, przede wszystkim bażyny czarnej (*Empetrum nigrum OCZ*), bagna zwyczajnego (*Ledum palustre OCZ*) oraz gdzieniegdzie zimoziołu północnego (*Linnea borealis OCZ*), gruszyczek: mniejszej (*Pyrola minor OCZ*) i zielonawej (*Pyrola chlorantha OCZ*), gruszycznika jednokwiatowego (*Moneses uniflora OCZ*), kruszczyka szerokolistnego (*Epipactis helleborine OCZ*), wiciokrzewu pomorskiego (*Lonicera periclymenum OCZ*), tajęży jednostronnej (*Goodyera repens*) oraz widłaków: goździstego (*Lycopodium clavatum OCZ*) oraz jałowcowatego (*Lycopodium annotinum OCZ*). Również warstwa mszysta i porostowa jest tu właściwie wykształcona, z licznymi gatunkami mchów borowych, z których część jest objęta ochroną częściową (*Leucobryum glaucum, Pseudoscleropodium purum, Climacium dendroides, Rhytidiadelphus squarrosus, Hylocomium splendens, Ulota crispa, Ptilium crista-castrensis, Polytrichum commune, Pleurozium schreberi, Thuidium tamariscinum, Dicranum polysetum i Dicranum scop*arium). Lasy mieszane i bory na wydmach nadmorskich (siedlisko 2180) obejmują większość fitocenoz leśnych terenu planowanej inwestycji.

Na południe od fitocenoz borowych występują niewielkie płaty kwaśnej buczyny niżowej (siedlisko 9110), oraz płaty żyznych buczyn *Galio odorati-Fagenion* (siedlisko 9130) charakteryzujące się bezwzględną dominacją buka (*Fagus sylvatica*) w drzewostanie oraz słabo wykształconą warstwą krzewów w ubogim runie. Wiek najstarszych drzew wg opisu taksacyjnego drzewostanów wynosi ponad 150 lat. Płaty siedliska żyznych buczyn związane są tu z niewielkimi formami morenowymi, przechodząc płynnie w uboższe florystycznie płaty buczyny kwaśnej. Na pniach buczyn występują często porost mąkla tarczowa (*Evernia prunastri CzL* 2006 NT) oraz grzyb wielkoowocnikowy błyskoporek podkorowy (*Inonotus obliquus* OCZ).

W środkowej części korytarza planowanej inwestycji występują głownie agrocenozy. Są to przede wszystkim uprawy zbóż, rzepaku czy kukurydzy. Agrocenozy cechuje jakościowe i ilościowe ubóstwo pospolitych chwastów segetalnych. Występują one głównie na obrzeżach budując wąski pas otaczający uprawę. Roślinność miedz oraz roślinność śródpolna ze względu na duże rozproszenie nie odgrywa tu większej roli, grupując się jedynie wzdłuż dróg.

W południowej części korytarza planowanej inwestycji od strony wschodniej występują zgrupowania leśne, na części których występują płaty siedlisk: grądu subatlantyckiego *Stellario holosteae-Carpinetum betuli* (siedlisko 9160) oraz żyznych buczyn *Galio odorati-Fagenion* (siedlisko 9130) i kwaśnych buczyn *Luzulo-Fagion* (siedlisko 9110). Płaty tych siedlisk na omawianym obszarze są powierzchniowo niewielkie, co pociąga za sobą ich degradacje florystyczną i oznacza ubytek cennych gatunków.

Przez korytarz planowanej inwestycji, na wysokości wsi Lędowo przechodzi jeden ciek płynący. Jest nim Struga Lędowska, zwana także rzeką Wędą kończącą swój bieg w położonym na zachód od omawianego terenu jeziorze Modła. Akwen objęty jest ochroną rezerwatową „Jezioro Modła". Odnoga strugi Lędowskiej zasila wodami podziemnymi niewielki płat łęgu dębowo-wiązowo-*jesionowego Ficario-Ulmetum* (siedlisko 91F0) leżącego w obrębie terenu planowanej inwestycji na granicy obrębów Lędowo i Duninowo.

Biorąc pod uwagę charakter, skalę oraz położenie przedsięwzięcia, nie można wykluczyć jego oddziaływania na środowisko przyrodnicze obszaru, gdzie realizowane będzie zamierzenie.

Planowana inwestycja będzie realizowana w sąsiedztwie planowanych i zrealizowanych przedsięwzięć o podobnym charakterze, tj.:

- istniejący układ przesyłowy 450 kV prądu stałego Szwecja-Polska (SWEPOL Link),
- istniejąca stacja elektroenergetyczna 400/110 kV Słupsk-Wierzbięcino,
- planowanej Infrastruktury przyłączeniowej morskiej farmy wiatrowej MFW Bałtyk I,
- planowanej Infrastruktury przyłączeniowej morskiej farmy wiatrowej FEW Baltic II

Oddziaływanie skumulowane dotyczyć może przede wszystkim etapu budowy, który potencjalnie charakteryzuje się większym oddziaływaniem na środowisko niż etap eksploatacji.

Ze względu na usytuowanie i sposób realizacji planowanego Przedsięwzięcia, nie przewiduje się by jego realizacja, na którymkolwiek etapie, spowodowała wystąpienie transgranicznych oddziaływań na środowisko. Odległość obszaru budowy planowanego Przedsięwzięcia do granicy morskiej, tj. polskiej wyłącznej strefy ekonomicznej wynosi ok. 35 km.

Tut. organ, wziąwszy pod uwagę łącznie wszystkie uwarunkowania wymienione w art. 63 ustawy ooś, z uwagi na:

- rodzaj, charakter inwestycji, położenie względem obszarów chronionych;
- możliwość utraty powierzchni i fragmentacji siedlisk przyrodniczych;
- prawdopodobieństwo pogorszenia stanu siedlisk przyrodniczych lub siedlisk gatunków roślin i zwierząt, dla których ochrony został wyznaczony ww. obszar Natura 2000;
- możliwe wystąpienie negatywnego wpływu na warunki bytowania (wędrówek, żerowania, rozrodu) chronionych gatunków zwierząt;
- możliwość skumulowanego oddziaływania z innymi inwestycjami o tym samym charakterze zlokalizowanymi w bezpośrednim sąsiedztwie terenu przeznaczonego pod inwestycję;
- emisję do środowiska hałasu, gazów i pyłów do powietrza związaną głównie z wykorzystaniem sprzętu mechanicznego i urządzeń;

uznał, iż przedsięwzięcie może w sposób znaczący wpłynąć na cele i przedmioty ochrony obszarów: Natura 2000 PLB990002 Przybrzeżne Wody Bałtyku, PLC990001 Ławica Słupska oraz Obszaru Chronionego Krajobrazu Pas Pobrzeża na zachód od Ustki.

W związku z czym **konieczne będzie** przeprowadzenie oceny oddziaływania na środowisko, wymaganej art. 63 *ustawy OOŚ*, w tym wymaganej art. 6.3 Dyrektywy Siedliskowej.

W związku z powyższym postanowiono jak na wstępie.

POUCZENIE

Na postanowienie niniejsze służy Stronie prawo wniesienia zażalenia do Generalnego Dyrektora Ochrony Środowiska, za pośrednictwem Regionalnego Dyrektora Ochrony Środowiska w Gdańsku, w terminie 7 dni od dnia jego doręczenia.

Regionalny Dyrektor
Ochrony Środowiska
w Gdańsku
Radosław Iwiński

Otrzymują

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3. aa

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Instytut Budownictwa Wodnego
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Założony w 1953

IBW PAN

Institute of Hydro-Engineering
of the Polish Academy of Sciences
Established 1953

Modelling of the suspended solids spreading during the laying of the submarine cable to the Baltic II OWF and Baltic III OWF

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Magdalena Stella-Bogusz, Piotr Szmytkiewicz

Gdańsk, August 2022

Ordering Party:	EKO-KONSULT Spółka z o.o. 6 Narwicka Street, 80-557 Gdańsk
Subject of the order:	Development of modelling of the suspended solids spreading during the laying the submarine cable for the needs of the environmental documentation of the report on the environmental impact of the project entitled "Connection infrastructure for offshore wind farms Baltic II OWF and Baltic III OWF".
Contractor:	Institute of Hydroengineering of the Polish Academy of Sciences (IBW PAN) 7 Kościerska Street, 80-328 Gdańsk
Work symbol:	C2-15/22
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List of abbreviations

IBW PAN	Institute of Hydroengineering of the Polish Academy of Sciences (IBW PAN)
LoC	Length of Coastline. On the Polish coast, there is a unified location system known as the length of coastline of the Maritime Offices. LoC 0.0 is located on the border with Russia, LoC 428.1 is located on the border with Germany. Separate length of coastline is valid for the Hel Peninsula, the Vistula Lagoon and the Szczecin Lagoon.
OWF	Offshore Wind Farm
CI	Connection Infrastructure
Sediment	Fragmented rock material carried by currents and waves deposited by the sea and forming the seabed.
PAN	Polish Academy of Science (Polska Akademia Nauk)
Debris	See: Sediment

1. Formal basis

The study was commissioned by EKO-KONSULT Sp. z o.o. in accordance with the order No. 582.22/IBWPAN/2022 of June 24, 2022. The subject of the study is the modelling of the suspended solids spread during the laying of the submarine cable for the needs of the environmental documentation of the environmental impact report for the project entitled "Connection infrastructure for offshore wind farms Baltic II OWF and Baltic III OWF".

2. Introduction, subject matter and scope of the study

A very important element of the offshore wind farm (OWF) is the so-called Connection Infrastructure (CI) connecting wind turbines to the onshore power grid. For safety reasons, the electrical cables forming the CI are usually placed under the seabed, beach and dune and are led out to the land surface at a safe distance from the shore. A diagram of the CI system is shown at Fig. 1. Electric cables must be laid in such a way that they are not exposed or broken. The coastal zone of the sea is a critical place for CI, as intense bottom changes occur in this area due to strong hydrodynamic forces. Outside the coastal zone, the hydrodynamic impact on the bottom is much smaller. For this reason, in the open sea, the CI is laid shallower on the bottom than it is within the coastal zone. When the CI power cable is buried in the bottom, some of the bottom sediments are lifted up and spontaneously move (transport) in a suspended form in the water column. In the marine environment, processes related to the presence and movement of sediment particles in the water column are described by deposition [1] and sedimentation[2] processes. The presence of an increased amount of sediment in the water column may have a negative effect on ichthyofauna and phyto- and zoobenthos.

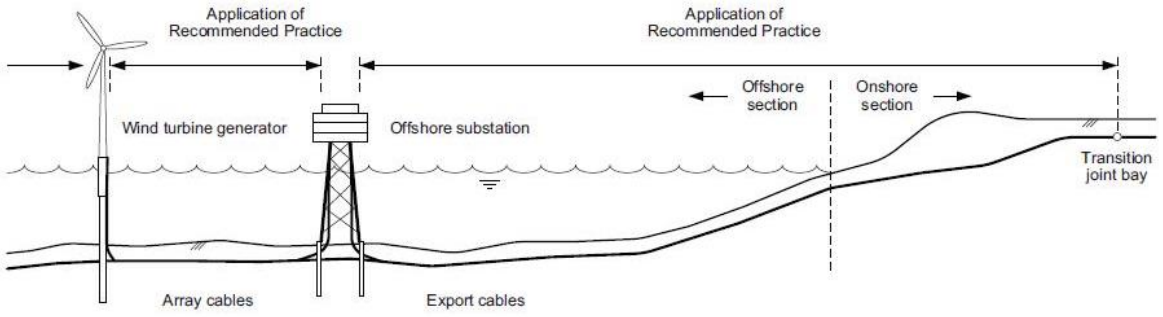

Fig. 1 Diagram of connecting offshore wind farm with land (based on DNV-RP-J301)

The scope of this work covers numerical modelling of the dispersion of the suspended solids during the submarine cable laying for the purposes of the environmental documentation that forms the basis for issuing a decision on environmental conditions for two power-output projects from offshore wind farms located in the Baltic Sea: Baltic II OWF and Baltic III OWF.

The aim of the study is to indicate the most unfavourable scenario in terms of environmental impact. The result of the work is, in particular, the determination of the range of the suspended solids

[1] **Deposition** is temporary depositing of sedimentary material on the seabed (Musielak 1985, Lund-Hansen et al. 1997, McKee and al. 1983).

[2] **Sedimentation** is a process involving the transport of particles, their distribution on the bottom, transfer and maintenance on the seabed (*ibid*).

spread, the duration of water column turbidity and the determination of the thickness of the sediment layer that will be formed in the project vicinity after complete sedimentation of the suspended solids.

Additionally, the report refers to the results of the modelling performed for the project by the Maritime Institute in Gdańsk in 2015.

3. Study area

3.1. Geology

The study area is a body of water covering a fragment of the Baltic Sea located in the area of Ustka in the vicinity of the corridor intended for the planned CI route connecting the land with the Baltic II OWF and Baltic III OWF. The CI corridor starts about 1 km west of Ustka, at the shore it is approx. 4 km wide (from approx. KM 235 to approx. KM 239) and extends to approx. 53 km north of the shoreline (Fig. 2).

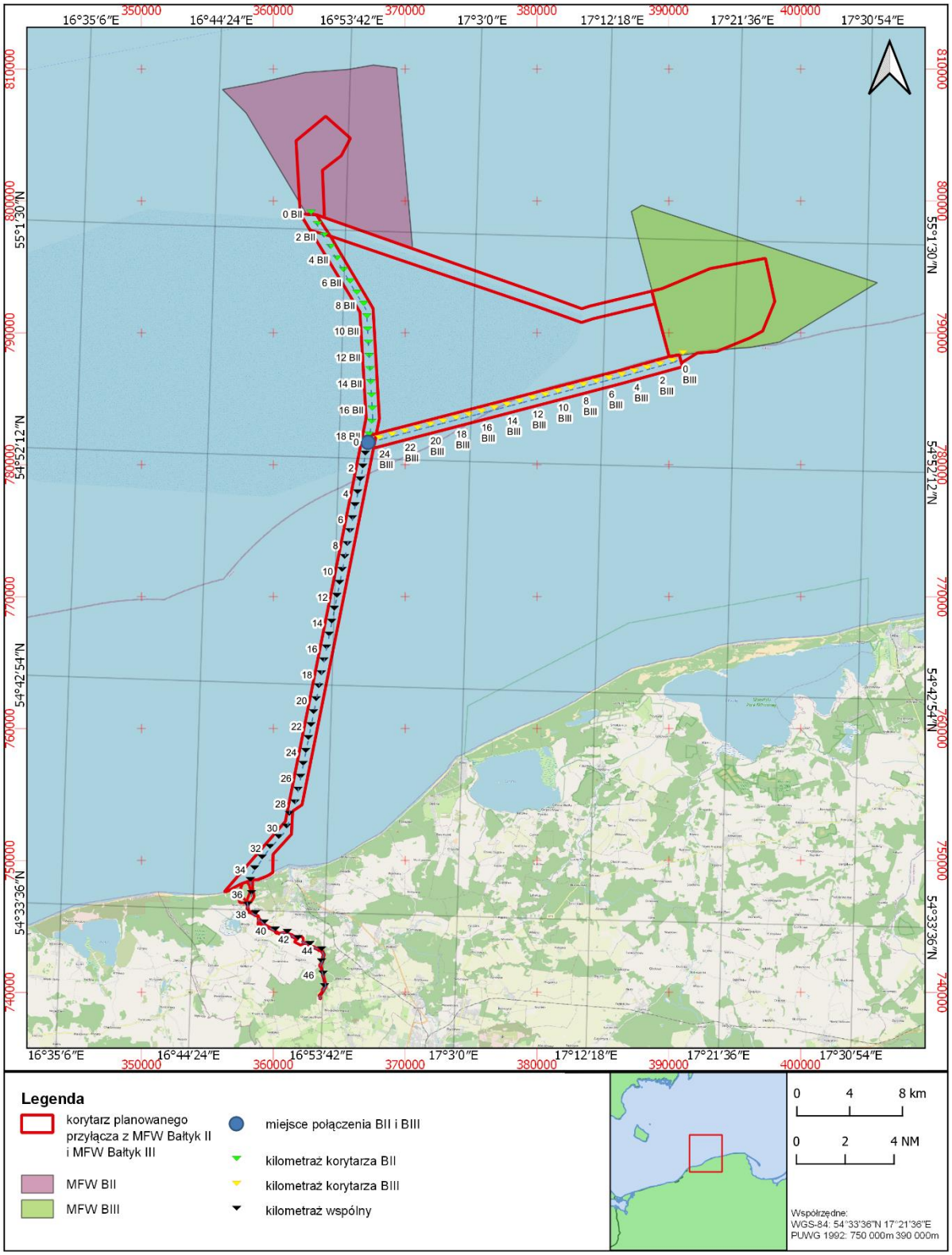

Fig. 2 Corridor location for IC of Baltic II OWF and Baltic III OWF.

The land part of the area designated for IC is located on the Słowiński Coast belonging to the Koszaliński Coast in the South Baltic Coastline (Kondracki 1998). This section is an area of spits overlain by a strip of coastal dunes (Zachowicz and Dobracki 2003). The Lędowskie Dunes stretching along the shore create a vast form of a dune plateau. The plateau surface ordinates reach about 35 m above sea level.

The sea shore in the analysed section is of the swept dune type. It is artificially consolidated with vegetation. The beach has a flat profile with a width not exceeding 30 m (Zachowicz and Dobracki 2003).

The underwater coastal slope descends with a gentle slope to a depth of 10–12 m (Mielczarski 1963). The configuration of isobaths in the foreshore zone is parallel to the shoreline. The 2.5 m isobath runs approximately 160-250 m from the shore, and the 5 m isobath is 400 to 500 m away from the waterline. The 10 m isobath is less regular and is located between 1,000 m to 1,400 m from the shore. The 15 m isobath, on the other hand, runs approximately 1,400–1,800 m from the shore. In the foreshore zone, there is a bottom typical of the southern Baltic Sea with two sandbanks. A well-developed first sandbank occurs up to the 5 m isobath, and the second sandbank occurs just behind the 5 m isobath. The average shore slope is 0.010-0.015. The deeper part of the Ustka Bay is marked by a hilly poligenetic relief related to the overlapping of forms of marine origin on the late-glacial surface destroyed by denudation and abrasion processes (Michałowska and Pikies 1992). In addition, there is a buried valley at the bottom of the Ustka Bay, which the main stage of development was related to the activity of subglacial and ablative waters in during the gardnenska period (Florek et al. 2005).

Further north of the shore, the sea part of the area designated for CI enters Słupsk Bank. The depths are significantly reduced at this moment – even to about 16 m (and outside the study area even to about 8 m locally). In general, in the area of the Słupsk Bank, the bottom in which the cable will be buried is at a depth of about 20 m below sea level.

The CI burying into the seabed takes place at a depth of several meters below the seabed. This means that regardless of the burying method used, the debris is only raised to this depth level. Therefore, the upper layers of bottom sediments, namely Quaternary Pleistocene and Holocene sediments (Fig. 3) are of key importance for the project.

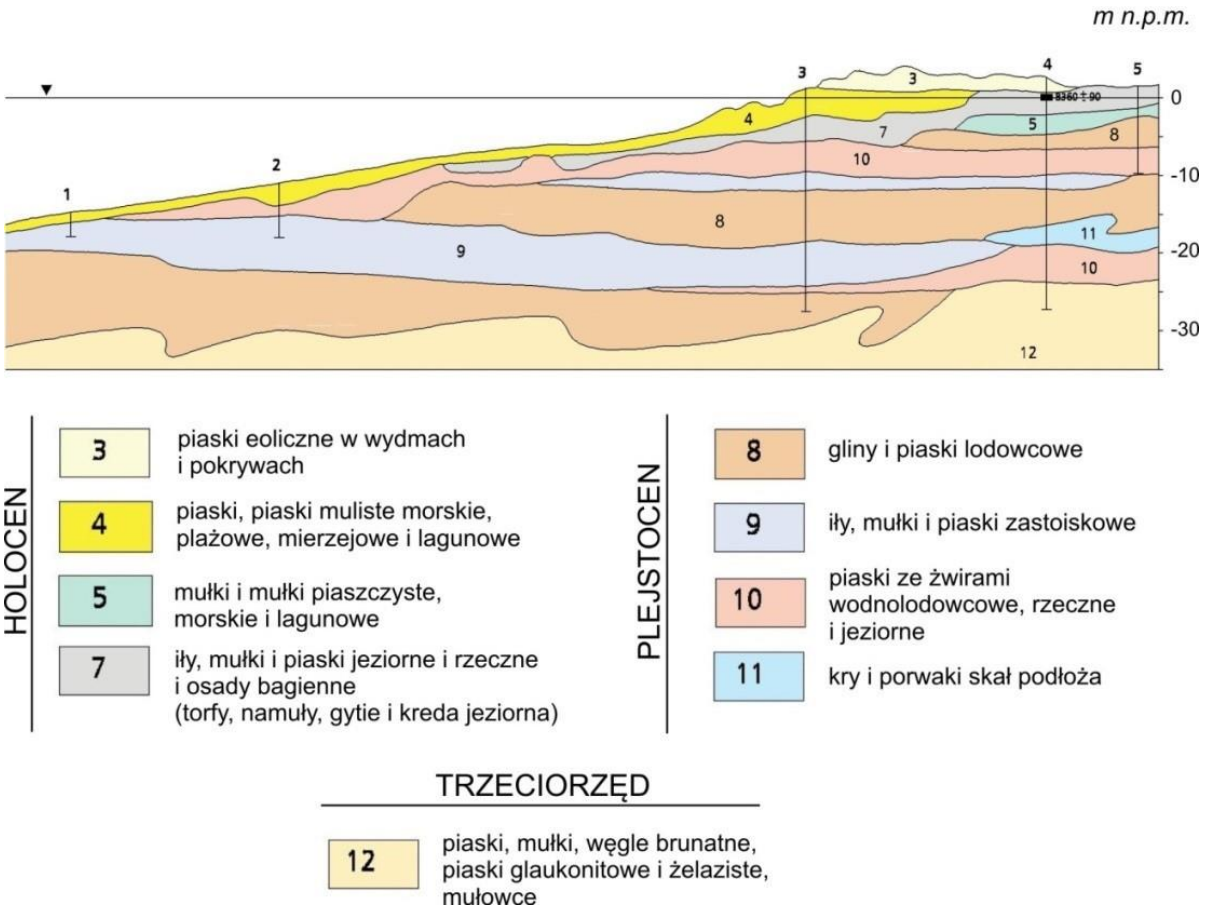

Fig. 3 Fragment of a geological cross-section transverse to the shore located in the vicinity of the ICI corridor (Geodesic Map of the Polish coastal zone of the Baltic Sea, sheet Modlinek /24/; Zachowicz and Dobracki 2003)

Pleistocene sediments are represented by several levels of glacial till, separated by sand-gravel formations of glacial water-glacial accumulation. The oldest level of glacial till of the Warta glaciation lies directly on the Miocene subsoil. Above, there is a series of glacial sands and gravels, which underlie the tills of the upper Vistula glaciation stage. The upper level of tills is strongly eroded, and its surface is located from 7 m above sea level up to 5 m below sea level

Holocene sediments are in the form of aeolian sands (in dunes and covers) reaching several meters in thickness, beach sands, sea spit and lagoon sediments and organic lake accumulation sediments. Beach settlements stretch in an uninterrupted zone up to 150 m wide along the seashore. It is a sandy and sand-gravel series with a thickness of 2 to 5 m (Uniejewska and Nosek 1986). Spit and lagoon sediments occur in the shallow coastal zone. They are 2-5 m thick and are developed as fine-grained and coarse-grained sands with admixture of gravel, deposited near outcrops of glaciofluvial deposits and glacial till. They are lined with glaciofluvial or stagnant deposits, or glacial till. Organogenic sediments (mainly peats) occur locally in the western part of the area at a depth of approx. 2 - 3 m below sea level, underlain by aeolian sands. In the foreshore area, these sediments occur up to an isobath of approx. 2 m, under a thin cover of sea sands (Zachowicz and Dobracki 2003). The figure Fig. 4 shows a map of surface sediments along the CI corridor. Most of the corridor has different types of sands on the bottom surface, while in the north-western part of the corridor there is clay at the bottom.

Below the Quaternary sediments, there are Palaeogene and Neogene sediments in the form of Oligocene glauconitic quartz sands and brackish-marine clays and silts, and in the upper part Pre-Miocene lignite sands and silts. Neogene sediments, whose ceiling is glacitectonically disturbed, lie at a depth of 25 m below sea level up to 90 m below sea level Therefore, it is possible that in the area of greater depths, there may be a situation where these sediments are lifted up and transferred to the water column.

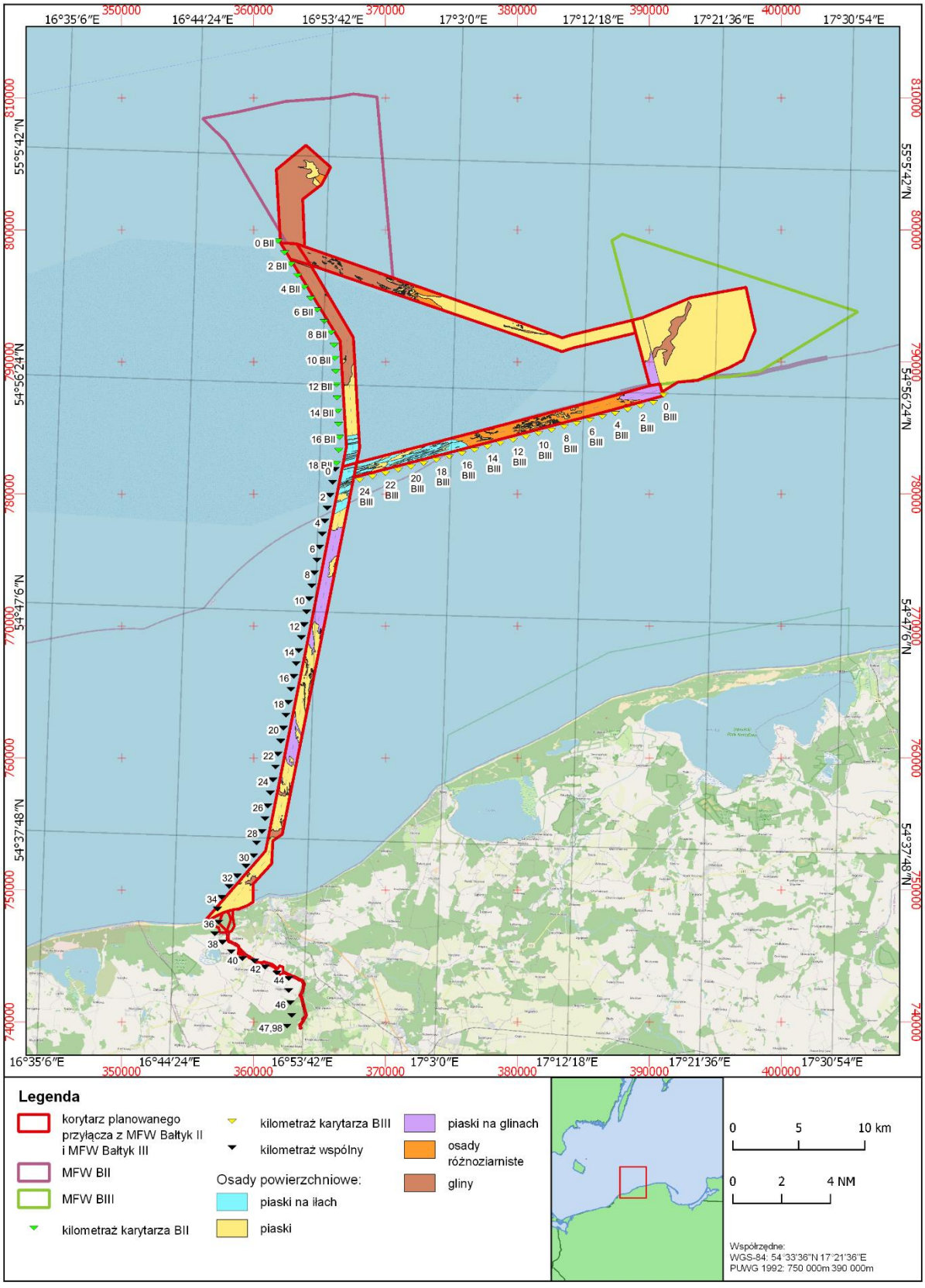

Fig. 4 Map of surface sediments along the corridor route for Baltic II OWF and Baltic III OWF CI

3.2. Wind

In the study area wind speed from 0 to 3 m/s occurs on average for about 36 days in an average statistical year. Wind speeds between 3 and 6 m/s occur on average for approximately 110 days. Wind speeds between 6 and 9 m/s occur for less than 70 days in the mean statistical year. Wind speeds between 9 and 12 m/s take an average of about 70 days per year. Wind speeds between 12 and 15 m/s will take approximately 30 days on average and speeds between 15 and 18 m/s do not last more than about 9 days. The other speeds do not last longer than a few or a dozen hours a year (Marcinkowski et al. 2014). The Fig. Fig. 5 presents the wind rose in the analysis area divided by speed classes. For speeds less than about 3 m/s, wind from all directions is equally likely. For higher speeds, the dominant wind propagation directions in the analysis area are westerly.

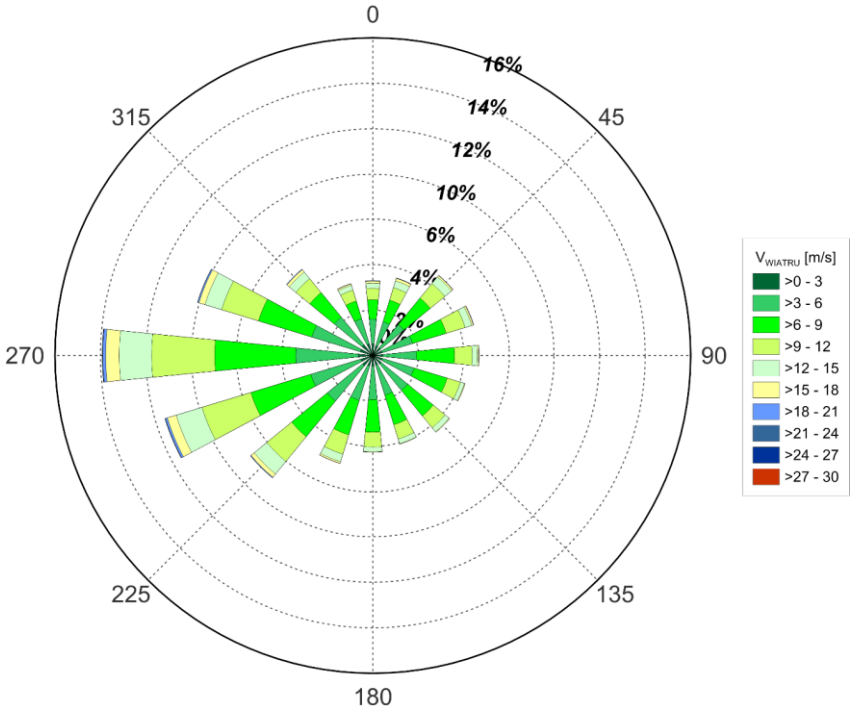

Fig. 5 Wind rose in the area of analysis (ibid.)

3.3. Wave

The work of Marcinkowski et al. (2014) showed that in the years 1958 - 2001 in the project area:

- → the maximum height of the significant wave was 8.6 m,
- → the smallest of the maximum annual wave heights was 3.9 m.
- → the mean significant wave height is 1.1 m,
- → wave conditions, during which the significant wave height (H_s) is between 0 and 1 m, occur on more than 212 days over an average statistical year,
- → wave conditions, during which the significant wave height (H_s) is between 1 and 2 m, occur on more than 104 days over an average statistical year,
- → wave conditions, during which the significant wave height (H_s) is between 2 and 3 m, occur on more than 33 days over an average statistical year,
- → on the remaining days (16), the height of the significant wave is greater than 3 m.

3.4. Currents

Based on the analysis of numerical simulation results obtained for the years 2005 - 2012 using the HIROMB model, Marcinkowski et al. (2014) showed that:

- → the velocities of the currents in the near-surface zone are most dynamic in their changes. These velocities vary over a wide range (from 0 to 90 cm/s). The greatest dynamics of changes is observed during autumn and winter. Although velocities of several tens of cm/s occur in the area, the most frequent are currents from 0 to 5 cm/s and 5 to 10 cm/s;
- → the velocities of the currents in the intermediate zone are less dynamic than those of the near-surface currents. The highest velocities at this depth occur in autumn and winter, and the lowest in summer. The prevailing velocities are in the range of 0 - 5 cm/s;
- → the velocities of the currents in the bottom zone, compared to the velocities occurring in the subsurface and intermediate layers, are more homogeneous. The characteristic of these currents is the lower dynamics of their velocity changes. This means that these velocities depend less on time-varying wind fields and are more related to the constant water flows resulting from the topography of the southern Baltic Sea. It should be noted that the percentage frequency of the currents at this depth indicates that, regardless of the season, the dominant current velocity class for this zone is 0 – 5 cm/sec.

3.5. Natural concentration of the suspended solids in the water column

According to Uścinowicz (2011), the concentration of the suspended solids in the Baltic Sea varies within a wide range from 0.3 mg/l (in the Gdańsk Basin) to 500 mg/l (Western Baltic). Szmytkiewicz (2016) showed that even just a few measurements in the Gulf of Gdańsk area indicate very large fluctuations in the suspended solids concentration in the water column, in this case from approx. 1 mg/l to 150 mg/l. The observed differences are related to the seasonality of hydrodynamic processes. In storm conditions, which usually occur in autumn and winter, the concentration of suspended solids is much higher than in summer during the calm period at sea. This means that each time during a storm episode, the amount of suspended solids in the water column naturally increases, only to decrease to pre-storm values once the storm has passed. Wangen (2010) showed that in closed and shallow seas, such as the Baltic Sea, storm concentration of suspended solids decreases to pre-storm values after a few to several hours.

Based on the literature (Eisma et al. 1991, Ferrari at al. 2003, Wangen 2010, Uścinowicz 2011, Szmytkiewicz 2016) and experiments in field and model studies of the Institute of Hydro-Engineering of Polish Academy of Sciences, it can be assumed that under storm conditions in the project area, the natural instantaneous suspended solids concentration in the water column may be from several tens to several hundred mg/l, and after the storm passes, after a few to several hours, the suspended solids concentration decreases to pre-storm values.

4. The numerical model

4.1. Model description

The entire calculation of the current fields and the spread of fine-clastic suspended solids in the sea was carried out using the *Delft3D* numerical package. The program is composed of several numerical modules for the calculation of flows, waves, sediment transport, rebuilding the seabed and the spread

of substances discharged into the sea. This model, working in three-dimensional space, allows simulating hydraulic problems with the mutual interaction of all used modules.

Delft3D is an open numerical package developed at the Delft University in the Netherlands, allowing the calculation of non-stationary flow, sediment transport parameters, etc. Flow velocities can be generated by factors such as river water outflows, wind-generated currents (drift currents), water table elevation differences (gradient currents), salinity and temperature differences (density currents), tides (tidal currents) and waves (wave origin currents). The software also allows numerical simulation of point discharge or water intake. The following calculation modules were used during the calculations: the FLOW module calculating the hydrodynamics of flows, the WAVE module calculating the wave, the SED module calculating the sediment transport and the MOR module calculating the changes in depth (Deltares 2010 a and b).

4.2. Model structure

The model prepared at the Institute of Hydro-Engineering of Polish Academy of Sciences uses rectangular calculation grids. In the case of waving calculations, i.e. in the WAVE module, the calculation area covers the entire Baltic Sea, and the resolution of the numerical grid is approx. 6 km (Fig. 6). This approach is based on the fact that the Baltic Sea is a closed sea with a narrow and shallow connection to the North Sea via the Danish Straits. Which means that the waves and currents of the North Sea do not affect the generation and propagation of waves and currents in the area of the project. Consequently, in the wave model there are no open boundaries on which to set the boundary conditions. This approach is particularly useful in the model calibration process.

In the case of the FLOW module, the calculation area was limited to the corridor area for Baltic II OWF and Baltic III OWF CI. It extends over a distance of 51 km in the E direction and 53 km in the N direction. This area was divided by a rectangular grid of 200 m x 200 m (Fig. 7).

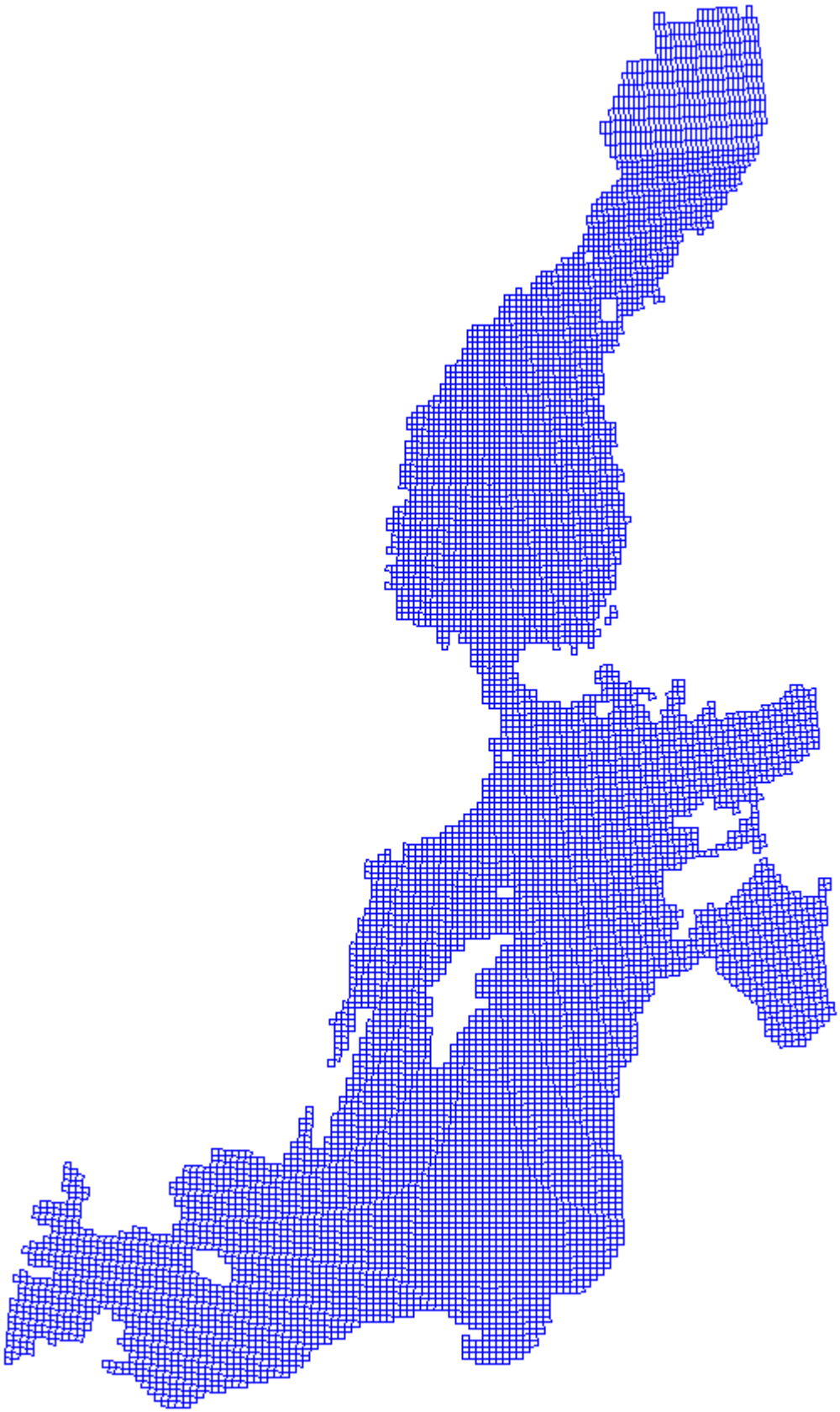

Fig. 6 Sketch of the numerical grid used in the WAVE module

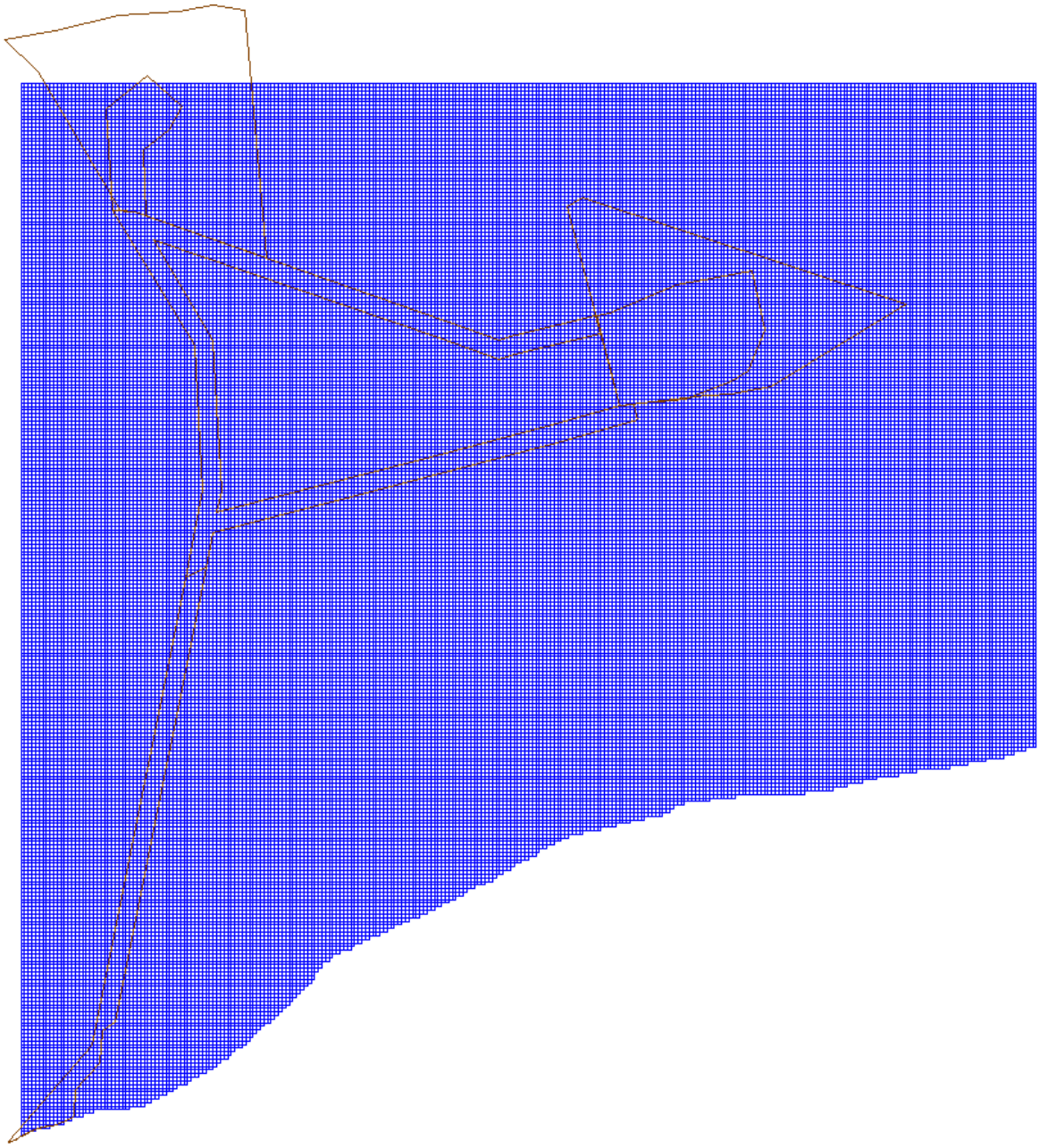

Fig. 7 Calculation area, sketch of the numerical grid used in the FLOW module against the background of the CI corridor and Baltic II OWF and Baltic III OWF

To build the model, the bathymetric data of the CI corridor and the bathymetric data of the Baltic Sea area from own resources of the Institute of Hydro-Engineering of Polish Academy of Sciences were used obtained from the Ordering Party. The discretisation of the water column was performed in the sigma coordinate system in which the water column is divided into a fixed number of layers, which thickness is proportional to the depth (at a given node of the grid) according to the given scheme. Based on the experience in modelling the water movement in the Baltic Sea basin, the following vertical division of the water column from the free surface to the bottom (10 layers) was assumed: 4.0%; 5.8%; 8.6%; 12.8%; 18.8%; 18.8%; 12.8%; 8.6%; 5.8%; 4.0%. This means that the thickness of the surface layer is 4% of the total depth at a given point, etc.

Model calibration

The wave model was calibrated using the wave data collected during a measurement expedition at the Marine Coastal Laboratory in Lubiatowo between 20/09/2006 and 12/11/2006. For this purpose, wave parameters measured by a directional wave buoy anchored approx. 2 km from the shore and at a depth of approx. 18 m were used, and wave data recorded with string probes at depths of approx. 2.5 m and approx. 4.5 m were used. The calibration result in the form of a "scatter plot" is shown in Fig. 8. Model calibration was performed at the R^2 = 0.98 level, which means a very good representation of the actual wave conditions in the prepared numerical model.

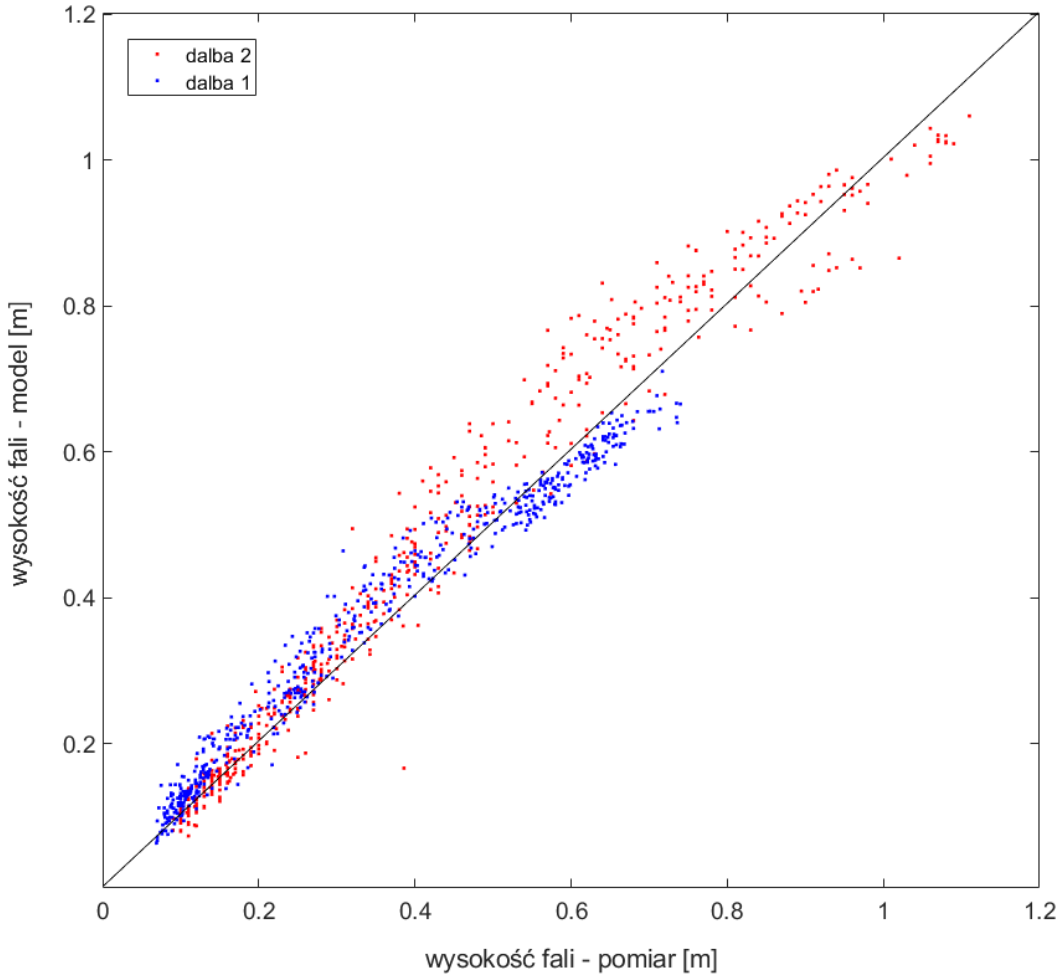

Fig. 8 Comparison of significant wave heights recorded at two measuring dolphins at Maritime Coastal Laboratory in Lubiatowo in 2006 with significant wave heights calculated with the wave module

4.3. Assumptions for simulation

Mathematical modelling of hydrodynamic processes performed for investment or infrastructure projects can generally be carried out in two ways.

One of them is to perform numerical simulations for a real meteorological/oceanographic scenario, i.e. assuming boundary conditions in the form of values obtained from field measurements or good quality data from numerical models. In this situation, a reconstruction of the actual hydrodynamic conditions prevailing at a given time in the modelling area is obtained. The problem to be solved, e.g. the spreading of suspended solids during the laying of a submarine cable, is analysed against these conditions. The obtained results provide information on what would have happened if the project had been implemented in the period from which the data used in the boundary conditions were derived. Due to the randomness of natural events and the wide spectrum of possible meteorological conditions that may occur in the same area at the same time of year, the basic drawback of this modelling philosophy is the fact that the conditions assumed in the model will never be repeated. Therefore, the results obtained are correct in principle, but it is not possible to draw general conclusions from them as to e.g. the extent of suspended matter spreading in the area of analysis.

The second method of modelling consists in performing numerical simulations for the most unfavourable meteorological and oceanographic scenarios from the point of view of the analysed problem. In such a situation, theoretical results are obtained, which provide information on the potential most negative effects of the project realization, which is an unquestionable advantage of such a modelling philosophy. In the opinion of Institute of Hydro-Engineering of Polish Academy of Sciences, such an approach to numerical modelling of hydrodynamic and lithodynamic processes is appropriate, especially in the context of analysing the environmental impact of a project.

The model assumes, as it is in real life, that the force generating sea water movement is the wind. Due to the use of WAVE and FLOW modules, wind is a driving force for both waves and sea currents. According to the information obtained from the Ordering Party, burying of the CI cable into the seabed can be performed in wave conditions with a significant wave height H_s not more than 1.5 m and with a maximum wind speed of 10 m/s. Therefore, the worst case scenario will occur at these limit values. The calculations were thus performed for waves of significant wave height H_s = 1.5 m and a wind blowing at a constant speed of 10 m/s from the dominant direction, i.e. from the west, throughout the simulation.

In the western part of the calculation area there is a common one corridor for Baltic II OWF and Baltic III OWF CI (Fig. 2, Fig. 7). At a distance of approx. 35 km from the coast, the CI corridor branches into two corridors, one of which leads approximately N to the Baltic II OWF, and the other leads approximately to ENE to Baltic III OWF. The total length of the offshore part of the corridor for Baltic II OWF CI is approx. 52.5 km, while the total length of the offshore part of the corridor for Baltic III OWF CI is approx. 59 km (Fig. 2). In the northern part of the calculation area there is a connector between the Baltic II OWF and Baltic III OWF. Its length is approx. 28.5 km. Within the CI corridor, it is planned to lay power cables to connect the two OWF with each other and with the national grid on land. Two cables will be laid to each OWF, so four cables will be buried in the section between the shore and the corridor bifurcation. According to the information provided by the Ordering Party, the cables will be laid from the land towards the sea. Moreover, they will be buried in separate trenches located at a safe distance from each other and will not be placed simultaneously, but successively one after the other. Therefore, calculations were made separately for the process of burying the CI cable for Baltic II OWF, Baltic III OWF and the connector between the farms. The process of burying a power cable involves, in simple terms, digging a trench while simultaneously laying the cable at its base.

A specification for the CI power cable trench has been obtained from the Ordering Party, which shows that it will be trapezoidal in cross-section (Fig. 9). Its dimensions will not be constant along the entire length of the route. The depth of the trench will be 4 m near the shore on a section of 800 m starting from the 6 m isobath, i.e. from the point where the cable is brought out of the foreshore zone. For the remaining section, the depth of the trench will be 3 m (Fig. 9 and Fig. 10). However, the width of the trench at the bottom surface and at the base will be constant and equal to 1.5 m and 0.25 m, respectively. Consequently, in the vicinity of the shore, along a 800 m long section, the volume of the excavated material will be 3.5 m^3/linear metre of excavation, while in the remaining area it will be 2.6 m^3/linear metre of excavation.

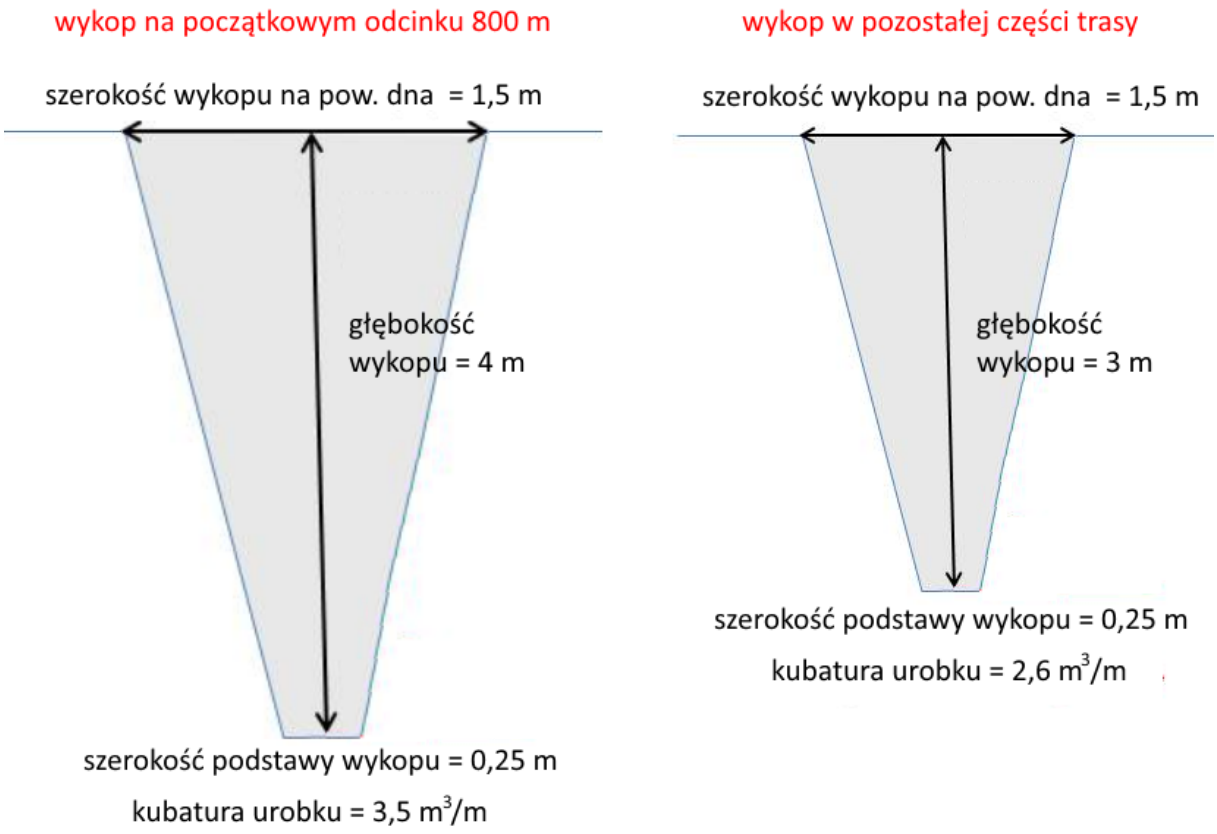

Fig. 9 Sketch of the geometry of the trench for the CI power cable

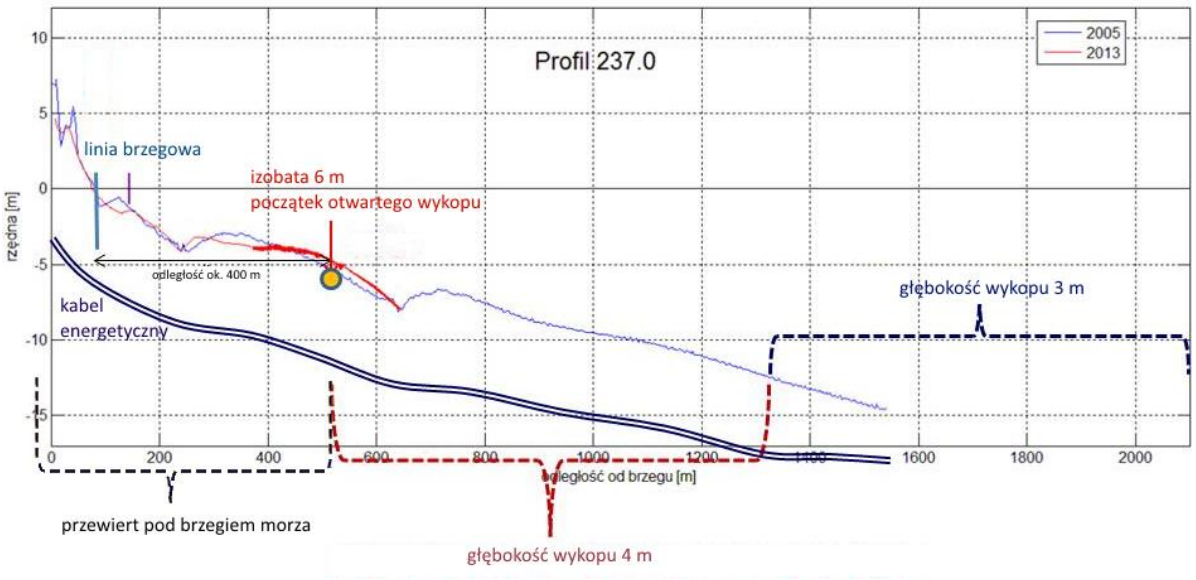

Fig. 10 Sketch of the CI power cable laying against bathymetric data

According to the information provided by the Ordering Party, the power cables will be buried with the use of the following techniques: jetting, ploughing and mechanical cutting, the first of which is the most invasive in terms of introducing sedimentary material into the water column. This method consists in rinsing water under high pressure into the bottom in order to liquefy bottom sediments and, at the same time, burying the cable to the expected depth. During the works, part of the debris is discharged into the water column. The vertical extent of this phenomenon depends on many factors and it is not possible to determine it at this stage. Therefore, in the simulations it was conservatively assumed that the discharge of the sediment would take place in the water column up to a height of approx. 5 m above the bottom. An additional issue is the amount of sediment that can pass into the water column during works (suspended solids input). It depends on the properties of bottom sediments and the cable burying method used. In the calculations it has been assumed, according to the information provided by the Ordering Party, that in the case of the chosen technique of burying the cable in the bottom, this value can vary between 20-50% of the excavated volume. Due to the high content of clay and silt fractions in the bottom sediments in the area of the CI corridor, it was assumed in the calculations that it is a cohesive sediment. Based on the surface sediments map (Fig. 4) and the results of the shallow core analysis, the amount of suspended solids input along the trench route was agreed with the Ordering Party as shown in Tab. 1. The process of burying the power cable and the resulting inflow of the suspended solids to the water column was simulated as a mobile source of the water-soil mixture moving in the middle of the CI corridor in the offshore direction. In the case of the connector, the direction of cable laying has been assumed; from west to east, i.e. from the Baltic II OWF to the Baltic III OWF.

Tab. 1 Specification of suspended solids inflow (percentage of excavated volume) along the trench route

20% of the excavated volume goes to the water column	**50% of the excavated volume goes to the water column**
35-32 km	32-31 km
31-29 km	29-28 km
28-24 km	24-23 km
23-19 km	19-13 km
13-8 km	8-7 km
7-3 km	3-0 km
14 BII – 10 BII	18-14 BII km
9 BIII – 3 BIII	10 BII – 0 BII
central and eastern part of the connector	24 BIII – 9 BIII
	3 BIII – 0 BIII
	western part of the connector

As agreed with the Ordering Party, modelling of suspended solids spread was carried out for two speed scenarios for the burying the cable into the bottom. In the V100 scenario, a work speed of 100 m/h was assumed, while in the V200 scenario, work was assumed to be carried out at a speed of 200 m/h. Due to the length of the corridor in which the cable will be laid, the process of its routing and burying to Baltic II OWF will last approx. 22 days in the case of V100 and approx. 11 days in the case of V200. To the Baltic III OWF it will take approx. 24.5 for the V100 and approx. 12 days for the V200, while in the case of the connector it will take approx. 12 days for the V100 and approx. 6 days for the V200. The given values result directly from the length of the trench route and the theoretical speed rate. The calculations assume that each time there will be a sufficiently long favourable weather window, allowing the works to be carried out without any interruptions. Due to the specificity of the works (the cables will not be buried simultaneously, but sequentially), numerical simulations of the suspended solids spread were carried out for the process of burying a single power cable.

5. Calculation results

Numerical simulations of the lithodynamic processes induced by the continuous introduction of cohesive sediments into the water column during the burying of a power cable into the seabed were carried out. As a result of the calculations, spatial (three-dimensional) distributions of the instantaneous concentrations of finer-grained clastic suspended solids in the research area were obtained. At the moment, there are no norms or recommendations in Polish legislation regarding concentration levels and interpretation of suspended solids concentration in the marine environment.

Nevertheless, the literature adopts several concentration thresholds according to the following scheme:

- 5 mg/l – is the suspended solids background recorded under normal conditions in the marine environment,

- 10 mg / l – concentration of the suspended solids not relevant for the environment,

- 30 mg / l – the most frequently presented level of suspended solids concentration in foreign studies, used in the Danish and German recommendations, considered acceptable, both for breeding and recreational areas,

- 100 mg / l – the level of visible turbidity of the water.

Due to the adopted assumption of a mobile source of suspended solids moving at 100 m/h (V100 scenario) and 200 m/h (V200 scenario), a full presentation of the calculation results is only possible as an animation. Therefore, only examples of the calculation results are shown for the V100 and V200 scenarios, respectively, on the trench route to the Baltic II OWF (Fig. 11 and Fig. 12), on the trench route to the Baltic III OWF (Fig. 13 and Fig. 14) and along the route of the connector (Fig. 15 and Fig. 16). The presented results illustrate the instantaneous ranges of water turbidity in the bottom layer limited by the 5 mg/l isoline at different time points. For each trench route, they were selected in such a way that the results were comparable, i.e. when the cable was buried at corresponding points (i.e. for the same locations of the suspended solids source).

The calculation has shown that the area in which the turbidity of the water will occur has an extended oval shape and is approximately stretched according to the wind direction. At this point, it should be noted that the bending of the coastline in the NE direction to the east of the Ustka affects the direction of the suspended solids spreading, i.e. the direction of the marine currents, diverting them in the NE direction in the case of wind from the western sector. This influence is still clearly visible at a distance of approx. 30 km from the coast (Fig. 11c and Fig. 12c) and to a negligible extent at a distance of about 40 km from the coast (Fig. 15 and Fig. 16).

The spot of turbid water moves along the trench as the works progress. Its range depends on the speed of sea currents (it is obvious, so it has not been studied for the purposes of this study) and the amount of debris inflow. The amount of suspended solids introduced into the water column, on the other hand, depends on the cable burying technique used (this was not analysed in this study), the type of bottom sediment and the speed of the works.

In the case of sediments with a high content of silty and clay fractions, the extent of turbid water is greater than in the case of a sandy bottom. This is especially noticeable with the connector (Fig. 15 and Fig. 16).

In the case of a higher cable burying speed, i.e. in the V200 scenario, the turbidity range is 2-3 times greater than in the V100 scenario, which is due to the greater inflow of debris per unit time. Near the shore (Fig. 11b and Fig. 12b) and in the western part of the connector (Fig. 15b and Fig. 16b) the situation is apparently different, as the extent of turbidity is similar in both scenarios. However, it should be taken into account that these cases refer to the initial stage of the work (at the 10th and

5th, and at the 12th and 6th hours from the start of the cable burying, respectively), so the water turbidity in the V200 scenario is not yet fully developed at the moments shown.

The situation shown in Fig. 13b and Fig. 14b is noteworthy. In this area, a 50% of suspended solids inflow was assumed in the model, similarly to the northern part of the corridor to the Baltic II OWF and the western part of the connector. However, the turbidity range obtained in the calculations is significantly smaller. This is due to the fact that this is a much deeper area. Therefore, the water velocities are lower, resulting in a smaller turbidity range.

The situation presented in Fig. 13c and Fig. 14c stands out from all the others shown in Fig. 11 - Fig. 16. In this case, the extent of the turbid water spot in the V100 scenario is approx. 7 times smaller than in the V200 scenario (approx. 1.5 km vs. approx. 10 km). This is due to the overlap of two factors:

- the route of the trench to the Baltic III OWF is in the ENE direction, where the suspended solids spreading takes place during the westerly wind,

- in this area, approx. 1 km earlier (approx. km 9 BIII), there was a change in the characteristics of bottom sediments to sandy ones (in the model, the inflow of debris has changed from 50% to 20% of the excavated volume). Consequently, the turbidity of the suspended water has decreased significantly.

Shown on Fig. 11 - Fig. 16 the spots of turbid water in the bottom layer obtained in numerical simulations range from few to several kilometres. However, this is turbidity not exceeding 10 mg/l. The range of turbid water with a suspended solids concentration exceeding 30 mg/l is no more than approx. 1 km in the V200 scenario and no more than approx. 0.5 km in the V100 scenario.

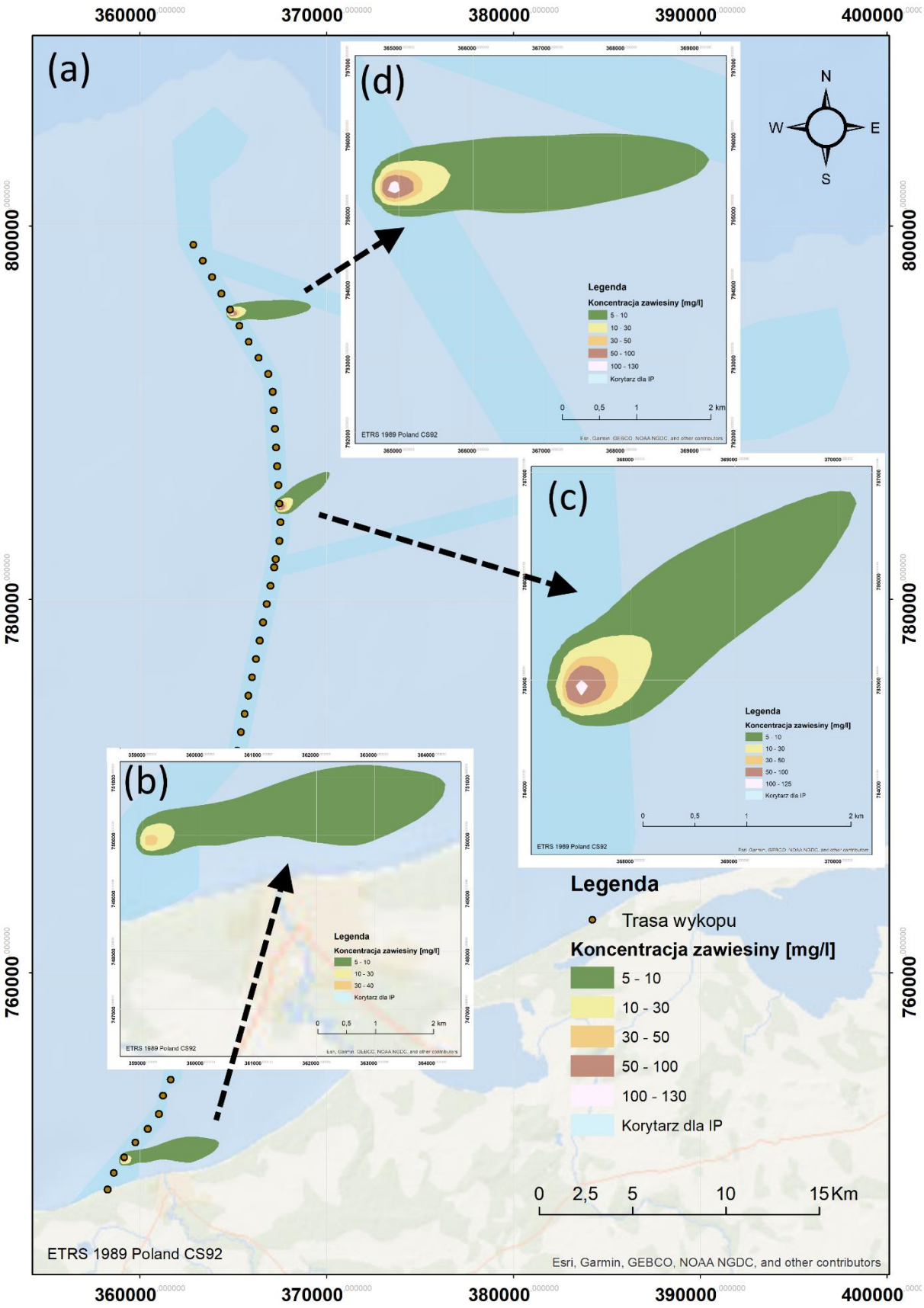

Fig. 11 (a) Summary of the instantaneous ranges of water turbidity on the route to the Baltic II OWF for the V100 scenario, determined (b) at 10 hours (point at 33 km), (c) at 372 hours (point at 15 km BII) and (d) at 482 hours (point at 4 km BII) from the start of cable burying

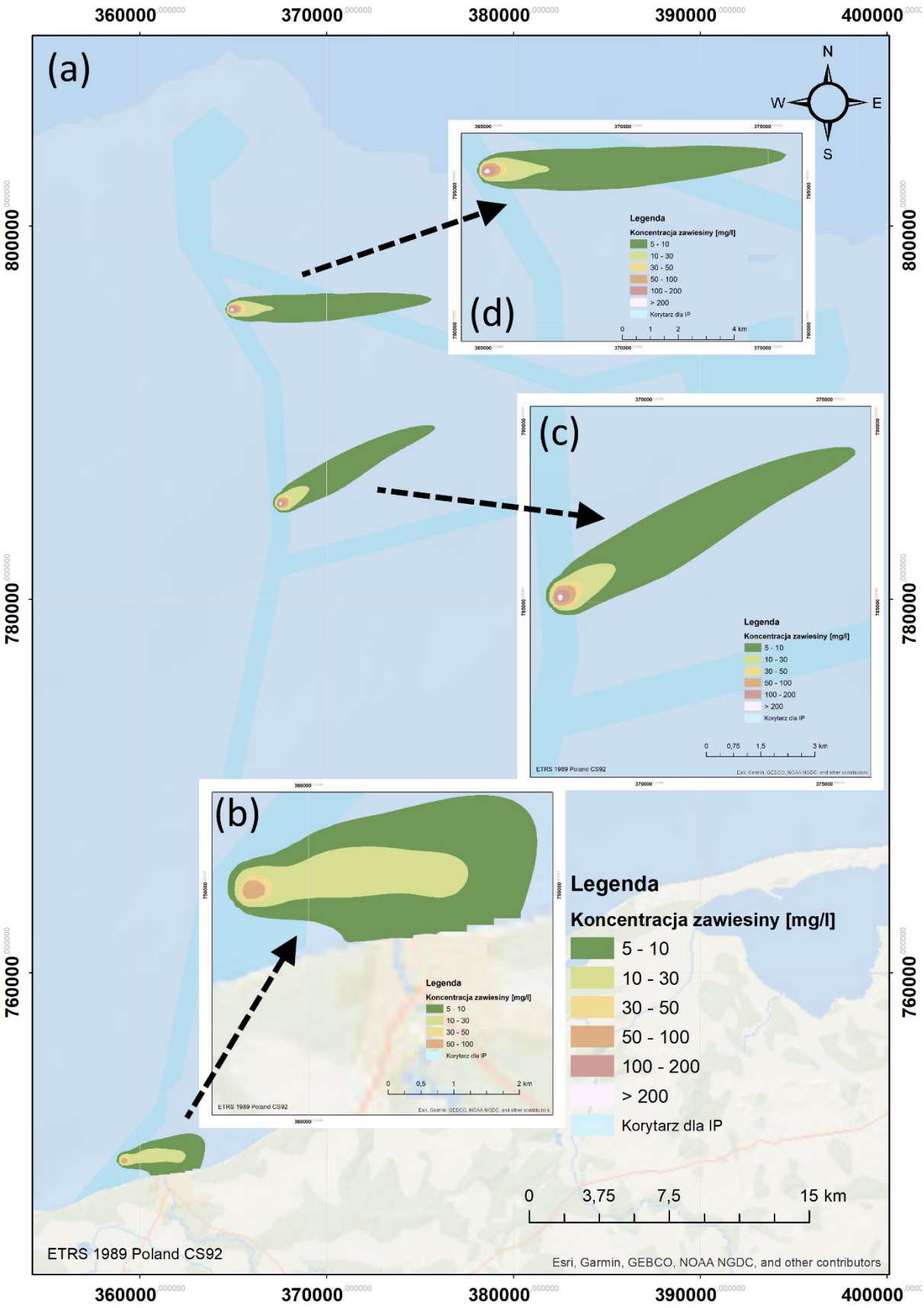

Fig. 12 (a) Summary of the instantaneous ranges of water turbidity on the route to the OWF Baltic II in the case of the V200 scenario, determined (b) at 5 hours (point at 33 km), (c) at 186 hours (point at 15 km BII) and (d) in 241 hours (point at approx. 4 km BII) from the start of cable burying

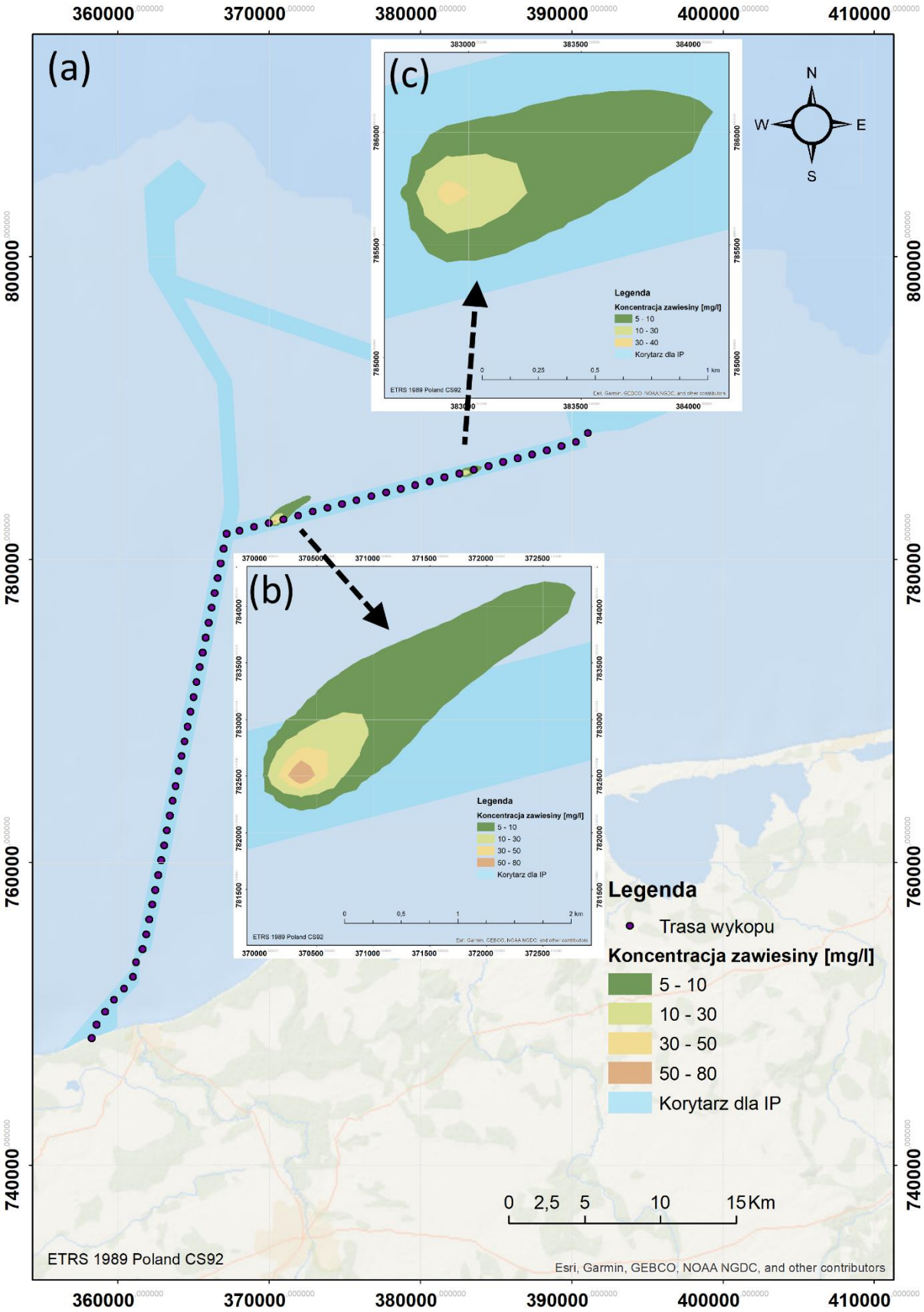

Fig. 13 (a) Summary of the instantaneous ranges of water turbidity on the route to the Baltic III OWF for the V100 scenario, determined (b) at 372 hours (point at approx. 21.5 km BIII) and (c) at 502 hours (point at approx. 8 km BIII) from the start of cable burying

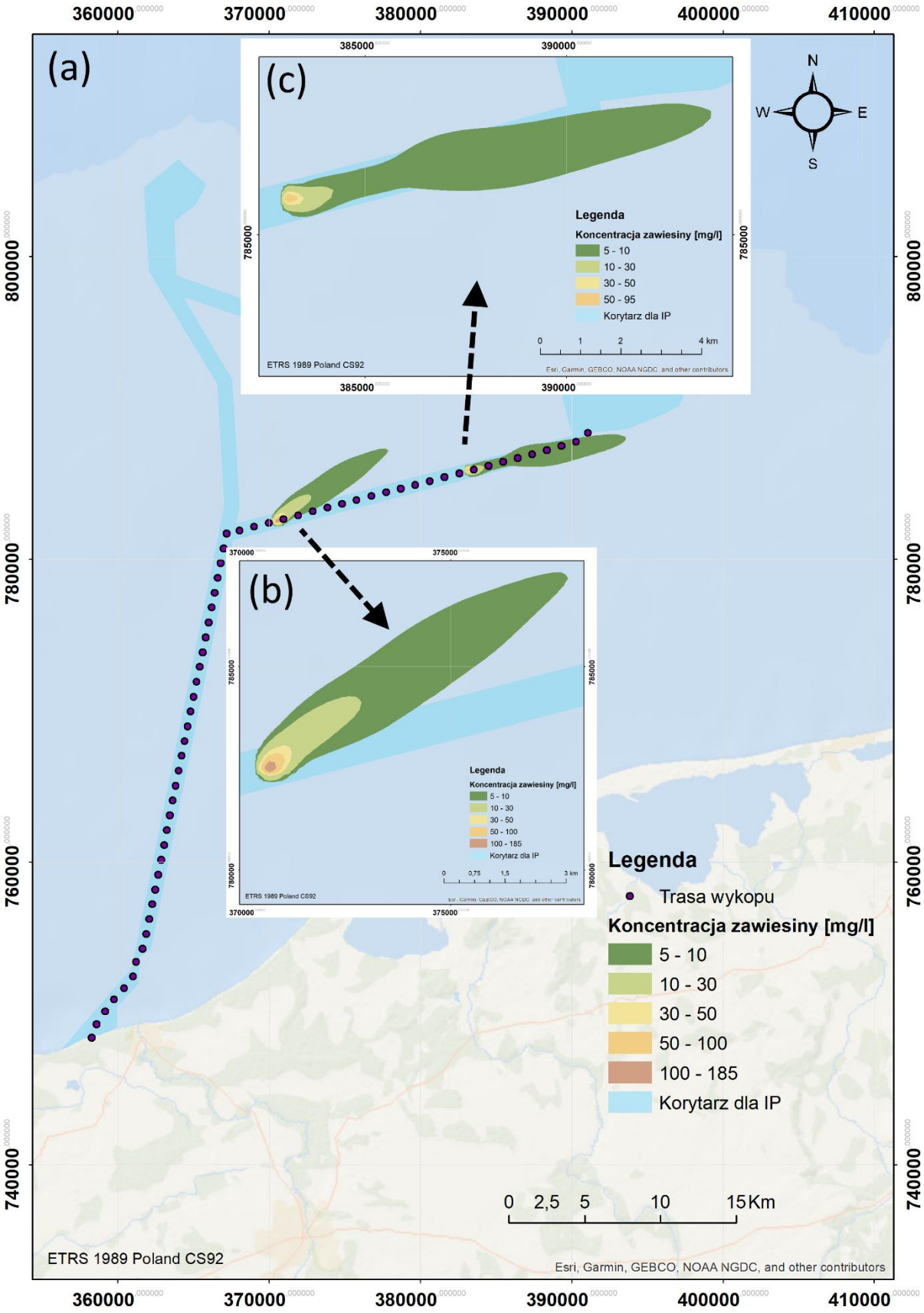

Fig. 14 (a) Summary of the instantaneous ranges of water turbidity on the route to the Baltic III OWF for the V200 scenario, determined (b) at 186 hours (point at approx. 21.5 km BIII) and (c) at 251 hours (point at approx. 8 km BIII) from the start of cable burying

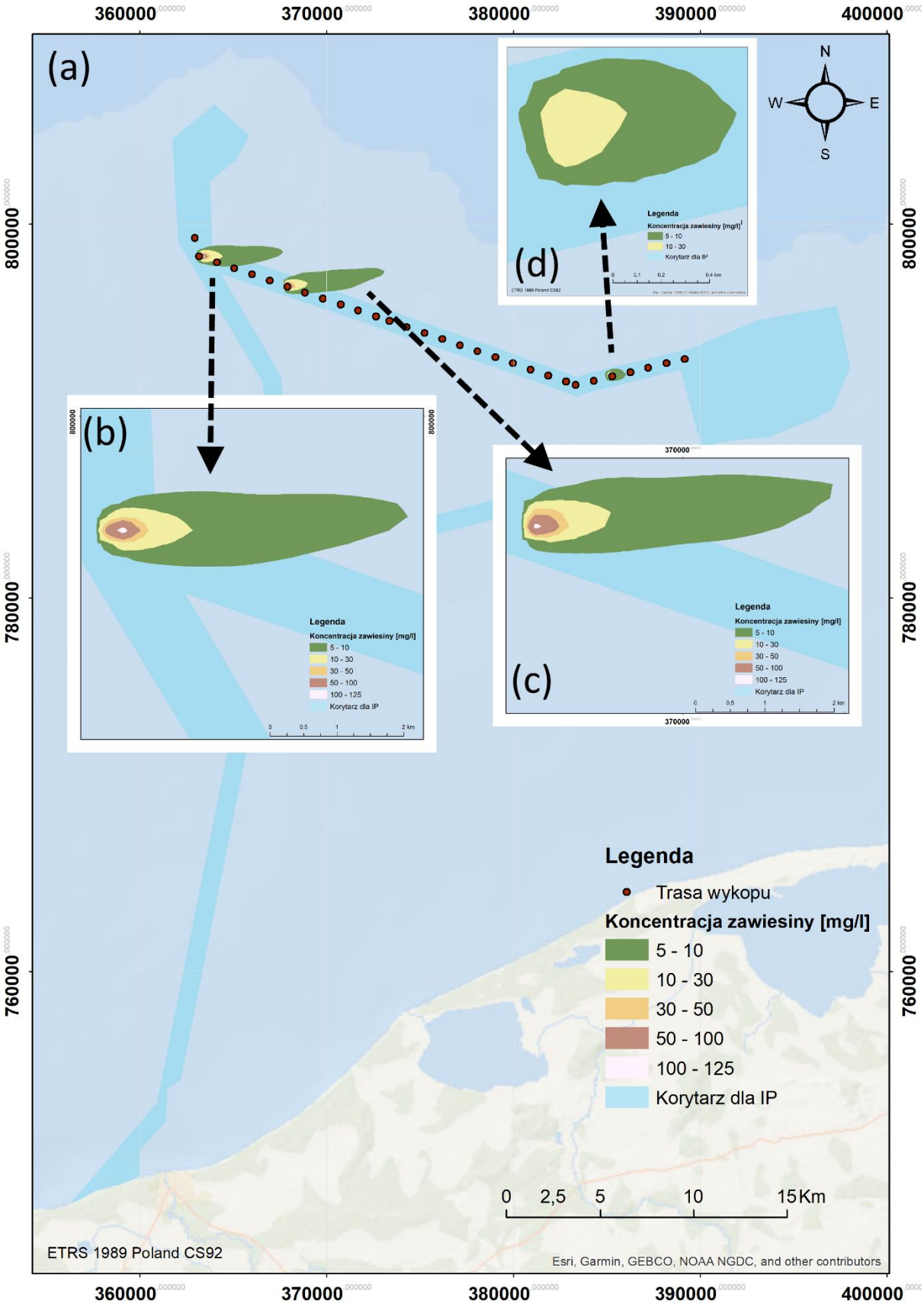

Fig. 15 (a) Summary of the instantaneous ranges of water turbidity on the route of the connector in the case of the V100 scenario, determined (b) at 12 hours (point at approx. 1 km), (c) at 60 hours (point at approx. 6 km) and (d) in 240 hours (point at approx. 24 km) from the start of cable burying

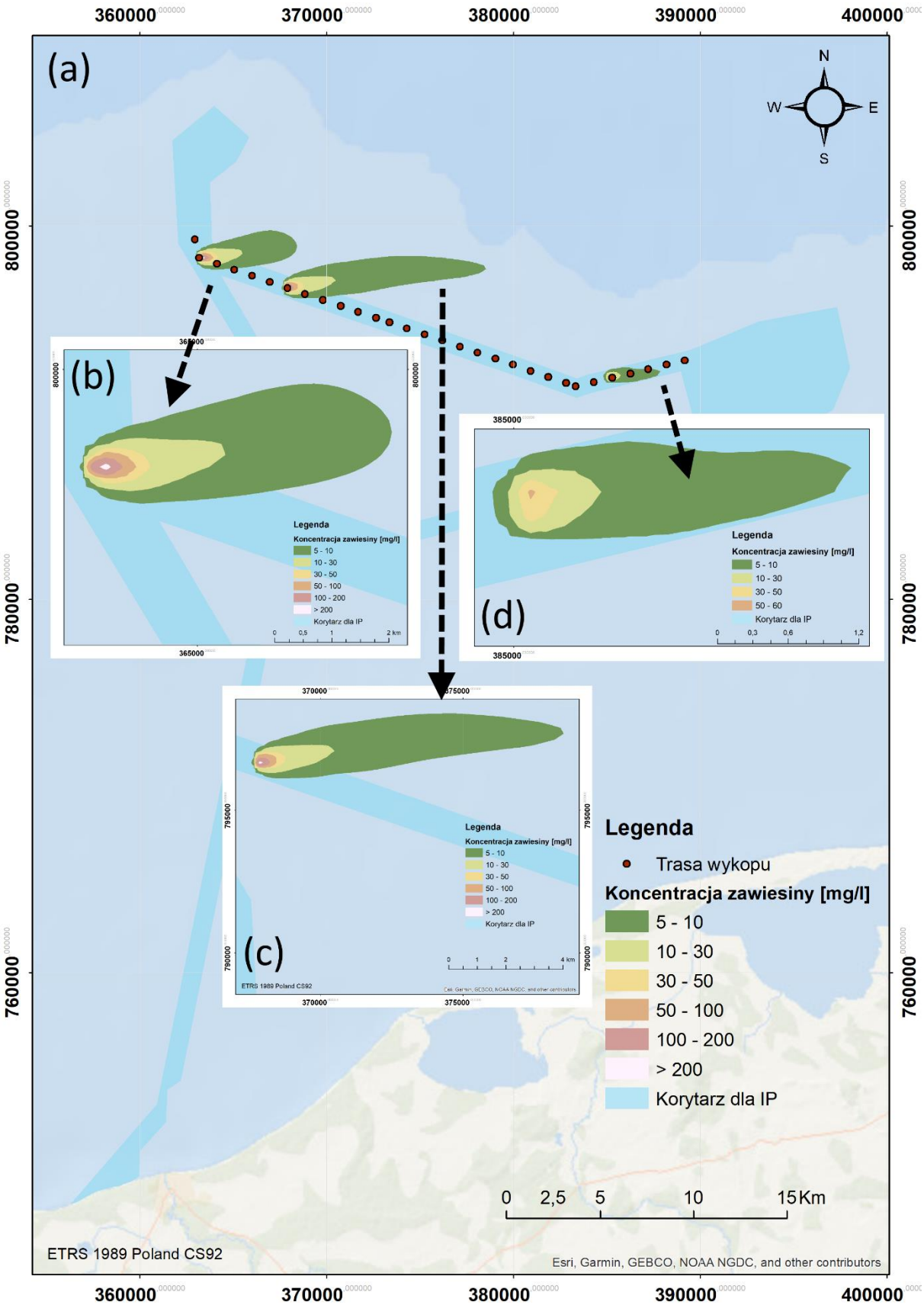

Fig. 16 (a) Summary of the instantaneous ranges of water turbidity on the route of the connector in the case of the V200 scenario, determined (b) at 6 hours (point at approx. 1 km), (c) at 30 hours (point at approx. 6 km) and (d) in 120 hours (point at approx. 24 km) from the start of cable burying

In Fig. 17 - Fig. 22 maps are presented illustrating the values of the maximum turbidity in the entire water column occurring while burying the power cable into the bottom on the route to the Baltic II OWF (Fig. 17 and Fig. 18), Baltic III OWF (Fig. 19 and Fig. 20) and the connector (Fig. 21 and Fig. 22). It should be clearly emphasized that the content presented in these figures does not reflect the value of the suspended solids concentration at a specific point in time (such examples of temporary situations are illustrated in Fig. 11 - Fig. 16), but show the maximum values of suspended solids concentration in each node of the grid during the entire cable laying process in the bottom. Therefore, they present the maximum ranges of water turbidity along with an indication of the intensity of this phenomenon. On their basis, conclusions analogous to the previous observations can be drawn.

Depending on the properties of bottom sediments and the size of the debris inflow, the maximum range of water turbidity ranges from approx. 1 km to several kilometres, and usually the concentration of suspended solids does not exceed 10 mg/l. The range of water turbidity with a concentration of more than 30 mg/l does not exceed approx. 1 km for the V200 scenario. For the V100 scenario, this range is smaller. In the case of deepening the cable in the bottom made of sediments with a high content of fine fractions, the extent of turbidity is much greater than in the case of trench in sandy bottom sediments.

It was calculated that during the works on the route to Baltic III OWF according to the V100 scenario in westerly wind conditions, the suspended solids spread in a narrow spot (approx. 1.6 km wide) along the trench route (Fig. 19). In the case of the V200 scenario, the width of the spot is greater, because at its widest point it is approx. 3.6 km (Fig. 20), but also spreads along the route of the trench. This is definitely a beneficial phenomenon as it minimizes the environmental impact of the project. This is particularly important as approx. 75% of the length of the Baltic III OWF corridor runs in cohesive soils (Fig. 4, km 0 BIII - km 3 BIII and km 9 BIII - km 24 BIII). In the case of the west wind and the route to Baltic II OWF, which leads approximately in the N and then NW direction, water turbidity may occur in a strip approx. 6 km wide in the V100 scenario (Fig. 17) and in a strip about 10 km wide, and sometimes even about 13 km in the V200 scenario (Fig. 18). A similar situation occurs in the case of the connector (Fig. 21 and Fig. 22).

The appendix to the study presents maps illustrating the values of the maximum turbidity of water in the surface layer, in the water column and in the bottom layer, occurring during the power cable burying into the bottom on the route to the Baltic II OWF (Fig. 35 - Fig. 40), Baltic III OWF (Fig. 41 - Fig. 46) and the connector (Fig. 47 - Fig. 52). They show that the greatest extent of water turbidity occurs in the bottom layer and it coincides with the values presented in Fig. 17 - Fig. 22. Turbidity of the water in the water column may occur in a similar area, however, except for local situations, e.g. near the

shore, the concentration of suspended solids should not exceed the value of 30 mg/l. In an area where clays, silts and clays are present in the seabed, water turbidity may reach the surface layer.

Fig. 17 Maximum suspended solids concentrations in the entire water column determined at each grid node during the cable burying process on the route to Baltic II OWF in the V100 scenario, limit value 5 mg/l

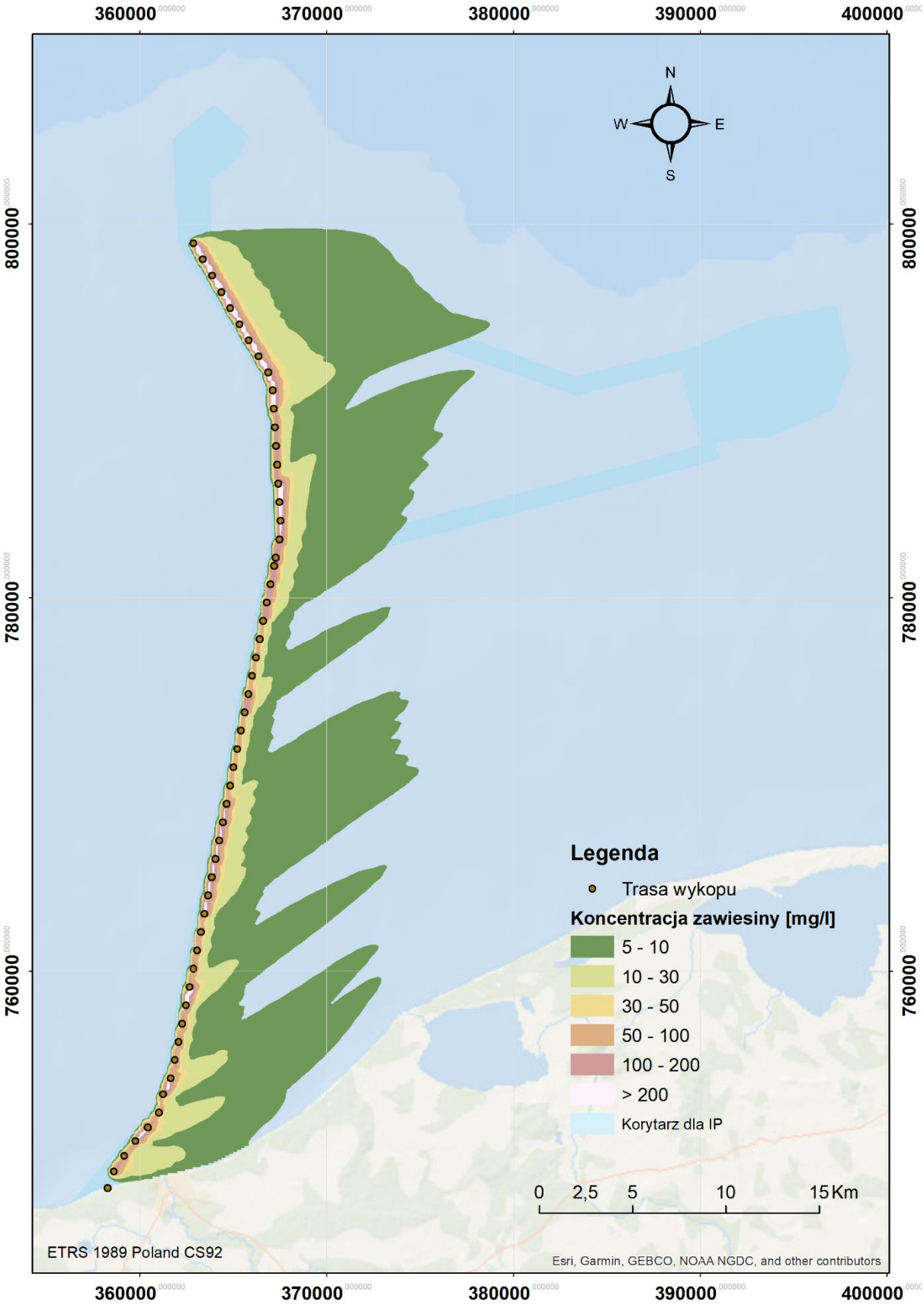

Fig. 18 Maximum suspended solids concentrations in the entire water column determined at each grid node during the cable burying process on the route to Baltic II OWF in the V200 scenario, limit value 5 mg/l

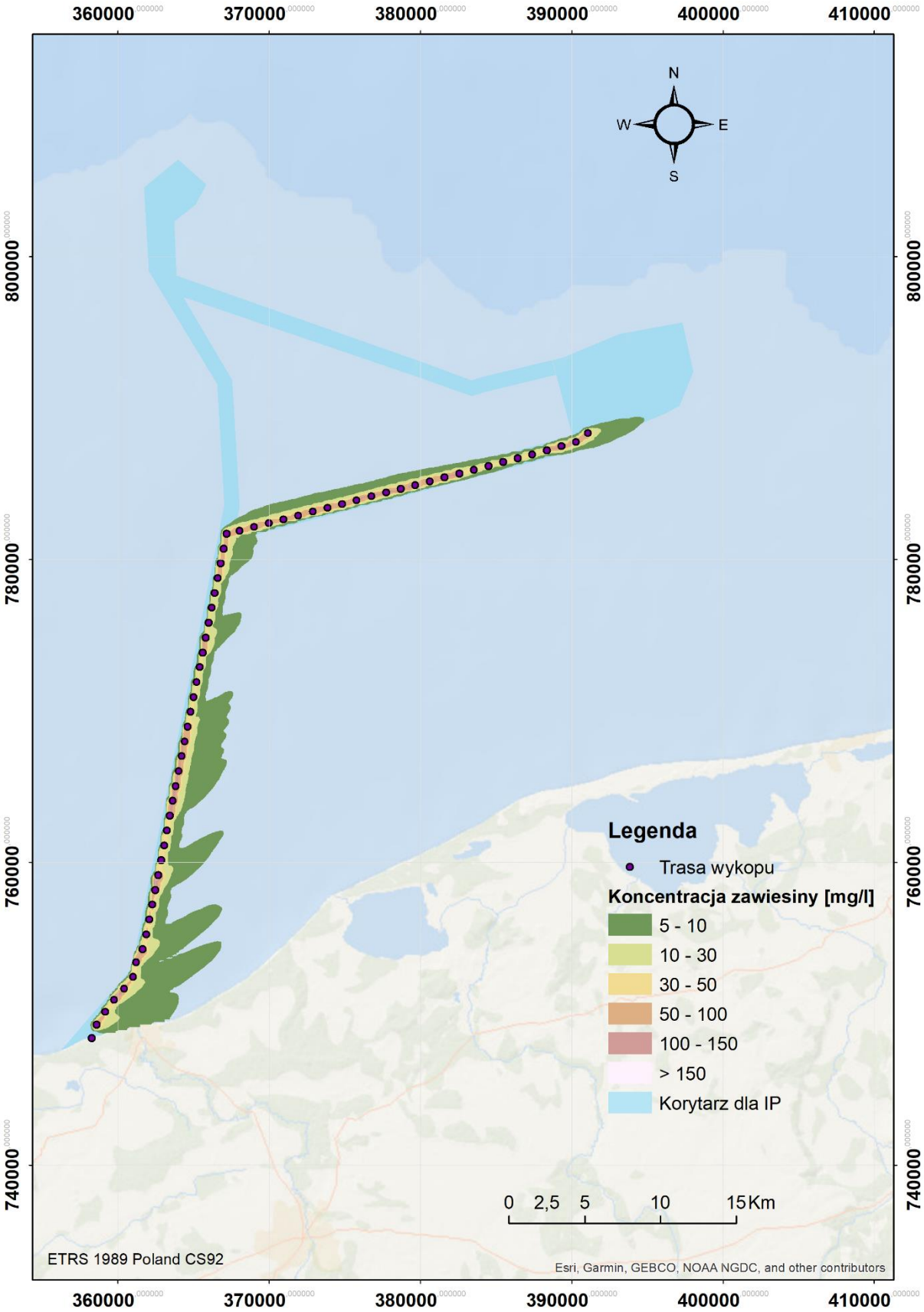

Fig. 19 Maximum suspended solids concentrations in the entire water column determined at each grid node during the cable burying process on the route to Baltic III OWF in the V100 scenario, limit value 5 mg/l

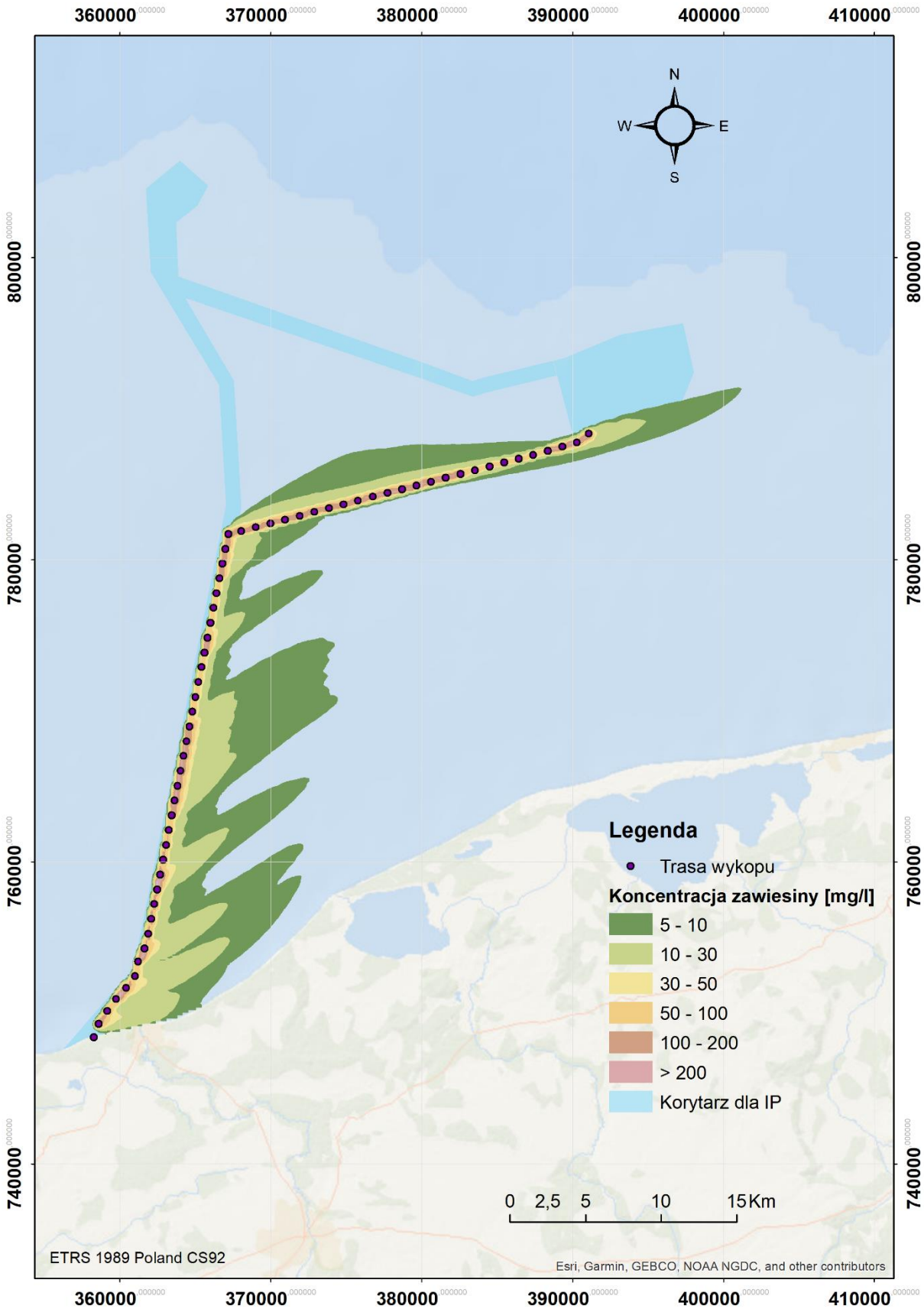

Fig. 20 Maximum suspended solids concentrations in the entire water column determined at each grid node during the cable burying process on the route to Baltic III OWF in the V200 scenario, limit value 5 mg/l

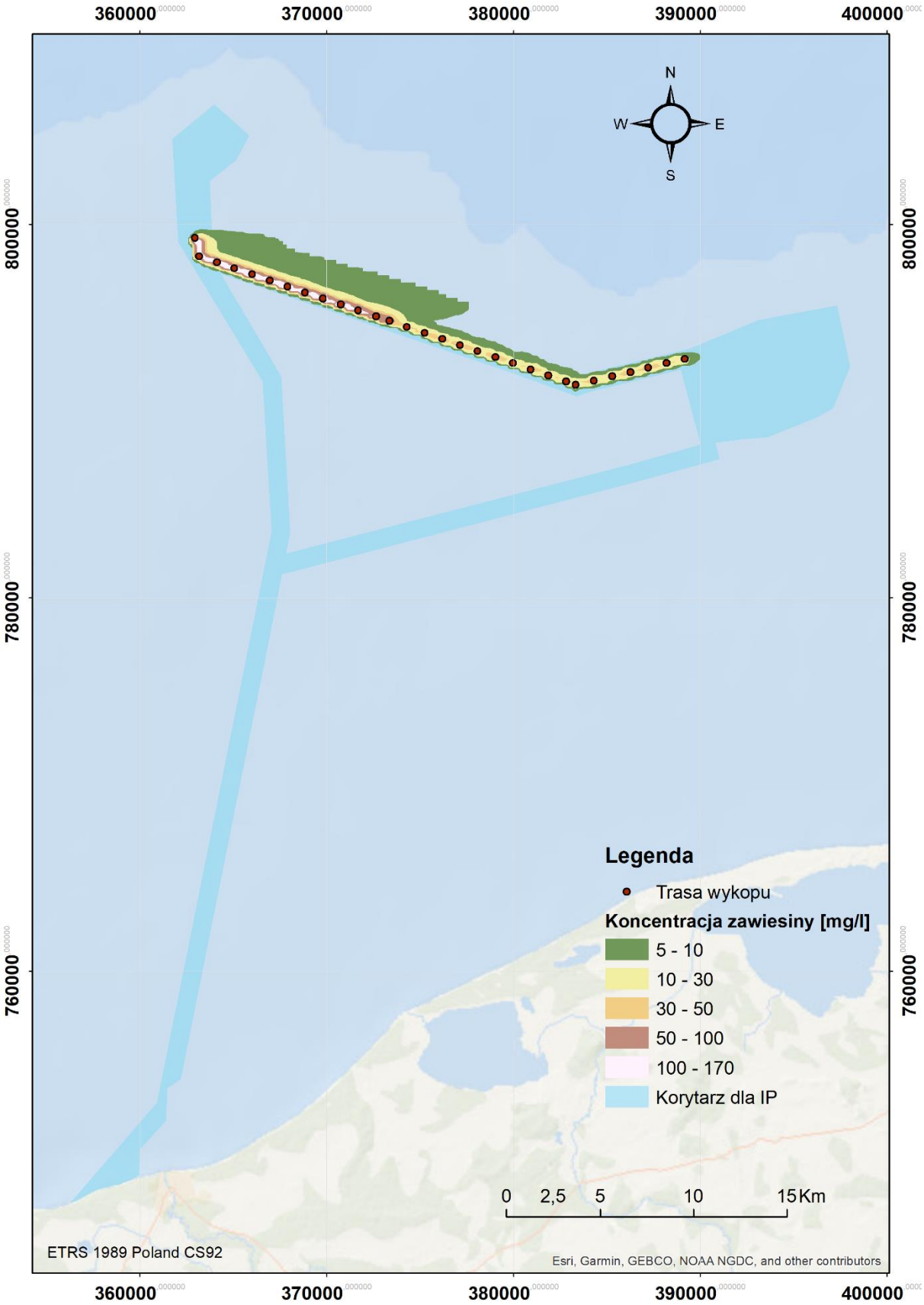

Fig. 21 Maximum suspended solids concentrations in the entire water column determined at each grid node during the cable burying process on the connector route in the V100 scenario, limit value 5 mg/l

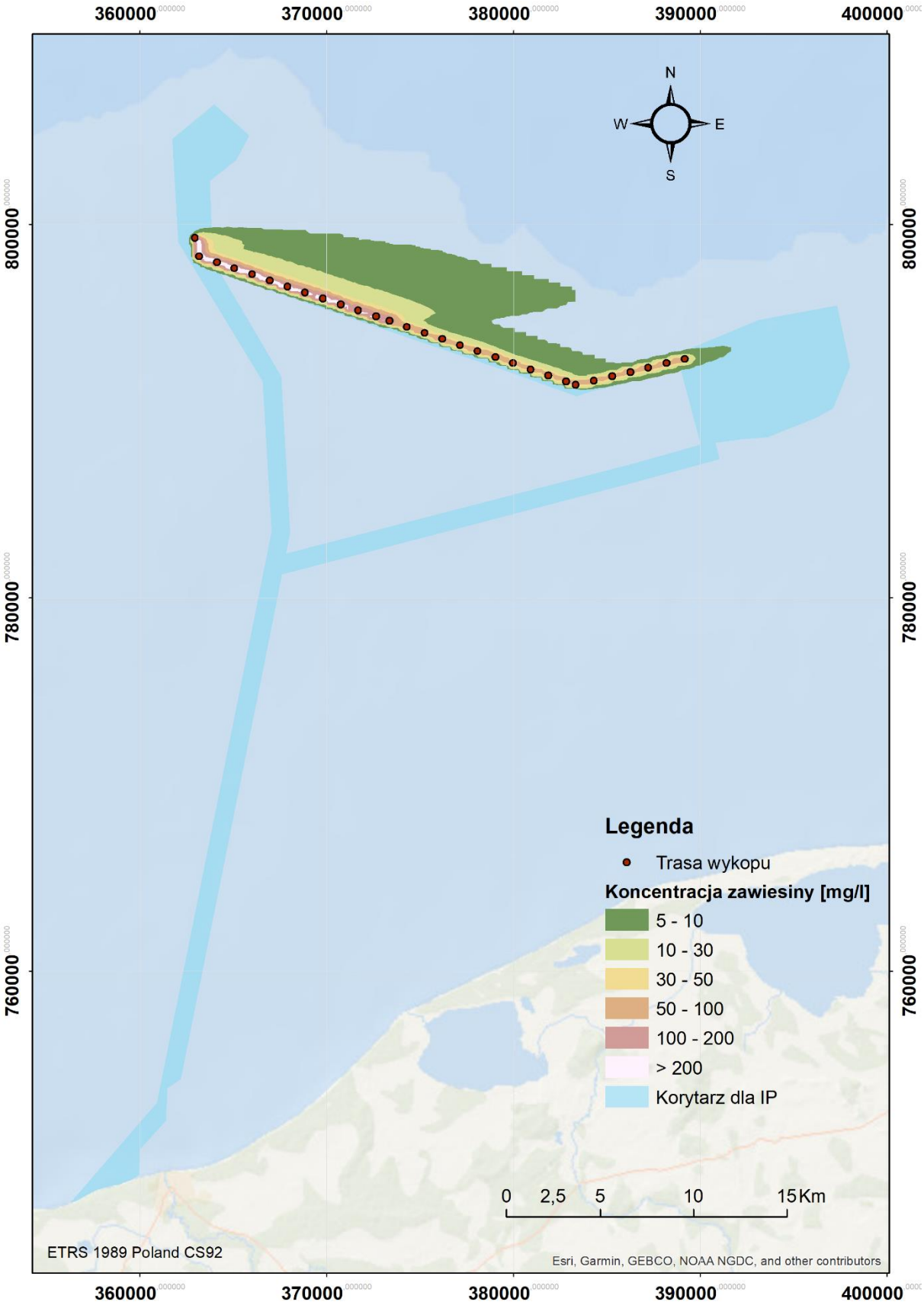

Fig. 22 Maximum suspended solids concentrations in the entire water column determined at each grid node during the cable burying process on the connector route in the V200 scenario, limit value 5 mg/l

In Fig. 23 - Fig. 28 maps are presented illustrating the duration of turbidity in the water column occurring while burying the power cable into the bottom on the route to the Baltic II OWF (Fig. 23 and Fig. 24), Baltic III OWF (Fig. 25 and Fig. 26) and the connector (Fig. 27 and Fig. 28). The presented values determine the total time during which the concentration of suspended solids in individual grid nodes exceeds the background limit value, i.e. 5 mg/l. The ranges of water turbidity marked on the maps are the same as the ranges presented on Fig. 17 - Fig. 22.

In the case of carrying out the trench leading to the Baltic II OWF, it was obtained that the time of water turbidity at any point will not be longer than 16 hours for the V100 scenario (Fig. 23) and 12 hours for the V200 scenario (Fig. 24). The increased concentration of suspended solids remains the longest near the shore, and between 0 km and 2 km and 12 km and 18 km of the corridor shared by the Baltic II OWF and Baltic III OWF, as well as along the entire corridor to the Baltic II OWF, except for the section from 10 km BII up to 12 km BII. These are the areas where the bottom sediments contain significant amounts of cohesive fractions. In their case, the water turbidity time exceeds 10 hours in the V100 scenario and 8 hours in the V200 scenario.

In the case of the route leading to the Baltic III OWF, significantly longer turbidity times were obtained. They reach up to 42 hours for V100 scenario (Fig. 25) and up to 46 hours for V200 scenario (Fig. 26). This is a consequence of the suspended solids spreading along the route of the trench. These maximum values will only occur at a few points, while at most points the turbidity time will not exceed 30 hours.

In the case of the connector, where cohesive sediments are present in the bottom in the western part and non-cohesive sediments in the eastern part, an analogous distribution of water turbidity time was obtained. In the area of the trench part in cohesive sediments, the water turbidity time is longer and reaches 30 hours for the V100 scenario (Fig. 27) and up to 23 hours for the V200 scenario (Fig. 28). In

the eastern part, where sands are present, the water turbidity time reaches up to 8 hours for the V100 scenario and up to 15 hours for the V200 scenario.

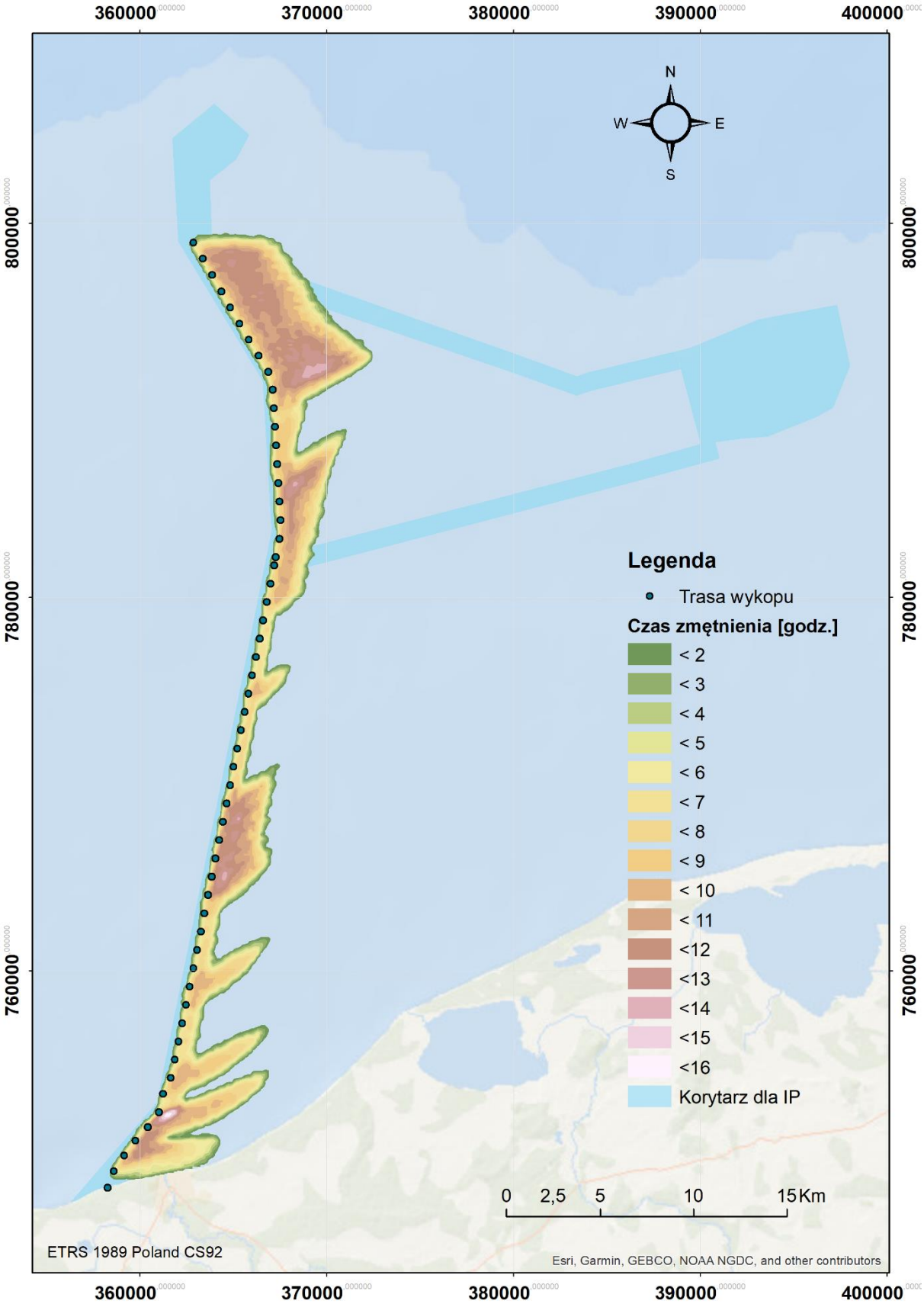

Fig. 23 Total time of water turbidity created during the entire cable burying process on the route to Baltic II OWF for the V100 scenario

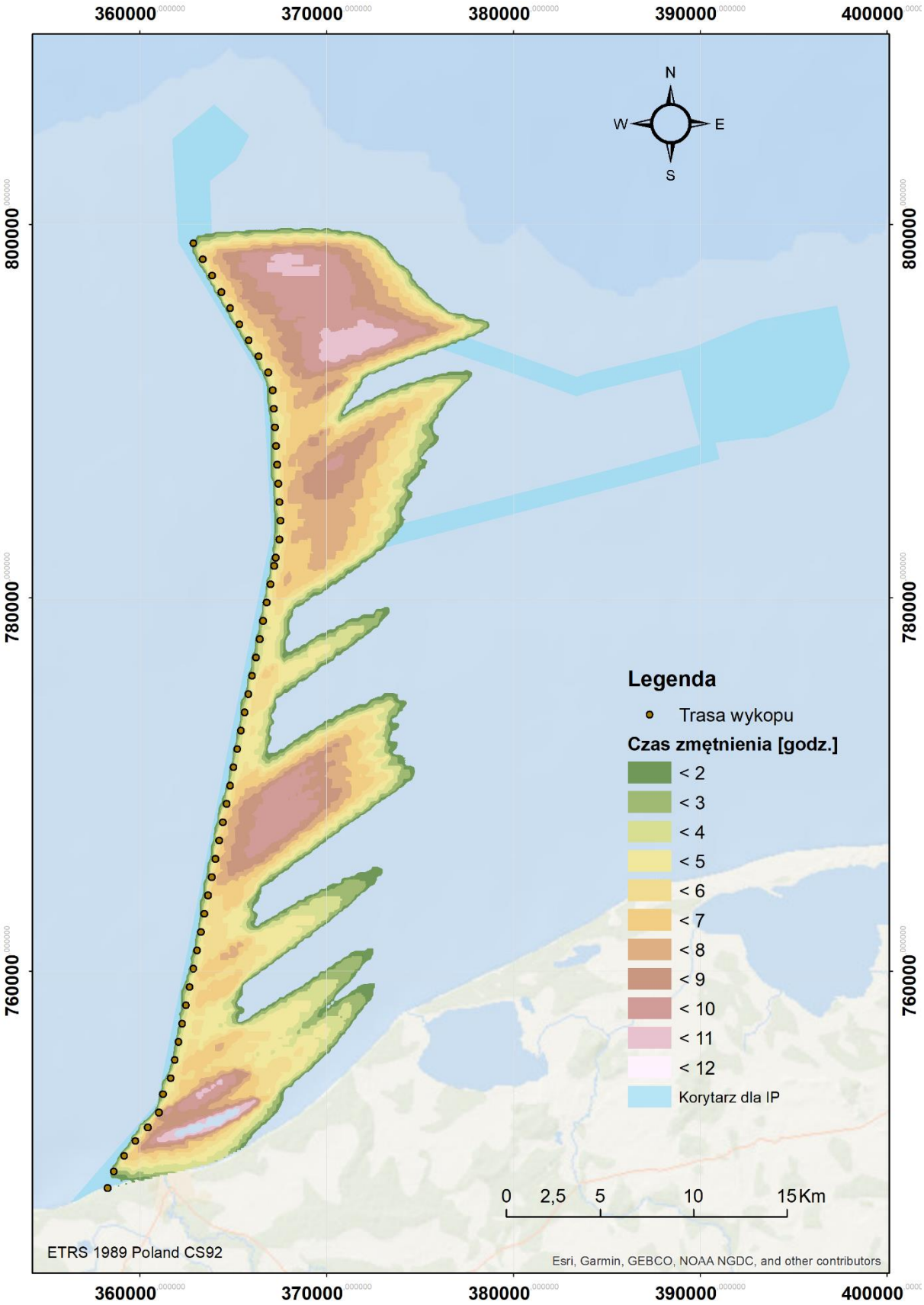

Fig. 24 Total time of water turbidity created during the entire cable burying process on the route to Baltic II OWF for the V200 scenario

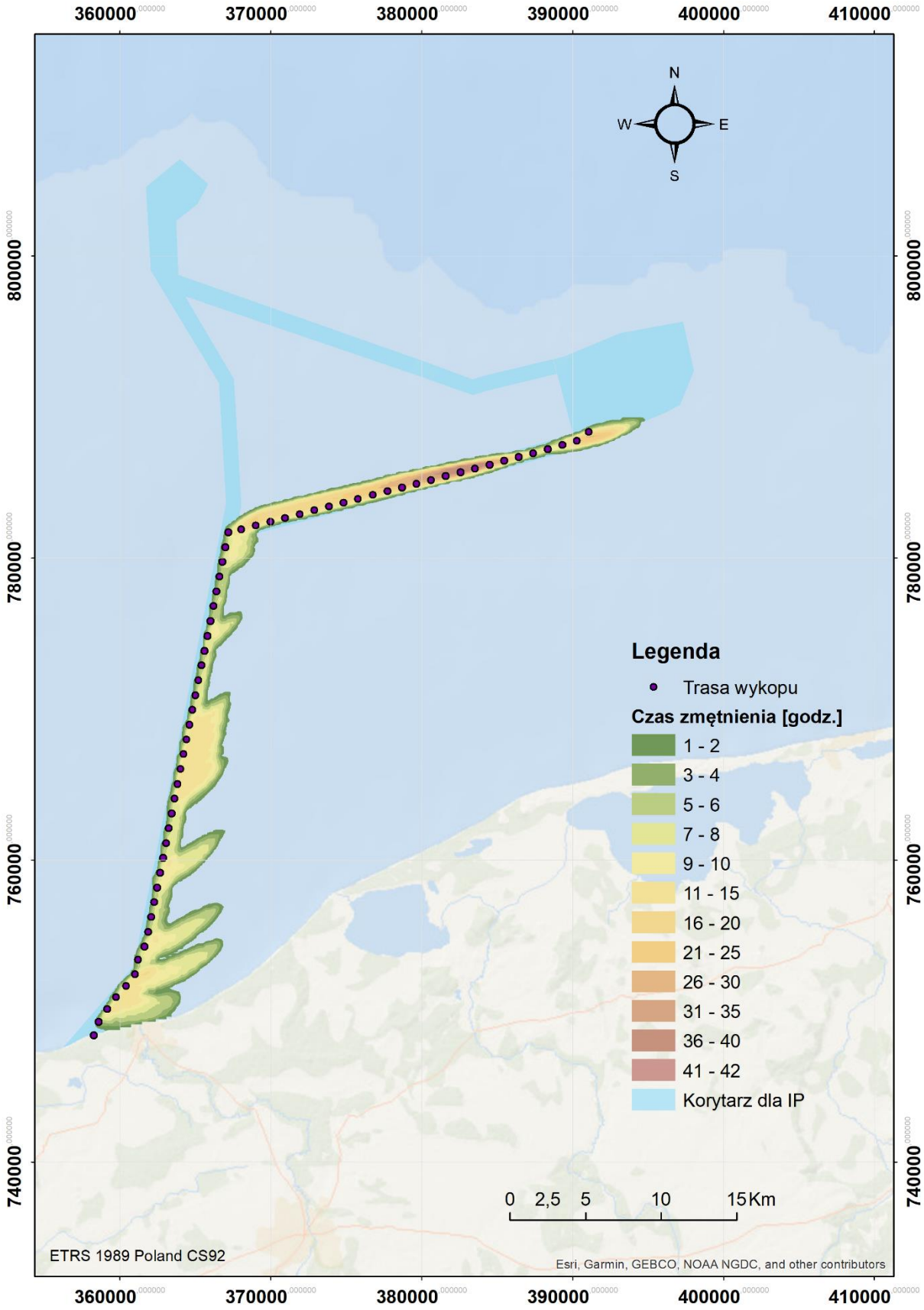

Fig. 25 Total time of water turbidity created during the entire cable burying process on the route to Baltic III OWF for the V100 scenario

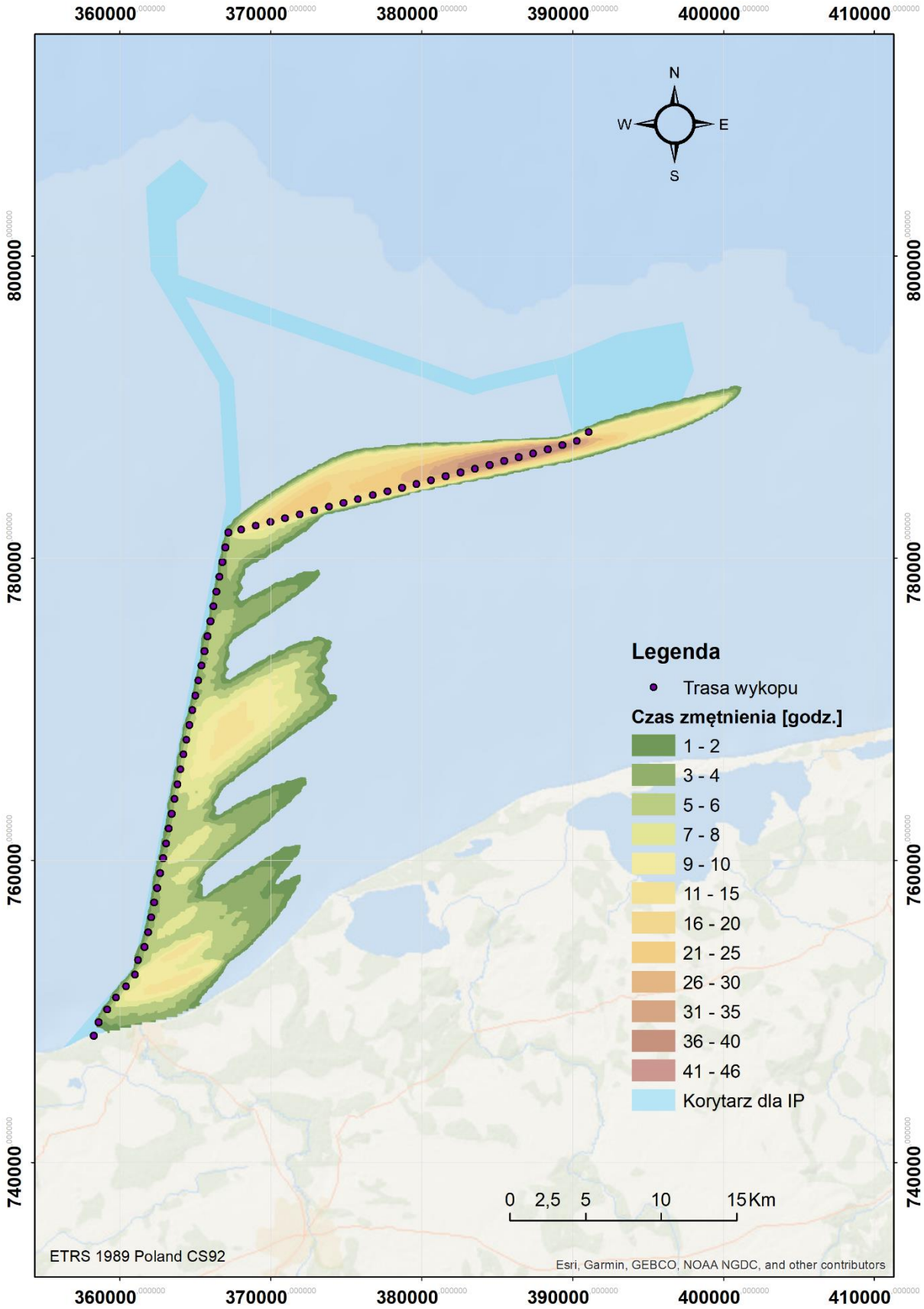

Fig. 26 Total time of water turbidity created during the entire cable burying process on the route to Baltic III OWF for the V200 scenario

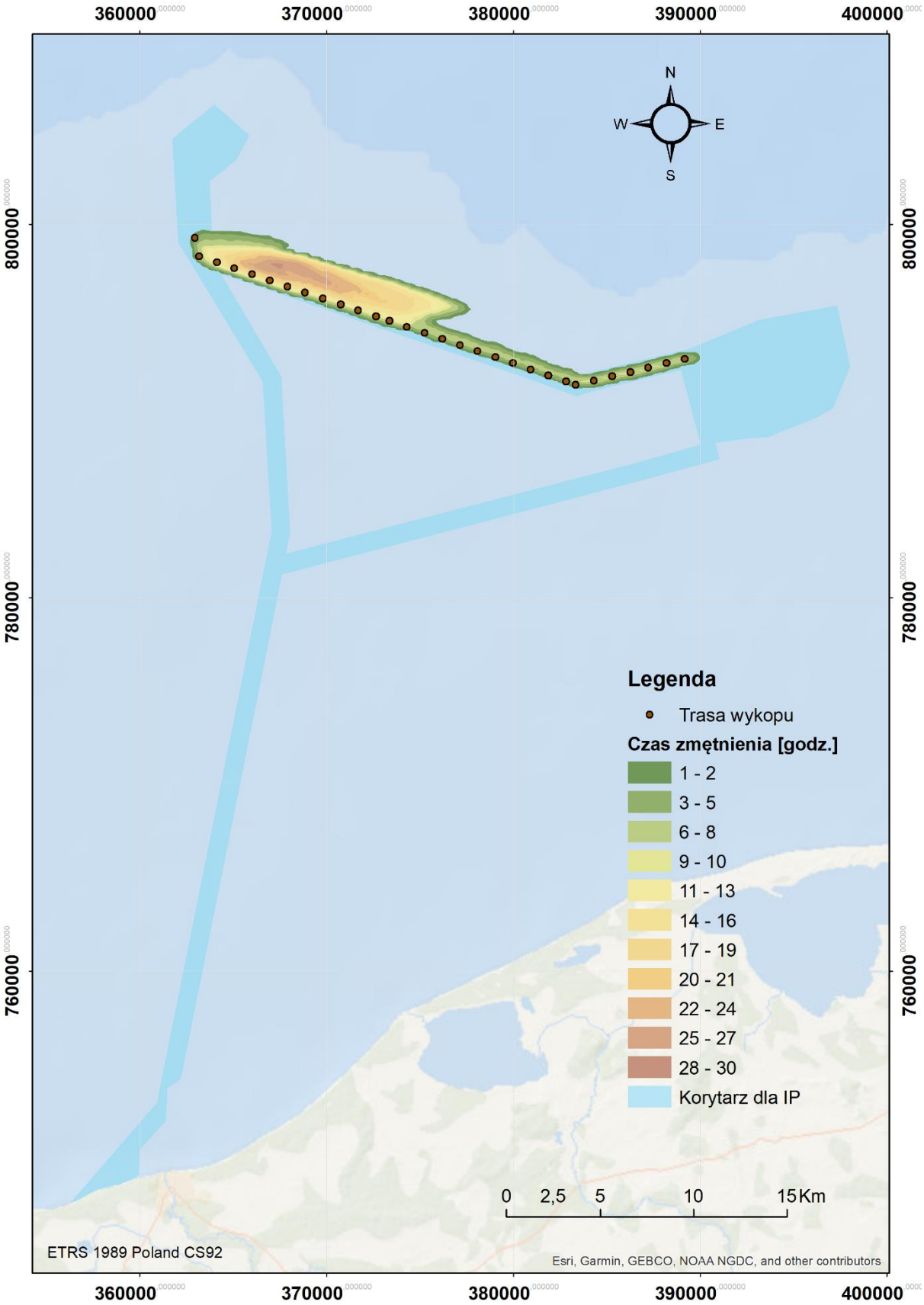

Fig. 27 Total time of water turbidity created during the entire cable burying process on the connector route for the V100 scenario

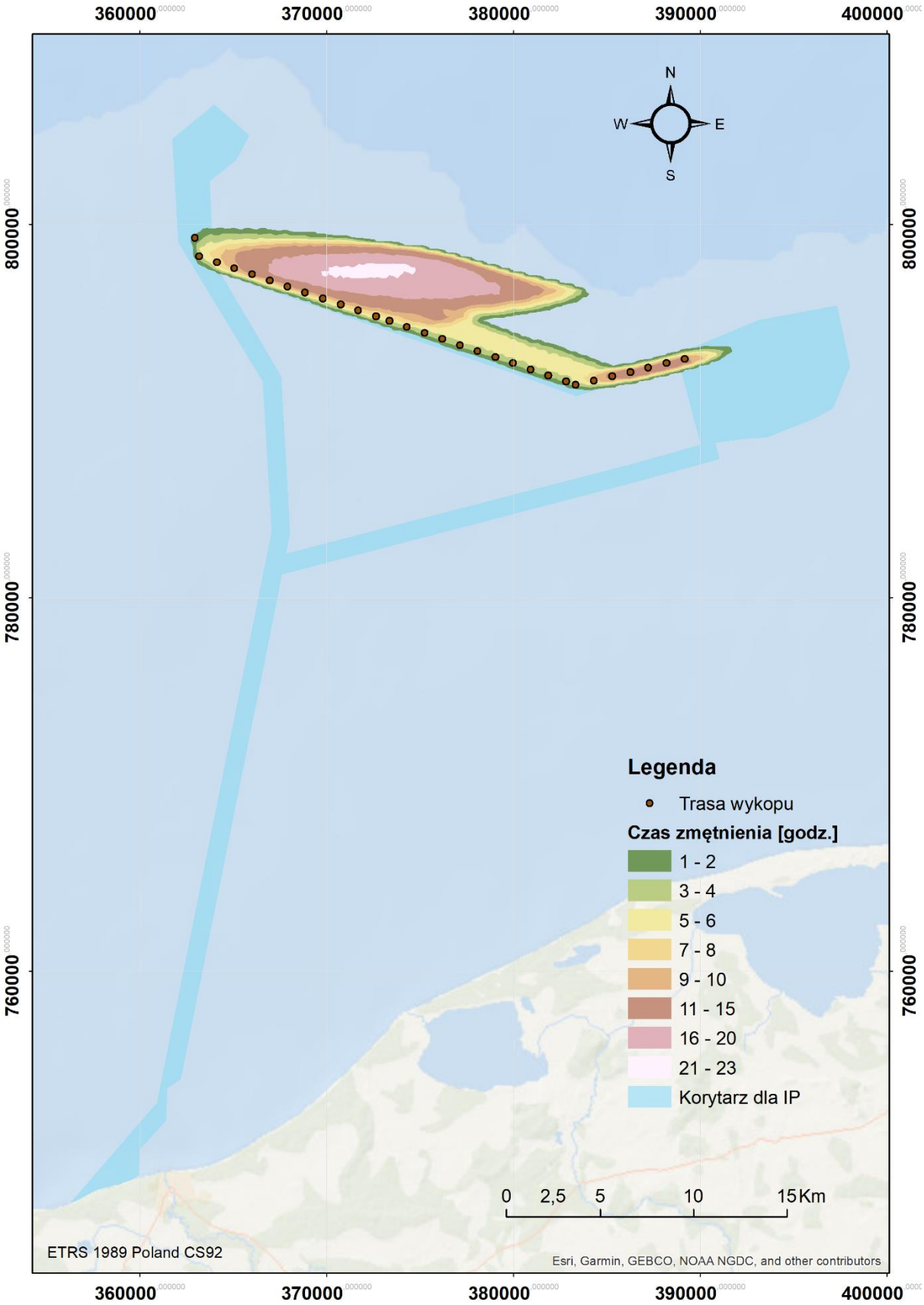

Fig. 28 Total time of water turbidity created during the entire cable burying process on the connector route for the V200 scenario

The Fig. 29 - Fig. 34 presents the thickness of the sediment layer obtained as a result of numerical simulations, formed after the total sedimentation of the suspended solids introduced into the basin during the cable burying. Fig. 29 and Fig. 30 present the situation resulting from the works on the route to the Baltic II OWF in the case of the V100 and V200 scenarios, respectively. Fig. 31 and Fig. 32 present the situation resulting from the works on the route to the Baltic III OWF in the V100 and V200 scenarios, respectively, while Fig. 33 and Fig. 34 present the situation resulting from the works on the connector route in the case of the V100 and V200 scenarios, respectively.

The obtained results indicate that sediment deposition will occur in a relatively small area. However, apart from the close vicinity of the trench, the thickness of the new deposit may be considered insignificant. Its spatial extent depends little on the speed variant of the cable burying into the bottom, while it is really influenced by the amount of debris inflow. In regions where the bottom is built of

cohesive sediments, the extent of the deposition is significantly greater than in the areas with a sandy bottom.

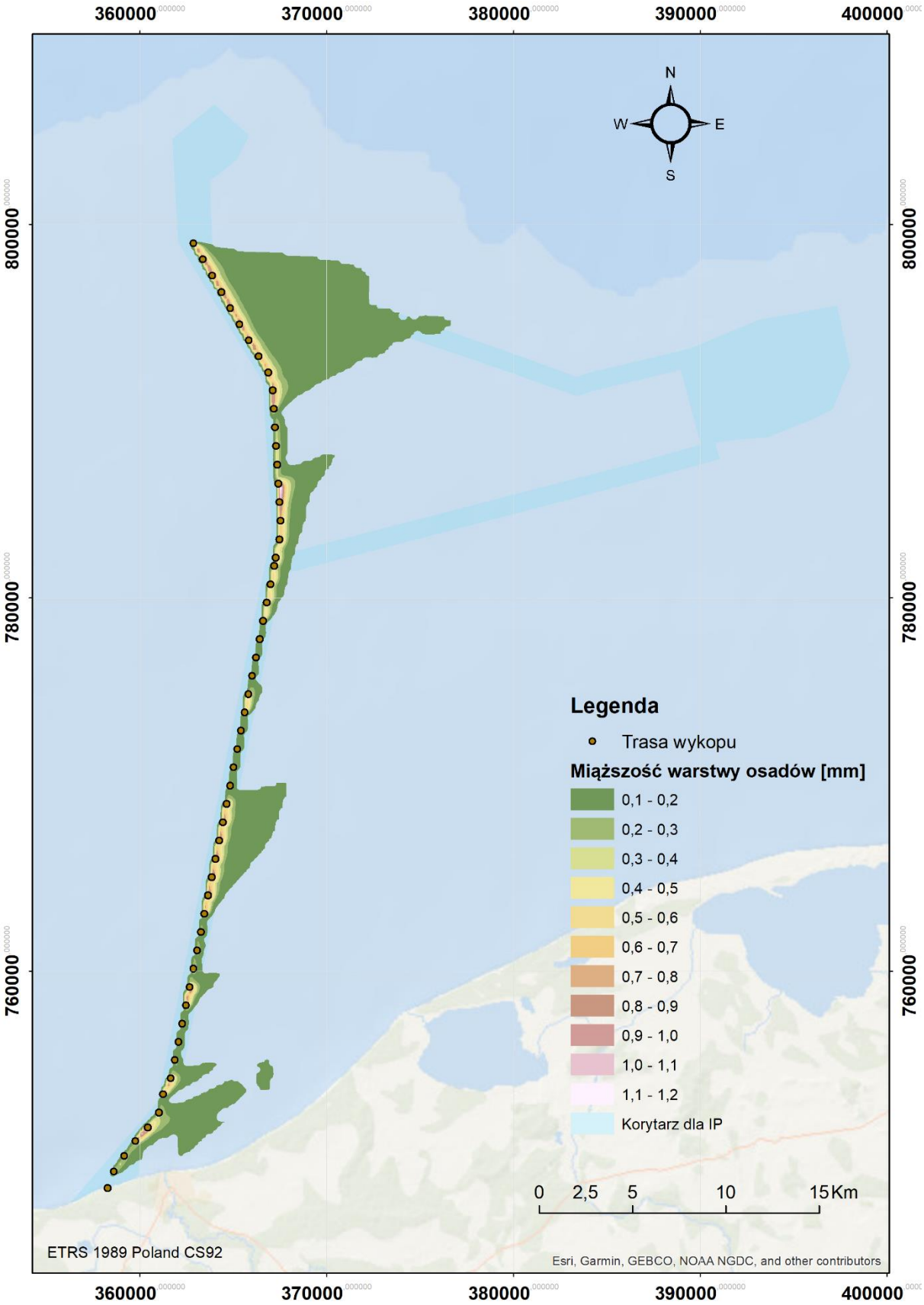

Fig. 29 The thickness of the sediment layer formed after the total sedimentation of the suspended solids introduced to the basin during cable burying on the route to Baltic II OWF for V100 scenario

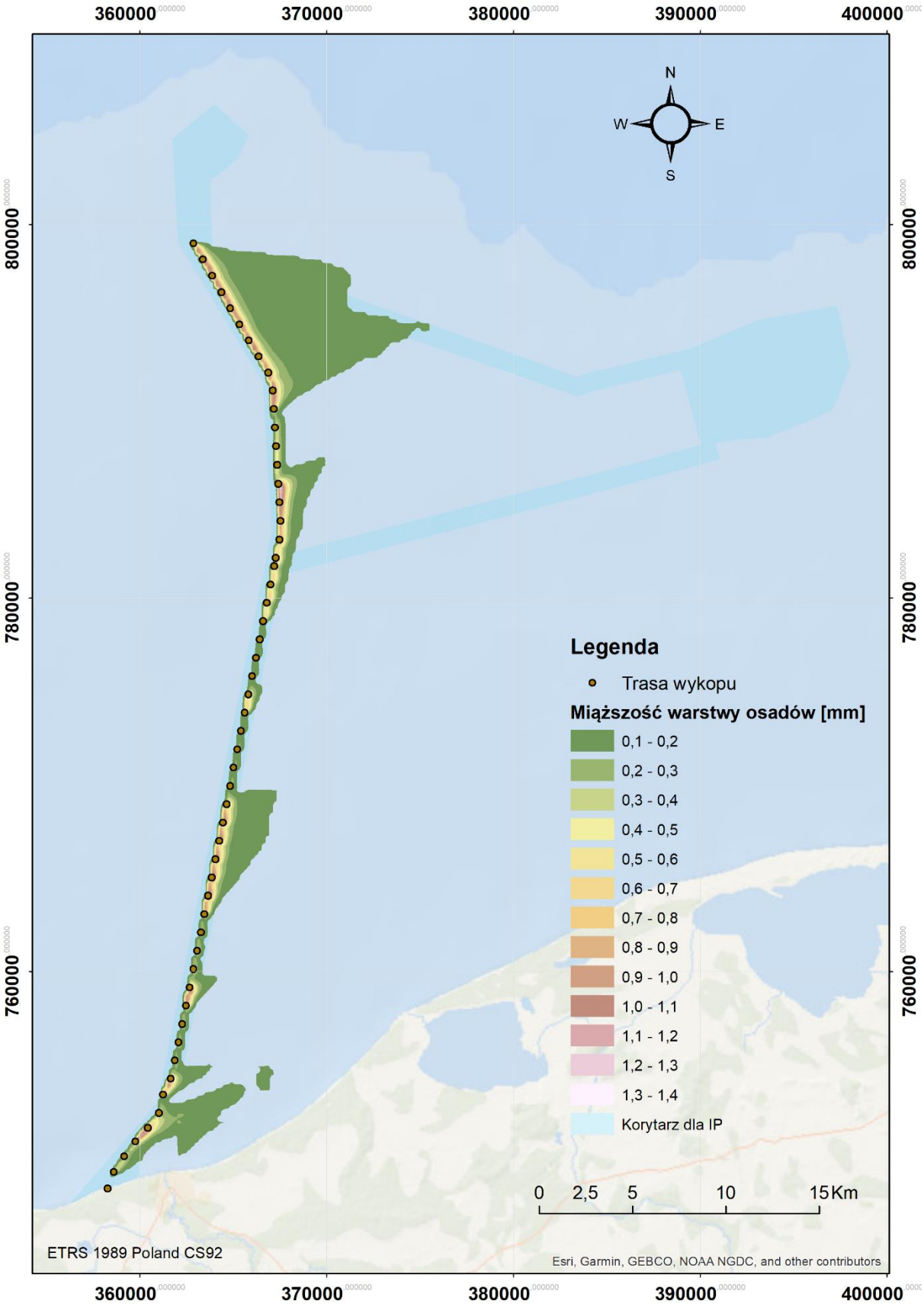

Fig. 30 The thickness of the sediment layer formed after the total sedimentation of the suspended solids introduced to the basin during cable burying on the route to Baltic II OWF for V200 scenario

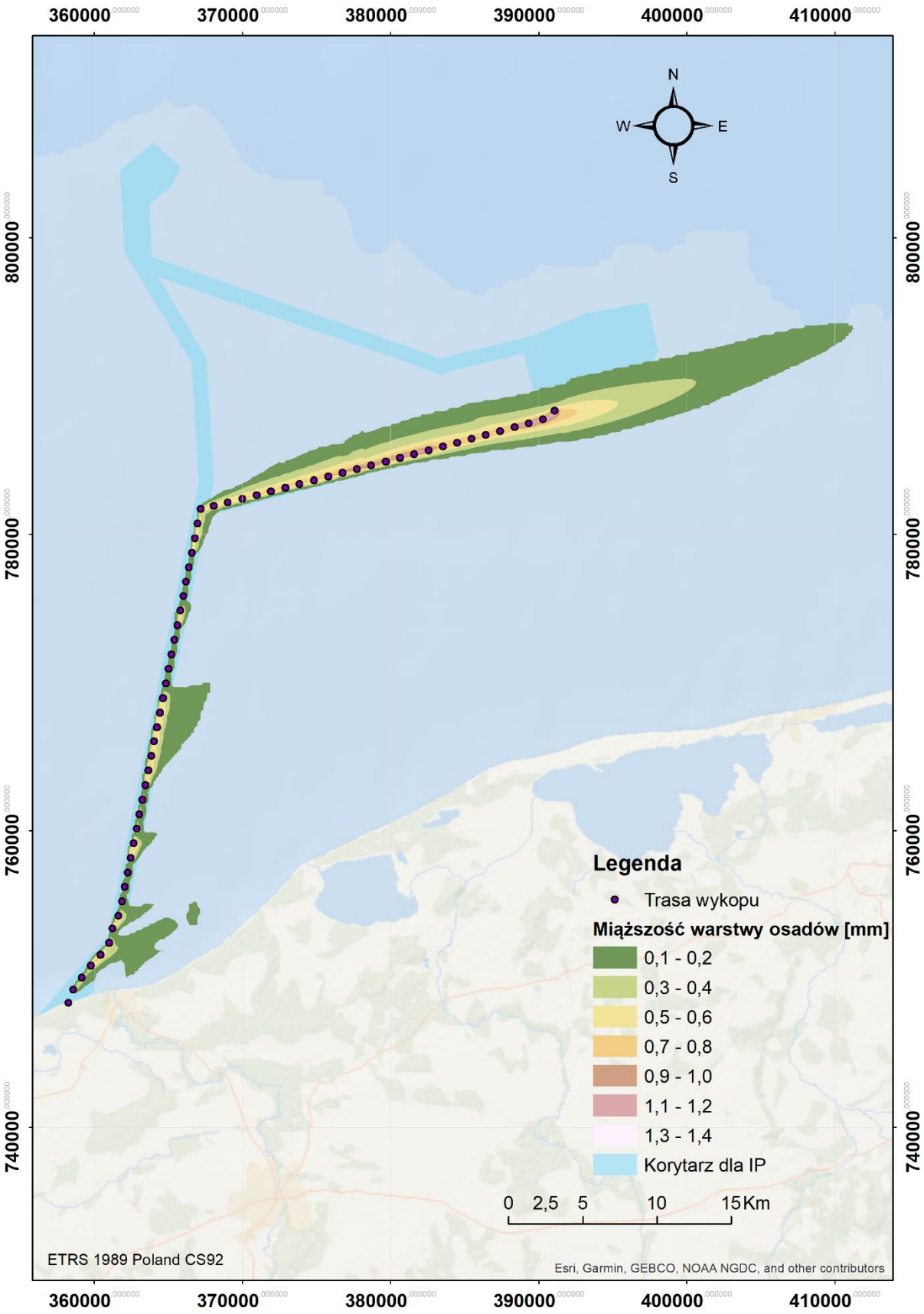

Fig. 31 The thickness of the sediment layer formed after the total sedimentation of the suspended solids introduced to the basin during cable burying on the route to Baltic III OWF for V100 scenario

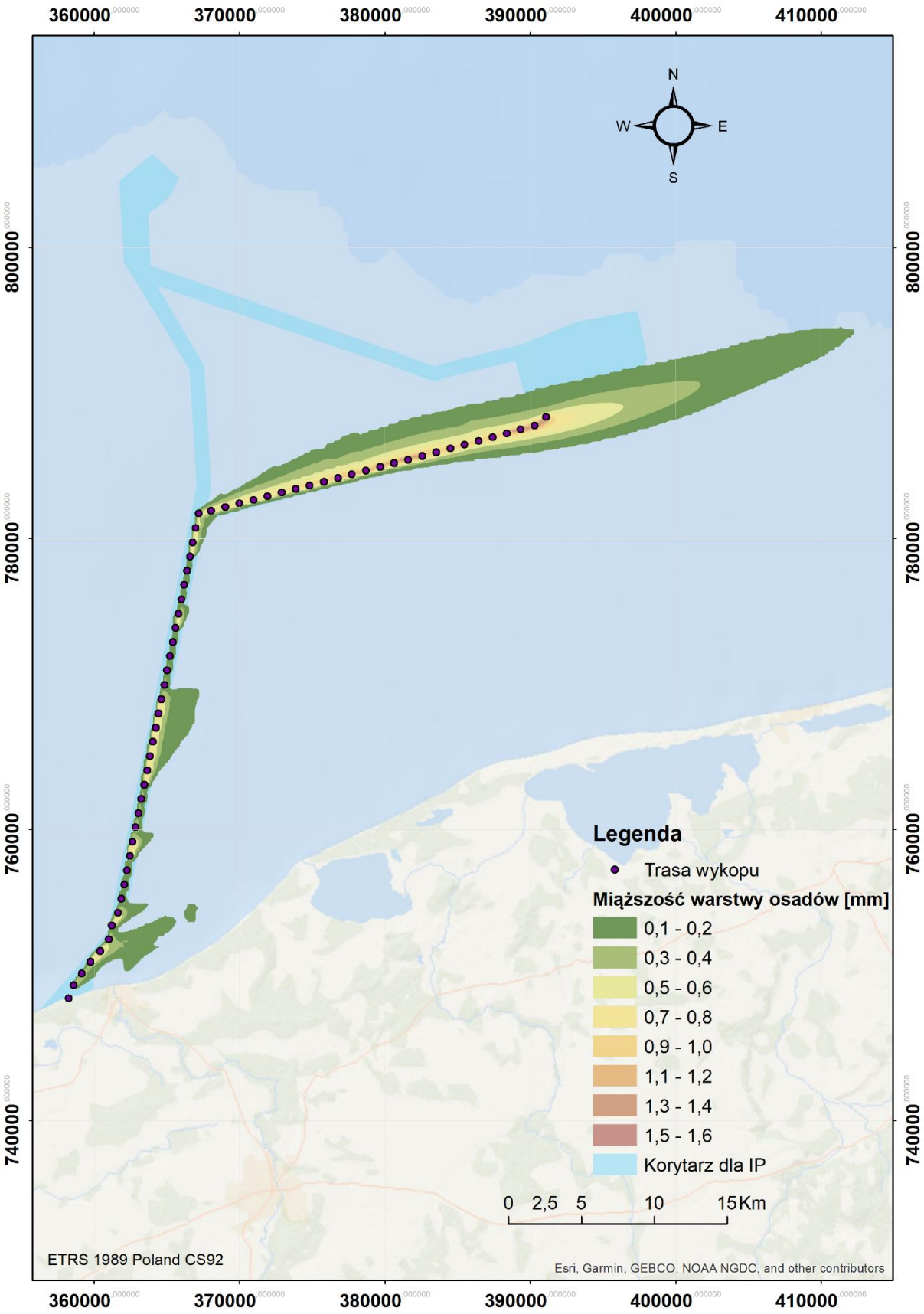

Fig. 32 The thickness of the sediment layer formed after the total sedimentation of the suspended solids introduced to the basin during cable burying on the route to Baltic III OWF for V200 scenario

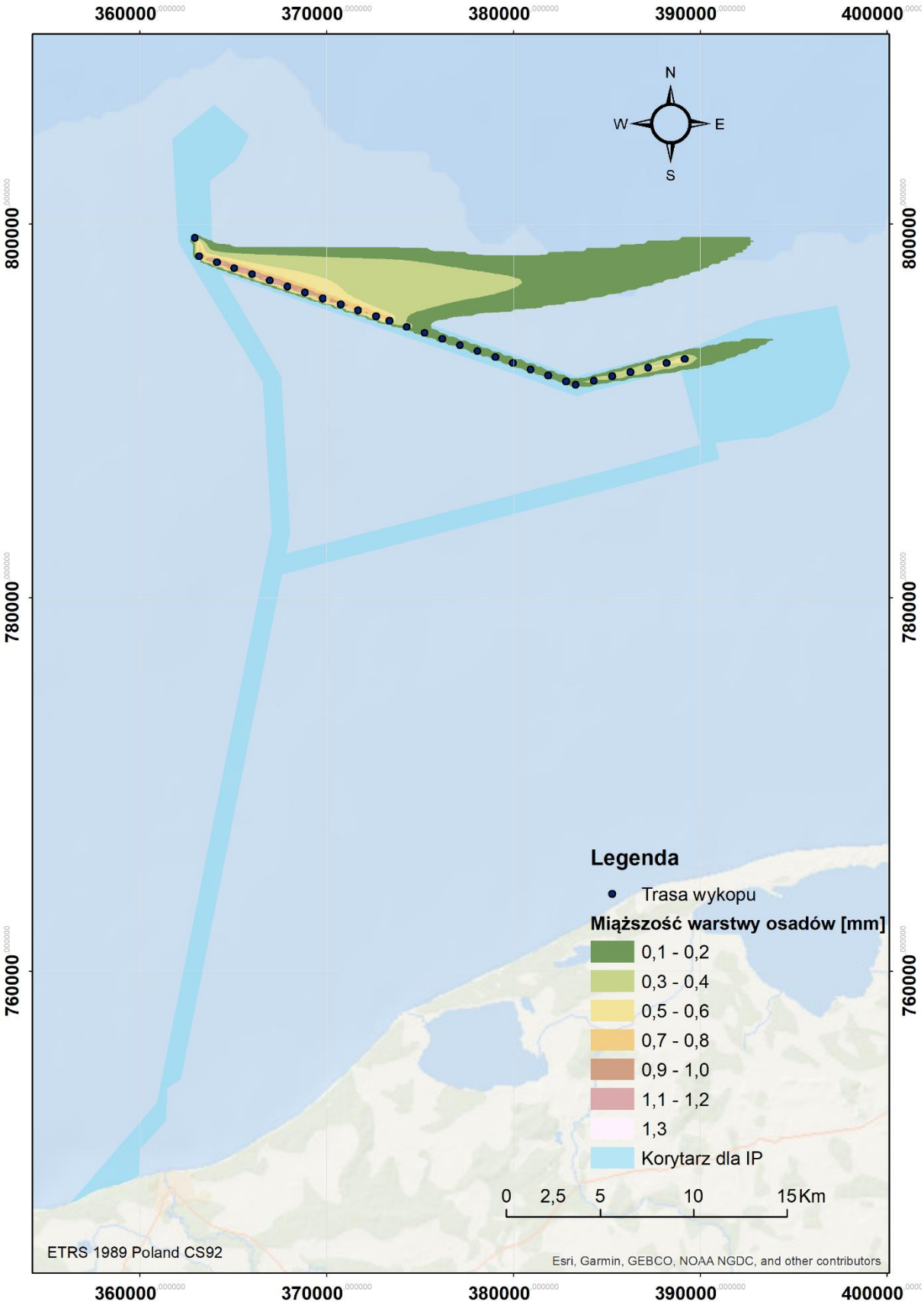

Fig. 33 The thickness of the sediment layer formed after the total sedimentation of the suspended solids introduced to the basin during cable burying on the connector route for V100 scenario

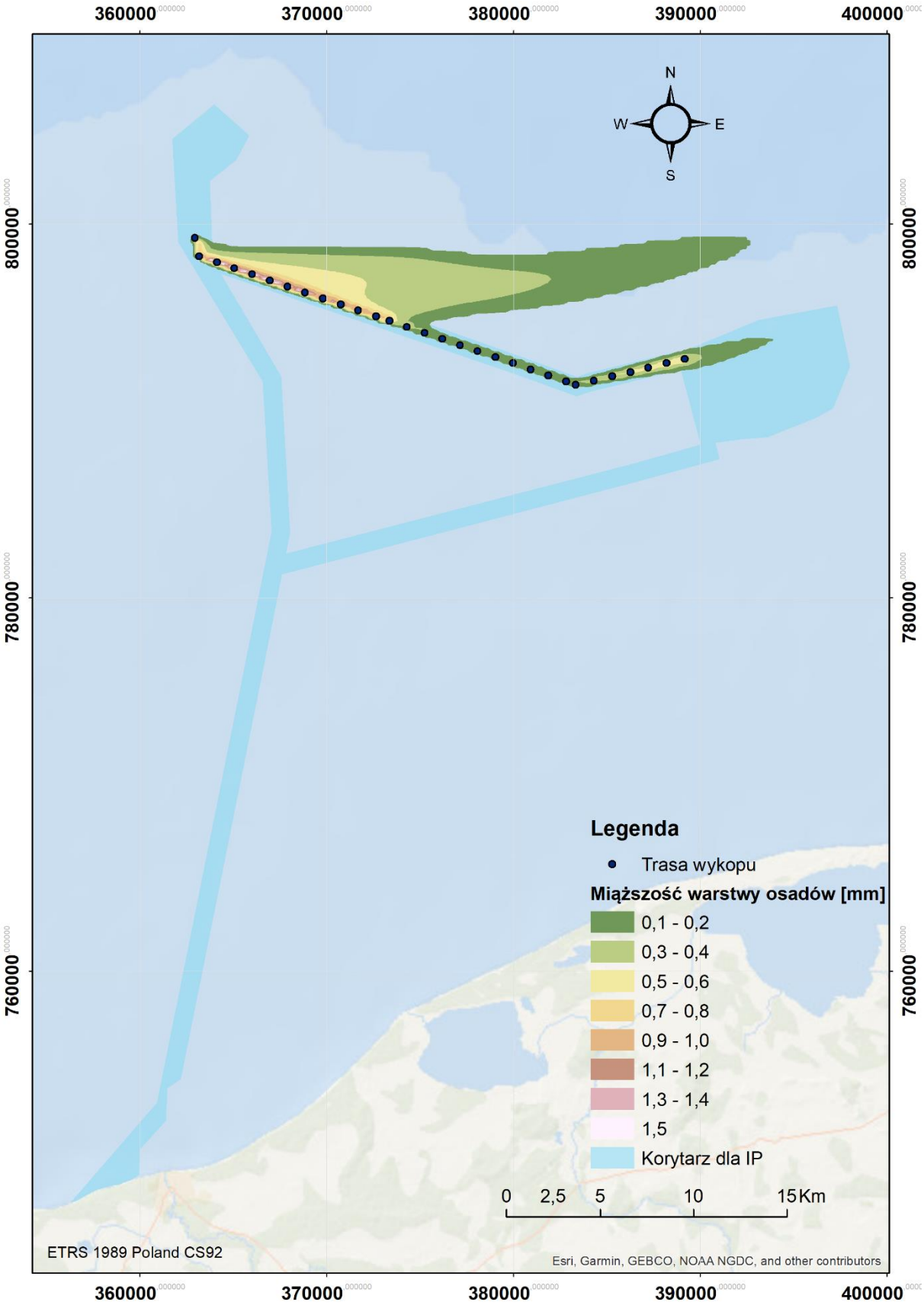

Fig. 34 The thickness of the sediment layer formed after the total sedimentation of the suspended solids introduced to the basin during cable burying on the connector route for V200 scenario

6. Commentary on the results of modelling of suspended solids spreading in the corridor area for the CI obtained by the Maritime Institute in Gdańsk in 2015.

The Maritime Institute in Gdańsk performed numerical modelling of the spread of suspended solids during the laying of the export cable in the seabed in the corridor area for the CI of Baltic II OWF and Baltic III OWF in 2015. The report on these tests discusses various techniques of cable burying and presents the results of numerical simulations obtained for them. The calculations were made assuming the boundary conditions in the form of the actual hydro and meteorological situation, which occurred between March 24, 2013 and May 31, 2013. This period was chosen due to the conditions present at the time, which were favourable for the implementation of the project. Therefore, a reconstruction of the actual hydrodynamic conditions prevailing at a given time in the area covered by the modelling was obtained, and, consequently, the spreading ranges of the suspended solids that would occur if the works were performed between 24.03.2013 and 31.05.2013.

Due to the randomness of events occurring in nature and the wide spectrum of possible meteorological conditions that may occur in the same area at the same time of the year, the basic drawback of the methodology used by the Maritime Institute in Gdańsk is the fact that the boundary conditions assumed in the model will never be repeated. This means that the spreading ranges of the suspended solids during the implementation of the project will differ from those that would have occurred in 2013. However, the most important problem is the variability of the boundary conditions over time. Therefore, it is not possible to draw general conclusions on the extent of the spread of suspended solids on the basis of the obtained calculation results. It is not possible to determine to what extent the results were influenced by the time-varying hydro-meteorological conditions, and to what extent by the amount of debris inflow to the water column. In addition, the methodology used by the Maritime Institute in Gdańsk does not allow to determine what the maximum range of water turbidity may be, as it does not implement the worst-case scenario. Thus, the results of numerical simulations obtained in this way do not allow for a general assessment of the project's environmental impact. However, the methodology used by the Maritime Institute in Gdańsk is appropriate for the reconstruction of phenomena and processes. Moreover, the advantage of the results presented in the study of the Maritime Institute in Gdańsk is the possibility of comparing the environmental impact of the application of various methods of cable burying. This is possible by assuming the same boundary conditions each time.

7. Summary

Underwater works related to the planting of connecting infrastructure (CI) in the seabed are currently carried out in most of the world's seas and oceans (Wang et al. 2020, Kitty Hawk Offshore 2021, ESS Group 2013, Eversource Energy Park 2018). In all these projects, for the purpose of preparing an environmental impact report, the increase in the suspended solids concentration in the water column is analysed as a result of the construction works, the scope of this increase and the duration of the increased concentration are also studied. Depending on the water basin and construction technology, the concentration of suspended solids and the extent of water turbidity vary.

The study presents the results of mathematical modelling of the suspended solids spreading during the laying of the submarine cable in the corridor for Baltic II OWF and Baltic III OWF CI. In order to enable the assessment of the environmental impact of the project, the most unfavourable hydro-

meteo scenario was assumed in the simulations, i.e. the calculations were made for the permissible limit values, i.e. waves with a significant wave height H_s = 1.5 m and the wind blowing throughout the simulation at a constant speed of 10 m/s. The prevailing wind direction was assumed to be westerly. The calculations were made for two scenarios of the cable burying speed: 100 m/h (V100 scenario) and 200 m/h (V200 scenario).

It was obtained that the area of increased turbidity > 5 mg/l has an elongated oval shape and is approximately extended according to the wind direction. The spot of turbid water moves along the trench as the works progress. Its range depends on the speed of sea currents and the amount of debris inflow, which depends on the cable burying technique used, the type of bottom sediments and the speed of works. In the case of sediments with a high content of silty and clay fractions, the extent of turbid water is greater than in the case of a sandy bottom. In the case of a higher cable burying speed (V200), the range of increased turbidity of the water is 2-3 times greater than in the case of the V100, due to the higher debris inflow per unit time.

The greatest range of increased water turbidity **occurs in the bottom layer and is a few to several kilometres**, with suspended solids concentrations not exceeding 10 mg/l. The area of the increased water turbidity is directly adjacent to the site of the currently conducted works. The range of turbid water with a suspended solids concentration exceeding 30 mg/l is no more than approx. 1 km in the V200 scenario and no more than approx. 0.5 km in the V100 scenario. Turbidity of water in the water column may occur in a similar area as in the bottom layer, however, the suspended solids concentration does not exceed 30 mg/l (except for local situations, e.g. near the shore). In the area of clay, silt and loam in the seabed, increased turbidity of the water may also appear in the surface layer.

In the conditions of the west wind, during the works on the route to Baltic III OWF, the suspended solids spread in a narrow spot along the route of the trench. This is definitely a beneficial phenomenon as it minimizes the environmental impact of the project. In the case of the west wind and the route to the Baltic II OWF and the connector, water turbidity may occur in a strip of approx. 6 km in the case of the V100 and in a strip of approx. 10 km, and sometimes even of approx. 13 km in the case of the V200.

In the case of winds blowing transverse to the trench direction (case of the Baltic II OWF), increased turbidity will persist for no more than several hours. This time is shorter for higher cable burying speed (V200 vs. V100). This is due to the shorter period of debris inflow. In the case of long-term wind blowing along the direction of the trench (in the case of the Baltic III OWF), the increased turbidity of the water may remain up to approx. 2 days (up to 42 hours - V100 and up to 46 hours - V200), although usually the turbidity time will not exceed 30 hours. This is a consequence of the suspended solids spreading along the route of the trench.

Sediment deposition can occur over a relatively small area. Importantly, apart from the close vicinity of the trench, the thickness of the new deposit may be considered as trace (less than 1 millimetre), and even in the close vicinity of the trench as insignificant (a maximum of a few millimetres). The spatial extent of deposition depends little on the speed variant of the cable burying into the bottom, while it is really influenced by the amount of debris inflow. In regions where the bottom is built of

cohesive sediments, the extent of the deposition is significantly greater than in the areas with a sandy bottom.

If jetting (or similar) technology is used, the increased concentration of suspended solids in the water column as a result of the conducted works will be comparable to the concentration of suspended solids in the sea during heavy storms.

8. Difficulties resulting from technical deficiencies and gaps in modern knowledge

There is little information in the literature on the problem of burying cables and pipelines into the seabed about the amount of bottom sediment that ends up in the water column as a result of this process. Most of them concern non-cohesive sediments, while there is very little data on cohesive sediments. Recognition of this issue is further complicated by the fact that in practice many different methods of penetrating the linear infrastructure into the seabed are used. Nevertheless, against the background of the values presented in the literature, the assumptions adopted in this study, i.e. 20% of excavated material in sandy soils and 50% of excavated material in non-cohesive soils, can be considered conservative.

All oceanographic processes, and in particular the processes of cohesive sediment transport, are highly non-linear, quasi-random and burdened with high inertia, as well as dependent on local disturbances. Therefore, during CI laying, the concentration of suspended solids in the water column should be continuously monitored and/or its spreading modelled based on meteorological and hydrological forecasts. This will allow for appropriate interventions in the event of exceeding the limits permitted by the environmental decision.

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Annex - Maximum concentration of suspended solids in the surface layer, in the water column and in the bottom layer during cable burying for V100 and V200 scenarios

The appendix to the study presents maps illustrating the values of the maximum turbidity of water in the surface layer, in the water column and in the bottom layer, occurring during the power cable burying into the bottom on the route to the Baltic II OWF (Fig. 35 - Fig. 40), Baltic III OWF (Fig. 41 - Fig. 46) and the connector (Fig. 47 - Fig. 52) for the V100 and V200 scenarios.

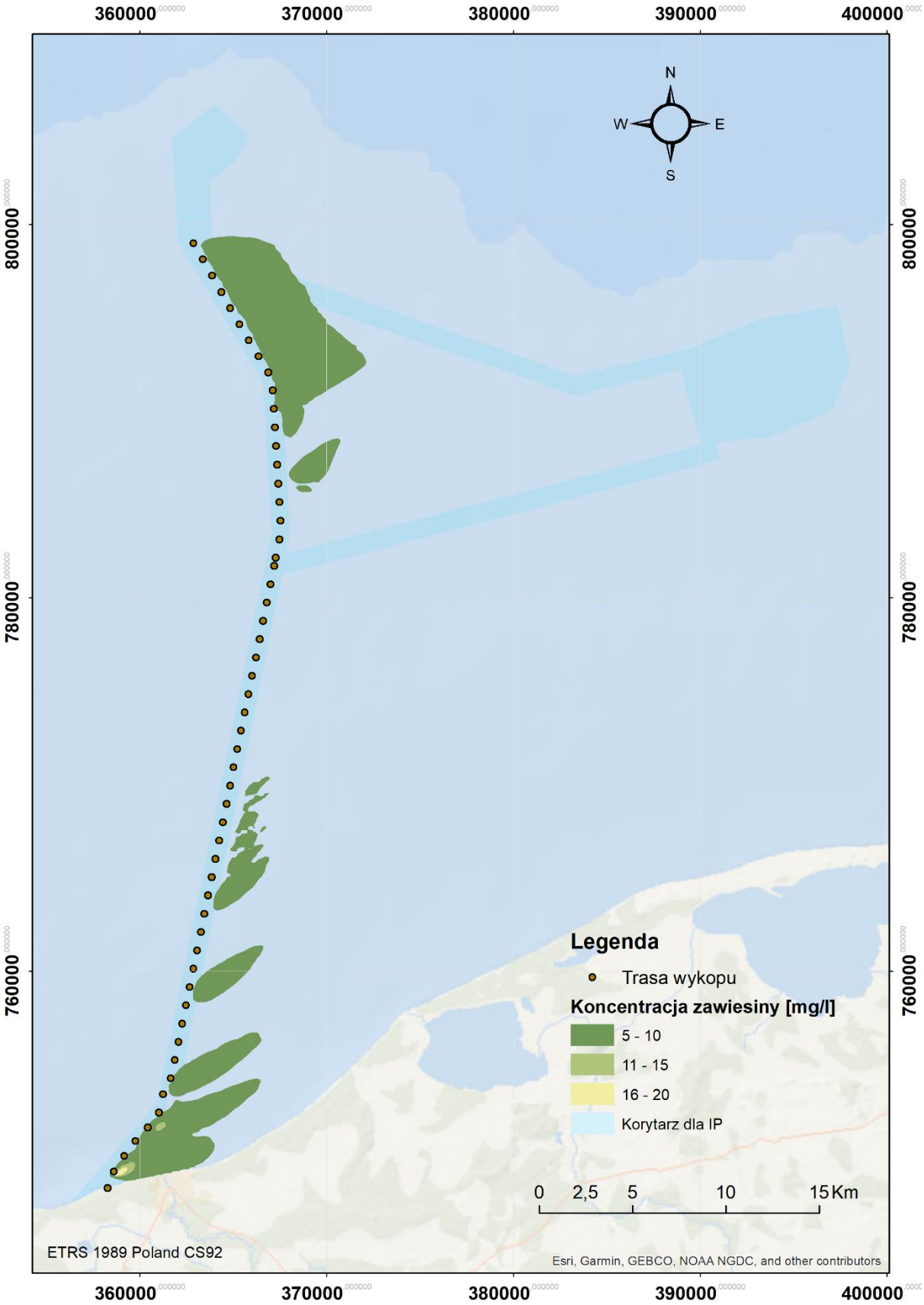

Fig. 35 Maximum suspended solids concentrations in the surface layer determined at each grid node during the cable burying process on the route to Baltic II OWF in the V100 scenario, limit value 5 mg/l

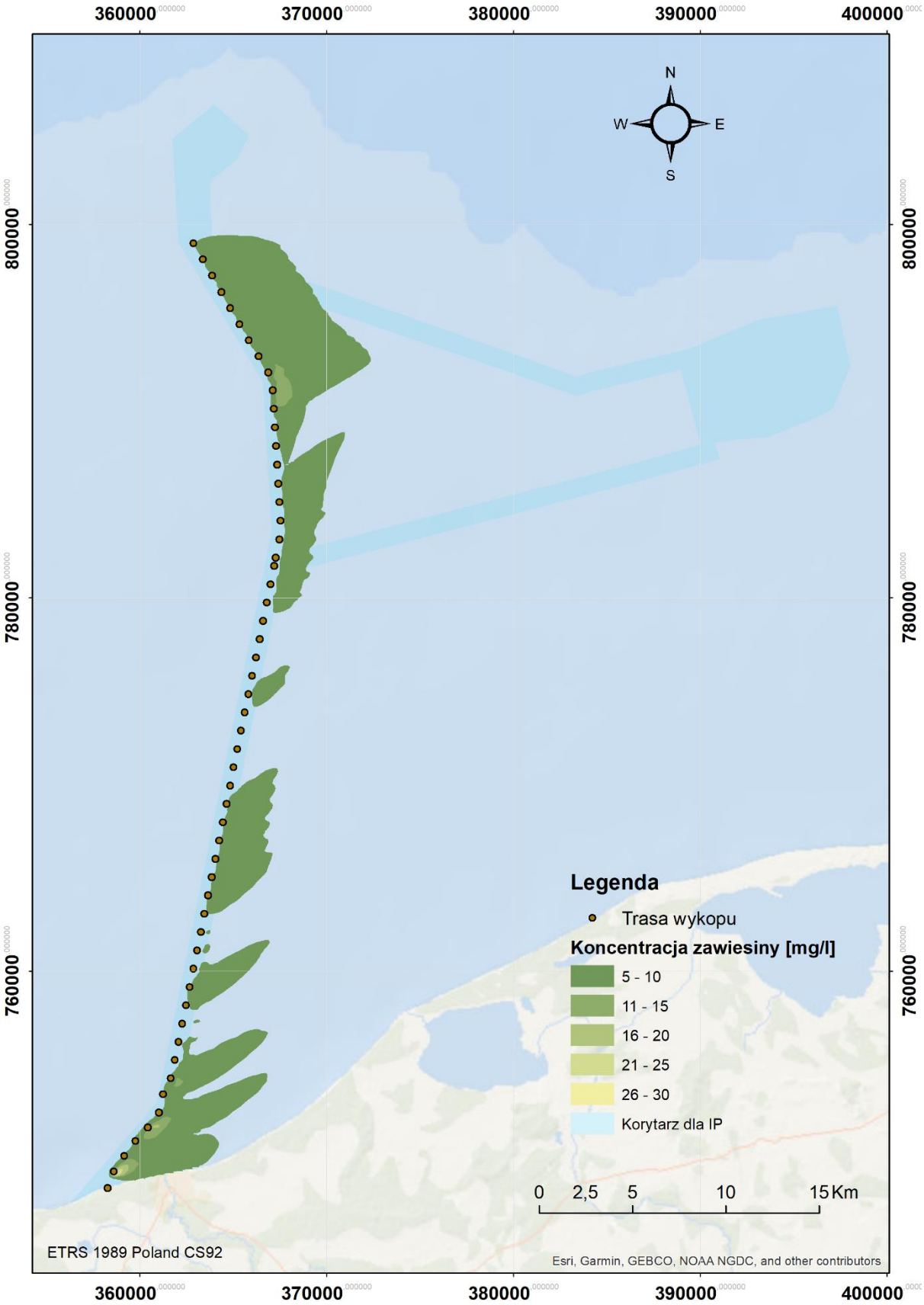

Fig. 36 Maximum suspended solids concentrations in the water column determined at each grid node during the cable burying process on the route to Baltic II OWF in the V100 scenario, limit value 5 mg/l

Fig. 37 Maximum suspended solids concentrations in the bottom layer determined at each grid node during the cable burying process on the route to Baltic II OWF in the V100 scenario, limit value 5 mg/l

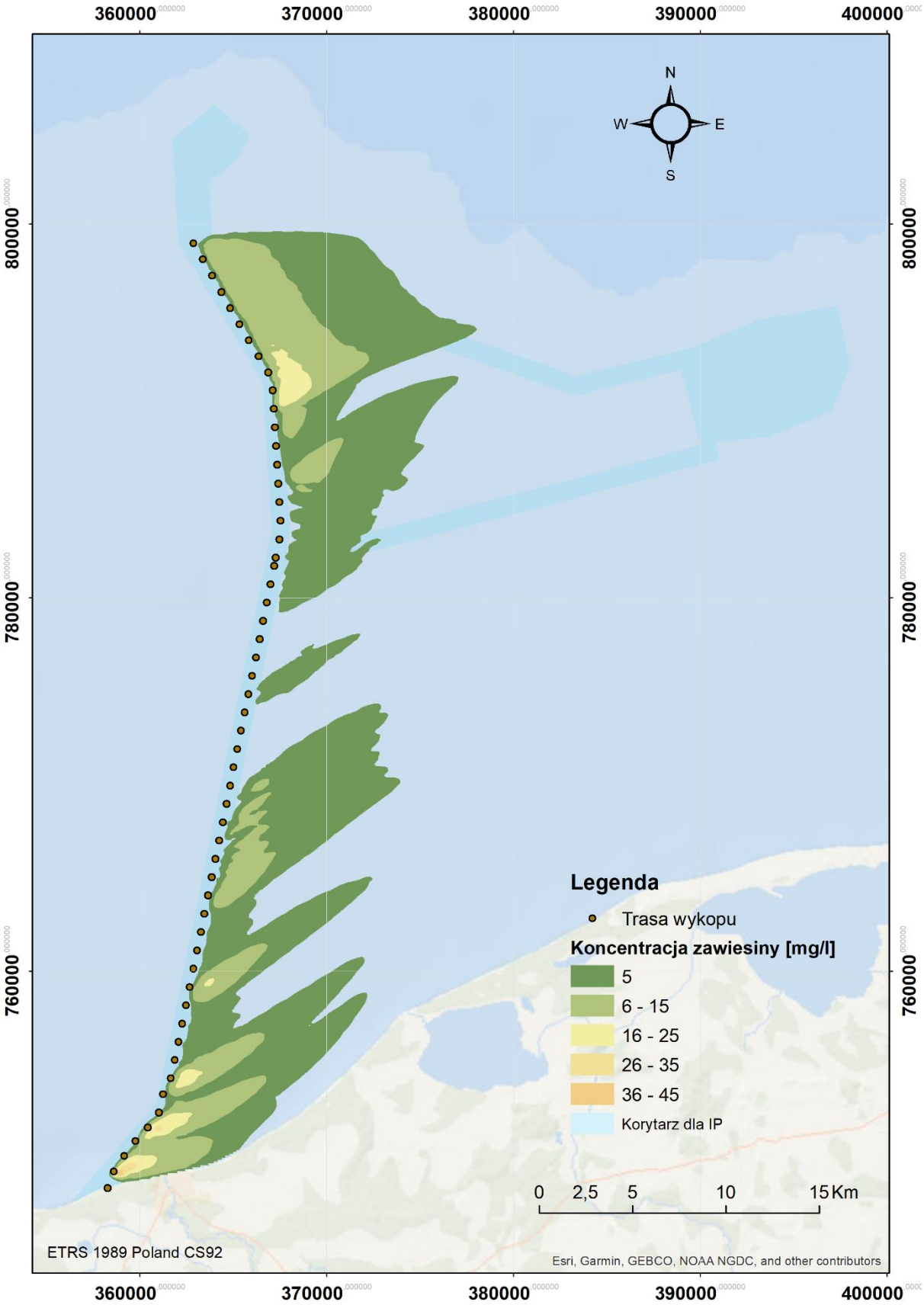

Fig. 38 Maximum suspended solids concentrations in the surface layer determined at each grid node during the cable burying process on the route to Baltic II OWF in the V200 scenario, limit value 5 mg/l

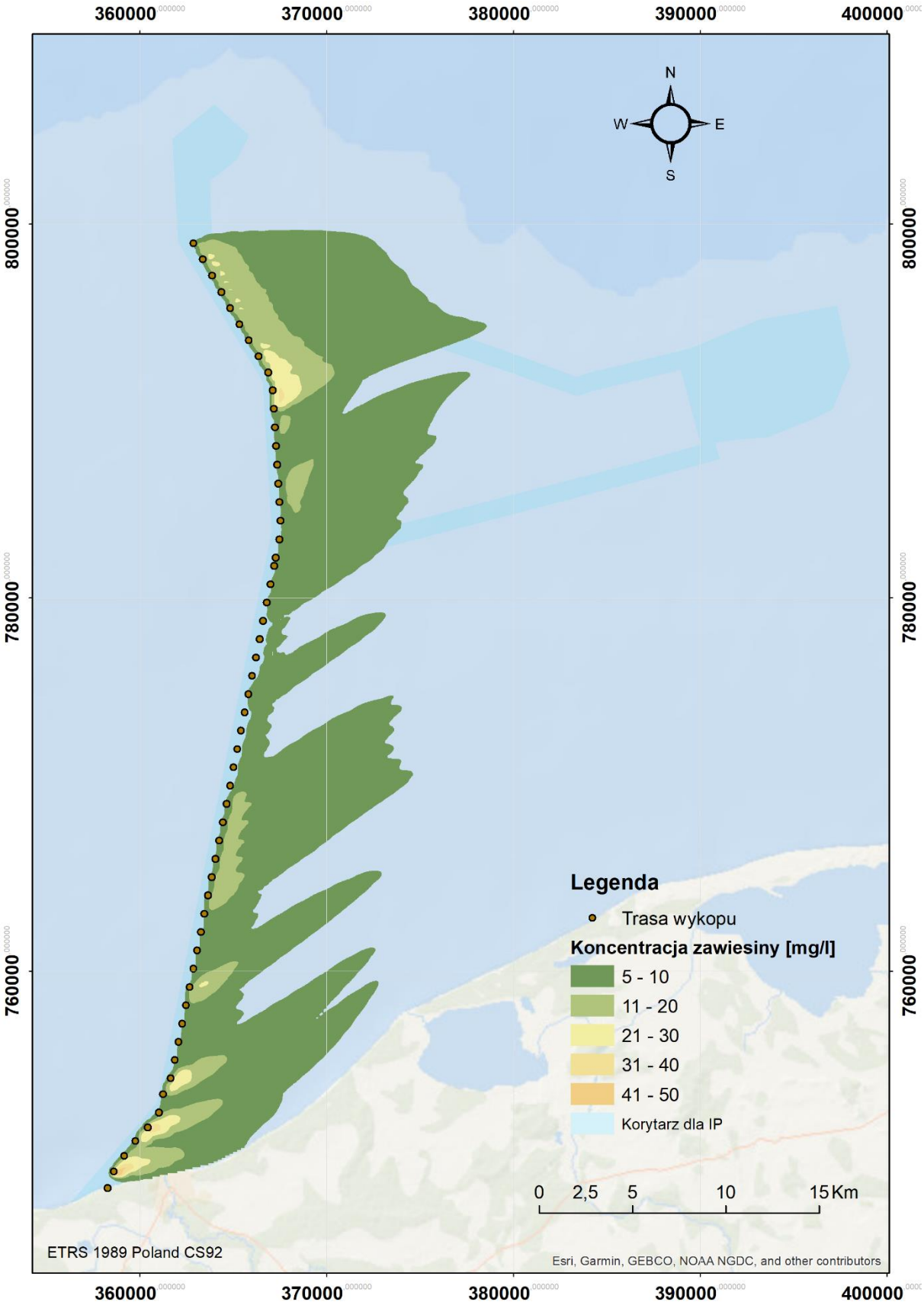

Fig. 39 Maximum suspended solids concentrations in the water column determined at each grid node during the cable burying process on the route to Baltic II OWF in the V200 scenario, limit value 5 mg/l

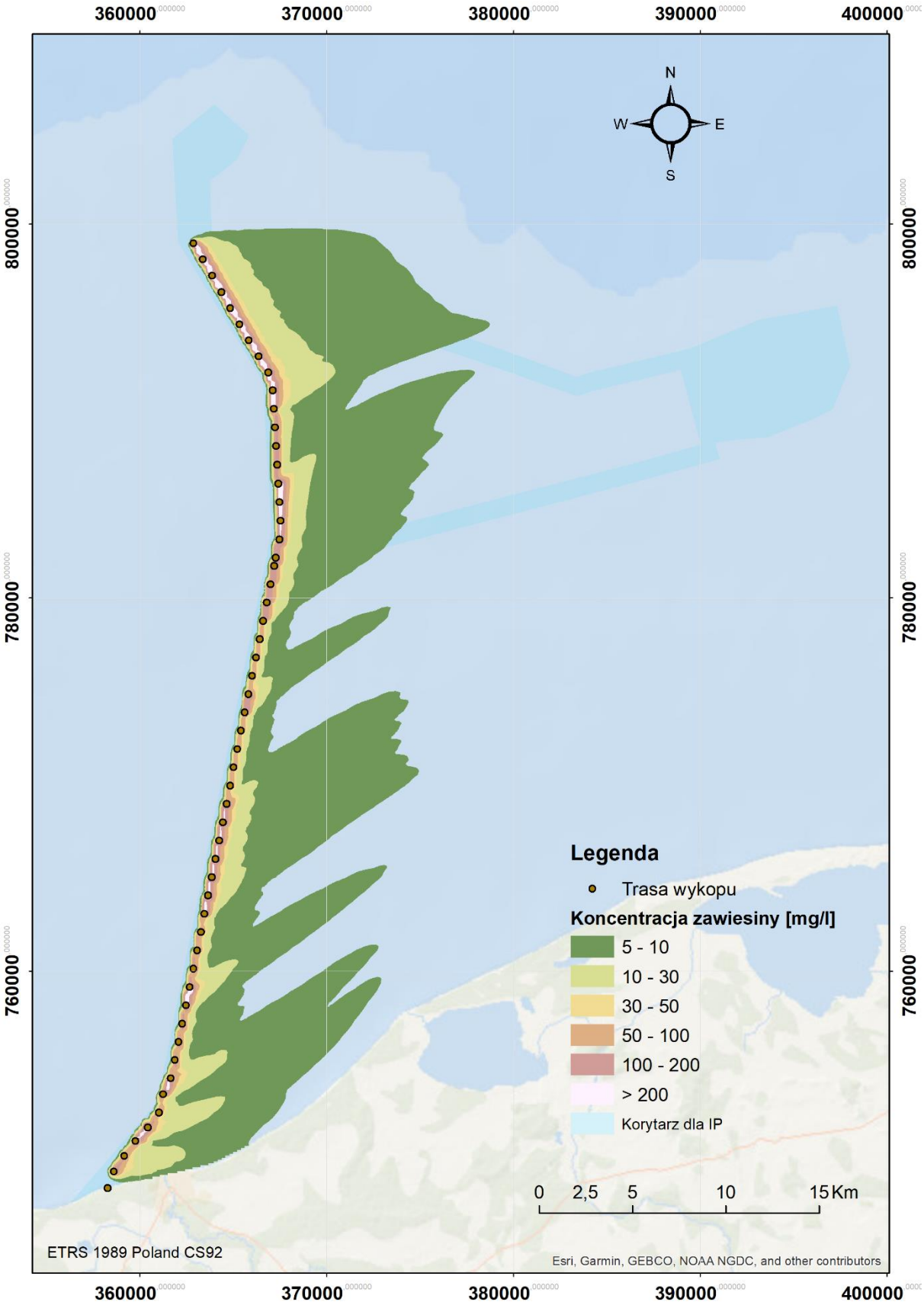

Fig. 40 Maximum suspended solids concentrations in the bottom layer determined at each grid node during the cable burying process on the route to Baltic II OWF in the V200 scenario, limit value 5 mg/l

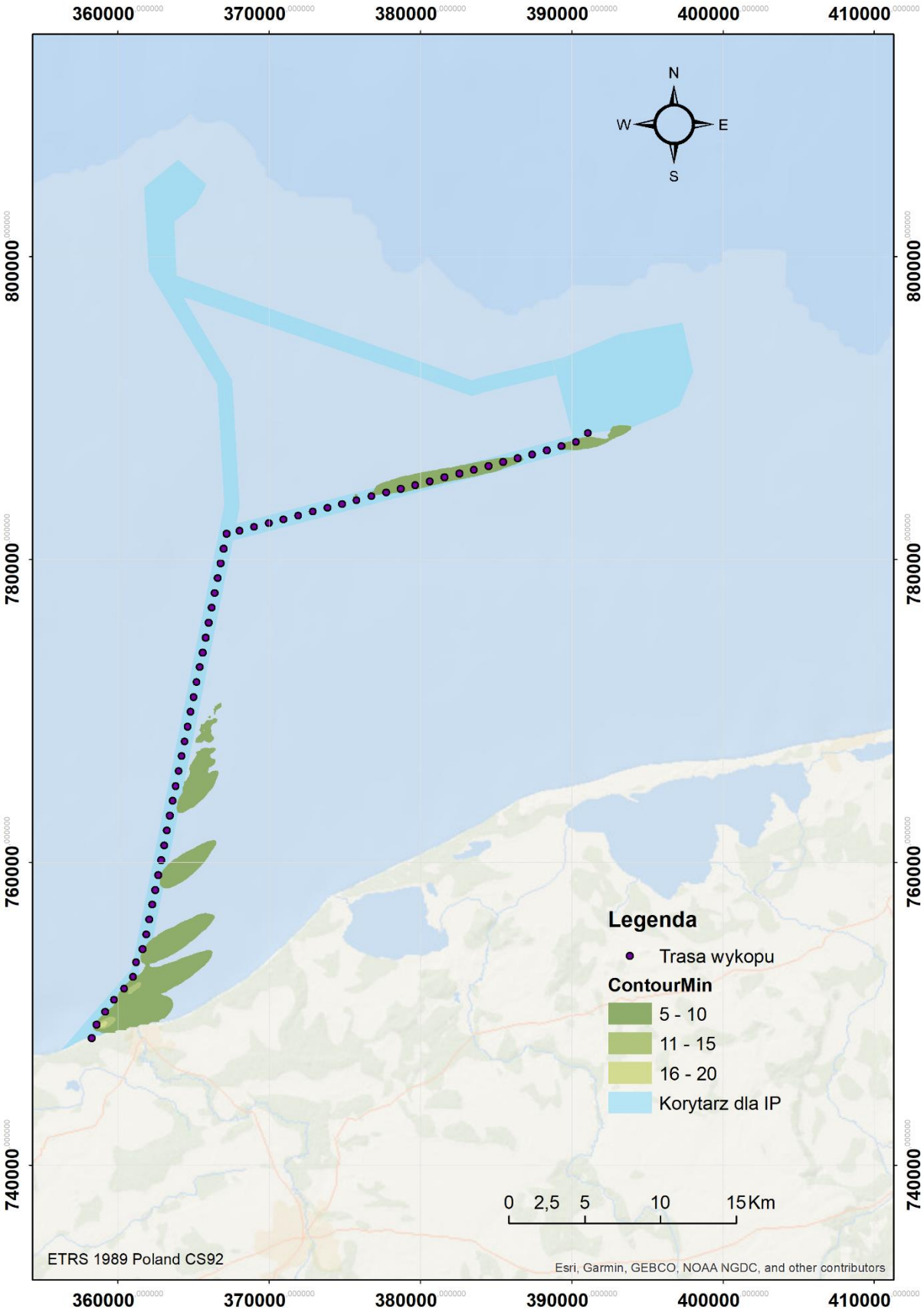

Fig. 41 Maximum suspended solids concentrations in the surface layer determined at each grid node during the cable burying process on the route to Baltic III OWF in the V100 scenario, limit value 5 mg/l

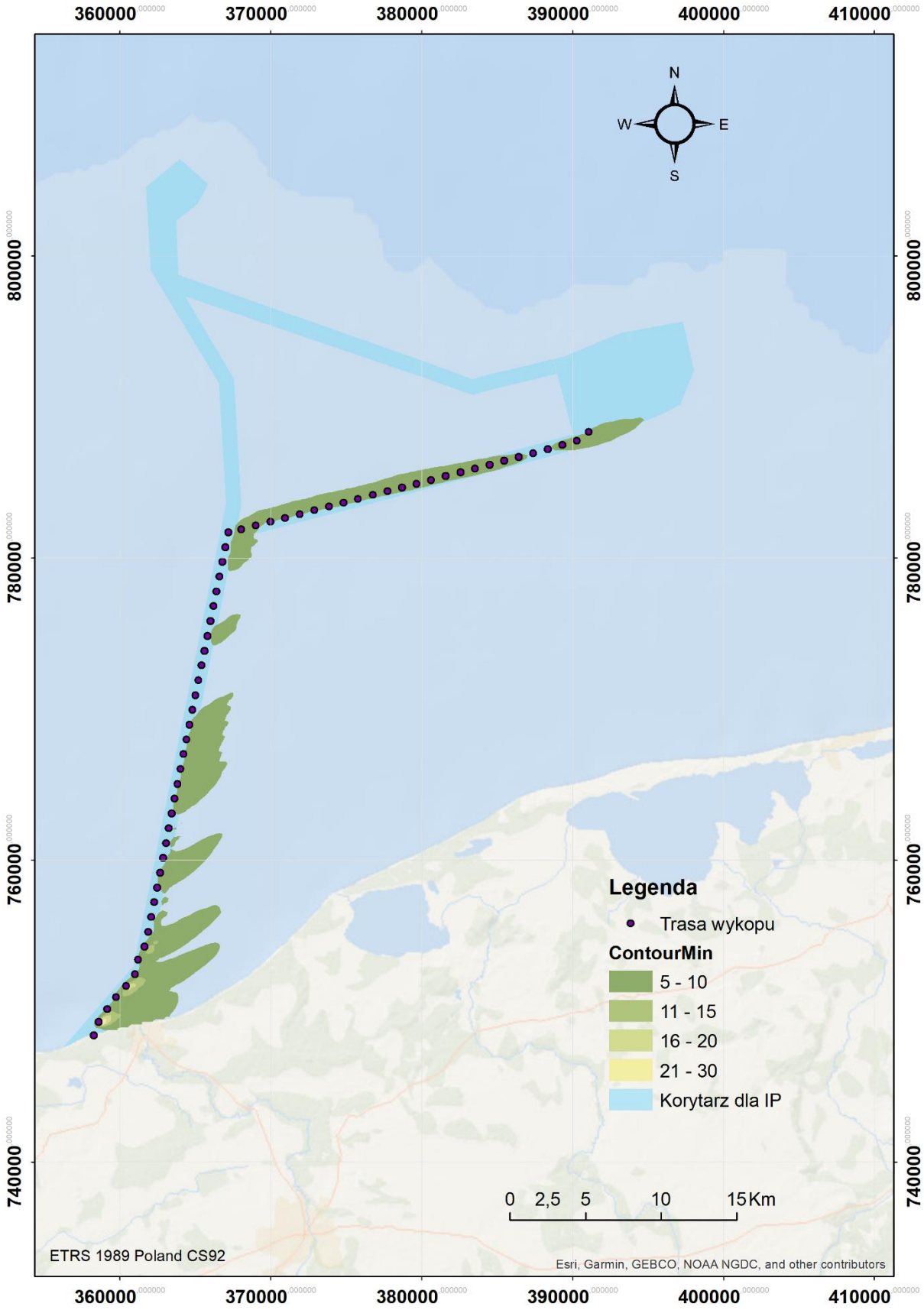

Fig. 42 Maximum suspended solids concentrations in the water column determined at each grid node during the cable burying process on the route to Baltic III OWF in the V100 scenario, limit value 5 mg/l

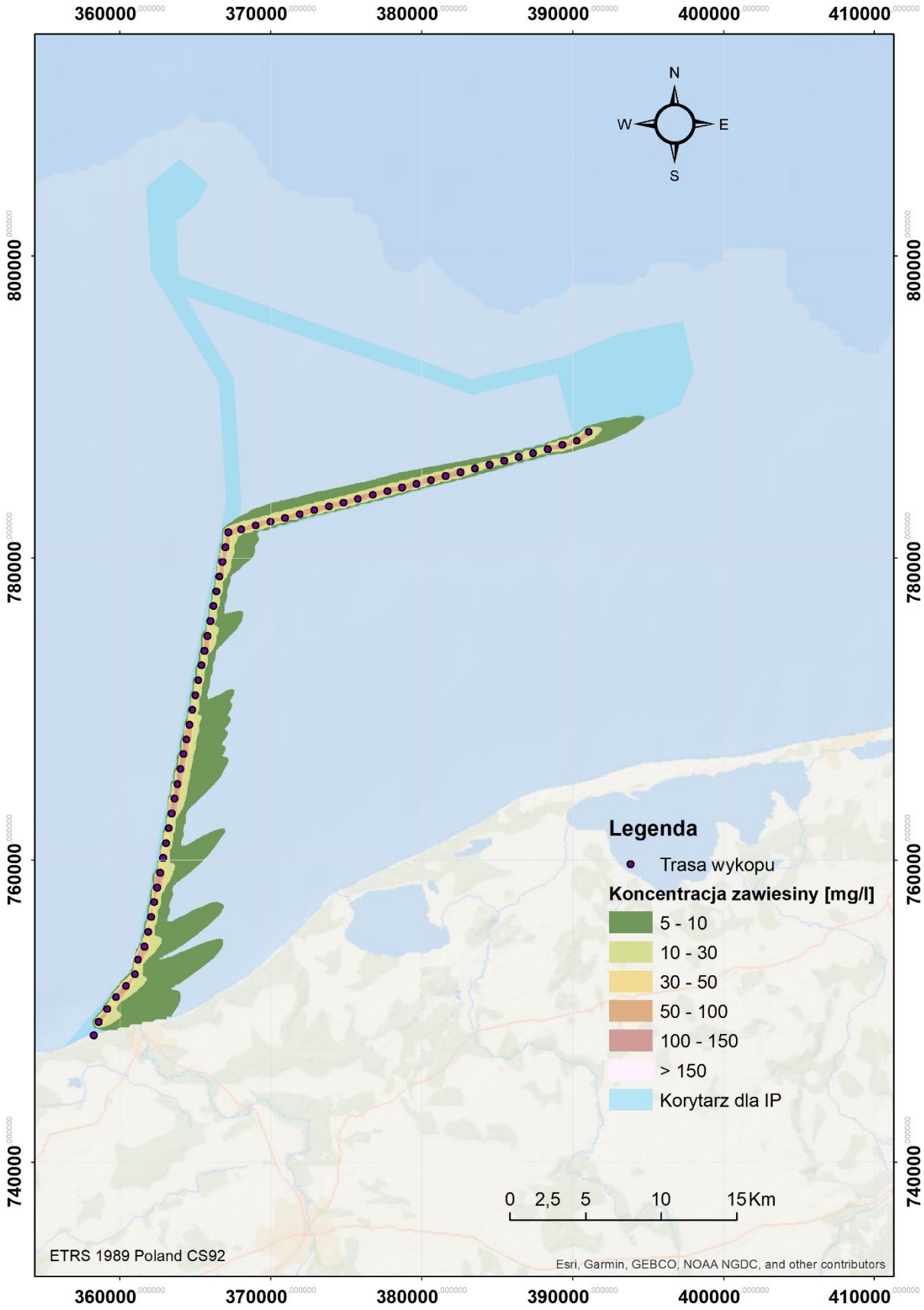

Fig. 43 Maximum suspended solids concentrations in the bottom layer determined at each grid node during the cable burying process on the route to Baltic III OWF in the V100 scenario, limit value 5 mg/l

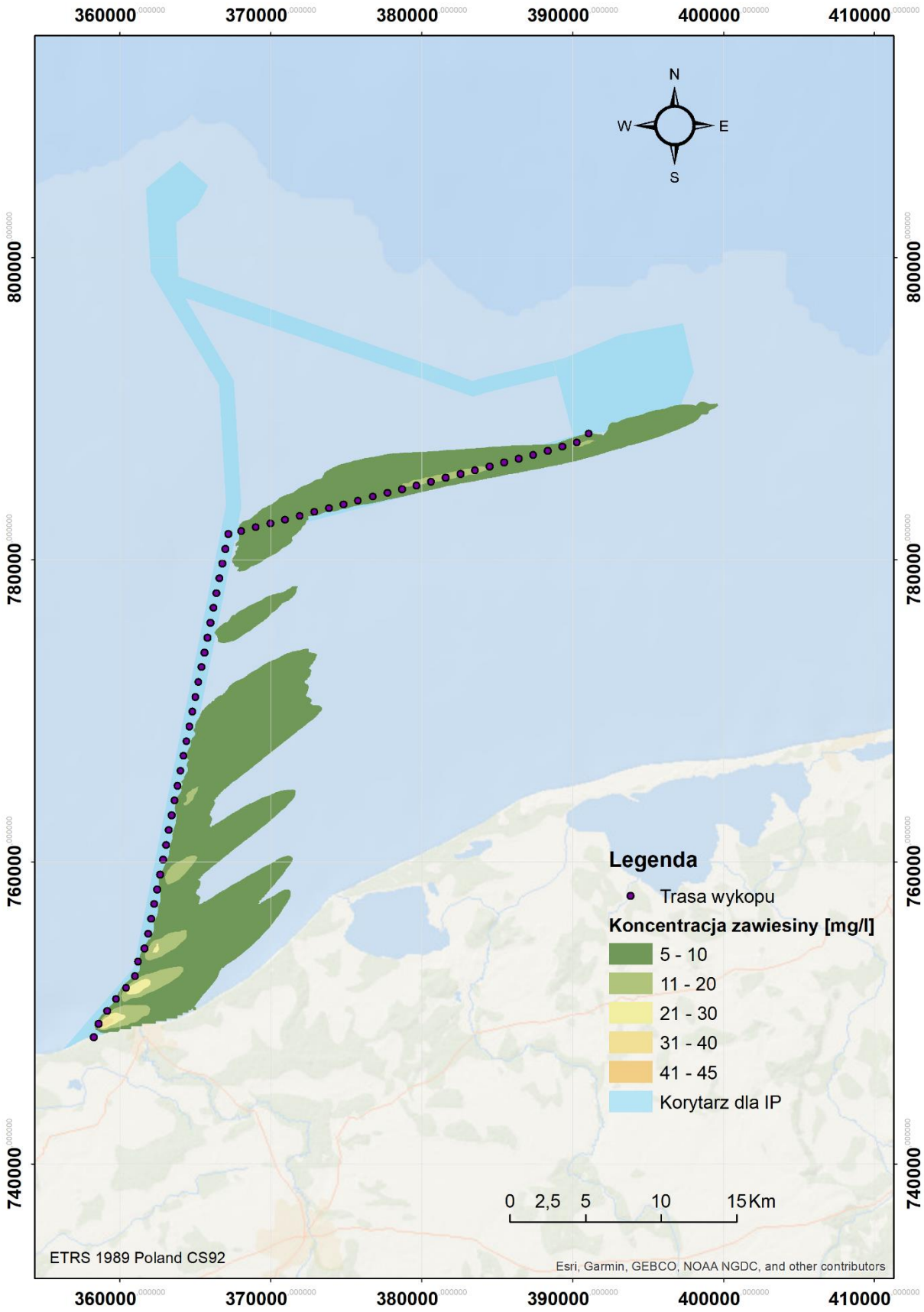

Fig. 44 Maximum suspended solids concentrations in the surface layer determined at each grid node during the cable burying process on the route to Baltic III OWF in the V200 scenario, limit value 5 mg/l

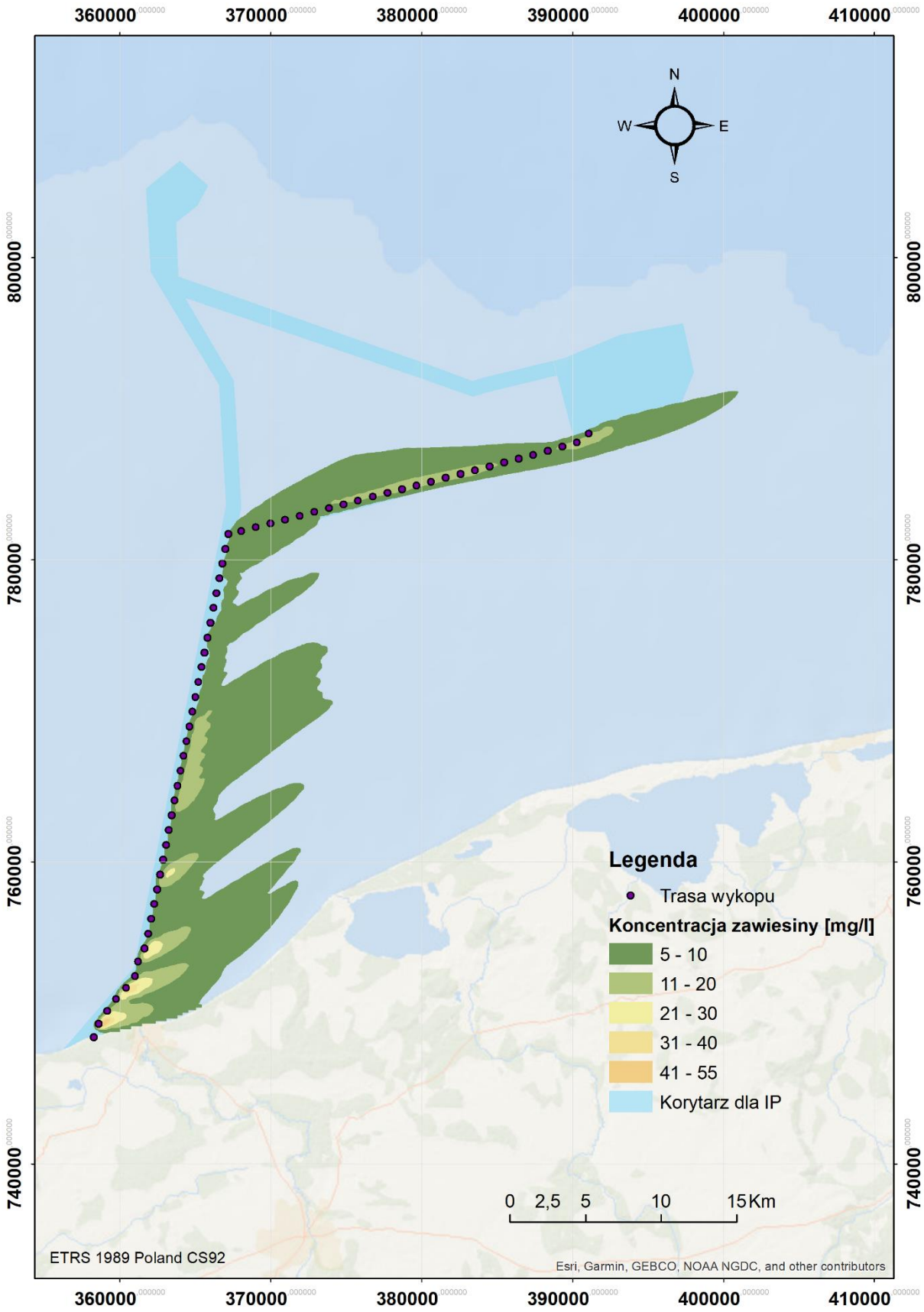

Fig. 45 Maximum suspended solids concentrations in the water column determined at each grid node during the cable burying process on the route to Baltic III OWF in the V200 scenario, limit value 5 mg/l

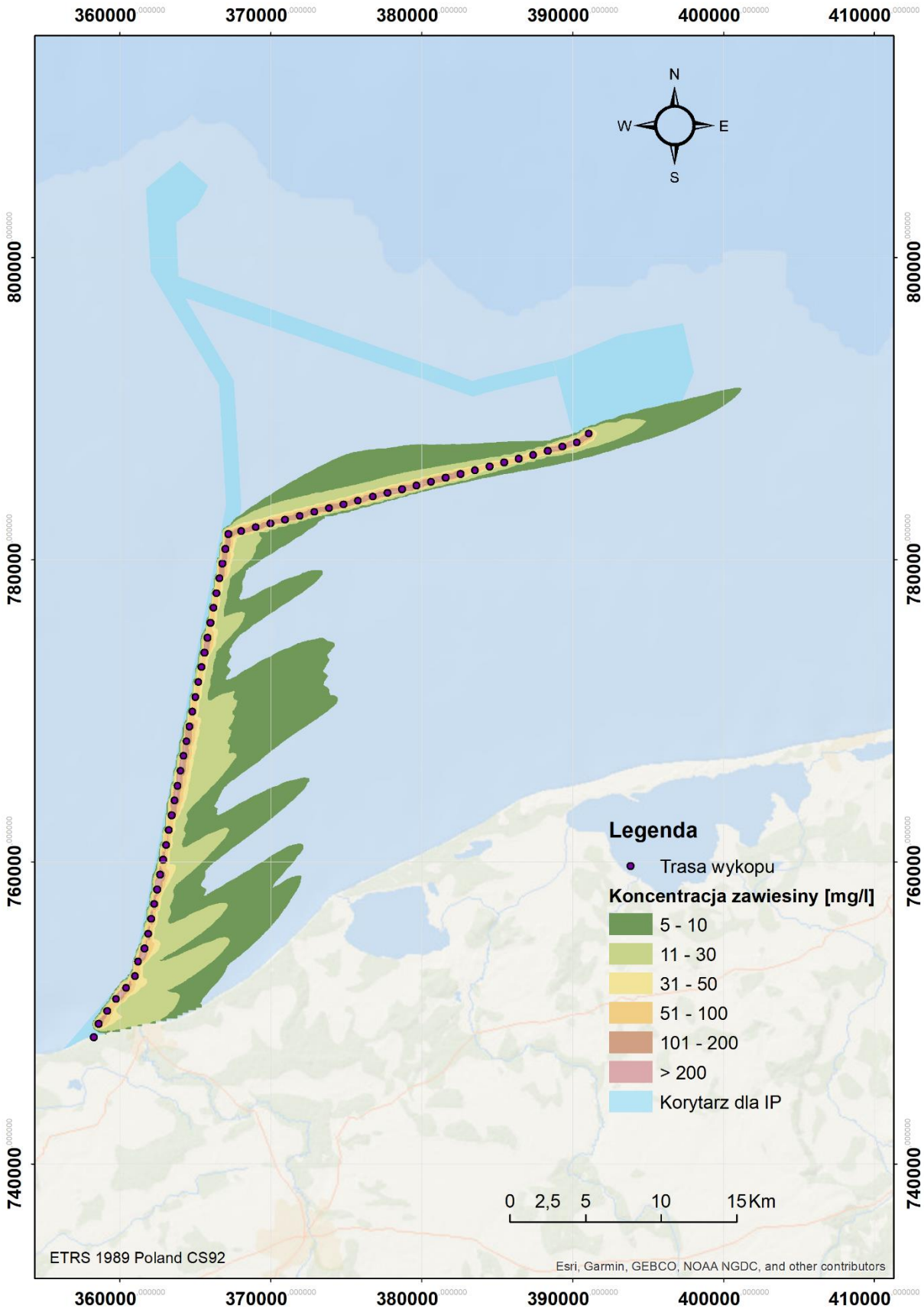

Fig. 46 Maximum suspended solids concentrations in the bottom layer determined at each grid node during the cable burying process on the route to Baltic III OWF in the V200 scenario, limit value 5 mg/l

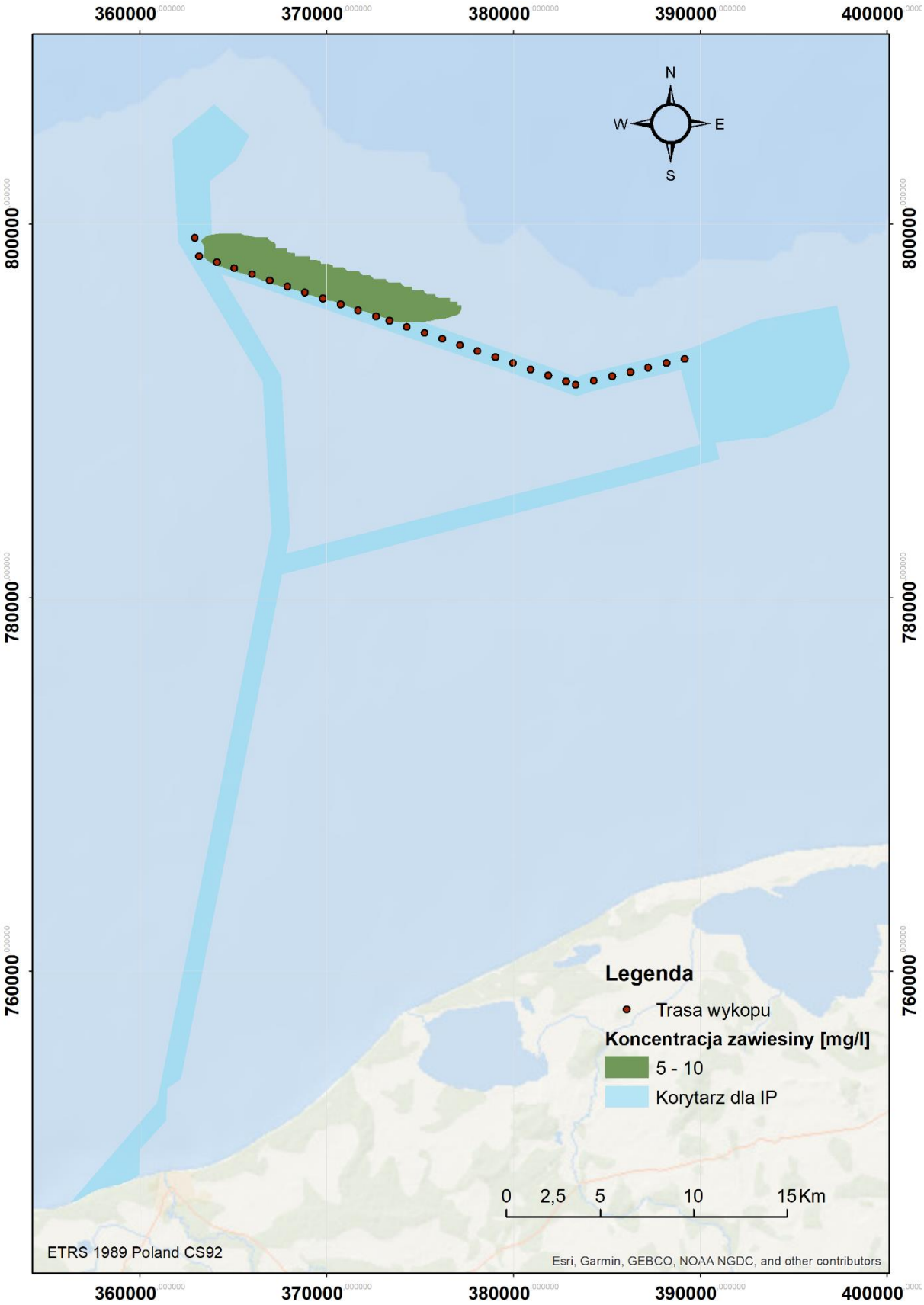

Fig. 47 Maximum suspended solids concentrations in the surface layer determined at each grid node during the cable burying process on the connector route in the V100 scenario, limit value 5 mg/l

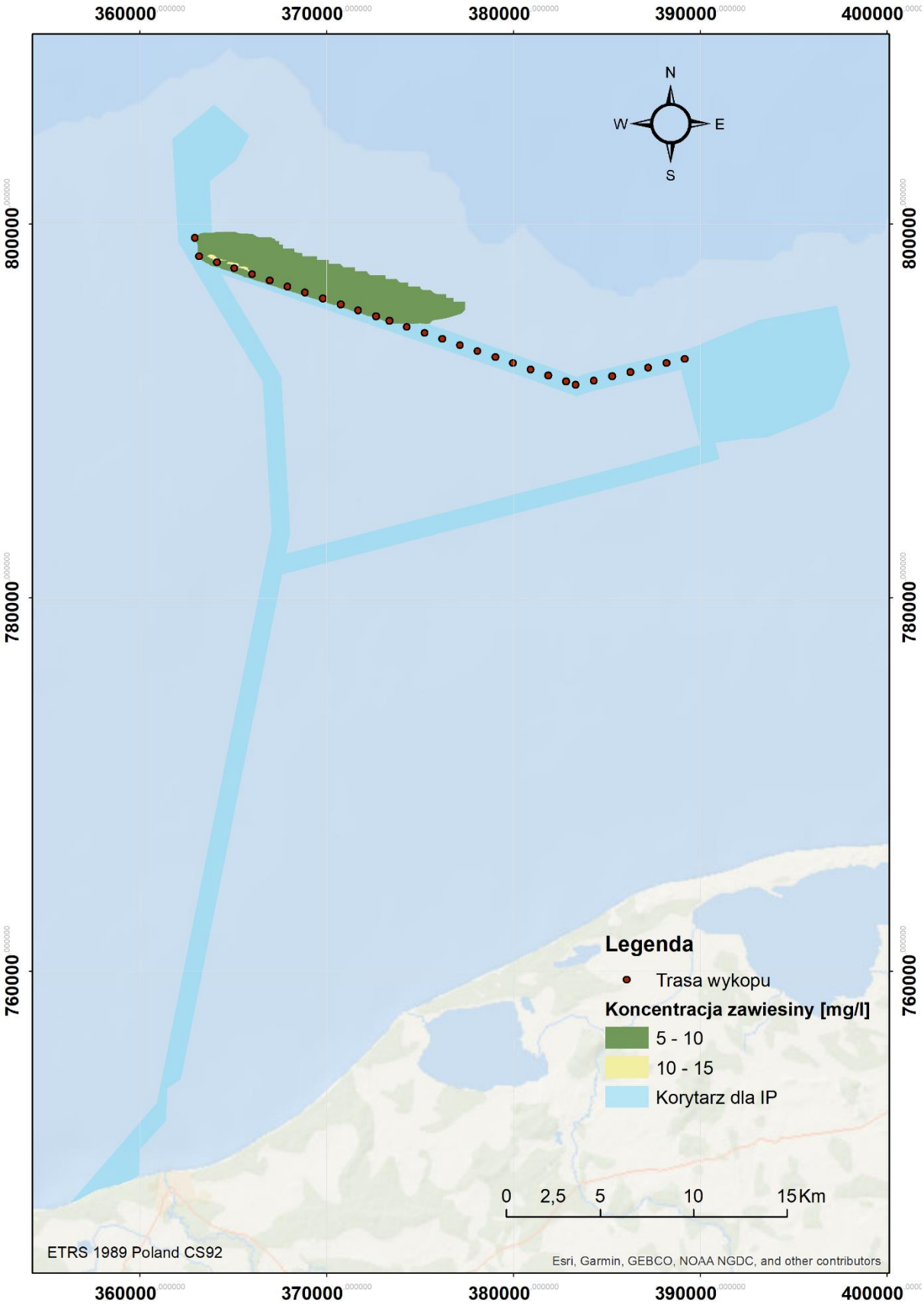

Fig. 48 Maximum suspended solids concentrations in the water column determined at each grid node during the cable burying process on the connector route in the V100 scenario, limit value 5 mg/l

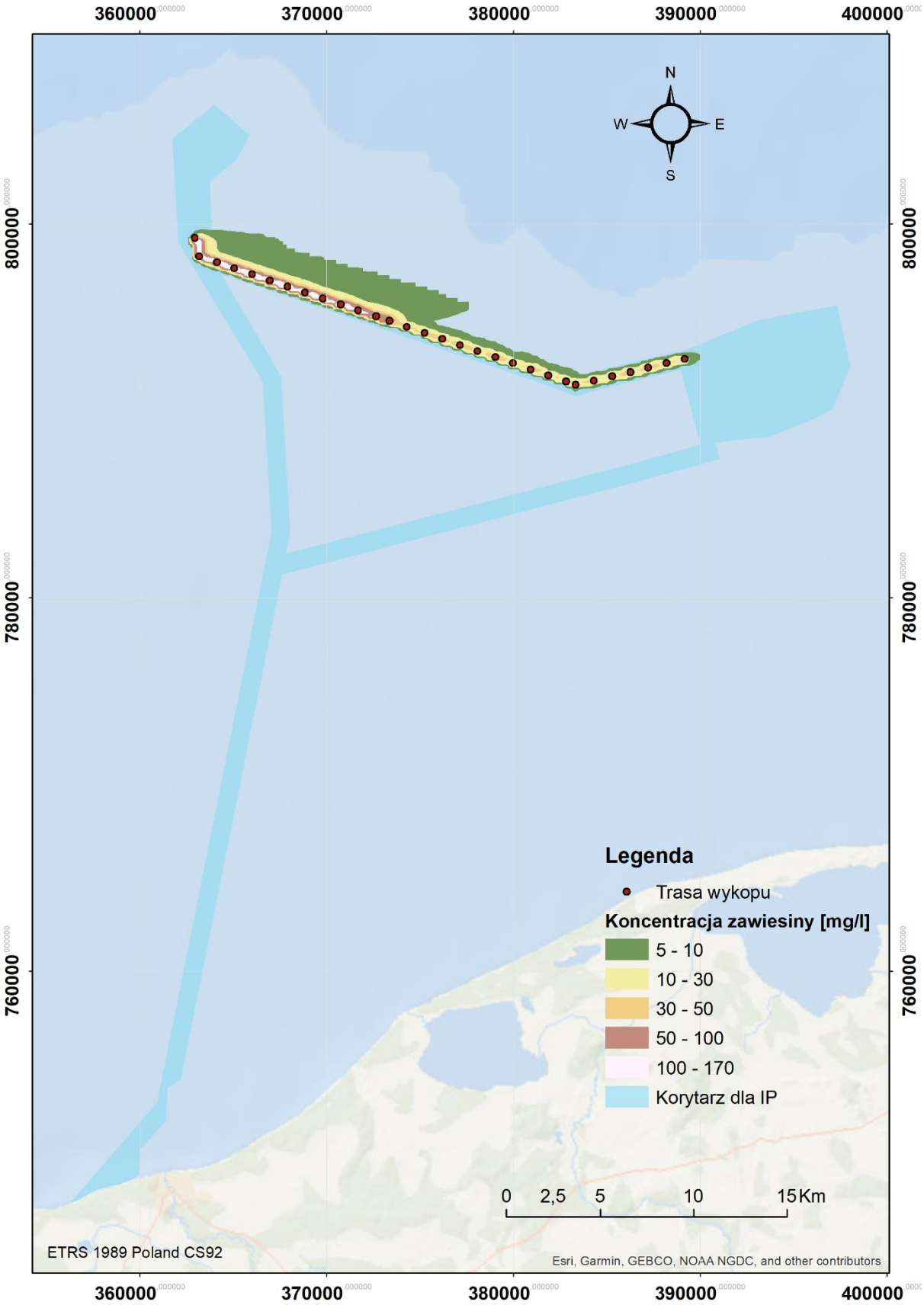

Fig. 49 Maximum suspended solids concentrations in the bottom layer determined at each grid node during the cable burying process on the connector route in the V100 scenario, limit value 5 mg/l

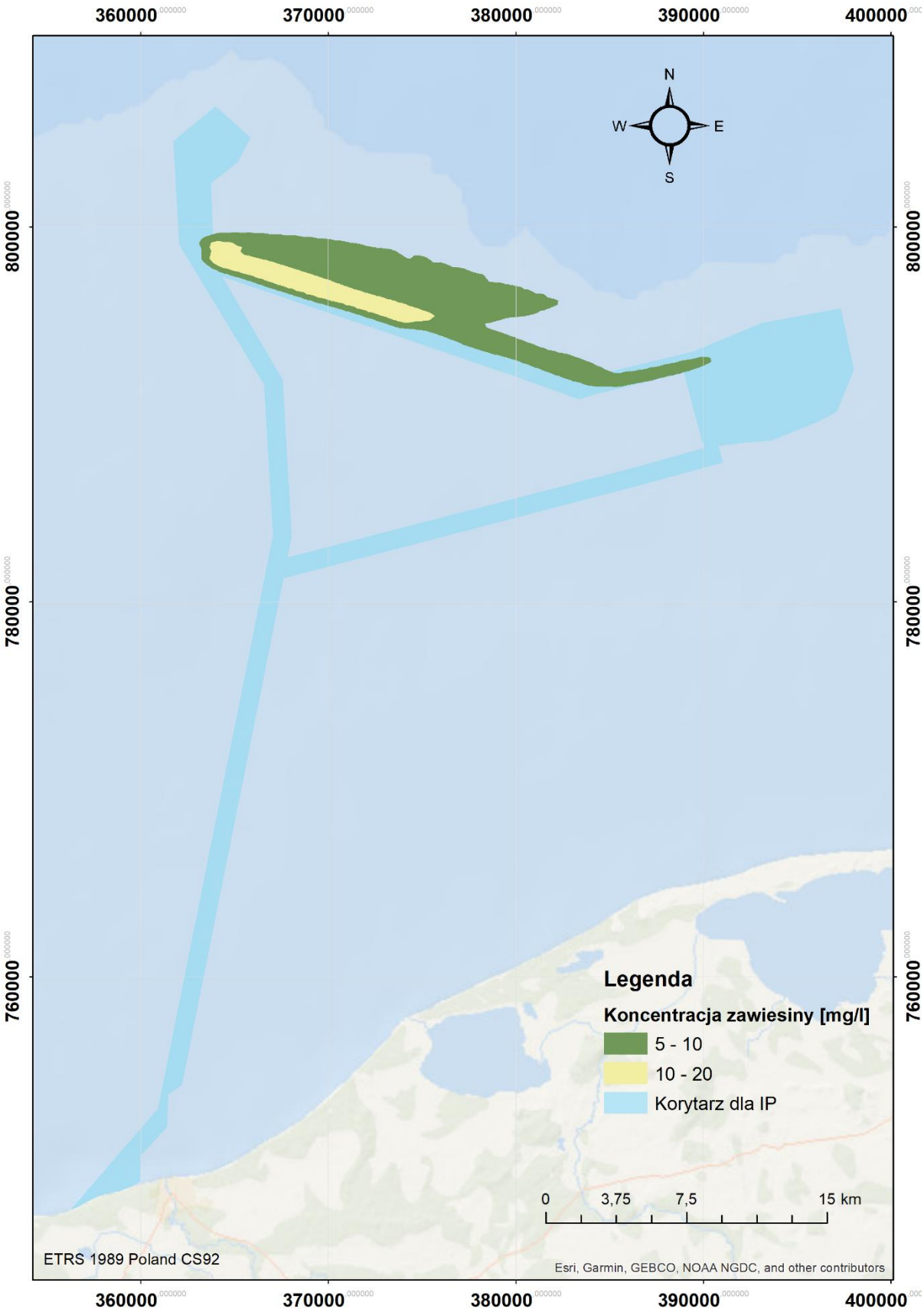

Fig. 50 Maximum suspended solids concentrations in the surface layer determined at each grid node during the cable burying process on the connector route in the V200 scenario, limit value 5 mg/l

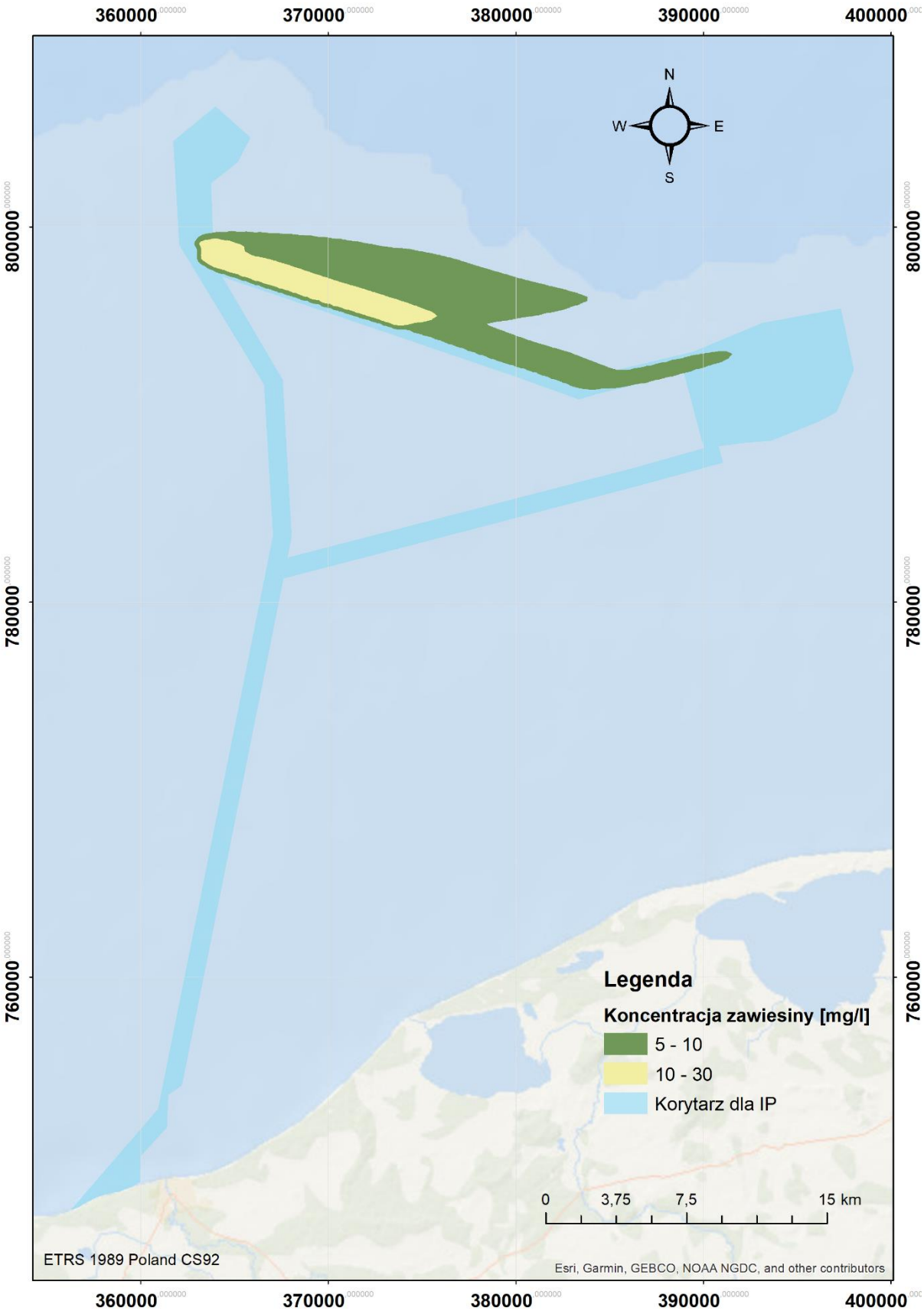

Fig. 51 Maximum suspended solids concentrations in the water column determined at each grid node during the cable burying process on the connector route in the V200 scenario, limit value 5 mg/l

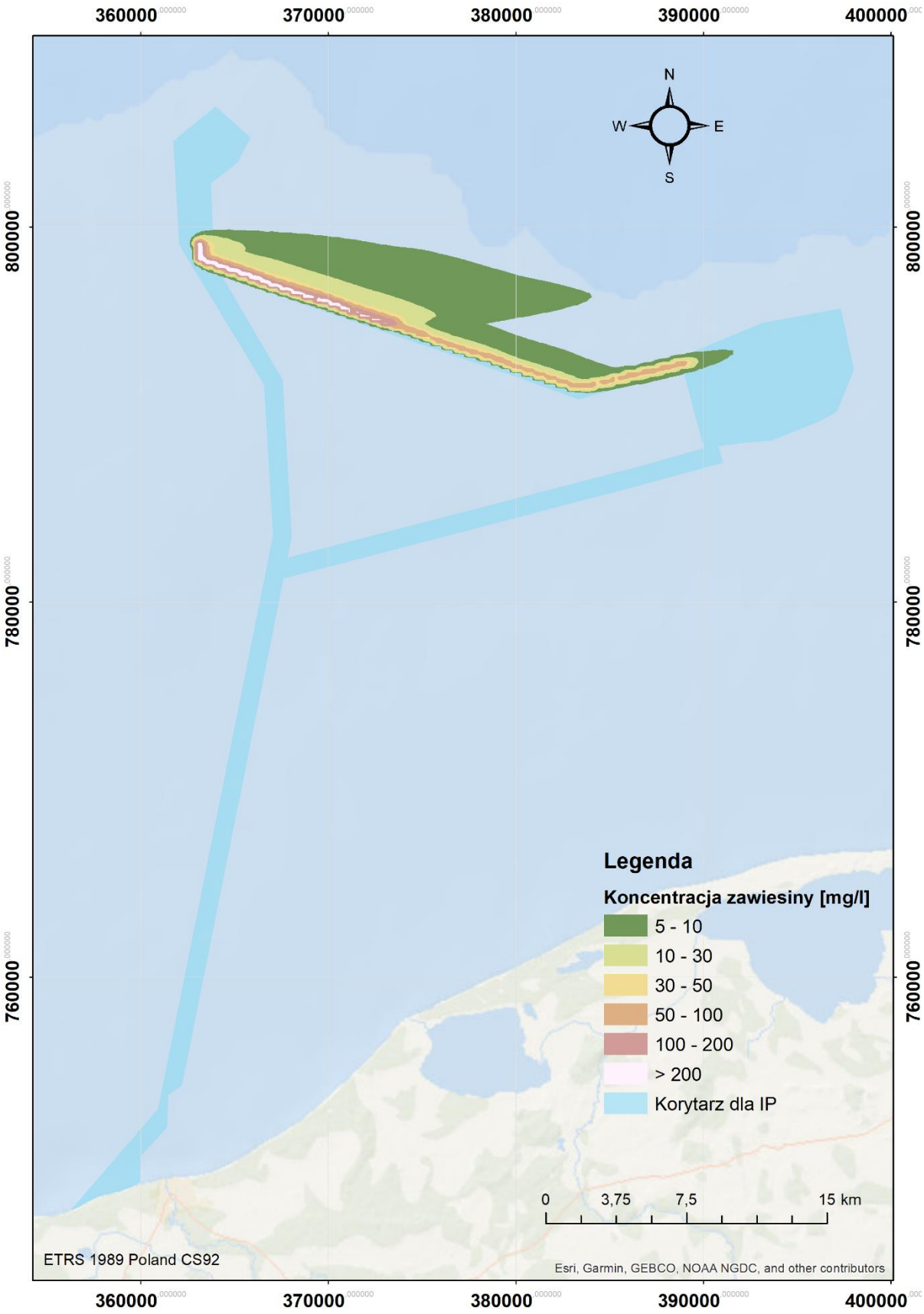

Fig. 52 Maximum suspended solids concentrations in the bottom layer determined at each grid node during the cable burying process on the connector route in the V200 scenario, limit value 5 mg/l

Instytut Budownictwa Wodnego
Polskiej Akademii Nauk
Założony w 1953

IBW PAN

Institute of Hydro-Engineering
of the Polish Academy of Sciences
Established 1953

Modelling of the spread of suspended solids during submarine cable laying for offshore wind farms MFW Bałtyk II and MFW Bałtyk III

Annex

Grzegorz R. Cerkowniak, Rafał Ostrowski, Piotr Szmytkiewicz

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Gdańsk, December 2022

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Subject of the order:	Development of modelling of the spread of suspended solids during submarine cable laying for the needs of the environmental documentation of the EIA report on the environmental impact of the project entitled "External connection infrastructure for offshore wind farms MFW Bałtyk II and MFW Bałtyk III”
Contractor:	Instytut Budownictwa Wodnego Polskiej Akademii Nauk / Institute of Hydro-engineering of the Polish Academy of Sciences (IBW PAN) ul. Kościerska 7, 80-328 Gdańsk
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1. List of abbreviations

IBW PAN	Instytut Budownictwa Wodnego Polskiej Akademii Nauk / Institute of Hydro-engineering of the Polish Academy of Sciences
LoC	Length of Coastline. On the Polish coast, there is a unified location system known as the length of coastline of the Maritime Offices. LoC 0.0 is located on the border with Russia, LoC 428.1 is located on the border with Germany. A separate length of coastline is valid for the Hel Peninsula, the Vistula Lagoon and the Szczecin Lagoon.
MFW	Offshore Wind Farm
ECI	External Connection Infrastructure
Sediment	Fragmented rock material carried by currents and waves deposited by the sea and forming the seabed.
PAN	Polska Akademia Nauk / Polish Academy of Science
Debris	See: Sediment

2. Subject and purpose of the study

The study was commissioned by EKO-KONSULT Sp. z o. o. in accordance with the order No. 582.22/IBWPAN/2022 of 24 June 2022. The study is an Annex to the study titled 'Modelling of the spread of suspended solids during submarine cable laying of External Connection infrastructure for offshore wind farms MFW Bałtyk II and MFW Bałtyk III' performed by IBW PAN in August 2022, in accordance with order No. 582.22/IBWPAN/2022 of 24 June 2022 of EKO-KONSULT Sp. z o. o. The subject of this study is to interpret how a change in input data would affect the extent of the spread of suspended solids, and thus to what extent previous conclusions would change if the conditions of the works were modified.

The main purpose of the presented study is to indicate whether a change in the input parameters will not result in an increase in the range of impact of the suspended solids. The study will serve the environmental documentation, which is the basis for the issuance of a decision on environmental conditions for two projects involving power output from offshore wind farms located in the Baltic Sea: MFW Bałtyk II and MFW Bałtyk III.

3. Introduction

Design assumptions and the technology for laying cables on the seabed are being verified throughout the ongoing investment process. In the case of the ECI of offshore wind farms MFW Bałtyk II and MFW Bałtyk III, conservative assumptions were initially adopted for modelling in order to assess the maximum possible range of suspended solids spreading in the water as a result of laying cables by jetting method at speeds of 100 m/h and 200 m/h.

Subsequently, the data was verified by the technical and purchasing departments of the Contracting Authority. As a result, the original assumptions regarding seabed interference were reduced, including, in particular, reducing the depth of the cable foundation from 3 m to 1.5 m along most of the route. Assumptions were also revised regarding the assumed amount of excavated material, divided into cohesive and non-cohesive substrate, that will pass into the water during construction activities. A value of 10% of excavated material for non-cohesive soils (sands) and 35% for cohesive soils (clays, silts) was assumed in accordance with literature data (Foreman 2002, HDR 2014a, HDR 2014b). In addition, due to the technologies available on the market, it is necessary to adopt a higher speed of cable laying in the seabed. A comparison of the conservative, theoretical data previously used to model suspended solids spreading during the ECI cable laying with the data that was refined in the course of design work is presented in Table 1.

The main objective of the study is to identify the most unfavourable scenario in terms of environmental impact. Consequently, a question arises as to whether changing the input parameters will increase the extent of the suspended solids' impact. Obtaining an answer requires re-modelling of the spread of suspended solids based on the changed input parameters. Thus, for the purpose of this study, a recalculation of the spread of suspended solids along the selected trench route to MFW Bałtyk II was performed to verify how a change in the input parameters for modelling might affect the results of the suspended solids' spread calculations.

Table. 1 Parameters of the planned Project - for jetting technology, which have changed in relation to the input data for the modelling performed for the study "Modelling of the spread of suspended solids during submarine cable laying for offshore wind farms MFW Bałtyk II and MFW Bałtyk III".

Parameter	Parameters adopted for modelling in 08.2022	Parameters adopted in Annex in 01.2023
Trench depth	**3 m** – for most of the route	**1,5 m** – for most of the route **2,5 m** – for the navigation channel TSS Ławica Słupska (a section with a length of approx. 9 km)
Width of the trench at the seabed surface	**1.5 m**	For the depth of 1.5 m: **1 m** For the depth of 2.5 m: **1.5 m**
Width of the base of the trench	**0.25 m**	For the depth of 1.5 m: **0.5 m** For the depth of 2.5 m: **0.5 m**
Trench volume	For the depth of 3 m: **2.6 m^3/m b.**	For the depth of 1.5 m: **1.12 m^3/m b.** For the depth of 2.5 m: **2.5 m^3/m b.**
Cable laying speed	Min. **100 m/h** Max. **200 m/h**	Min. **250 m/h** Max. **350 m/h**
The amount of excavated material that will go into the sea during construction work	Cohesive substrate – **50%** Non-cohesive substrate – **20%**	Cohesive substrate – **35%** Non-cohesive substrate – **10%**

The values shown in Table 1 show that the modifications designed by the Contracting Authority would, on the one hand, significantly reduce the dimensions of the underwater linear trench, resulting in a reduction in the volume of excavated works and, consequently, a reduction in the inflow of suspended sediment. This effect is further enhanced by a reduction in the expected percentage of the amount of excavated material that will pass into the water during the works. On the other hand, the modifications assume a significant increase in the speed of excavation - variably up to 250 m/h and 350 m/h, which in turn obviously increases the volume of sediment being introduced into suspension per unit of time.

Since the dependence of the theoretical calculation results on the input data values changes nonlinearly (as determined by the nonlinear nature of the advection-diffusion process), it is necessary to carry out new series of mathematical modelling.

4. Numerical model

4.1. Model description

All calculations of current fields and spreading of fine-grained clastic suspended solids in the sea were carried out using the Delft3D numerical package. This program is composed of more than a dozen numerical modules for calculating flows, wave action, sediment transport, seabed reconstruction and the spreading of discharged substances into the sea. The model, working in three-dimensional space, enables simulation of hydraulic issues with mutual interaction of all used modules.

Delft3D is an open-source numerical package being developed at the Delft University in the Netherlands that allows calculation of non-stationary flow and sediment transport parameters, among other things. Flow velocities can be generated by such factors as river outflows, wind-generated currents (drift currents), differences in water table elevation (gradient currents), salinity and temperature differences (density currents), tides (tidal currents) and undulation (wave-derived currents). The software also allows numerical simulation of point discharge or water intake. The following calculation modules were used in the course of the calculations: the FLOW module calculating hydrodynamics of flows, the WAVE module calculating undulation, the SED module calculating sediment transport, and the MOR module calculating changes in depth (Deltares 2010 a and b).

4.2. Model structure

The model prepared at the IBW PAN uses rectangular calculation grids. In the case of wave calculations, that is, in the WAVE module, the calculation area covers the entire Baltic Sea, and the resolution of the numerical grid is about 6 km (Figure 1). The approach used takes advantage of the fact that the Baltic Sea is a closed sea with a narrow and shallow connection to the North Sea through the Danish Straits. This results in the fact that the North Sea's wave and currents do not affect the generation and propagation of wave and currents in the project area. As a result, there are no open boundaries in the wave model where boundary conditions should be inflicted. This approach is particularly useful in the model calibration process.

Due to the fact that revised parameters of the trench route were received from the Contracting Authority (longer route, ending in the area of MFW Bałtyk II) and due to the narrowing of the mathematical modelling only to the trench on the route to MFW Bałtyk II, the calculation area for the FLOW module was changed with respect to the one used for the study of IBW PAN from August 2022. The area adopted for the current calculations extends over a distance of 27 km to the East and 60 km to the North. The resolution of the numerical grid has not changed from the earlier calculations and has dimensions of 200 m x 200 m (Figure 2). Other settings of the model have also remained unchanged.

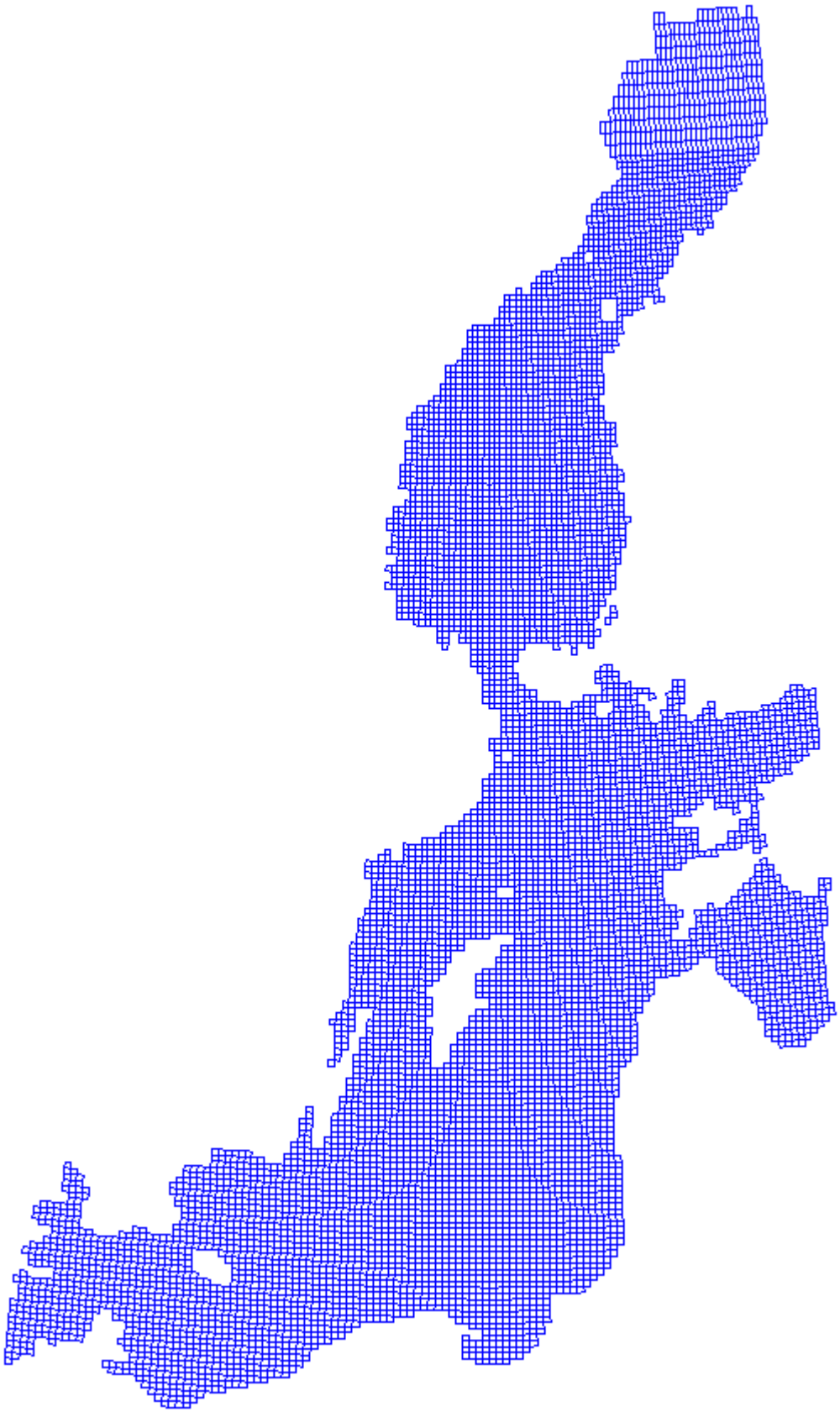

Figure 1 Sketch of the numerical grid used in the WAVE module

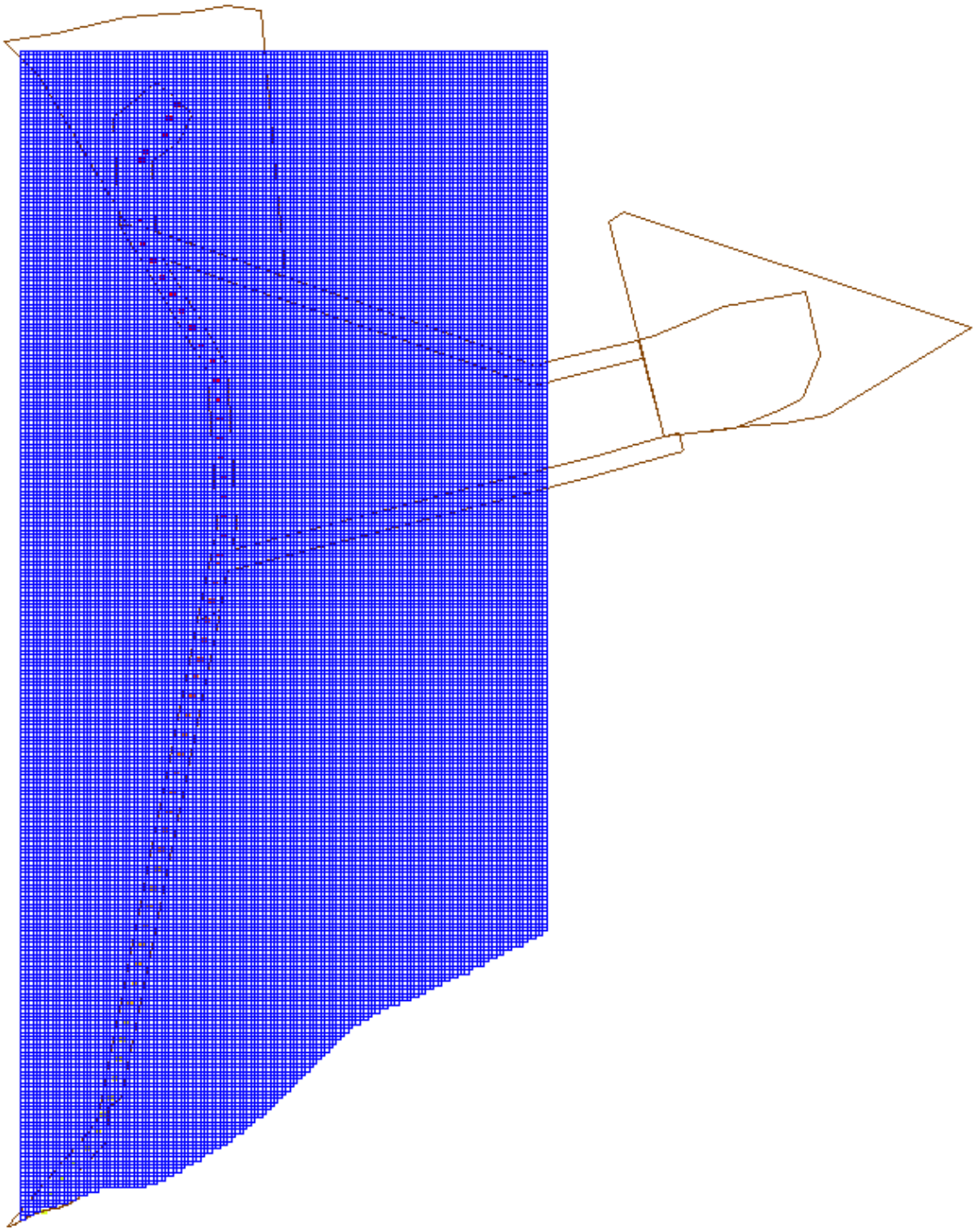

Figure 2 Calculation area, sketch of the numerical grid used in the FLOW module against the background of the ECI corridor and MFW Baltyk II and MFW Bałtyk III

To build the model, bathymetric data of the corridor for the ECI received from the Contracting Authority and bathymetric data of the Baltic Sea area from the IBW PAN's own resources were used. Discretization of the water column was performed in a sigma coordinate system, in which the water column is divided into a fixed number of layers, the thickness of which is proportional to the depth (at a given grid node), according to a given scheme. Based on the experience in modelling the water movement in the Baltic Sea basin, the following vertical division of the water column from the free

surface to the bottom (10 layers) was assumed: 4.0%; 5.8%; 8.6%; 12.8%; 18.8%; 18.8%; 12.8%; 8.6%; 5.8%; 4.0%. This means that the thickness of the surface layer is 4% of the total depth at a given point, etc.

4.3. Simulation assumptions

The model assumes, as in reality, that the wind is the force that generates seawater movement. Due to the use of WAVE and FLOW modules, wind is the driving force for both waves and currents. According to the information obtained from the Contracting Authority, the burial of the ECI cable in the seabed can be performed in wave conditions with a significant wave height Hs of no more than 1.5 m, and a maximum wind speed of 10 m/s. Therefore, the most unfavourable scenario will occur at these limits. Thus, the calculations were performed for waves with a significant wave height of Hs = 1.5 m and wind blowing at a constant speed of 10 m/s from the dominant direction, i.e. from the west, throughout the simulation.

In the western part of the calculation area, there is a common corridor for the ECI of MFW Bałtyk II and MFW Bałtyk III (Figure 2). At a distance of about 35 km from the shore, the ECI corridor divides into two branches, one of which leads in the approximate N direction to MFW Bałtyk II, while the other leads in the approximate ENE direction to MFW Bałtyk III. Within the boundaries of the ECI corridor, power cables are planned to be buried to connect the two OWFs to each other and to the national power grid on land. Two cables will be laid to each OWF, so four cables will be buried in the section between the shore and the corridor's branching point. According to the information provided by the Contracting Authority, the cables will be laid from land towards the sea. In addition, they will be buried in separate trenches located at a safe distance from each other and will not be laid simultaneously, but successively one after the other.

A revised specification for the ECI power cable trench has been provided by the Contracting Authority, which shows that it will be trapezoidal in cross-section (Figure 3, Table 1). Its dimensions will not be constant along the entire length of the route. The depth of the trench will be 2.5 m in a section of about 9 km along the TSS Ławica Słupska route, and 1.5 m in the rest of the ECI corridor. The width of the trench at the bottom surface will be 1.5 m on the section located on the route of TSS Ławica Słupska and 1 m in the rest, while the width of the trench at its base will be constant and equal to 0.5 m. Consequently, on the route of the TSS Ławica Słupska, the volume of excavated material will be 2.5 m^3/m b. of the trench, while in the remaining area it will be 1.12 m^3/m b. of the trench.

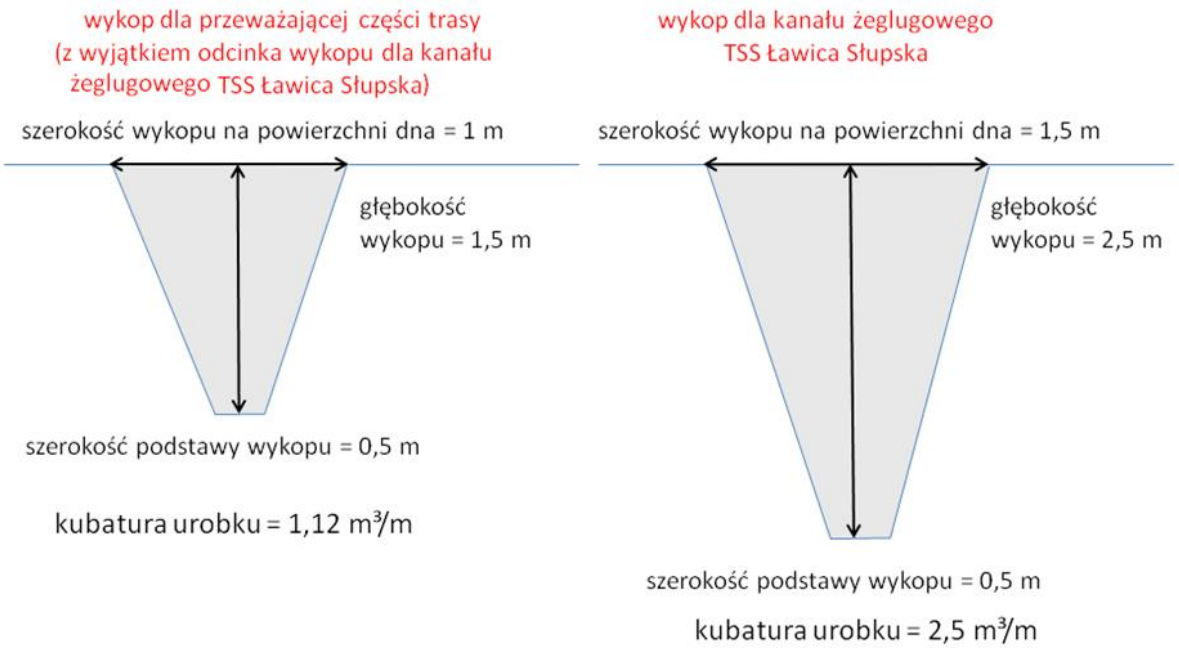

Figure 3 Sketch of the geometry of the trench for the ECI power cable

According to the information provided by the Contracting Authority, the burial of power cables will be performed using the 'jetting' de-silting technique; mechanical cutting and ploughing methods are also acceptable. The jetting method, which introduces the largest amount of sedimentary material into the water (in comparison with the cutting and ploughing method), is based on pumping high-pressure water into the bottom to liquefy the bottom sediments and simultaneously burrowing the cable to the expected depth. During the operation, some of the debris is ejected into the water. The vertical extent of this phenomenon depends on many factors, and at this stage there is no way to determine it. Therefore, the simulations conservatively assume that sediment ejection will take place in the water column to a height of about 5 m above the bottom. An additional issue is the amount of sediment that can pass into the water (suspended solids inflow) during the work. It depends, among other things, on the properties of the bottom sediments and the method of the cable burial. It was assumed in the calculations, according to the information provided by the Contracting Authority, that in the case of the selected technique of the cable burial into the bottom, this value can vary between 10-35% of the excavated material volume (Table 1). Due to the high content of clay and silty fractions in the bottom sediment in the ECI corridor area, it was assumed in the calculations that it is cohesive sediment.

The revised modelling input parameters presented collectively in Table 1 relate to the process of burrowing the power cable and the resulting inflow of suspended solids into the water depth. As a result of changes in this data, i.e. changes in the geometry of the excavation, the speed at which the cable is buried in the seabed and the amount of sediment that can pass into the water depth during the work, the amounts of suspended solids inflow simulated as a mobile source of water-soil mixture moving through the centre of the ECI corridor in the offshore direction have been recalculated.

As agreed with the Contracting Authority, suspended solids spread modelling was carried out for two scenarios for the speed of the cable burial into the bottom. The V250 scenario assumed a work speed of 250 m/h, while the V350 scenario assumed that work would be carried out at a speed of 350 m/h.

The installation for a single cable taking into account the preparation of the bottom, the laying of the cable and its burial will last about 35 days. For the modelling purpose, only the cable burial process itself was taken into account, the duration of which, assuming a speed of 250 m of cable per hour, will be about 10 days, while at a speed of 350 m of cable per hour it will be about 7 days. The given values are a direct result of the length of the excavation route and the theoretical speed of cable burial. The calculations assume that there will be a sufficiently long favourable weather window each time, allowing the work to be performed without any interruptions. Due to the specific nature of the works (the cables will not be buried simultaneously, but sequentially), numerical simulations of sediment spread were carried out for the process of the burial of the single power cable.

5. Calculation results

Numerical simulations of lithodynamic processes caused by the continuous introduction of bottom sediments into the seabed during the process of burrowing a power cable into the seabed were carried out. As a result of the calculations, spatial (three-dimensional) distributions of instantaneous concentrations of fine-grained clastic suspended solids in the study area were obtained. During the burial of cables in the bottom, the source of suspended solids is mobile and moves at a speed depending on the considered scenario. Sediments entering the water table are then displaced with the water masses (advection and convection), due to gravitational forces (sedimentation) and diffusion (movement of substances from a more concentrated medium to a less concentrated medium). Due to the assumption of a mobile debris source, a full presentation of the results of suspended matter spreading calculations is possible only in the form of animation.

In order to determine what effect the change in modelling input parameters has on the previously obtained results and whether it will increase the extent of the suspended solids impact, the results of calculations for the V250 and V350 scenarios were compared with the previously obtained results of calculations for the V100 and V200 scenarios along the trench route to MFW Bałtyk II.

Figures 4 – 7 7 show maps illustrating the values of maximum turbidity in the entire water column occurring during the burial of the power cable in the bottom along the route to MFW Bałtyk II for the V250, V350, V100 and V200 scenarios, respectively. It should be clearly noted that the contents presented on these maps do not reflect the values of suspended solids concentration at a single moment in time, but show the total maximum extent of water turbidity during the entire process of laying the cable in the bottom.

Depending on the characteristics of the bottom sediments and the amount of debris input, the maximum range of water turbidity is from about 500 m to about 9 km, with mostly suspended solids concentrations not exceeding 10 mg/l. The range of water turbidity with a concentration of more than 30 mg/l does not exceed about 700 m for the V350 scenario. For the V250 scenario, the range is slightly smaller and does not exceed about 650 m. When the cable is buried in a bed composed of sediments with a high content of fine fractions, the range of turbidity is greater than for sandy sediments.

When the cable is buried at a speed of 250 m/h (V250, Figure 4) in a bed composed mostly of sandy sediments, the concentration of suspended solids should not exceed 30 mg/l, while the range of turbidity is from about 500 m to about 950 m. At the same time, higher values were obtained within the route of TSS Ławica Słupska. Outside it, the range of turbidity does not exceed about 700 m. However, in the case of conducting works at a speed of 350 m/h (V350, Figure 5) in the sand bed, the

concentration of suspended solids exceeds 30 mg/l only in the immediate vicinity of the excavation. The range of turbidity in this case is from about 600 m to about 1,200 m. Larger values were obtained within the TSS Ławica Słupska route, while outside the route the range of turbidity does not exceed about 1,000 m.

When the cable is buried at 250 m/h (V250, Figure 4) in a bed composed of cohesive sediments, the range of turbidity is from about 1.5 km to about 6 km. The largest ranges were obtained near the seashore due to the smallest depths in this area. Within the route of the TSS Ławica Słupska, the range of turbidity is about 4.5 km. On the other hand, when the works are carried out at a speed of 350 m/h (V350, Figure 5) in the cohesive bottom, the range of turbidity is from about 3 km to about 9 km. The largest ranges were obtained near the seashore, while within the route of the TSS Ławica Słupska where the turbidity range reaches values of about 8.5 km.

The obtained water turbidity ranges for the V250 and V350 scenarios are significantly smaller than for the V200 scenario (Figure 7) analysed in the IBW PAN study of August 2022. Only in the case of running the works at a speed of 350 m/h (V350, Figure 5) in the cohesive bed within the TSS Ławica Słupska route was a turbidity range similar to that received in the V200 scenario.

Moreover, the obtained water turbidity ranges for the V250 scenario are smaller, while for the V350 scenario they are similar to the values obtained for the V100 scenario (Figure 6) analysed in the IBW PAN study of August 2022.

The attachment to this study, in Figure 16 - Figure 27, shows maps illustrating the values of maximum water turbidity in the surface layer, in the water depth and in the bottom layer, occurring during the burial of the power cable in the bottom along the route to MFW Bałtyk II for the V250, V350, V100 and V200 scenarios, respectively. They show that the greatest extent of water turbidity occurs in the bottom layer and coincides with the values shown in Figure 4 - Figure 7. Turbidity in the seabed can occur in a similar area, however, the concentration of suspended solids is much lower. In an area where clays and silts are found in the seabed, water turbidity can reach the surface layer. Similarly, as in the case of the discussed maximum concentrations of suspended solids in the entire water column, the obtained ranges of water turbidity for the V250 and V350 scenarios are much smaller than in the case of the V200 scenario analysed in the IBW PAN study of August 2022, and smaller or close to the values obtained for the V100 scenario.

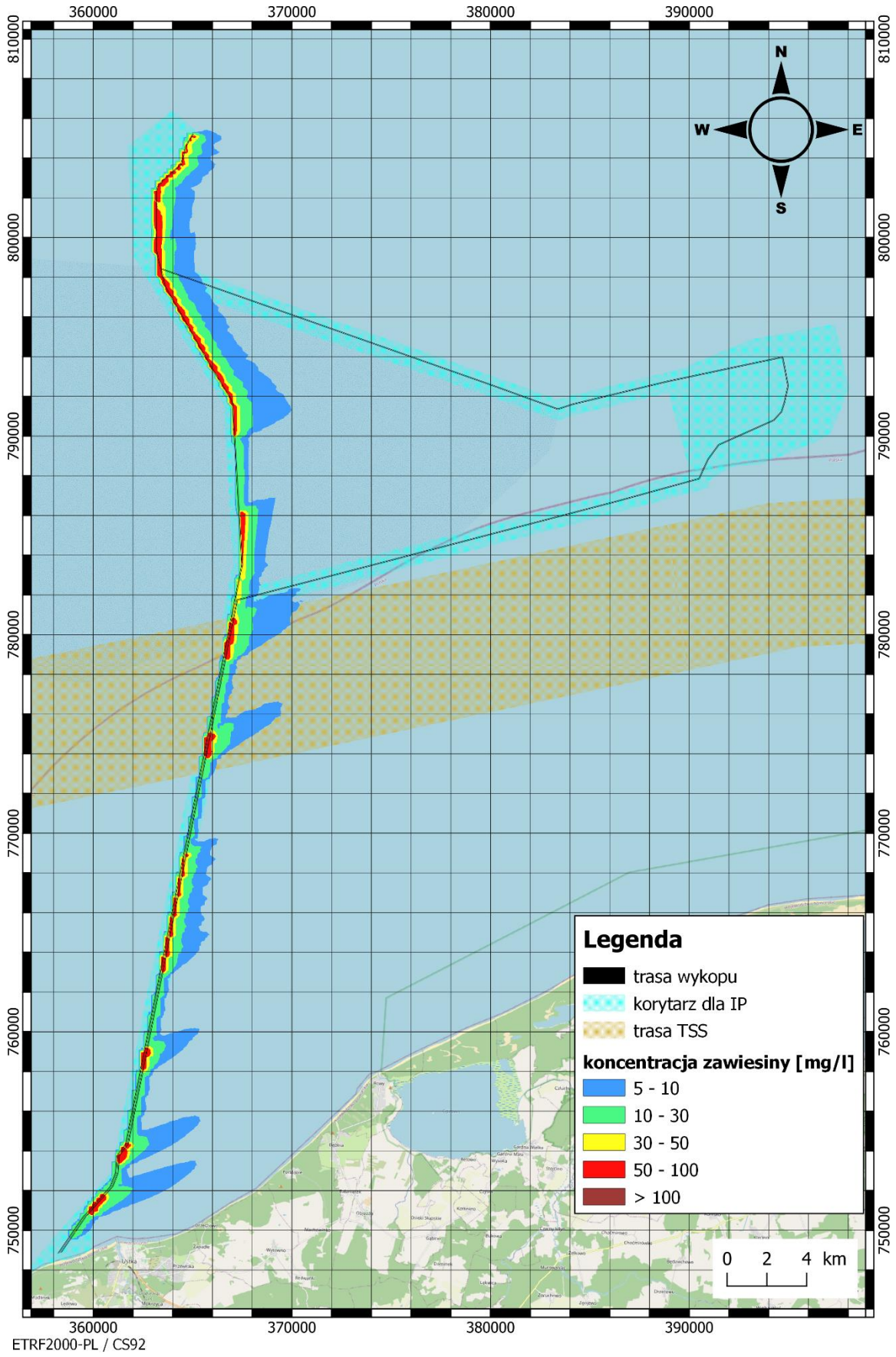

Figure 4 Map of maximum concentrations of suspended solids in the entire water column occurring during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V250 scenario

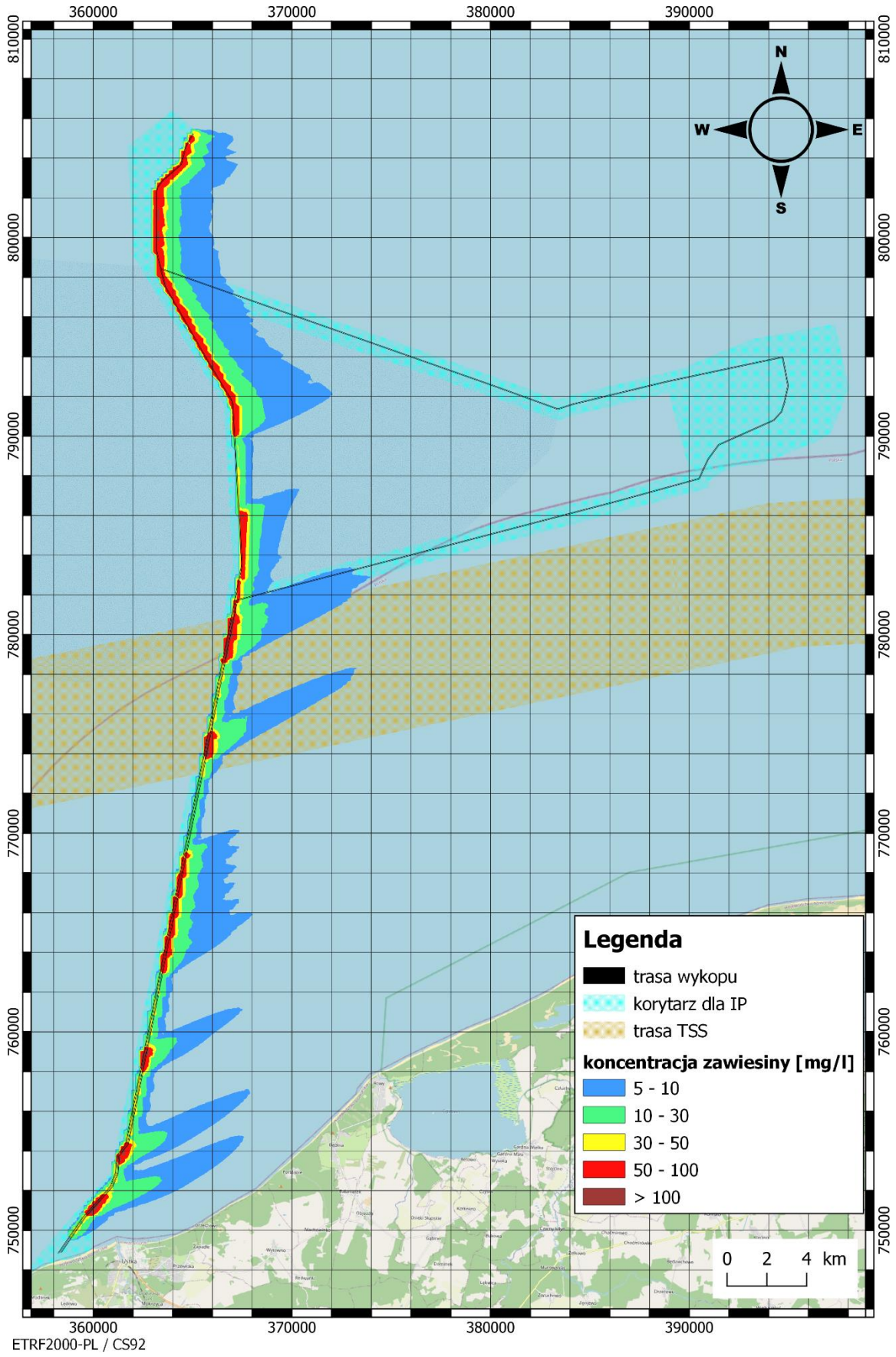

Figure 5 Map of maximum concentrations of suspended solids in the entire water column occurring during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V350 scenario

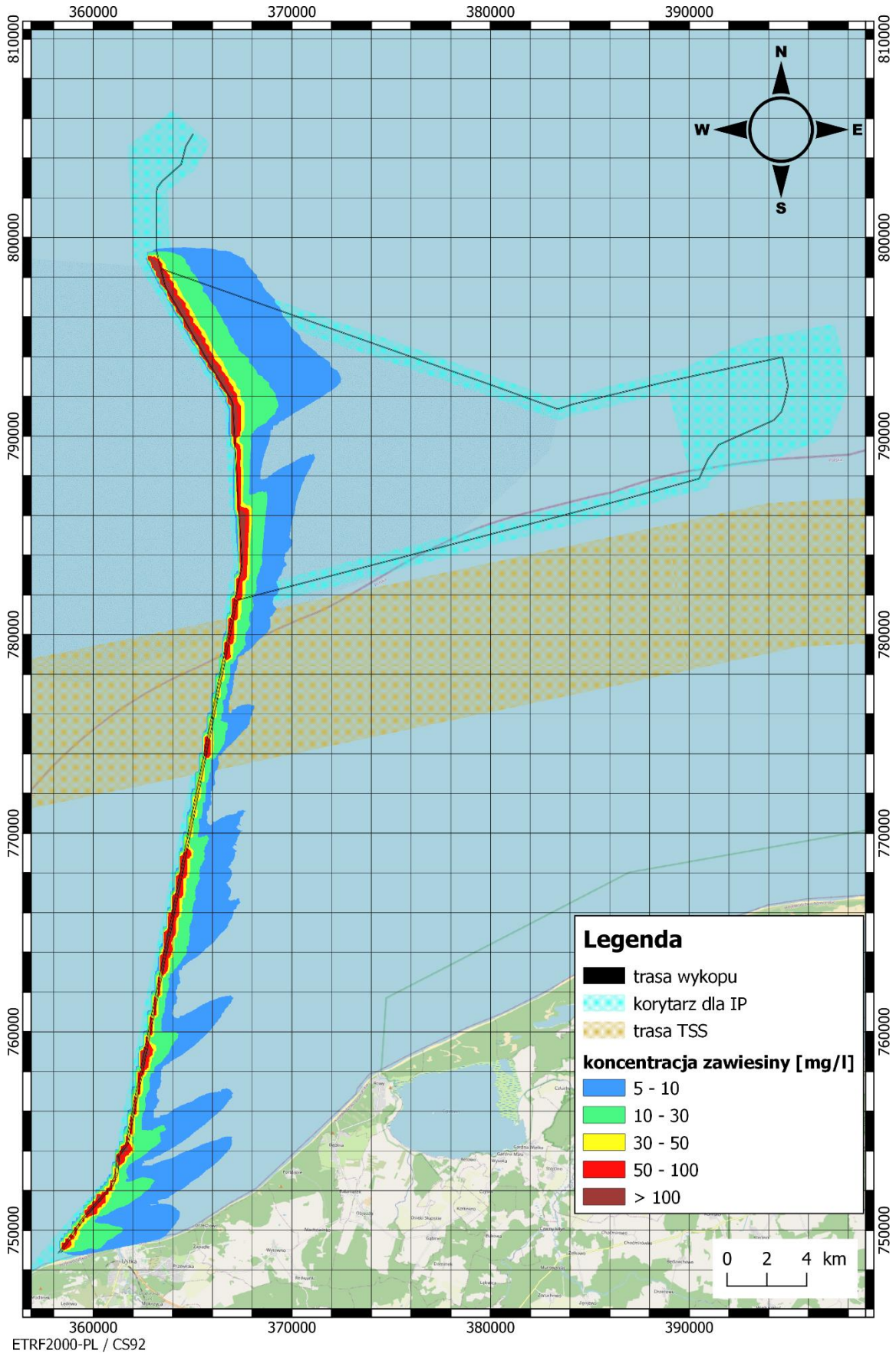

Figure 6 Map of maximum concentrations of suspended solids in the entire water column occurring during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V100 scenario

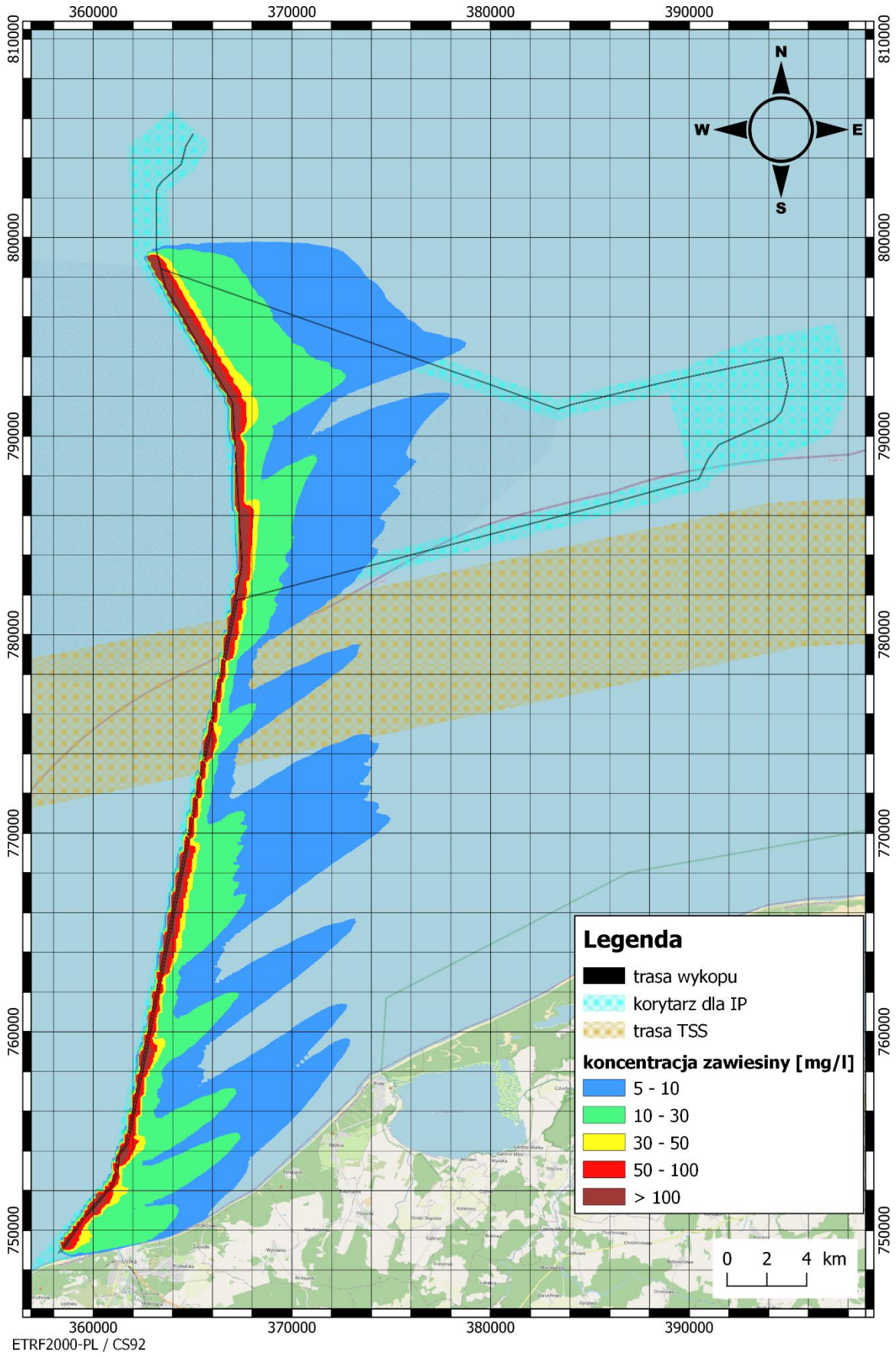

Figure 7 Map of maximum concentrations of suspended solids in the entire water column occurring during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V200 scenario

Figure 8 – Figure 11 show maps illustrating the time of turbidity in the water column during the burial of the power cable in the bottom along the route to MFW Bałtyk II for the V250, V350, V100 and V200 scenarios, respectively. The values presented define the total time when the concentration of suspended solids at individual grid nodes exceeds the background limit, i.e. 5 mg/l. The ranges of water turbidity determined on the maps are the same as the ranges presented in Figure 4 – Figure 7.

As a result of the calculations, it was found that in the case of excavation leading to MFW Bałtyk II according to the V250 or V350 scenario, the water turbidity time will not exceed 4 hours (Figure 8 and Figure 9). Only locally under the V250 scenario, the water turbidity time may reach 6 hours (Figure 8). The obtained values are much smaller than those for the V100 and V200 scenarios (Figure 10 and Figure 11) analysed in the IBW PAN study of August 2022, where it was obtained that the maximum water turbidity time could be up to 16 hours for the V100 scenario (Figure 10) and 12 hours for the V200 scenario (Figure 11).

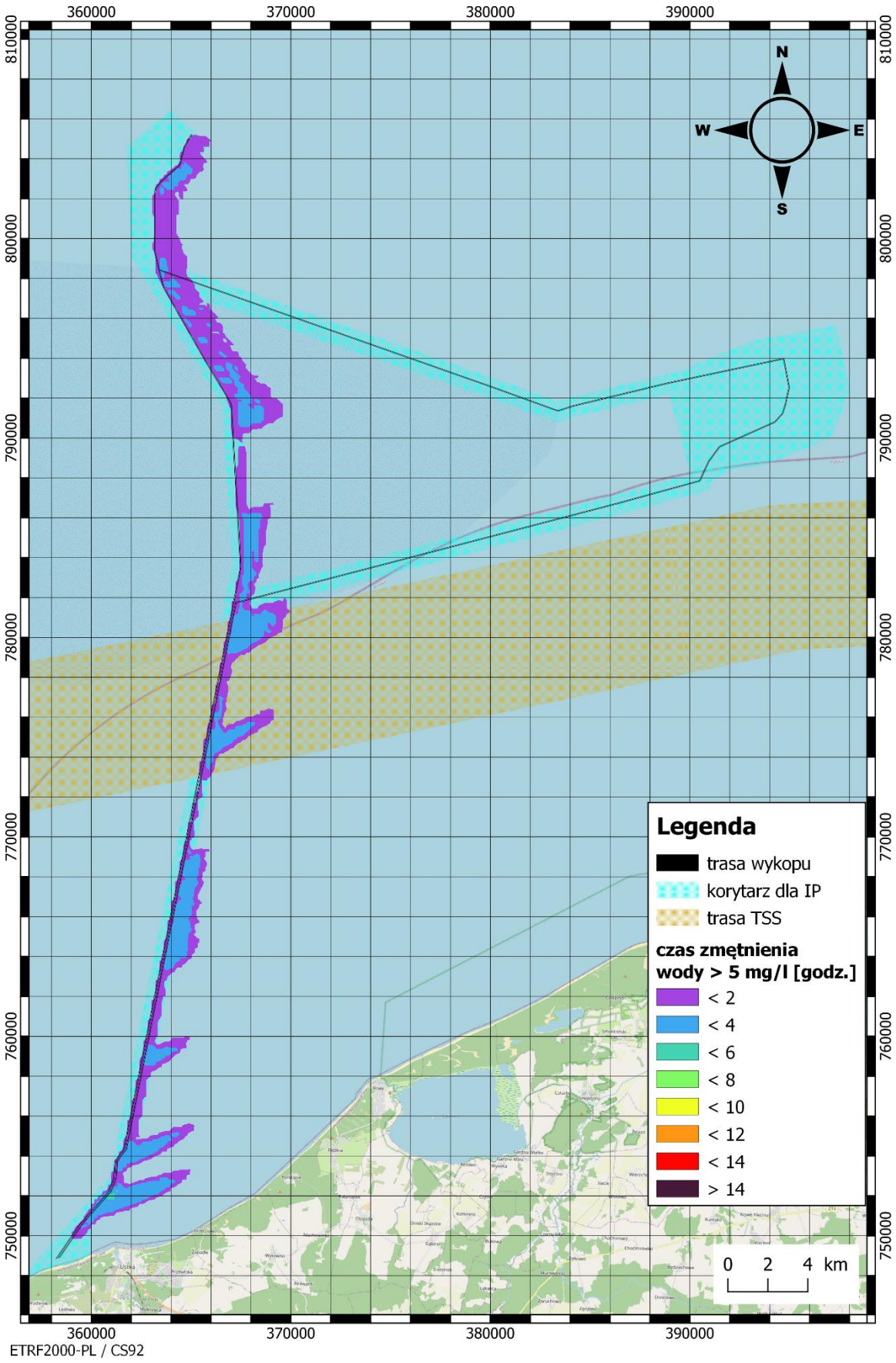

Figure 8 Total time of water turbidity generated during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V250 scenario

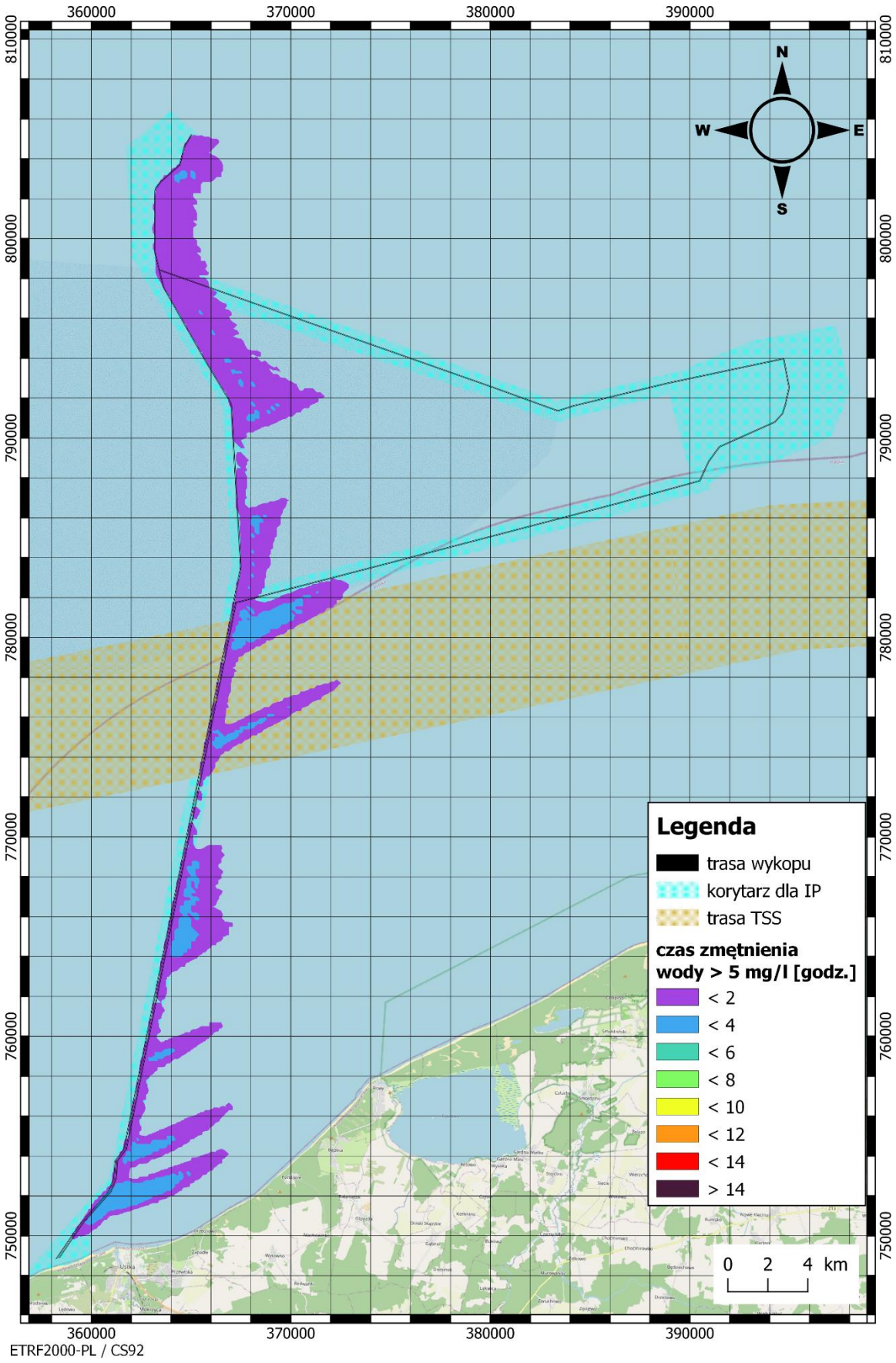

Figure 9 Total time of water turbidity generated during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V350 scenario

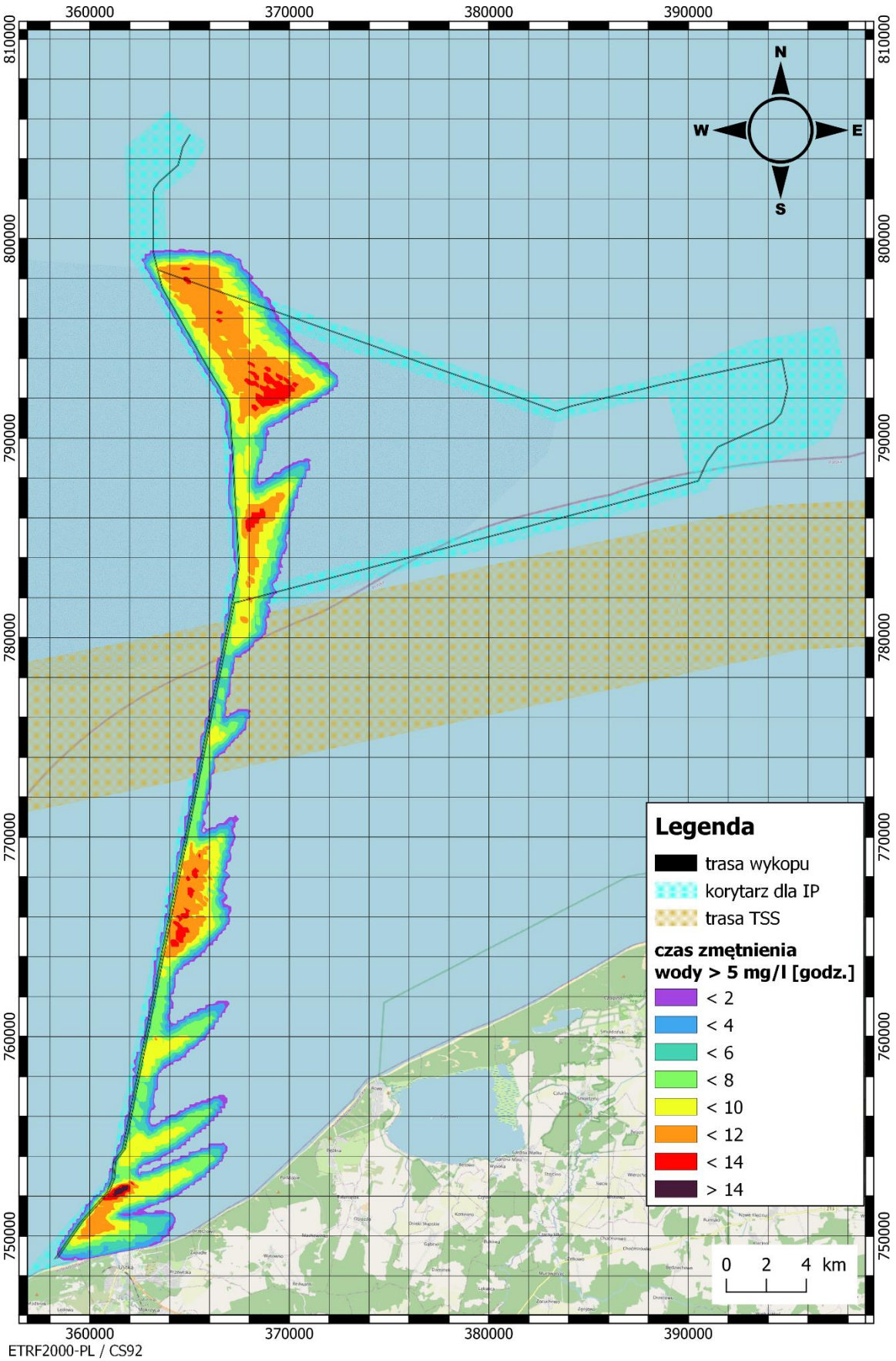

Figure 10 Total time of water turbidity generated during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V100 scenario

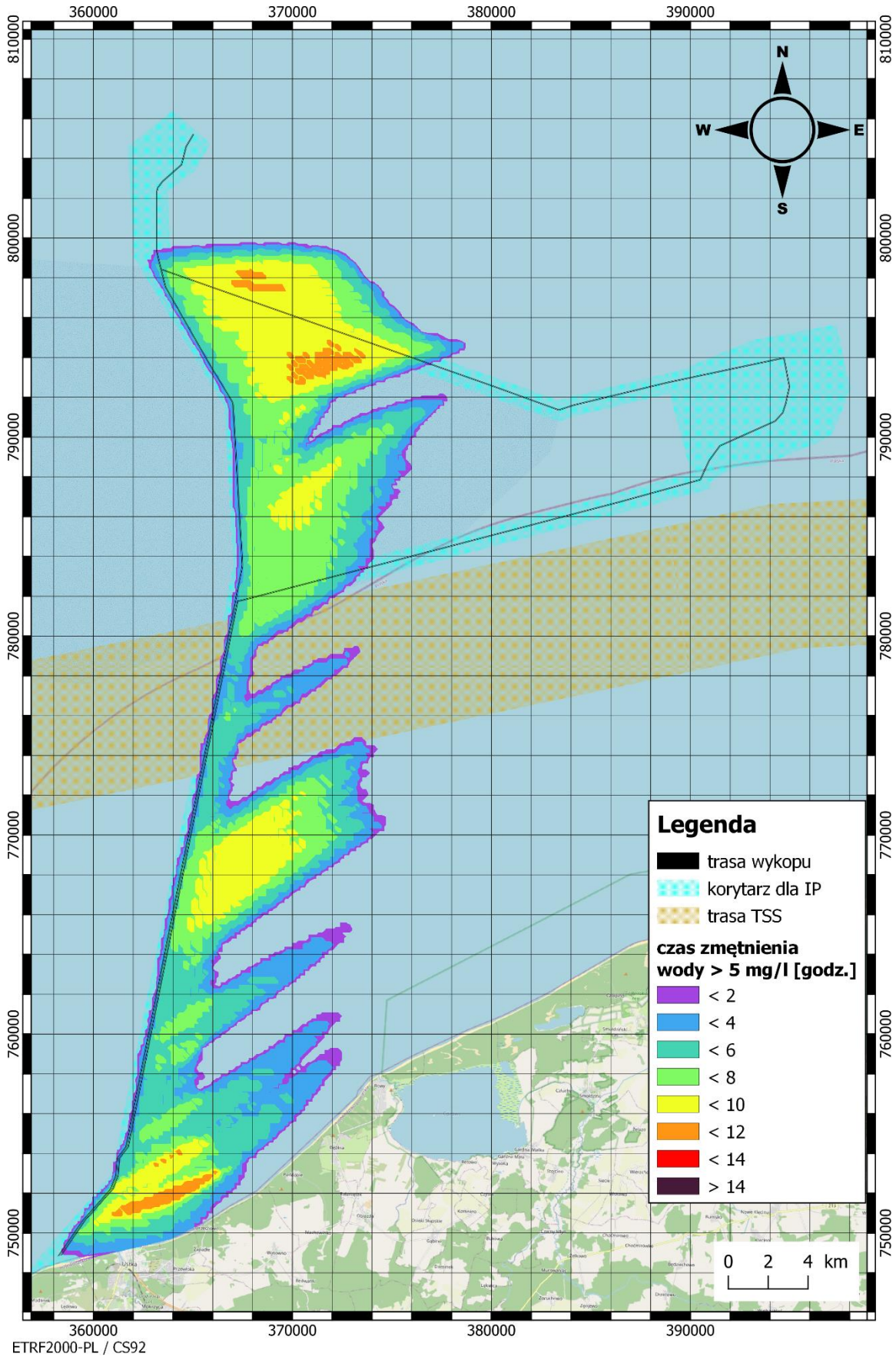

Figure 11 Total time of water turbidity generated during the complete process of burrowing the cable on the route to MFW Bałtyk II for the V200 scenario

Figure 12 – Figure 15 show the thickness of the sediment layer resulting from the numerical simulations after the total sedimentation of the suspended solids introduced into the basin during the burial of the cable on the route to MFW Bałtyk II for the V250, V350, V100 and V200 scenarios, respectively.

The received results indicate that sediment deposition will occur in a small area. Its spatial extent does not depend on the variant of the velocity of the cable burrowing into the bottom, while the amount of debris inflow and depth have the real influence on it. In areas where the bottom is composed of cohesive sediments and near the shore, the range of deposition is larger than in areas characterised by sandy bottoms. The obtained values are smaller than for the V100 and V200 scenarios (Figure 14 and Figure 15) analysed in the IBW PAN study of August 2022. This is due to the fact that, as a result of modifications to the modelling input data, the volume of sediment entering suspension has decreased several times.

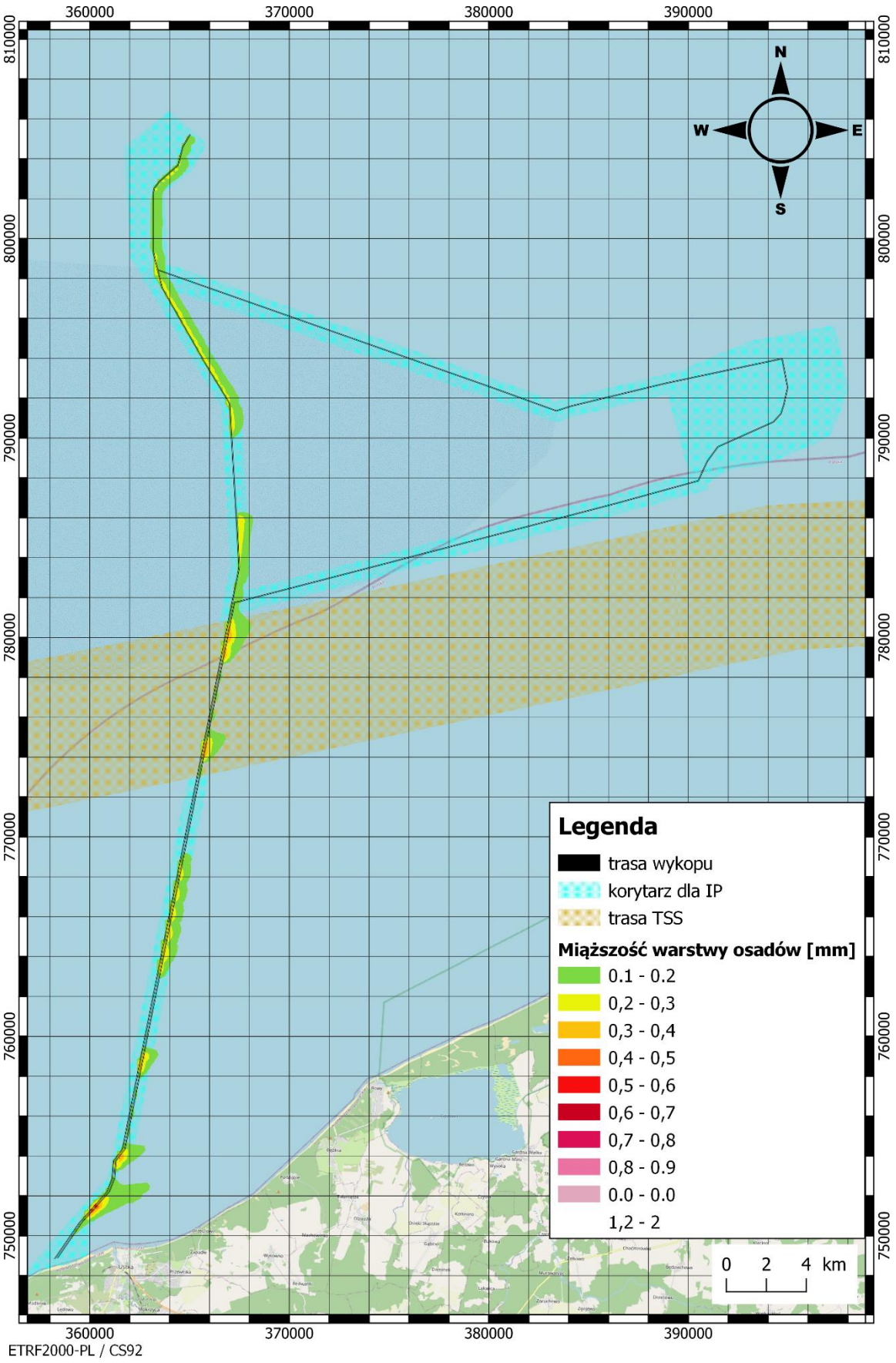

Figure 12 Thickness of the sediment layer formed after the complete sedimentation of the suspended solids introduced into the basin during the burial of the cable on the route to MFW Bałtyk II for the V250 scenario

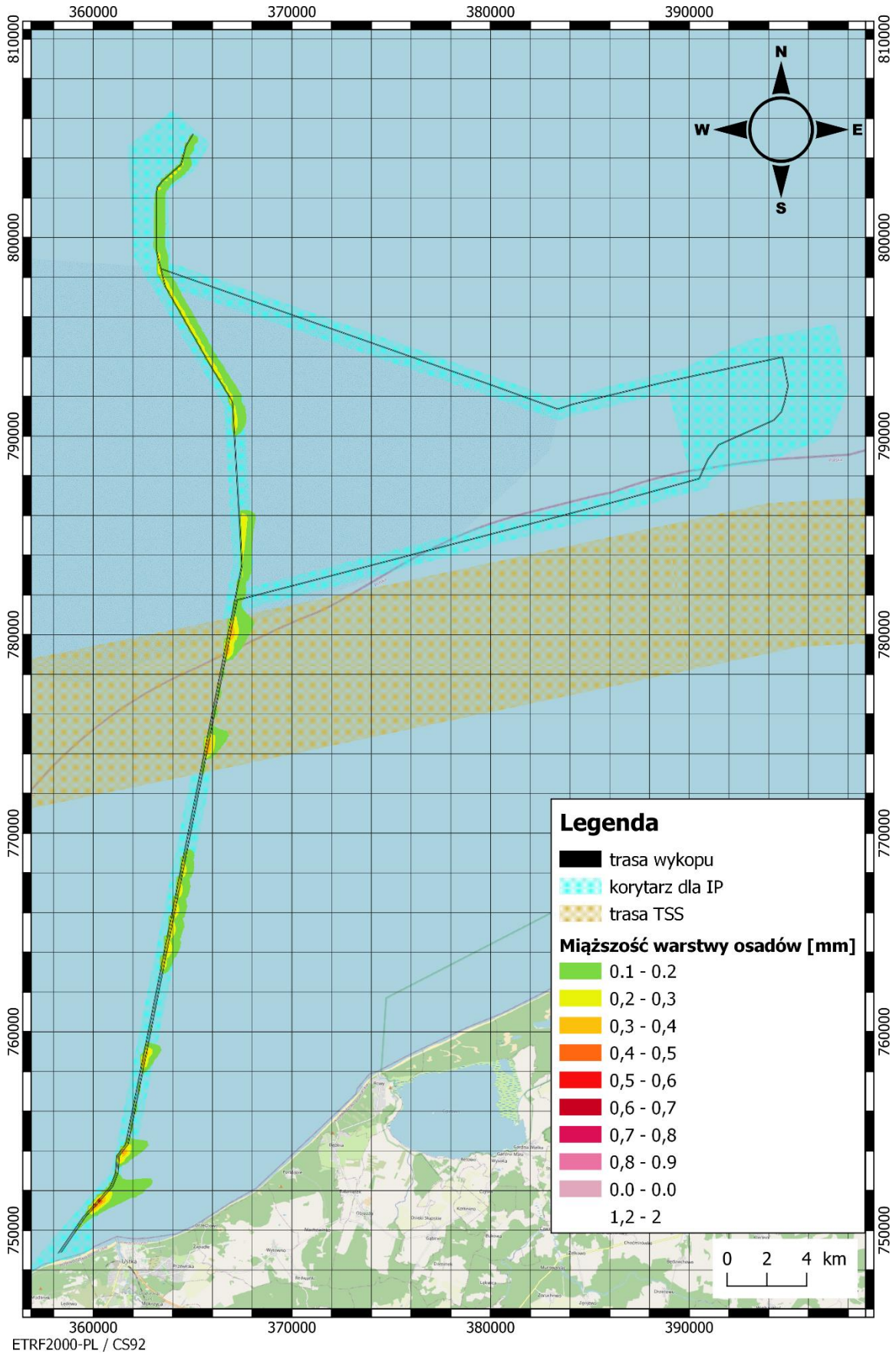

Figure 13 Thickness of the sediment layer formed after the complete sedimentation of the suspended solids introduced into the basin during the burial of the cable on the route to MFW Bałtyk II for the V350 scenario

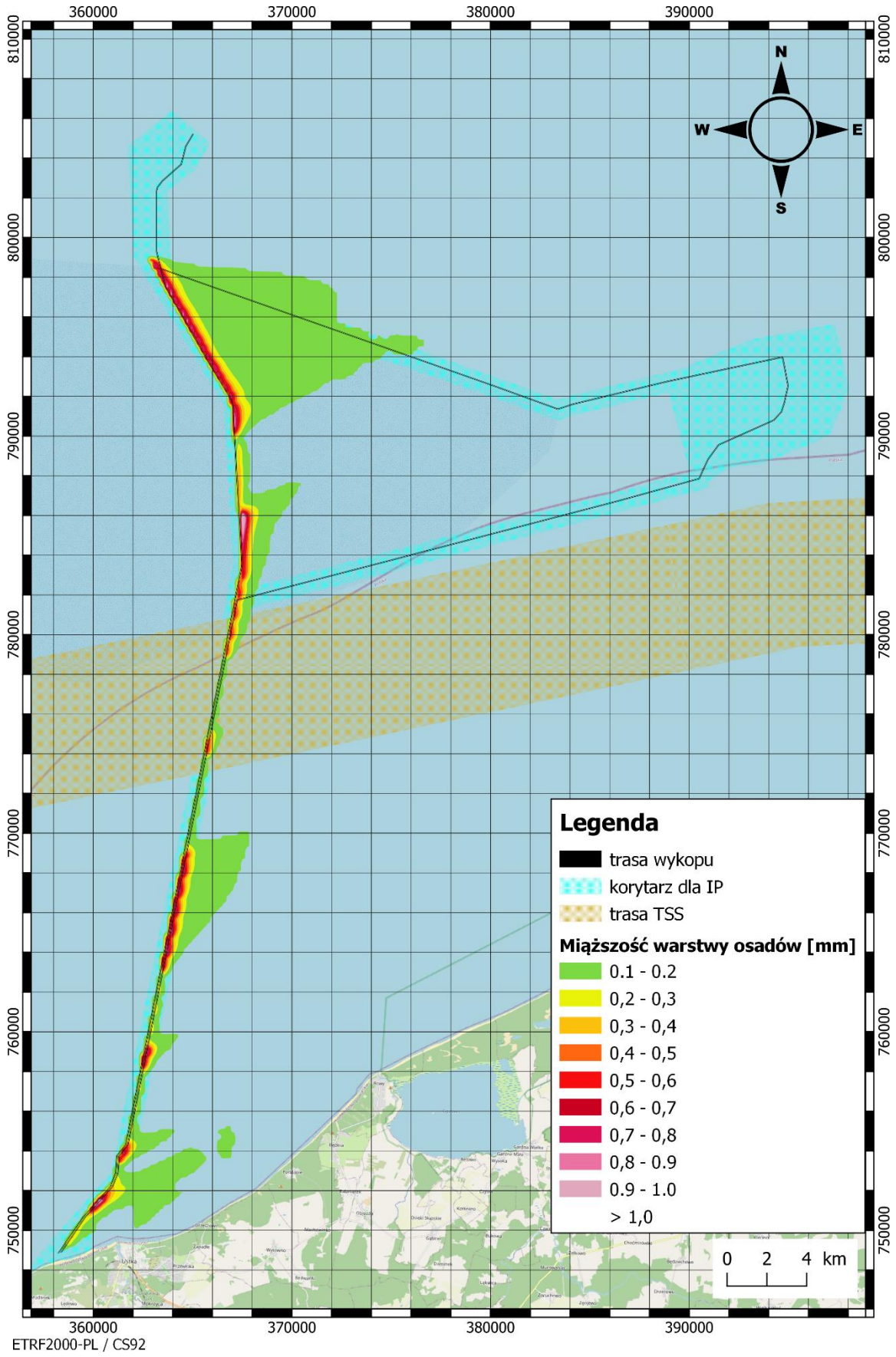

Figure 14 Thickness of the sediment layer formed after the complete sedimentation of the suspended solids introduced into the basin during the burial of the cable on the route to MFW Bałtyk II for the V100 scenario

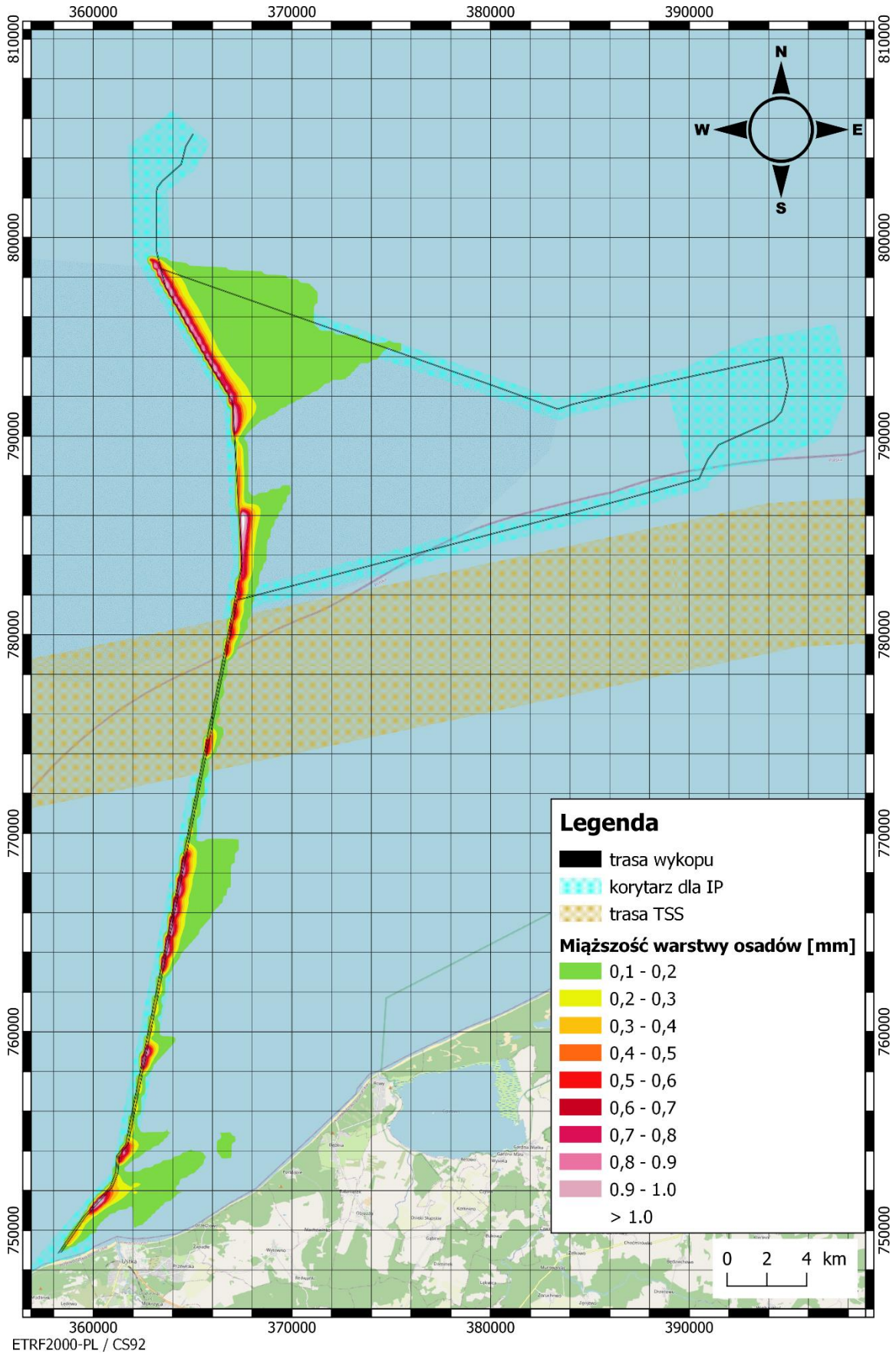

Figure 15 Thickness of the sediment layer formed after the complete sedimentation of the suspended solids introduced into the basin during the burial of the cable on the route to MFW Bałtyk II for the V200 scenario

6. Summary

The study is an annex to the study by IBW PAN titled 'Modelling of the spread of suspended solids during submarine cable laying for MFW Bałtyk II and MFW Bałtyk III' dated August 2022. It was created due to a change in input parameters for the modelling and the resulting need to interpret how a change in input data would affect the extent of the spread of suspended solids.

The study presents the results of mathematical modelling of the spread of suspended solids during the laying of a submarine cable in the corridor for the ECI of MFW Bałtyk II for the changed input parameters. Other model settings remained unchanged. The calculations were performed for two scenarios of cable burial speed: 250 m/h (scenario V250) and 350 m/h (scenario V350).

In order to determine what effect the change in modelling input parameters has on the previously obtained results and whether it will result in an increase in the extent of suspended solids' impact, the results of calculations for the V250 and V350 scenarios were compared with the previously obtained results of calculations for the V100 and V200 scenarios along the trench route to MFW Bałtyk II.

The obtained water turbidity ranges for the V250 and V350 scenarios are significantly smaller than for the V200 scenario analysed in the IBW PAN study of August 2022. Only in the case of conducting works at a speed of 350 m/h (V350) in the cohesive bed within the TSS Ławica Słupska route, a similar range of turbidity as in the V200 scenario was obtained. In addition, the water turbidity extents for the V250 scenario are smaller, while for the V350 scenario they are similar to the values obtained for the previously analysed V100 scenario.

As a result of the calculations, it was found that in the case of excavation leading to MFW Bałtyk II under the V250 or V350 scenario, the time of water turbidity along most of the route will not exceed 4 hours. Only in the case of the V250 scenario, the time of water turbidity may locally near the shore reach up to 6 hours. The obtained values are significantly less than for the V100 and V200 scenarios previously considered.

The received results indicate that sediment deposition will occur in a small area. Its spatial extent does not depend on the speed at which the cable is buried in the bottom, while the magnitude of debris inflow and depth have an influence. In areas where the bottom is composed of cohesive sediments and near the shore, the range of deposition is larger than in areas characterised by sandy bottoms. The values obtained are smaller than for the previously analysed V100 and V200 scenarios.

7. Table of literature

Deltares, 2010a. Delft3D-FLOW. Simulation of multi-dimensional hydrodynamic flow and transport phenomena, including sediments – User Manual. Version 3.04, rev. 11114. Deltares, Delft, The Netherlands.

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Foreman J., 2002, Resuspension of sediment by the jet plow during submarine cable installation. Submitted to GenPower, LLC, Needham, MA. Submitted by Engineering Technology Applications, Ltd, Romsey, Great Britain.

8. Attachment - maximum concentrations of suspended solids in the surface layer, in the water-depth and in the bottom layer during burrowing of the cable on the route to MFW Bałtyk II for scenarios V250, V350, V100 and V200

Maps showing the values of maximum turbidity in the surface layer (Figure 16 – Figure 19), in the water depth (Figure 20 – Figure 23) and in the bottom layer (Figure 24 – Figure 27), occurring when the power cable is submerged in the seabed along the route to MFW Bałtyk II for the V250, V350, V100 and V200 scenarios, are included in this attachment to the study.

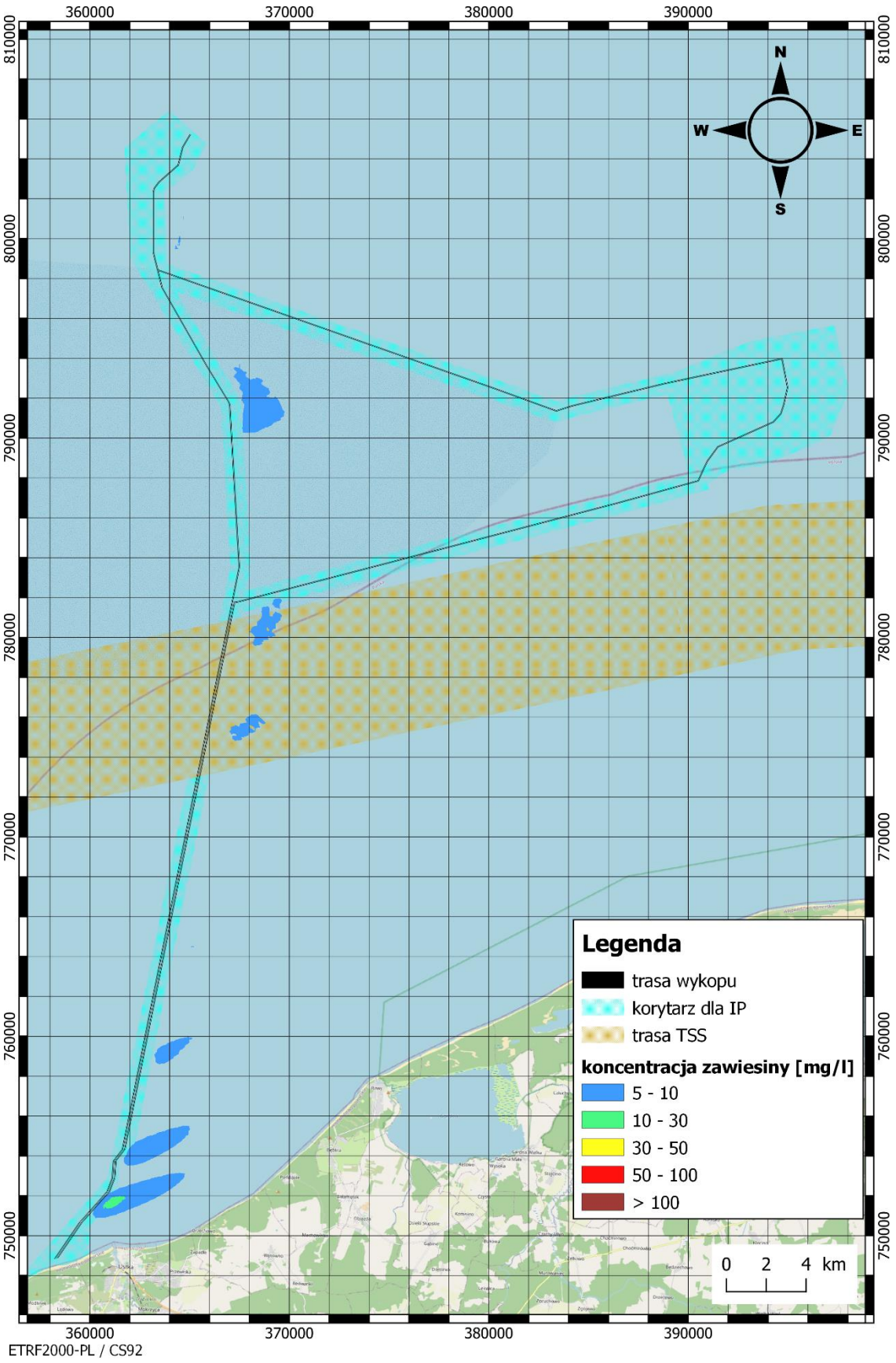

Figure 16 Maximum concentrations of suspended solids in the surface layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V250 scenario, limit value 5 mg/l

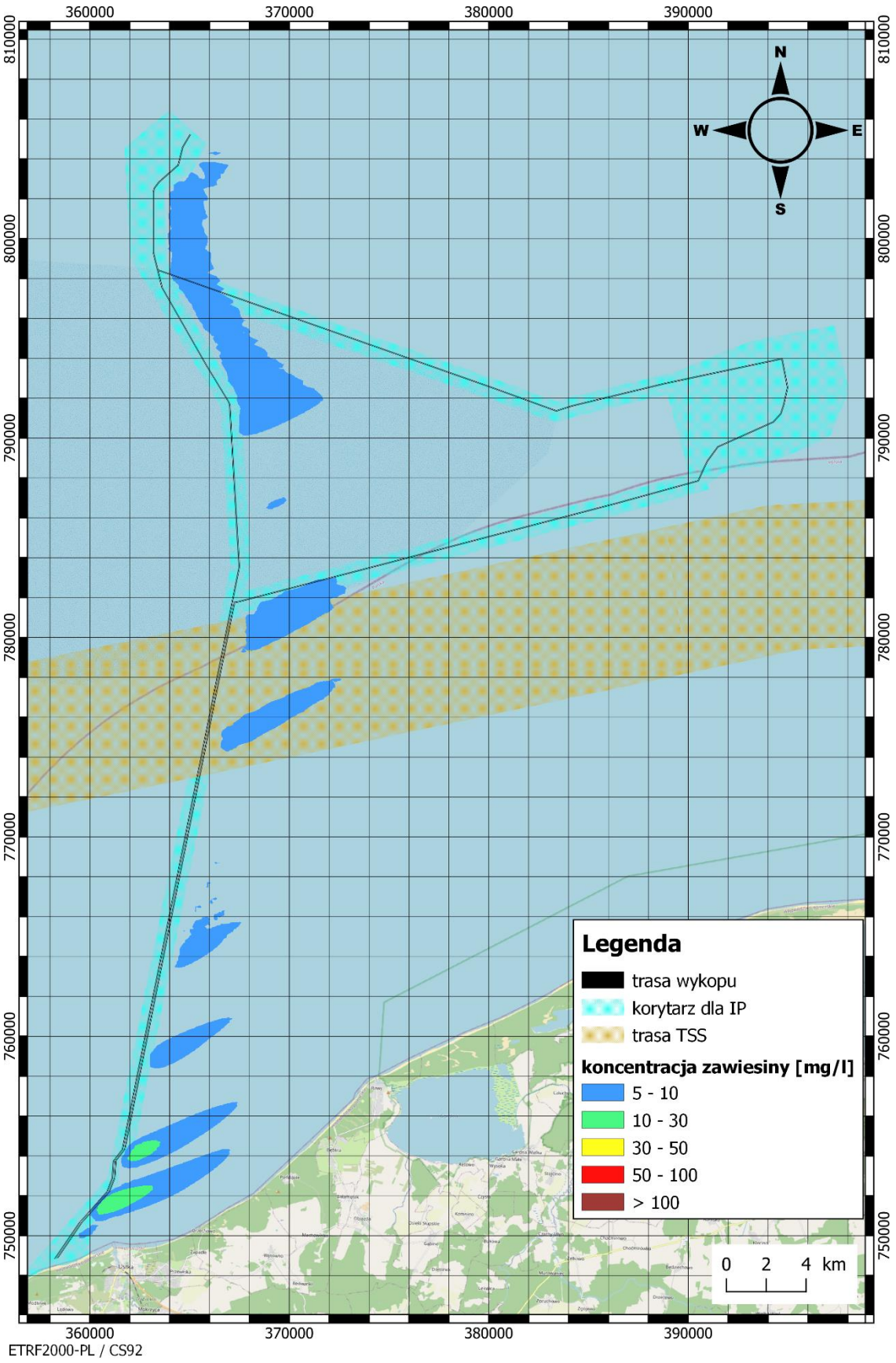

Figure 17 Maximum concentrations of suspended solids in the surface layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V350 scenario, limit value 5 mg/l

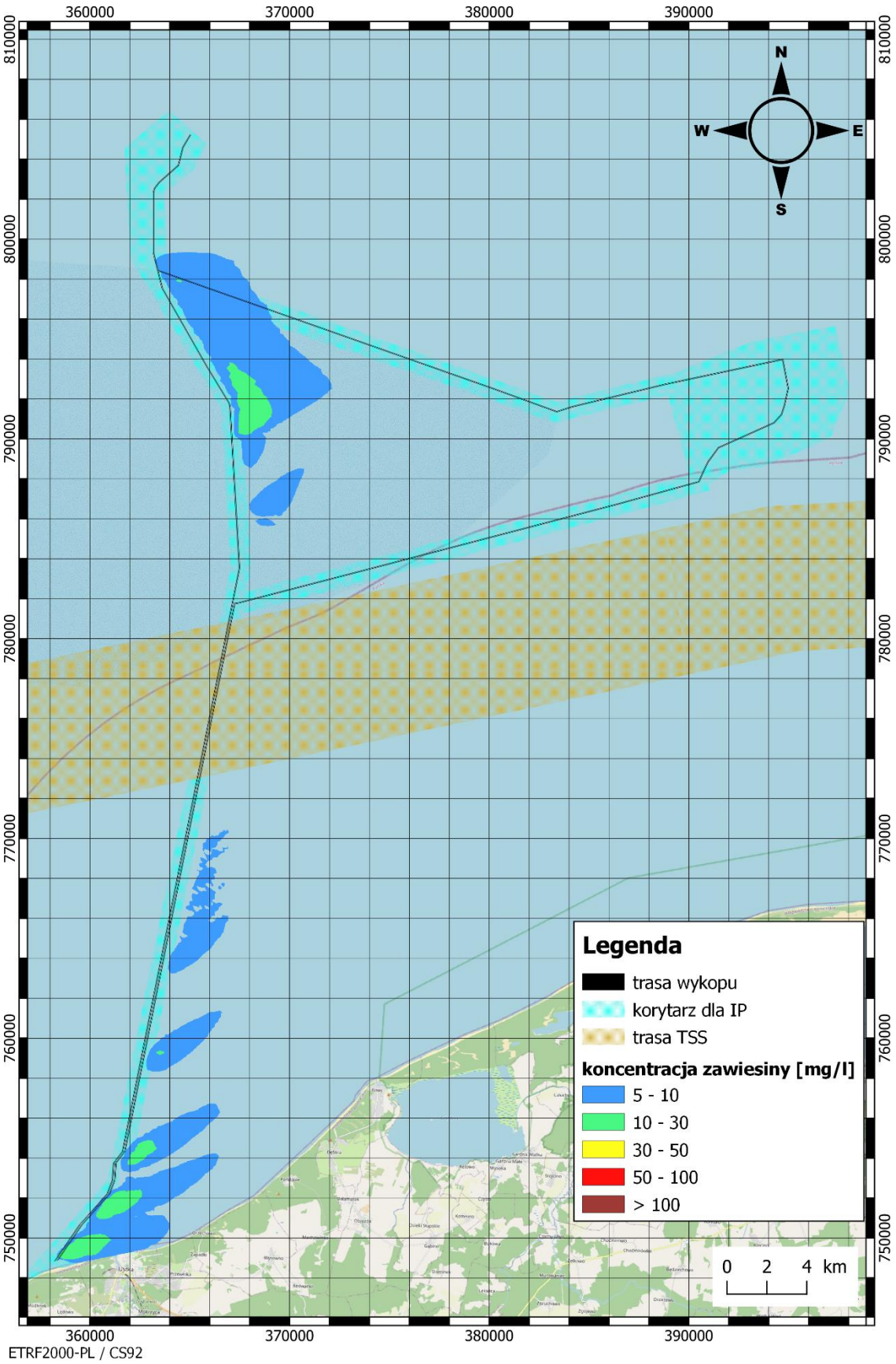

Figure 18 Maximum concentrations of suspended solids in the surface layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V100 scenario, limit value 5 mg/l

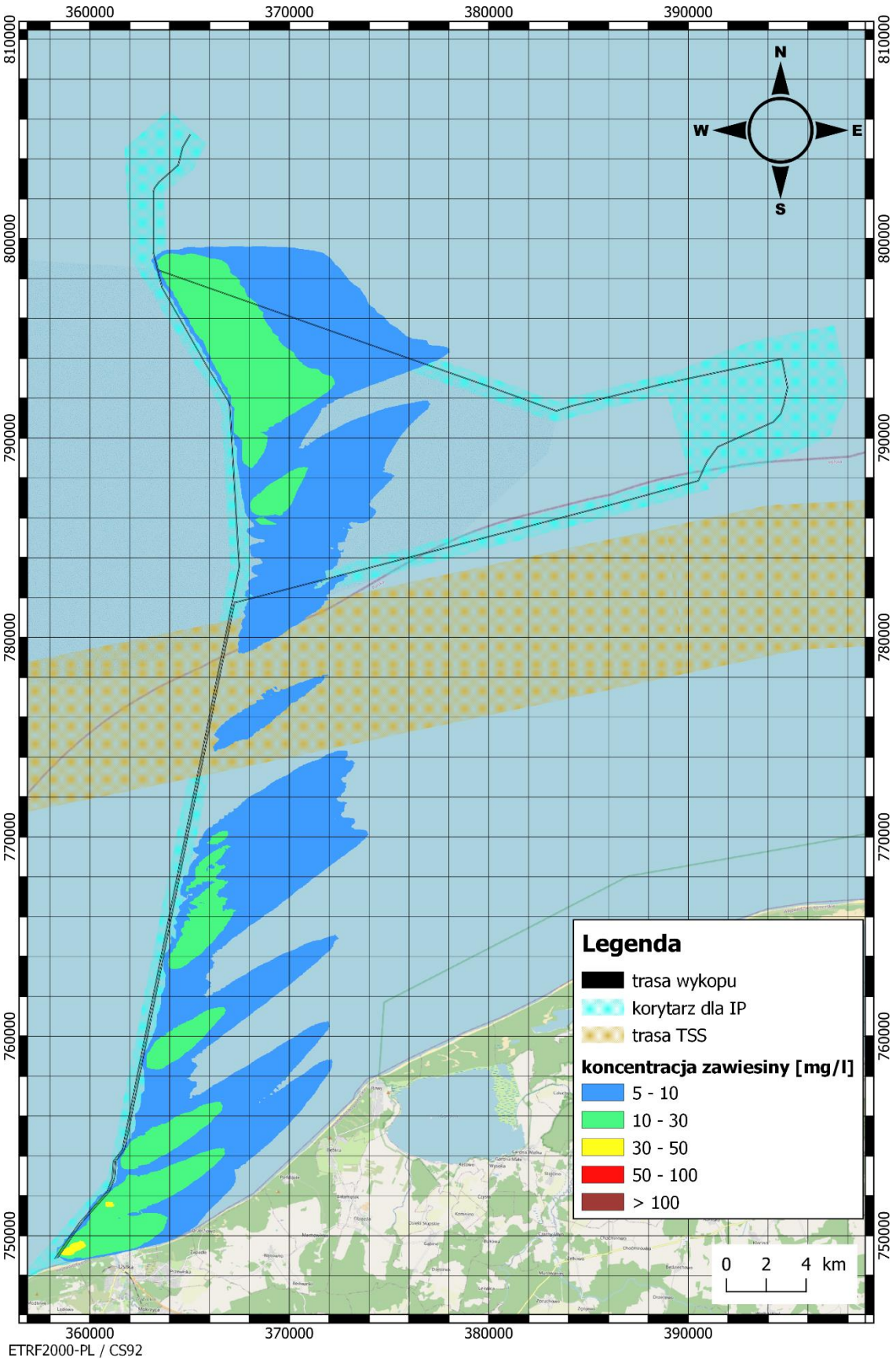

Figure 19 Maximum concentrations of suspended solids in the surface layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V200 scenario, limit value 5 mg/l

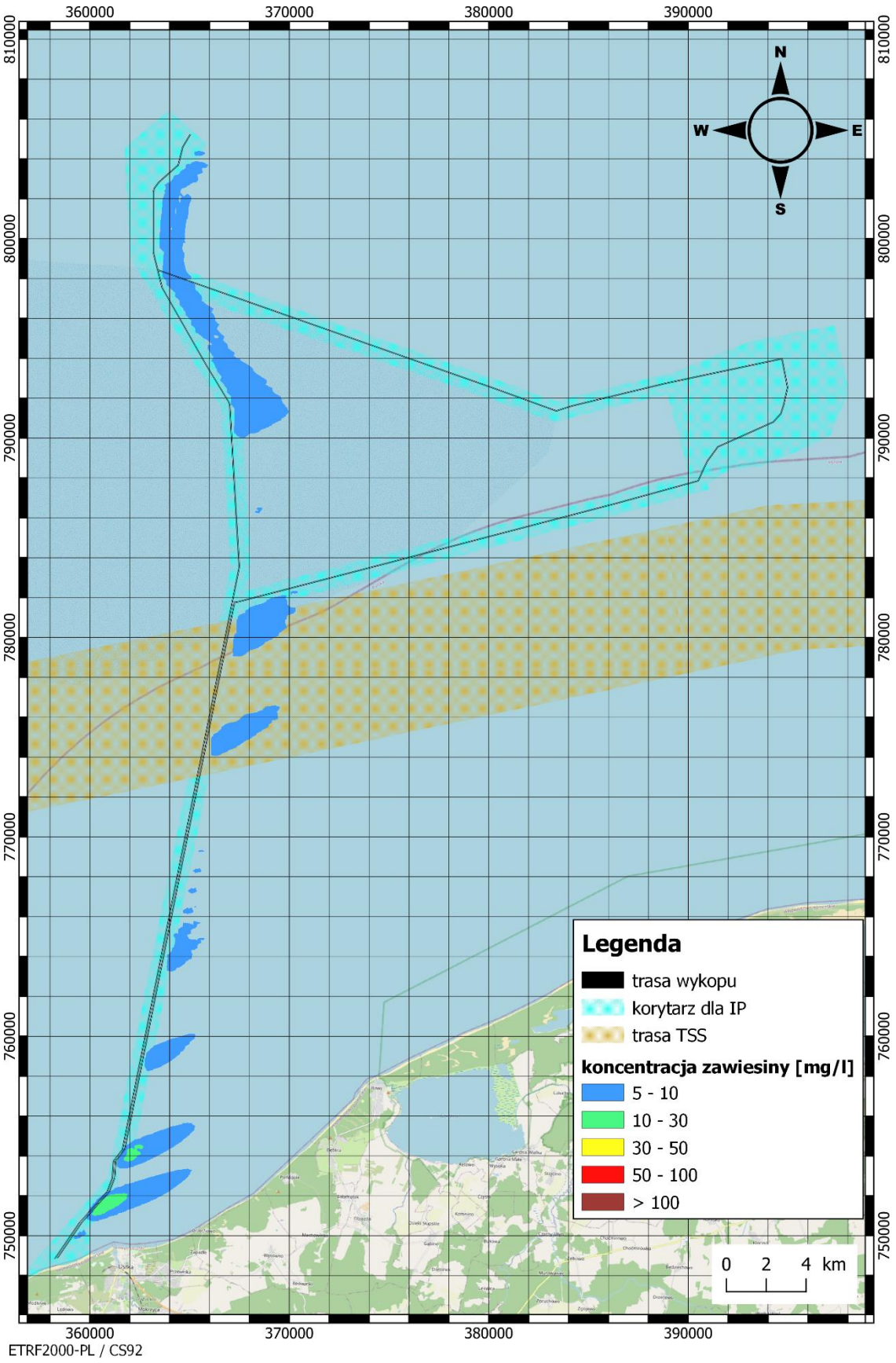

Figure 20 Maximum concentrations of suspended solids in the water depth determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V250 scenario, limit value 5 mg/l

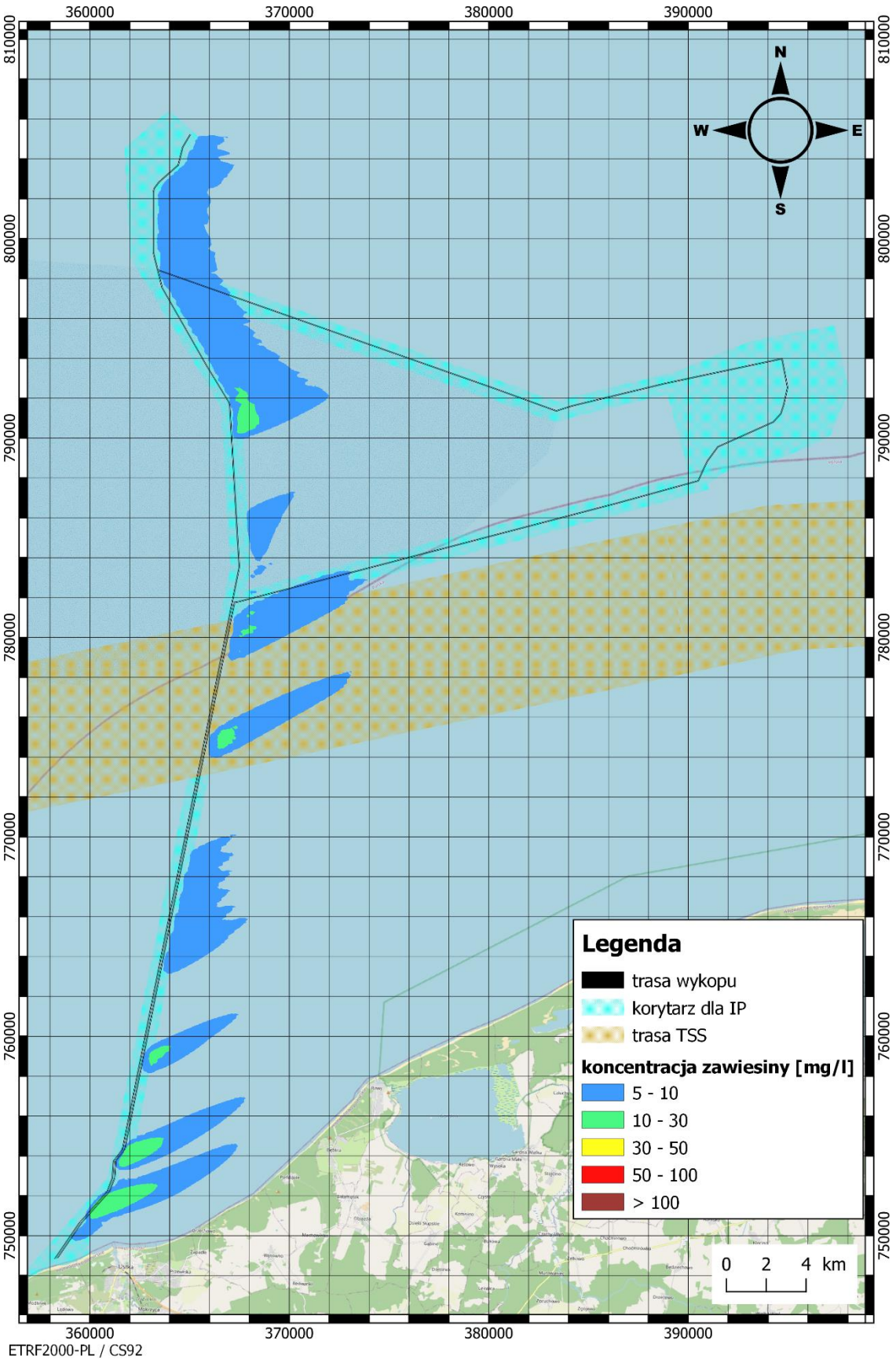

Figure 21 Maximum concentrations of suspended solids in the water depth determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V350 scenario, limit value 5 mg/l

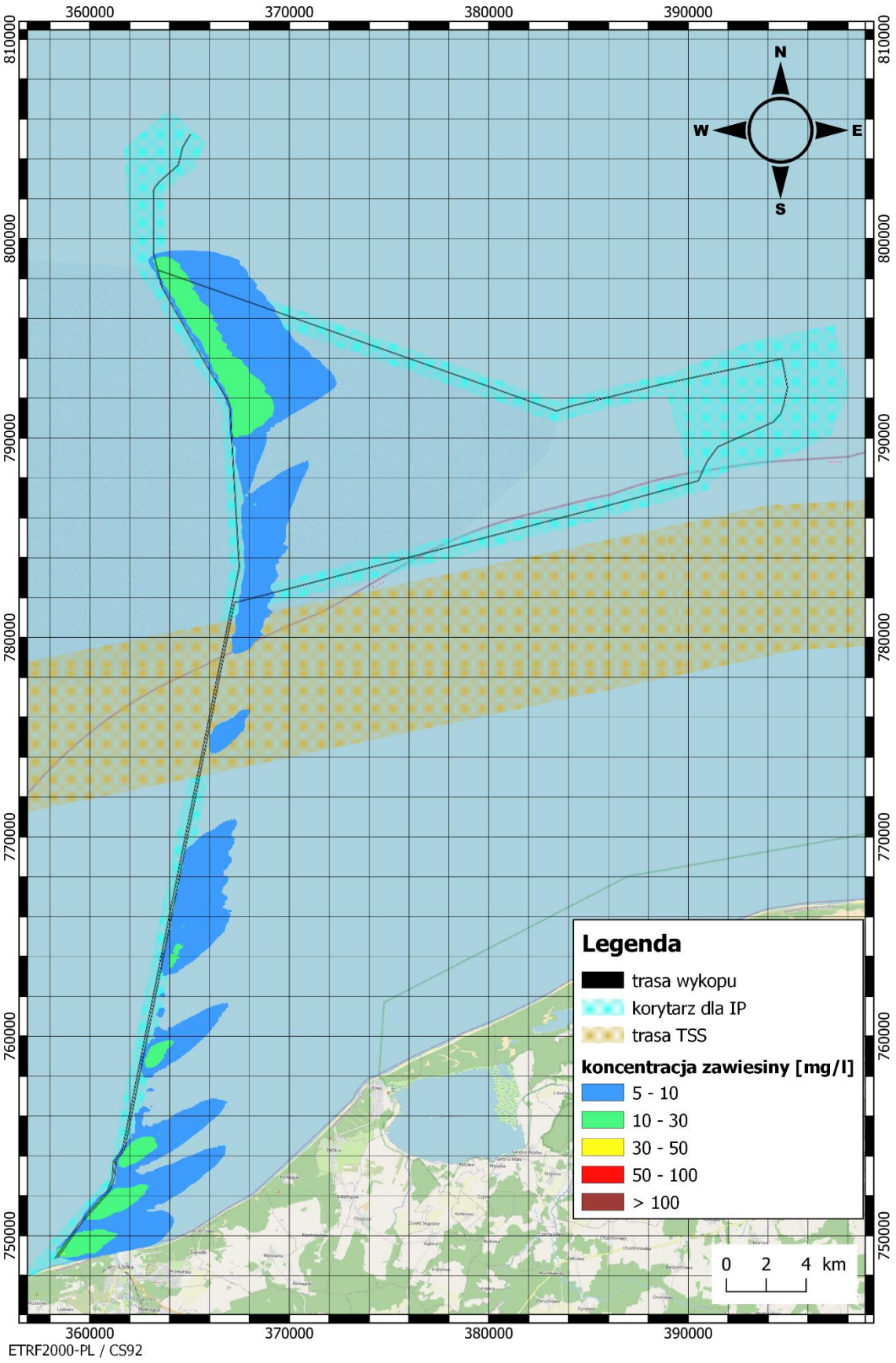

Figure 22 Maximum concentrations of suspended solids in the water depth determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V100 scenario, limit value 5 mg/l

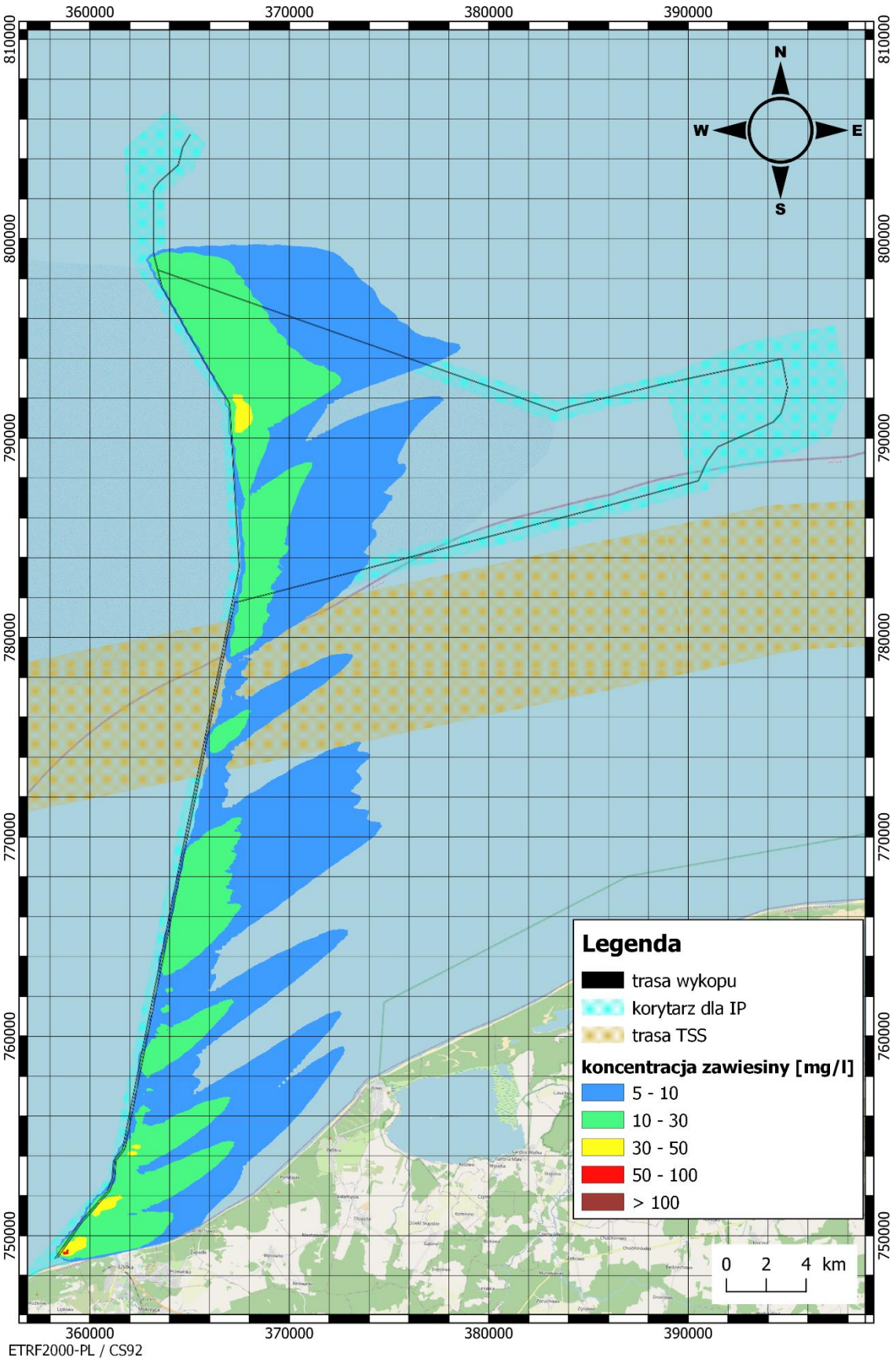

Figure 23 Maximum concentrations of suspended solids in the water depth determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V200 scenario, limit value 5 mg/l

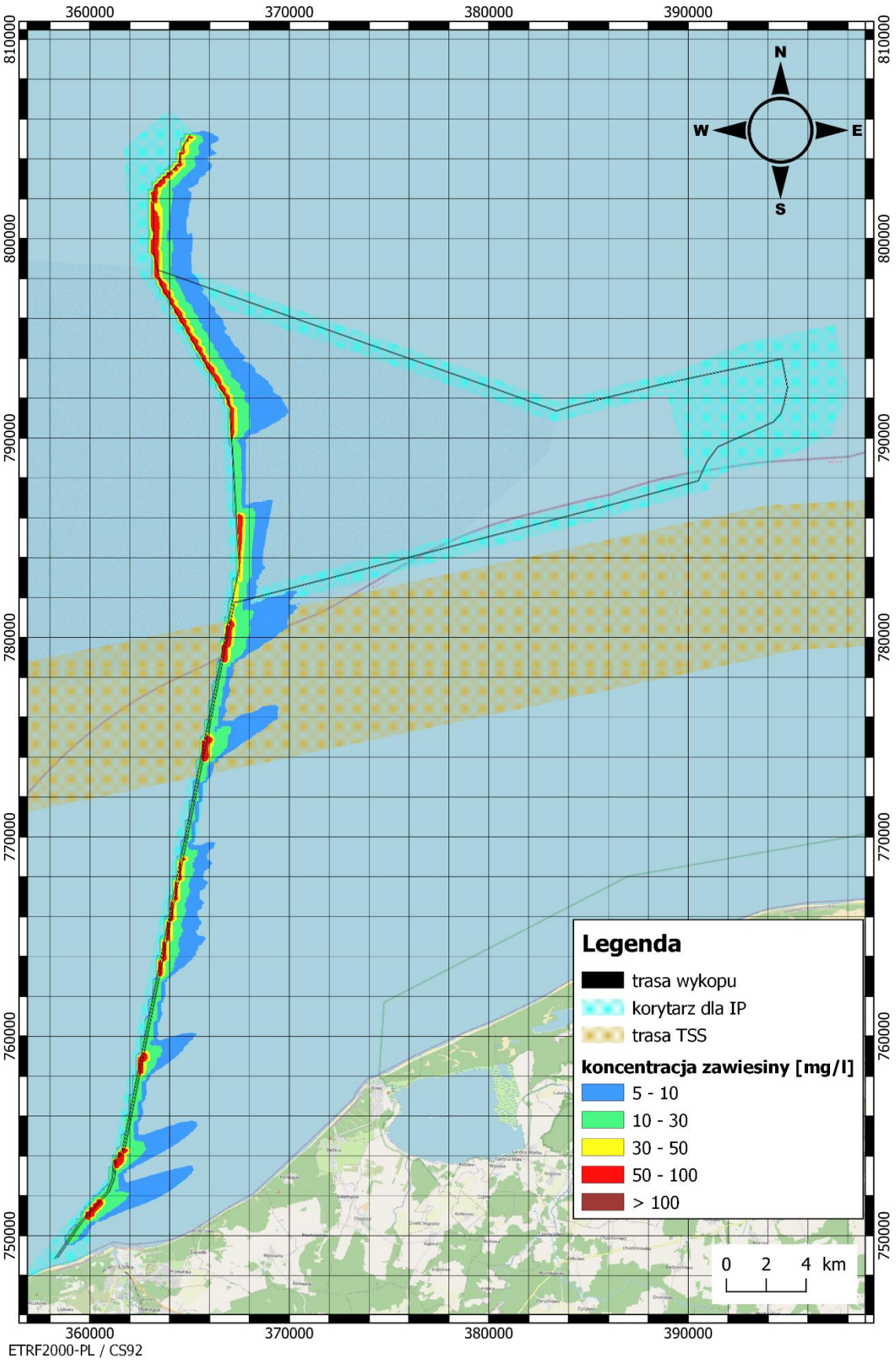

Figure 24 Maximum concentrations of suspended solids in the bottom layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V250 scenario, limit value 5 mg/l

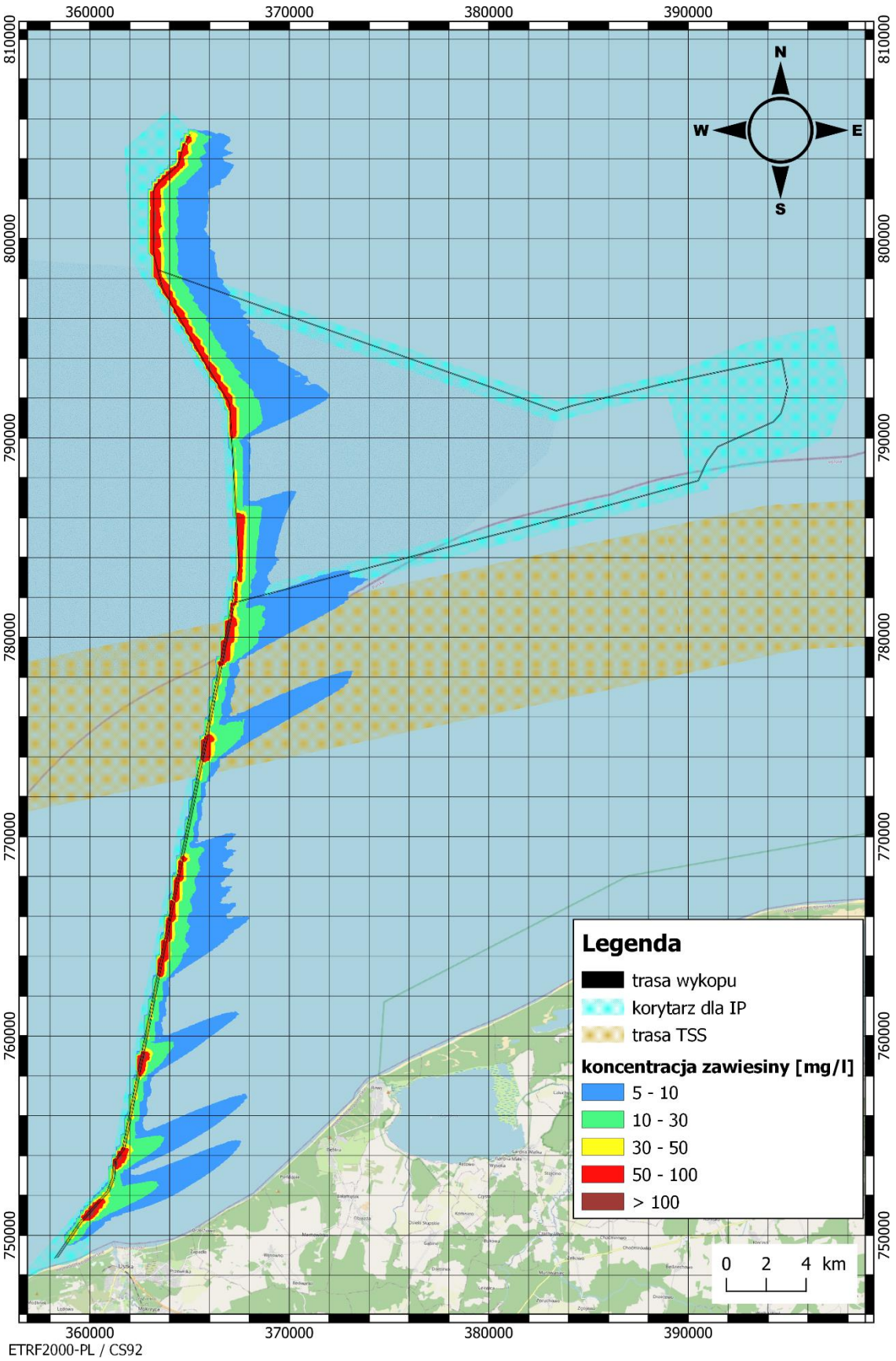

Figure 25 Maximum concentrations of suspended solids in the bottom layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V350 scenario, limit value 5 mg/l

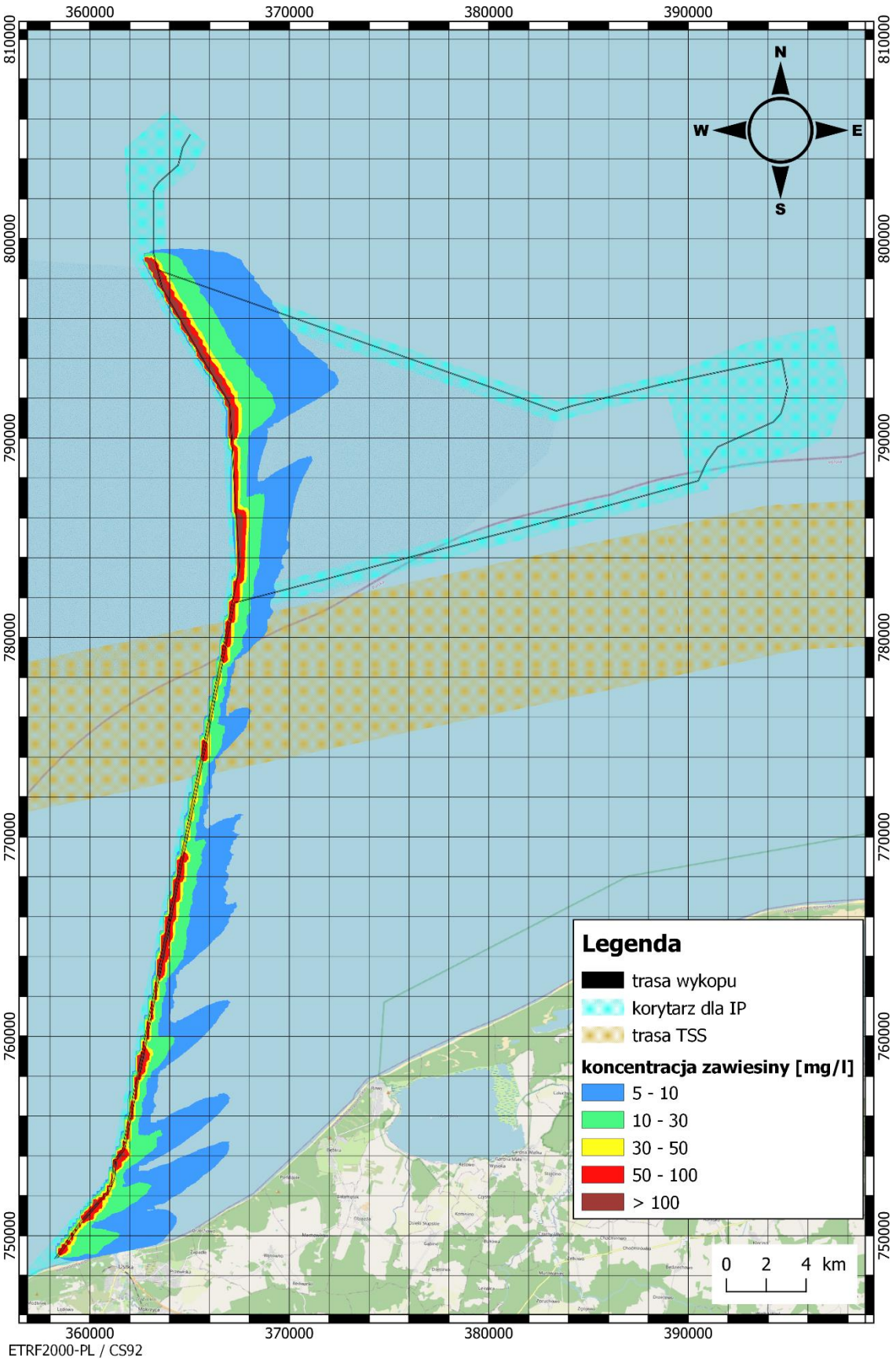

Figure 26 Maximum concentrations of suspended solids in the bottom layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V100 scenario, limit value 5 mg/l

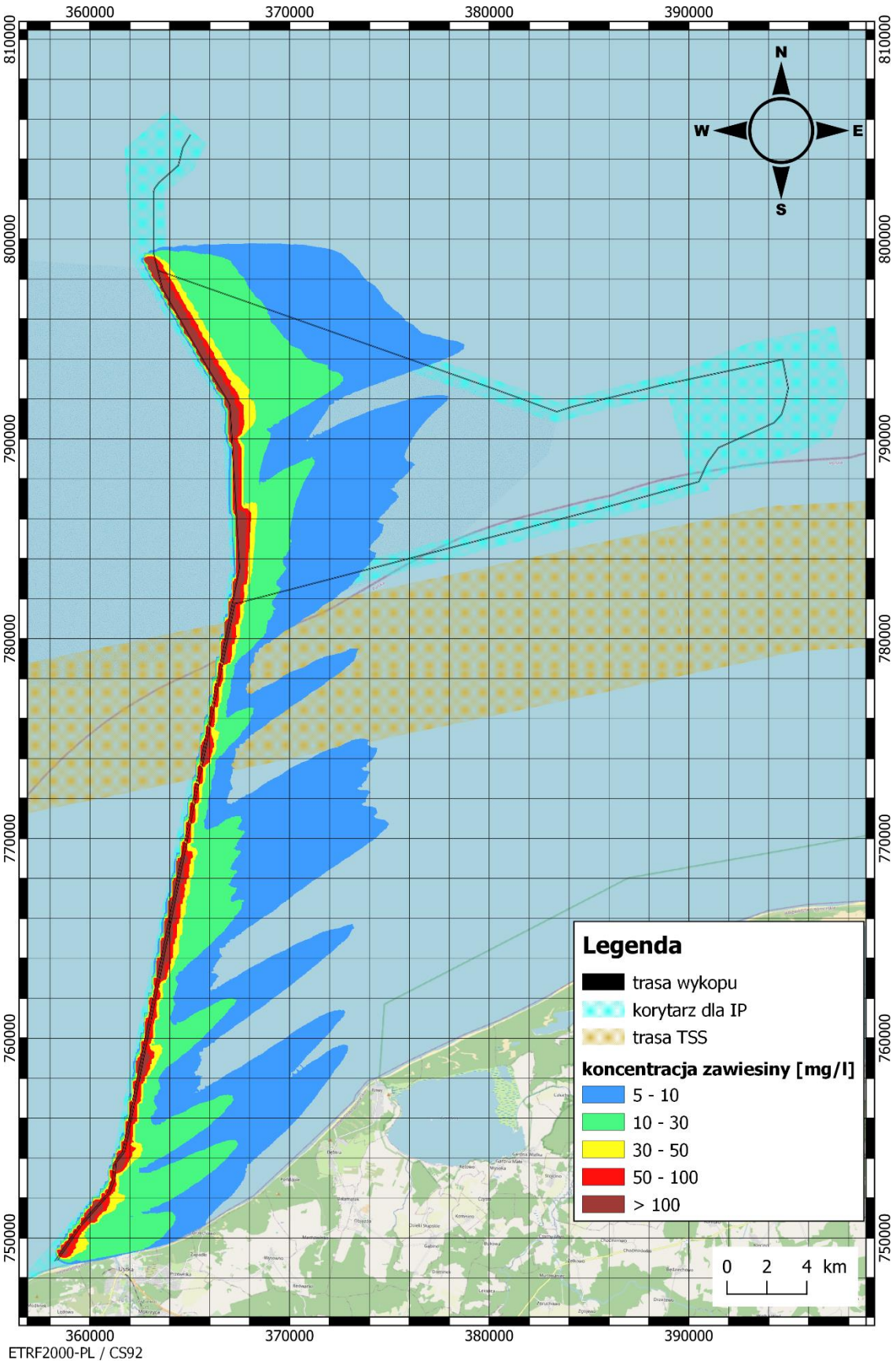

Figure 27 Maximum concentrations of suspended solids in the bottom layer determined at each grid node during the burial process of the cable on the route to MFW Bałtyk II for the V200 scenario, limit value 5 mg/l

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NAVIGATIONAL EXPERTISE for the External Connection Infrastructure of the offshore wind farms MFW Bałtyk II and MFW Bałtyk III

Investor: **Polenergia/Equinor**

Contractor: Marek Reszko

Authors:

Marek Reszko	

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Abbreviations and definitions

AHTS	*Anchor Handling Tug / Supply vessel*
AIS	*Automatic Identification System*
ARPA	*A radar interface that automatically guides the radar plot. It enables simultaneous tracking of multiple objects, calculation of their motion parameters and possibilities of collision.* *Automatic Radar Plotting Aid*
AV	*Accommodation Vessel*
AVI	*Person authorised to inspect ships and make CMID and MISW reports* *Accredited Vessel Inspector*
BHMW	*Biuro Hydrograficzne Marynarki Wojennej/ Hydrographic Office of the Navy*
CLV	*Cable lay vessel*
CMID	*Common Marine Inspection Document*
CWA	*Chemical warfare agent*
CTV	*Crew Transfer Vessel*
DP	*dynamic positioning*
DUM	*dyrektor urzędu morskiego/ director of the maritime office*
ENF	*emergency notification flowchart*
ERP	*emergency response plan*
GV	*guard vessel*
IMCA	*International Marine Contractors Association*
IM UMG	*Instytut Morski Uniwersytetu Morskiego w Gdyni/ Maritime Institute of the Maritime University in Gdynia*
IMO	*International Maritime Organization*
ECI of MFW BII/BIII	*External connection infrastructure of the offshore wind farms Bałtyk II and Bałtyk III for which a decision on environmental conditions of the project has been issued RDOŚ-Gd-WOO.4211.12.2016.KSZ/AJ.29.*
Project Information Card	*Project Information Card for the External connection infrastructure of the offshore wind farms Bałtyk II and Bałtyk III*
MEW	*morskie elektrownie wiatrowe/ offshore wind power plants*
MFW	*morska farma wiatrowa/offshore wind farm*
MFW BII	*the construction of the offshore wind farm MFW Bałtyk II at the location specified in the Environmental Decision RDOŚ-Gd-WOO.420.3.2021.KSZ.14 on 26.10.2021.*
MFW BIII	*the construction of the offshore wind farm MFW Bałtyk III at the location specified in the Environmental Decision RDOŚ-Gd-WOO.4211.12.2015.KP.22 on 27.07.2016.*
MISW	*Marine Inspection Document for Small Workboats (below 500 GT, IMCA M 189)*
OOU	*obszar ograniczonego użytkowania/ restricted use area*
OSV	*Offshore Supply Vessel*

OVID	*offshore vessel inspection database – eCMID*
OZE	*odnawialne źródła energii/ renewable energy sources*
PLB	*post lay burial*
POM Plan	*Regulation of the Council of Ministers of 14 April 2021 on the adoption of the Spatial Development Plan of Internal Sea Waters, Territorial Sea and Exclusive Economic Zone in the scale of 1:200 000 (Journal of Laws 2021.935)*
POM	*Polish maritime areas within the meaning of the Act of 21 March 1991 on Maritime Areas of the Republic of Poland and Maritime Administration (Journal of Laws 1991 No. 32, item 131 as amended)*
RA/MS	*a methodology of work organisation involving the identification of hazards, the qualitative and quantitative identification of risks, the designation of risk control measures and, subsequently, the detailed description of procedures for performing actions to eliminate or reduce the consequences of previously identified risks* *Risk Assessment / Method Statements*
SBV (ERRV)	*Standby vessel, Emergency Response Rescue Vessel*
Securite	*a procedure word used in the maritime radio service that warns the crew that the following message is important safety information. The most common use of this is by coast radio stations before the broadcast of navigational warnings and meteorological information which, however, does not cause an immediate danger to the life of the crew.*
SIMOPS	*Simultaneous operations*
SPS Code	*Special Purpose Ship Code*
SOV	*Service Operation Vessel*
UXO	*unexploded ordnance*
VMS	*Vessel Monitoring System*
W2W	*term used to describe the movement of workers to the workplace including staff transport, ship-to-ship, ship-to-facility and movement within a facility* *Walk to Work*
WGS 84	*World Geodetic System 1984*
WSE/EEZ	*Wyłączna strefa ekonomiczna/Exclusive Economic Zone*

1 Analysis of the impact of the ECI of MFW BII/BIII on navigation and fishery

1.1 Navigation

The impact of the project on navigation was assessed on the basis of AIS data recorded by the Polish Maritime Administration in 2021. Data on the intensity of vessel traffic in the first half of 2021 is presented in [Figure 1-1], and in the second half of 2021 in [Figure 1-2].

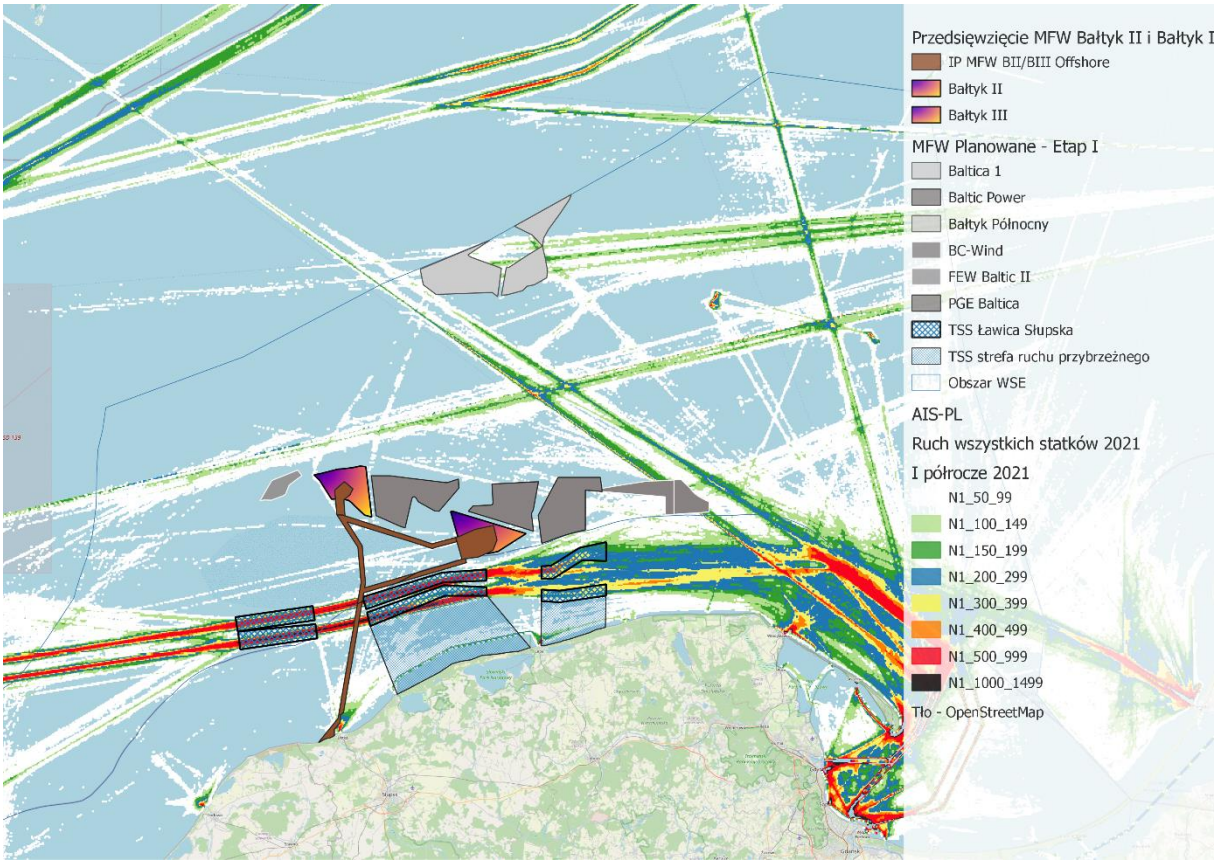

Figure 1-1. Traffic distribution in POM in the first half of 2021 based on AIS-PL data

An important reason for the separation of vessel traffic into two halves is the fact that new rules for regulating vessel traffic on the TSS Ławica Słupska have been introduced on 1 July 2021. The modified TSS has a different shape of directional tracks and a third part is added, the eastern part having two lanes of variable width, a traffic separation zone of variable shape and width and a coastal traffic separation zone.

The purpose of splitting the shipping traffic analysis into two half-years was to assess the changes in the shipping traffic picture caused by the changes in the traffic regulation system. The comparison of the two images also allows the assessment on whether these changes are related to the impact of the Project on navigation.

The captain of each vessel, while using the traffic separation scheme, navigating in its vicinity or crossing the scheme is obliged to follow the International Regulations for Preventing Collisions at Sea (COLREG 1972), including 10 of the regulations. Supervision over vessel traffic in the TSS Ławica Słupska area is performed by the VTS Ławica Słupska Traffic Control Service.

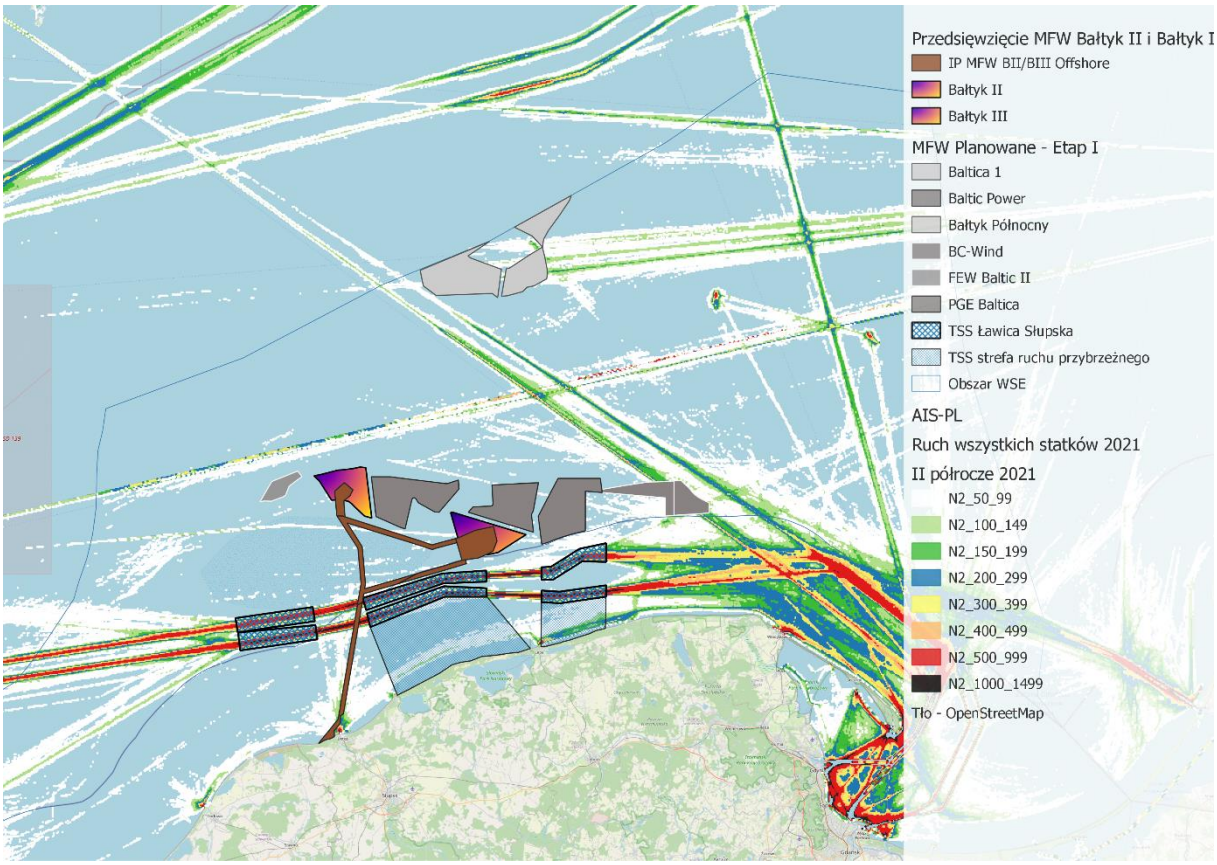

Figure 1-2. Traffic distribution in POM in the second half of 2021 based on AIS-PL data

The comparative analysis of vessel traffic in the two halves of 2021 allows for the conclusion that they have no influence on the Project's impact on the navigation. Significant changes in the alignment of the main ship traffic streams occurred in the sections delineated by the eastern part of the TSS Ławica Słupska and in the basin located to the east.

On the basis of the data presented in Figure above, the axes of the main shipping routes have been determined. The analysis of the course of these routes enables the indication of conflicts and threats related to the simultaneous functioning of navigation and activities associated with the construction and exploitation of the MFW BII/BIII and, in a broader meaning, all offshore wind energy activities, according to the POM Plan.

The maps below [Figure 1-3, Figure 1-4] show diagrams of the present and planned main navigation routes on a scale of 1: 1,000,000. The maps include both determinants resulting from the POM Plan as well as the modified area of the TSS Ławica Słupska traffic separation scheme covering its eastern part, i.e. the separation zone, lanes and coastal traffic zone.

The vessel traffic analysis shows that the Project will affect the navigation to a varying extent depending on the location. The impact relationship is directly related to the intensity of vessel traffic and is presented in detail in Subchapter **Błąd! Nie można odnaleźć źródła odwołania.**.

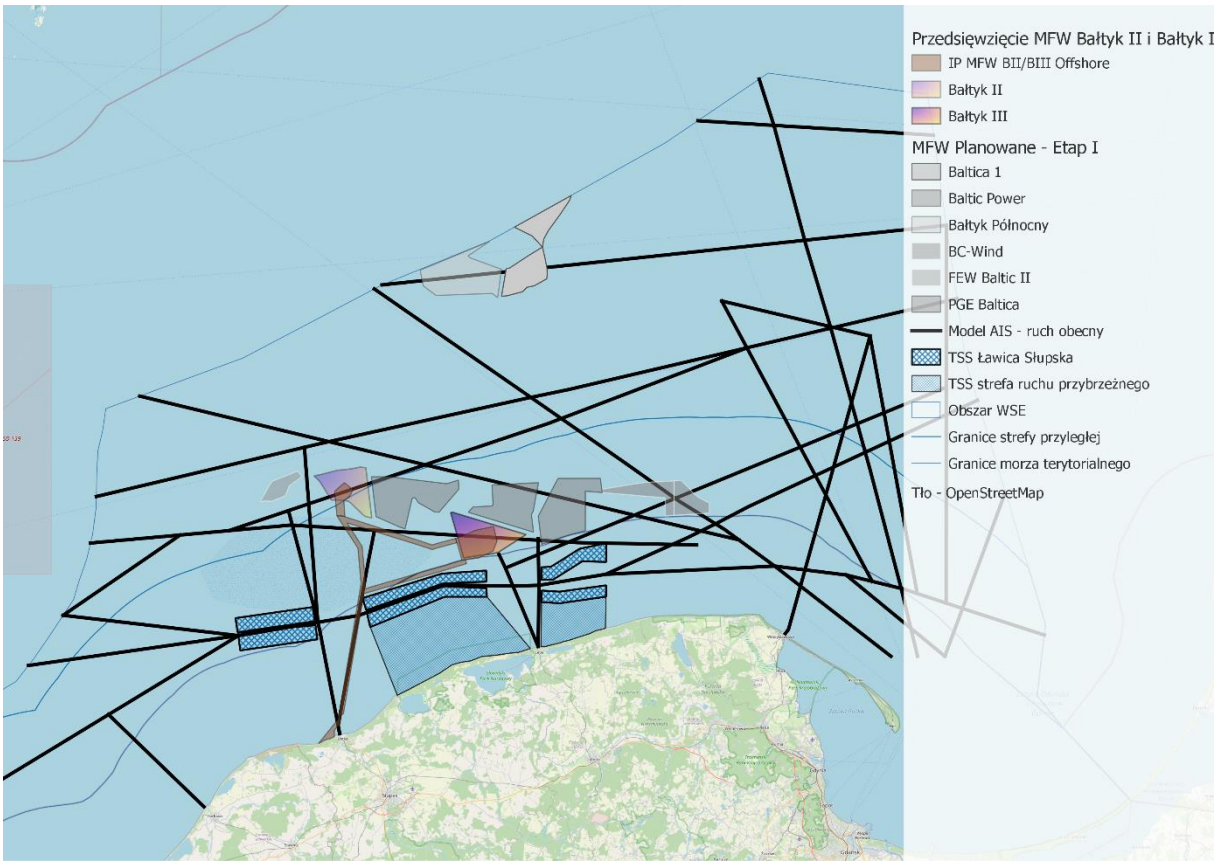

Figure 1-3. Linear model of vessel traffic - current state

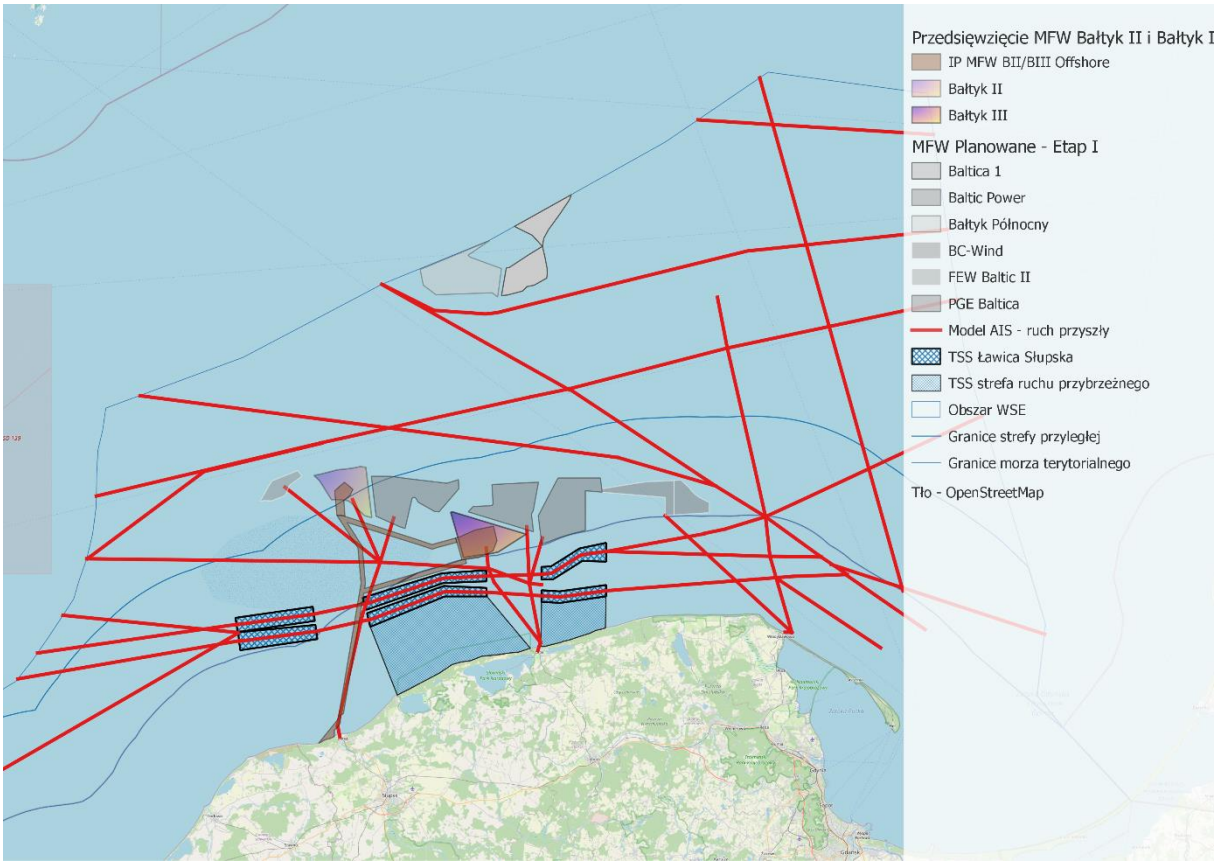

Figure 1-4. Linear model of vessel traffic - future state

1.2 Fishery

An image of the ship traffic in 2021 based on the AIS data is shown in the maps below.

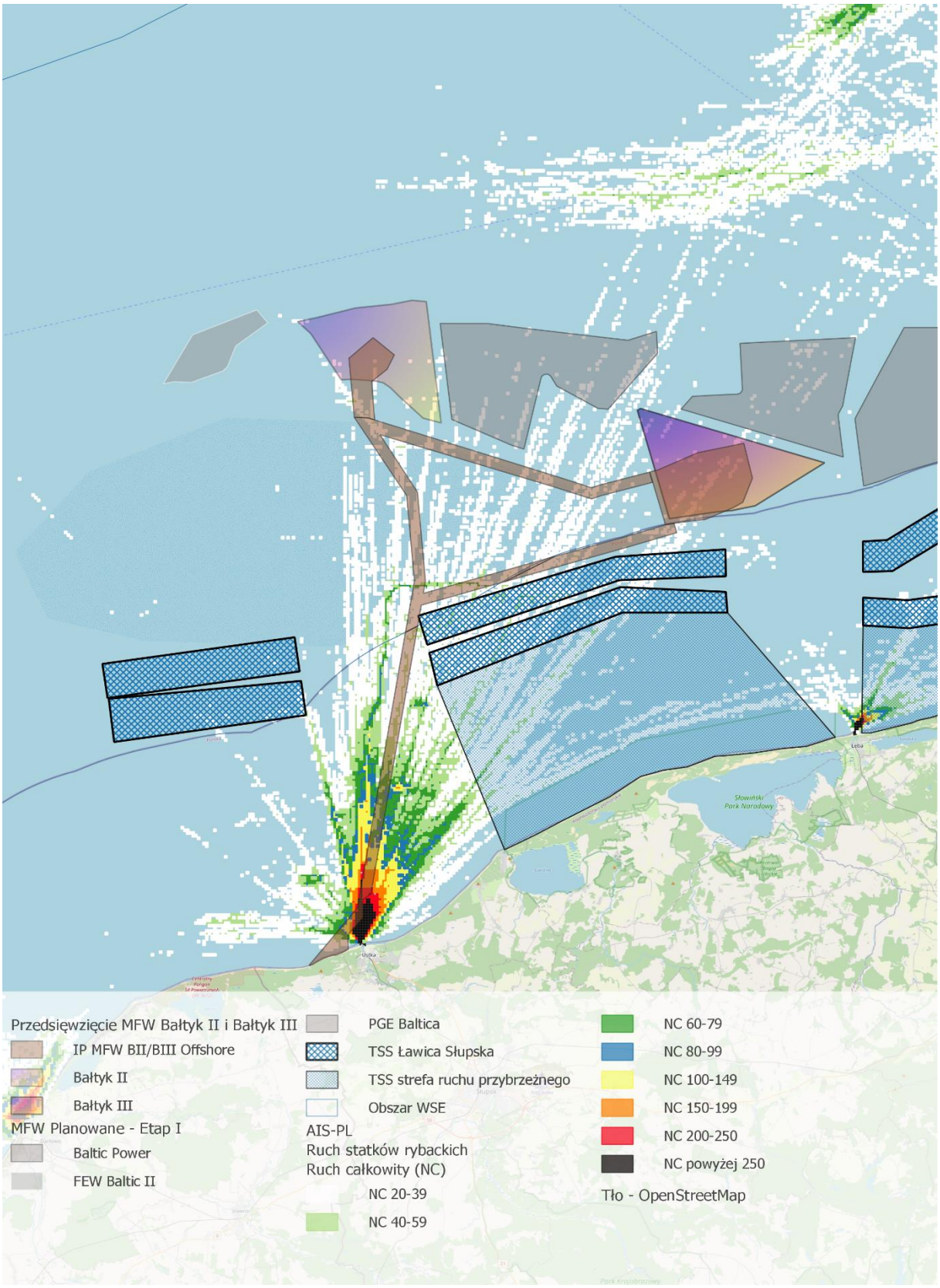

Figure 1-5. Fishing vessel traffic based on the AIS-PL data in 2021

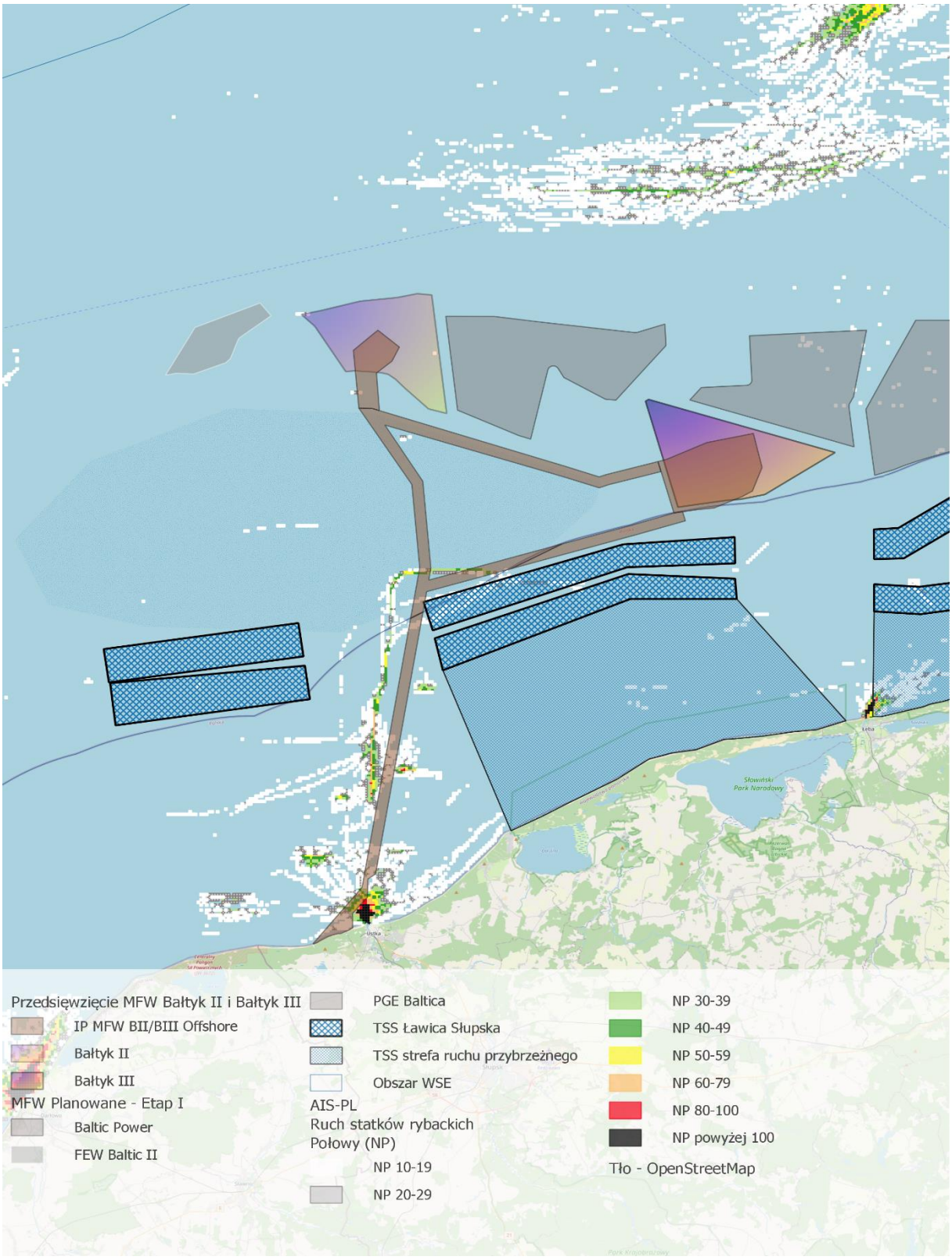

Figure 1-6. Fishing vessel traffic under 5 mph, based on the AIS-PL 2021 data

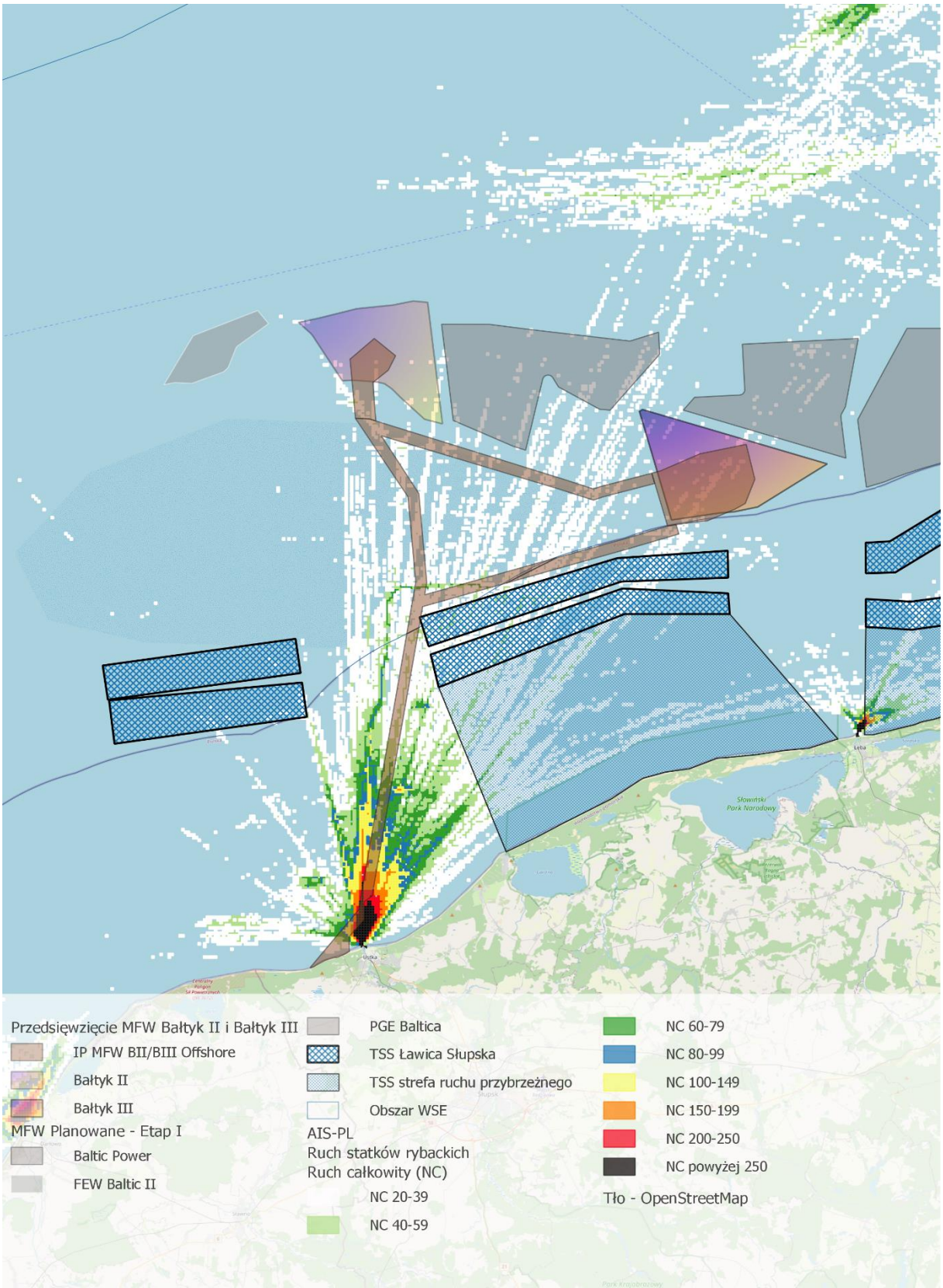

Figure 1-5] shows the traffic of all fishing vessels, irrespective of their speed, and [Figure

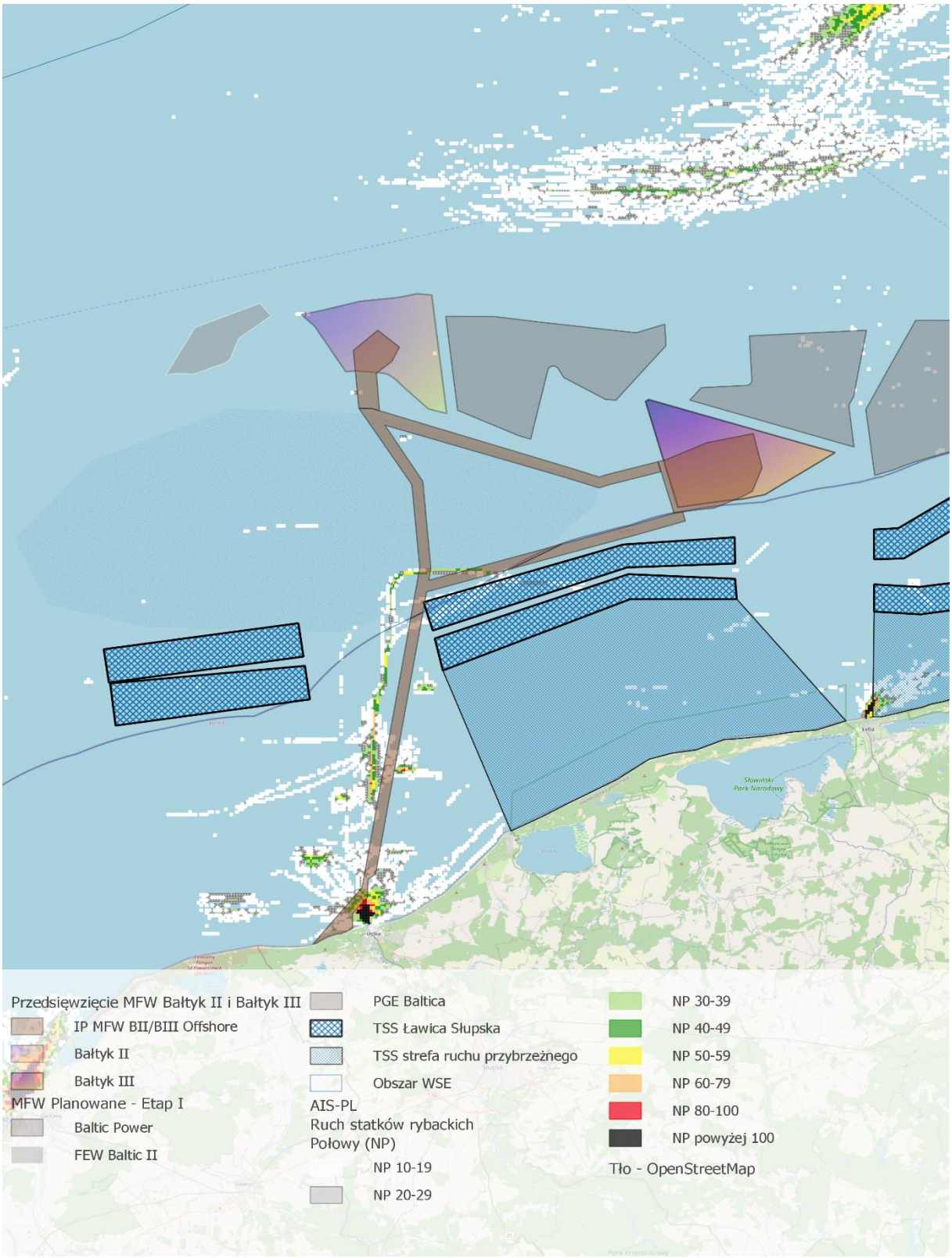

Figure 1-6] shows the traffic of vessels travelling at speeds of less than 5 knots, based on the assumption that this is the upper speed limit at which fishing can take place. A speed above 5 knots represents a fishing vessel's journey to the fishing area or its return from the fishing area to port.

The impact of the Project on fishery is considered from two points of view:

- The impact on fishing vessel traffic includes transits to and from the fishing areas and general vessel traffic on the approach to the port of Ustka. This type of traffic of fishing vessels does not differ in principle from the navigation of other vessels, except for those engaged in cargo and passenger transport between ports. This type of traffic, referred to as undetermined route navigation, is based on the movement of vessels to the task areas or for recreational purposes. The impact of the Project on fishing vessel traffic treated in this way is therefore assessed as a general impact on shipping involving fishing vessels. The dependence of the impact is directly related to the intensity of vessel traffic in particular basins and is presented in Subchapter 2.1.
- The traffic of fishing vessels with a speed of less than 5 knots is conventionally qualified as fishing. The map [

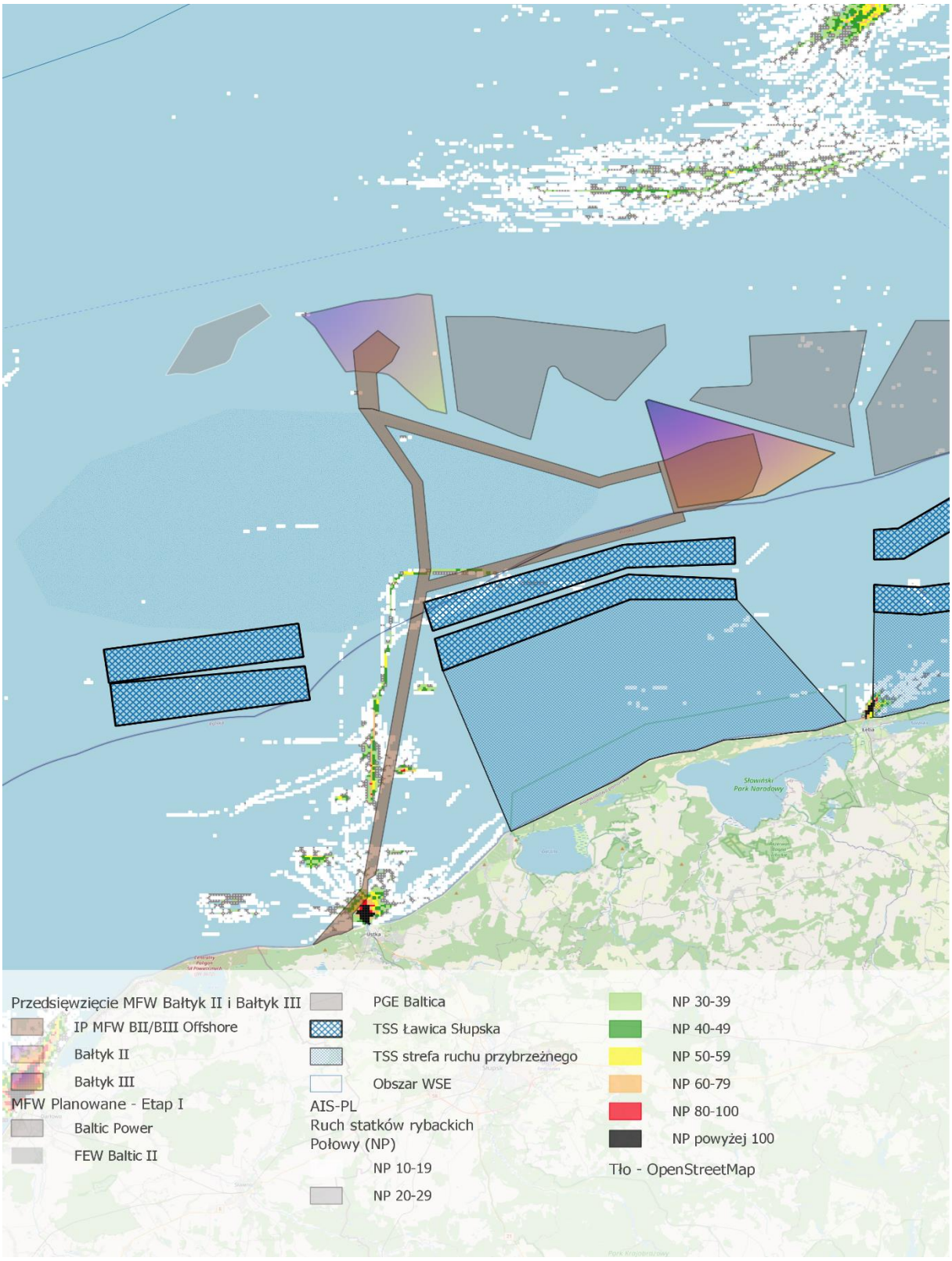

Figure 1-6] shows that within or not far from the ECI corridor, areas have been identified where the presence of fishing vessels travelling at speeds below 5 mph was recorded in 2021. The Project is located in four fishing areas according to the ICES classification. The probable fishing intensity in the ECI corridor of the MFW-BII/BIII and in its closest vicinity is presented in the table below [Table 1-1].

Table 1-1. Location of areas where fishing vessels travelling at speeds below 5 knots have been recorded.

ID-ICES	Number of registrations	Max number of crossings	ECI Kilometre
38G6	Very high (>500)	99	15-19; 25-49; 48-53(IP-BIII)
39G6	Very low (<10)	25	67-69
38G7	Low (10 - 20)	49	54 - 56 (IP-BIII)
39G7	No locations		

The analysis of fishing vessel traffic in individual fishing areas shows that the most sensitive area is the 38G6 ICES area, which roughly covers the ECI corridor of the MFW-BII/BIII located in territorial waters, in the section between the TSS Ławica Słupska and the Port of Ustka. Probable fishing locations were identified on both sides of the corridor, with ship traffic of less than 5 in. being significantly higher on its western side. The most intensive locations approximately 6 NM offshore. The intensity of fishing vessel traffic is very high in the vicinity of Ustka, however, this is considered to be related to the approach to the port.

In general, it should be considered that the impact of the Project on fishery is minimal. During the construction phase, the laying of the cable is very fast and possible fishing bans in individual areas will be limited to a few days. During the operation phase, the impact will not occur due to the maintenance-free operation of the cable (inspections will take place on average once every 5 years).

Details of the Project's impact on fishery can be found in the EIA Report (Vol. II, Subchapter 9).

2 Risk of major accidents or natural and construction disasters

The primary objective of a risk assessment is to identify risk and to estimate its level for ranking, as well as to manage it appropriately. Each step in the risk assessment process should be seen as an opportunity to identify potential measures for risk reduction.

The construction of the risk matrix is based on the comparison of the severity of an event (effect or consequence of an event) expressed as a numerical equivalent with the frequency (probability) of its occurrence interpreted as the number of events per ship per year. In practice, a logarithmic severity index (SI) and logarithmic frequency index (FI) are used due to the large range of probabilities. These indices are presented in the tables below [Table 2-1, Table 2-2].

Table 2-1. Logarithmic severity index SI (source: MSC-MEPC.2/Circ.12/Rev.2, IMO)

SI	Severity	Effects on human safety	Effects on ship	Equivalent fatalities (S)
1	Minor	Single or minor injuries	Local equipment	1.0E-02
2	Significant	Multiple or severe injuries	Non-severe ship damage	1.0E-01
3	Severe	Single fatality or multiple severe injuries	Severe damage	1.0
4	Catastrophic	Multiple fatalities	Total loss	10

Table 2-2. Logarithmic frequency index FI (source: MSC-MEPC.2/Circ.12/Rev.2, IMO)

FI	Frequency	Definition	F (per ship year)
7	Frequent	Likely to occur once per month on one ship	10
5	Reasonably probable	Likely to occur once per year in a fleet of 10 ships, i.e. likely to occur a few times during the ship's life	1.0E-01
3	Remote	Likely to occur once per year in a fleet of 1,000 ships, i.e. likely to occur in the total life of several similar ships	1.0E-03
1	Extremely remote	Likely to occur once in the lifetime (20 years) of a world fleet of 5,000 ships	1.0E-05

Concerning harm to the marine environment expressed by the severity index (SI) of damage caused by pollution of the sea by oil substances, 6 categories are distinguished according to the size of the pollution. This categorisation is presented in the table below [Table 2-3].

Table 2-3. Logarithmic severity index SI (source: MSC-MEPC.2/Circ.12/Rev.2, IMO)

SI	Severity	Definition
1	Category 1	Oil spill size < 1 tonne
2	Category 2	Oil spill size between 1-10 tonnes
3	Category 3	Oil spill size between 10-100 tonnes
4	Category 4	Oil spill size between 100-1,000 tonnes
5	Category 5	Oil spill size between 1,000-10,000 tonnes
6	Category 6	Oil spill size >10,000 tonnes

An example of a risk matrix resulting from the comparison of severity and frequency of events is shown in the table below [Table 2-4].

Table 2-4. Risk index RI (source: MSC-MEPC.2/Circ.12/Rev.2, IMO)

FI	Częstość	Dotkliwość (SI)			
		1	2	3	4

		Minor	Significant	Severe	Catastrophic
7	Frequent	8	9	10	11
6		7	8	9	10
5	Reasonably probable	6	7	8	9
4		5	6	7	8
3	Remote	4	5	6	7
2		3	4	5	6
1	Extremely remote	2	3	4	5

Table 2-5. ALARP risk index assessment and risk management (source: MSC-MEPC.2/Circ.12/Rev.2, IMO)

Risk index	Description
1-4	Level of risk acceptable, no risk reduction measures required.
5-8	Risk in the ALARP area - as low as reasonably practicable. The level of risk is relatively high; however, it may be acceptable if economically justifiable reduction measures are applied.
9-11	Level of risk intolerable, other solutions or very significant risk reduction measures required.

2.1 Construction phase

In order to assess the risk directly, a detailed analysis of ship traffic in the areas covered by the Project was conducted. Vessel traffic was analysed on the basis of AIS-PL data for the year 2021. For this purpose, four basins with different locations and expected specifics and intensity of vessel traffic were identified. The division into basins is presented in the table below [Table 2-6] and presented on a map.

Table 2-6. Division into areas for vessel traffic analysis

Area's name	Desription	Notes
A	ECI developed within the area from the borders of the MFW BII/BIII to the borders of TSS Ławica Słupska	Natura 2000 site Ławica Słupska
B	ECI implemented in the TSS Ławica Słupska and in the vessel traffic zone between the western and central parts of the TSS	The basin is a part of the most important southern navigation route to the ports of the Gulf of Gdansk
C	ECI implemented in the near-shore traffic zone to a line located 3 NM from the coast	High traffic of small vessels exempted from the obligation to navigate the TSS
D	ECI within a 3 NM wide strip delimiting the boundary for category D passenger shipping	High vessel traffic connected with functioning of the port in Ustka

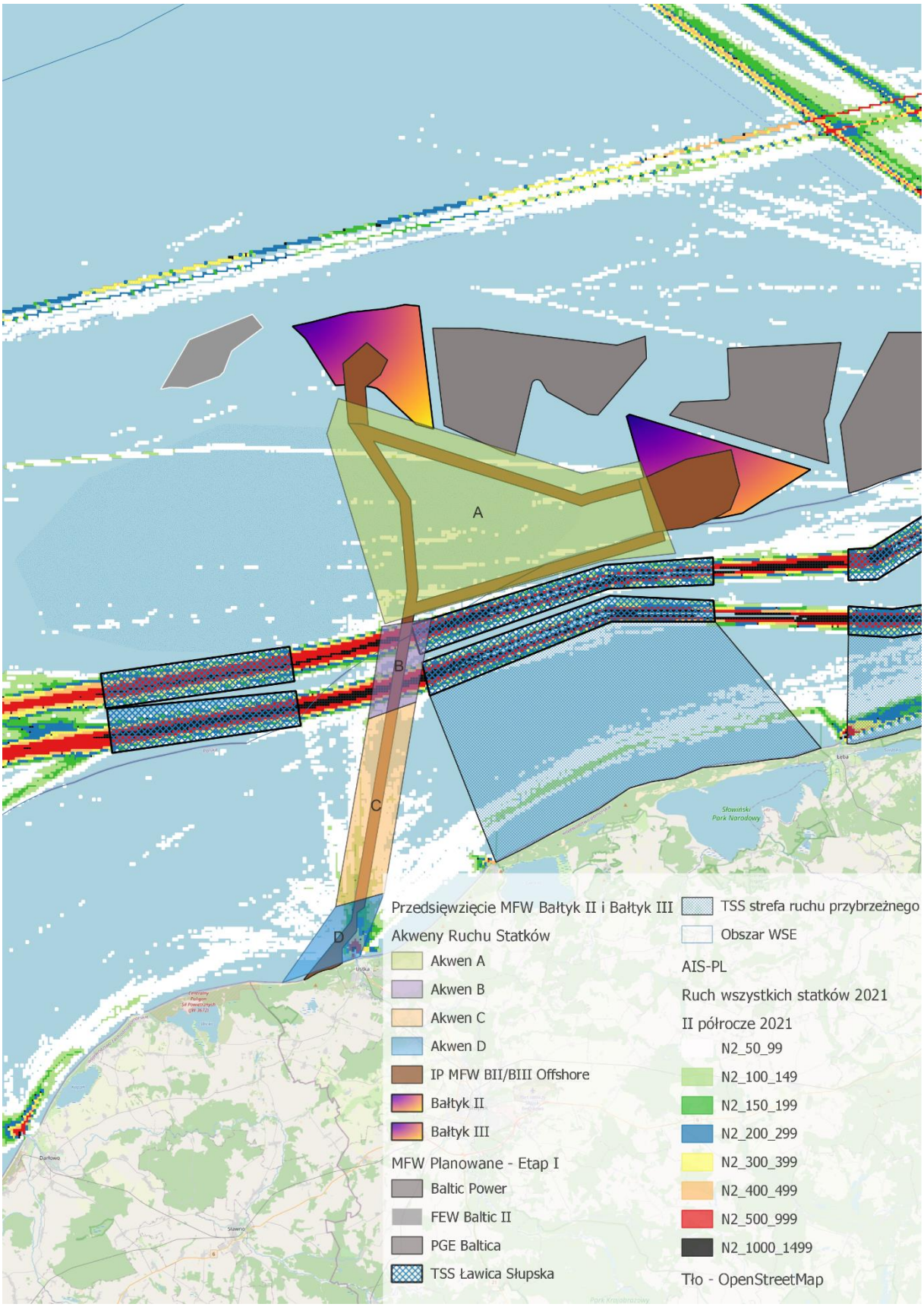

Figure 2-1. Navigation areas in the ECI of IMF-BII/BIII zone

Vessel traffic considered as the unique number of passages in each basin, divided by vessel category, is presented in the tables and graphs below.

Table 2-7. Vessel traffic in A area based on AIS-PL 2021 data

A area		
Vessel category	**Number of ship crossings**	**Share %**
Fishing vessels 1025/1778	1025	57.6%
Recreational vessels 238/1178	238	13.4%
Merchant vessels 230/1178	230	12.9%
Maintenance vessels 205/1178	205	11.5%
Tankers 37/1178	37	2.1%
Unidentified vessels 19/1178	19	1.1%
Warships 13/1178	13	0.7%
Other vessels 7/1178	7	0.4%
Passenger vessels 4/1178	4	0.2%
Total	**1778**	**100.0%**

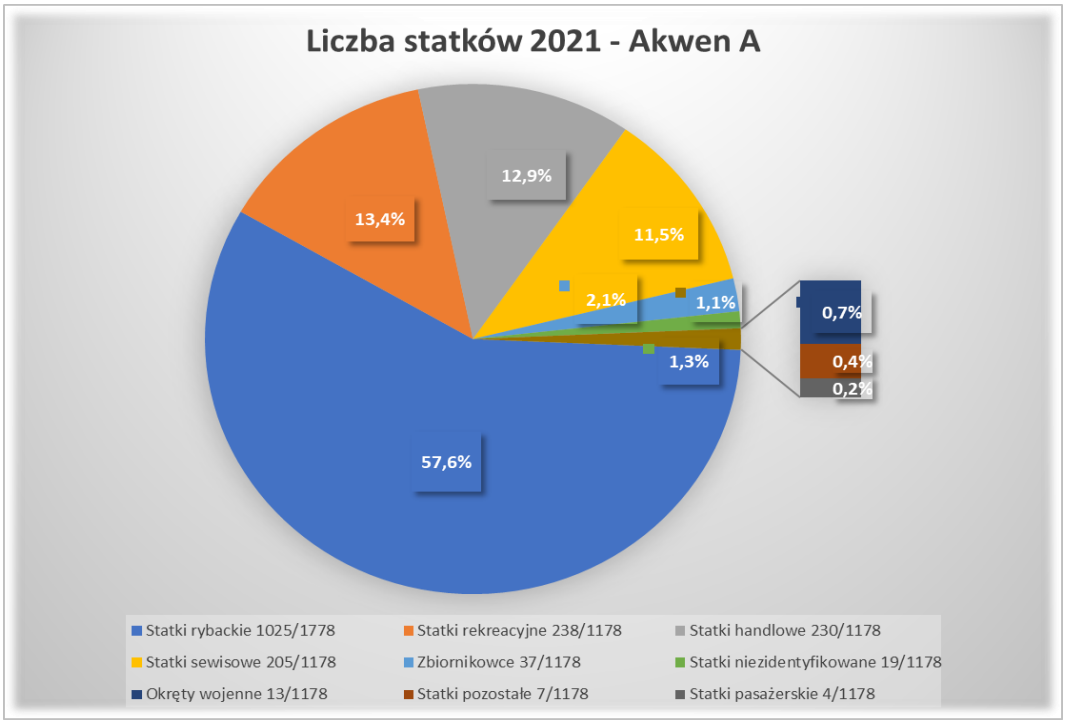

Figure 2-2. Share of different categories of vessels in the A area.

Table 2-8. Vessel traffic in the B area based on AIS-PL 2021 data

B area		
Vessel category	**Number of vessels**	**Share %**
Merchant vessels 4208/6630	4208	63.5%
Tankers 1249/6630	1249	18.8%
Maintenance vessels 566/6630	566	8.5%
Fishing vessels 329/6630	329	5.0%
Recreational vessels 142/6630	142	2.1%
Passenger vessels 57/6630	57	0.9%
Warships 29/6630	29	0.4%
RoRo PAX vessels 23/6630	23	0.3%
Unidentified vessels 20/6630	20	0.3%
Other vessels 7/6630	7	0.1%

Total	**6630**	**100.0%**

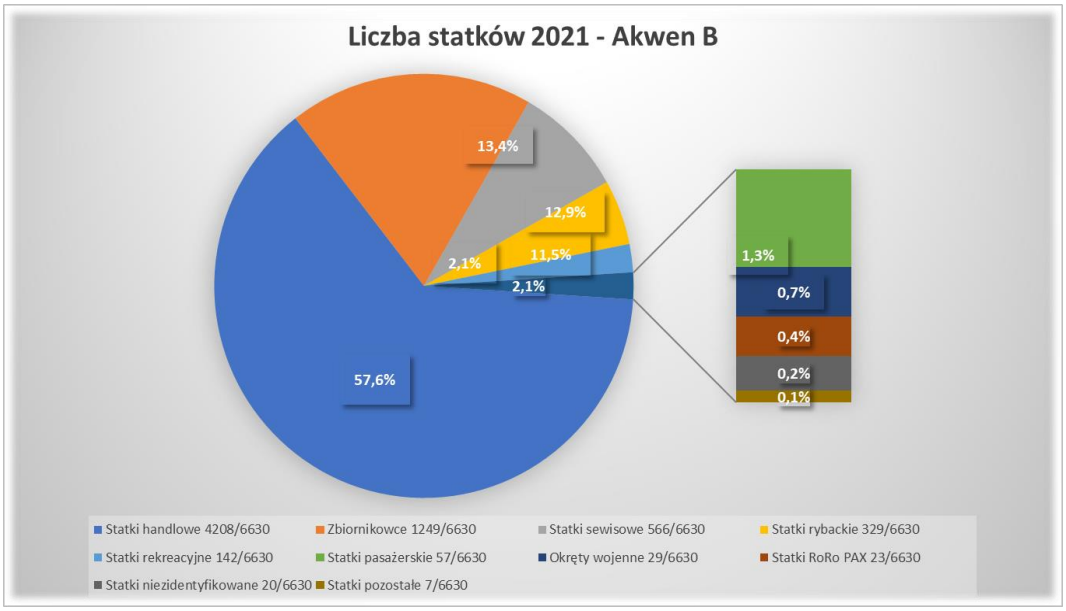

Figure 2-3. Share of different categories of vessels in the B area.

Table 2-9. Vessel traffic in the C area based on AIS-PL 2021 data

C area		
Vessel category	**Number of ship crossings**	**Share %**
Fishing vessels 1318/2187	1318	60.3%
Recreational vessels 507/2187	507	23.2%
Warships 138/2187	138	6.3%
Maintenance vessels 84/2187	84	3.8%
Other vessels 60/2187	60	2.7%
Tankers 56/2187	56	2.6%
Merchant vessels 13/2187	13	0.6%
Unidentified vessels 9/2187	9	0.4%
Passenger vessels 2/2187	2	0.1%
Total	**2187**	**100.0%**

Table 2-10. Vessel traffic in the D area based on AIS-PL 2021 data

D area		
Vessel category	**Number of ship crossings**	**Share %**
Fishing vessels 2227/4076	2227	54.6%
Recreational vessels 998/4076	998	24.5%
Maintenance vessels 526/4076	526	12.9%
Other vessels 179/4076	179	4.4%
Warships 123/4076	123	3.0%
Unidentified vessels 13/4076	13	0.3%

Merchant vessels 10/4076	10	0.2%
Total	**4076**	**100.0%**

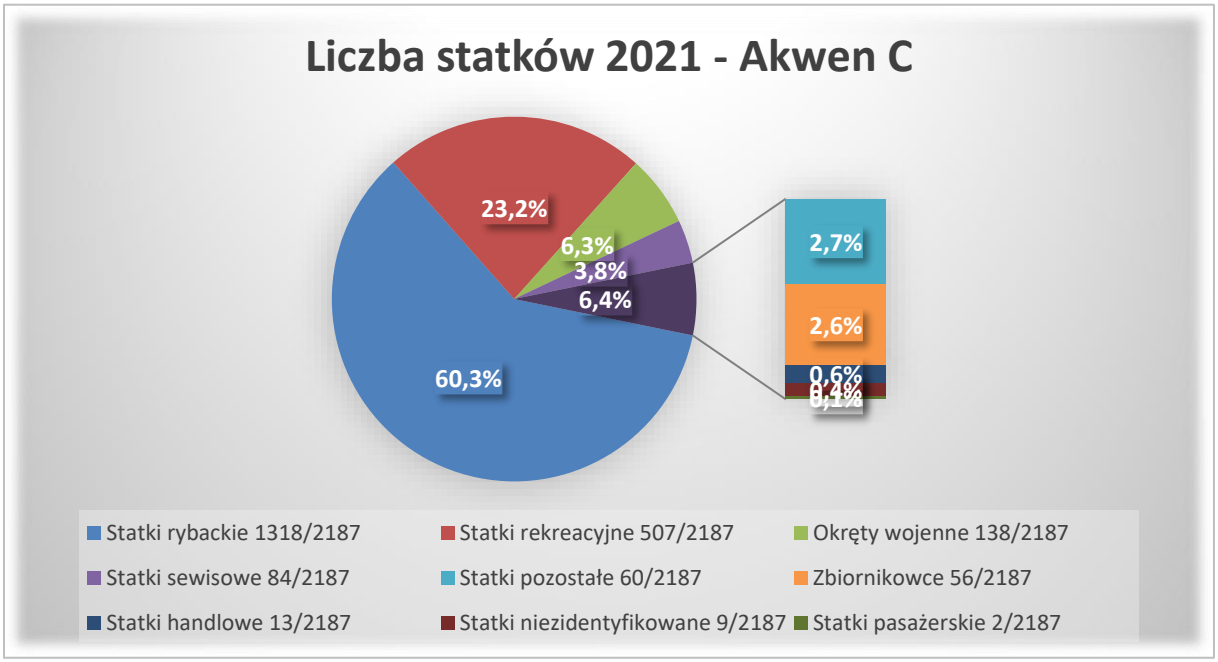

Figure 2-4. Share of different categories of vessels in the C area.

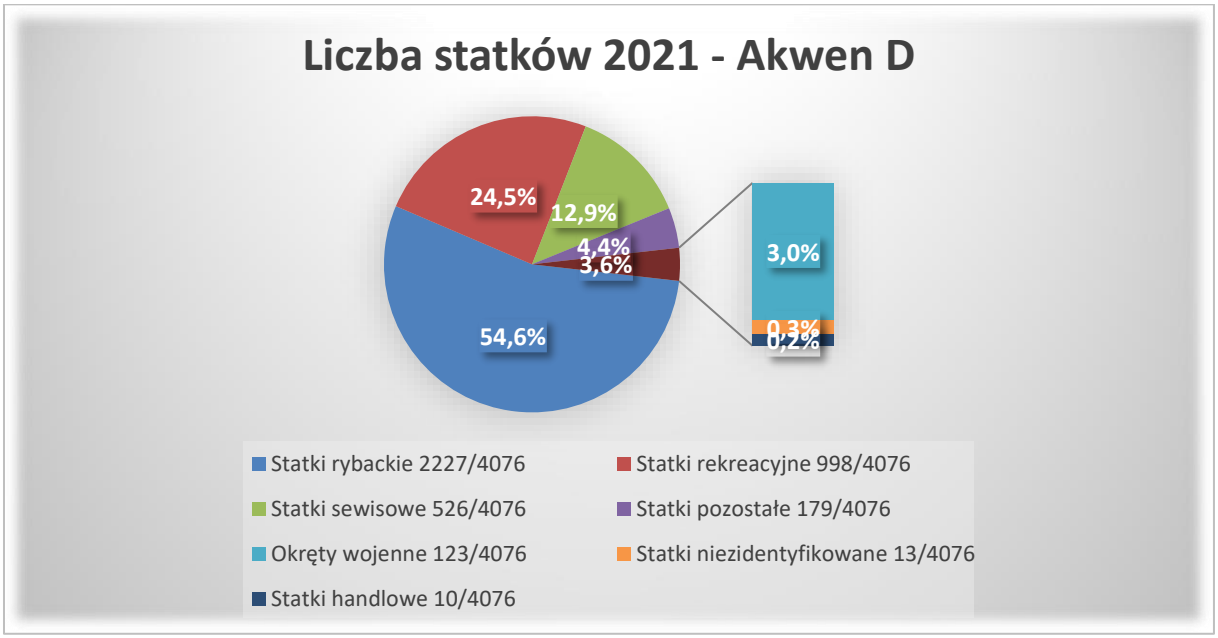

Figure 2-5. Share of different categories of vessels in the D area.

The analysis of vessel traffic shows that in areas A, C and D, the presence of fishing vessels is dominant, accounting for nearly 60% of the total. In area B, commercial vessel traffic is clearly dominant, accounting for more than 80% of the total.

In the A area, 11.5% is represented by the traffic of service vessels, which is related to preparatory works related to offshore wind energy. The presence of vessels in this category is expected to increase due to the large number of projects.

In areas C and D recreational shipping has a significant share of almost 25%. The number of vessels in this category is expected to increase in the future due to the development of tourism.

Relatively high ship traffic in area D, exceeding 4,000 units per year, is connected with functioning of the port in Ustka. A gradual increase in shipping traffic is anticipated due to the growing importance of Ustka as a service port for offshore wind energy projects, with the service port for OWF Baltic II and OWF Baltic III being the port of Leba. With constant or slightly decreasing traffic of fishing vessels, assumed development of recreational shipping and water sports it should be assumed that the harbour in Ustka and the area of the approach to the harbour will require special attention in terms of ensuring safety of navigation.

In order to assess and manage the risks directly during the construction phase, the project has been divided into water bodies, which vary in terms of traffic frequency and vessel type. A description of the areas is presented in the table below [Table 2-11] and in the map below [Figure 2-6], the risk assessment and risk management proposals are presented in the table [Table 2-12]. The ECI is understood as the ECI of the MFW-BII/BIII corridor together with a buffer of 1 km.

Table 2-11. Division of the ECI MFW-BII/BIII` project into water areas during the construction phase

Area's name	Description	Direction	Impact on navigation / cumulative impact
N1	ECI implemented in the area of MFW BII and MFW BIII, in the area of the EEZ		No impact
AK-N2	ECI executed between the borders of the MFW and Ławica Słupska. It also includes the part of the Project consisting in connecting the MFW BII and BIII, in the area of the EEZ	W-E; N-S	Small and medium-sized vessel traffic passing north of Ławica Słupska ECI of the MFW Baltica 2 projects ECI of the FEW Baltic II project
AK-N3	ECI implemented outside the MFW in Ławica Słupska area, in the EEZ	N-S	Minor small vessel traffic ECI of the FEW Baltic II project Domestic passenger shipping - A, B
AK-N4	ECI in the immediate vicinity of TSS Ławica Słupska, central part, on the boundary between the EEZ and territorial waters	W-E	Significant longitudinal large vessel traffic in west direction Domestic passenger shipping - A, B, C
AK-N5	ECI partly in TSS Ławica Słupska area and the zone connecting the western and central parts of the TSS, on the boundary between the territorial waters and the EEZ	N-S	Significant lateral traffic of large vessels ECI of FEW Baltic II project
AK-N6	ECI in the coastal traffic zone - in the territorial waters area	WE	Significant multi-directional small and medium vessel traffic, negligible traffic of large vessels. ECI of FEW Baltic II project Domestic passenger shipping A, B, C
AK-N7	ECI in the coastal waters area, from the line marking the distance of 3 Mm from the coast	N-S	Approach to the port of Ustka Domestic passenger shipping - A, B, C, D ECI of FEW Baltic II project

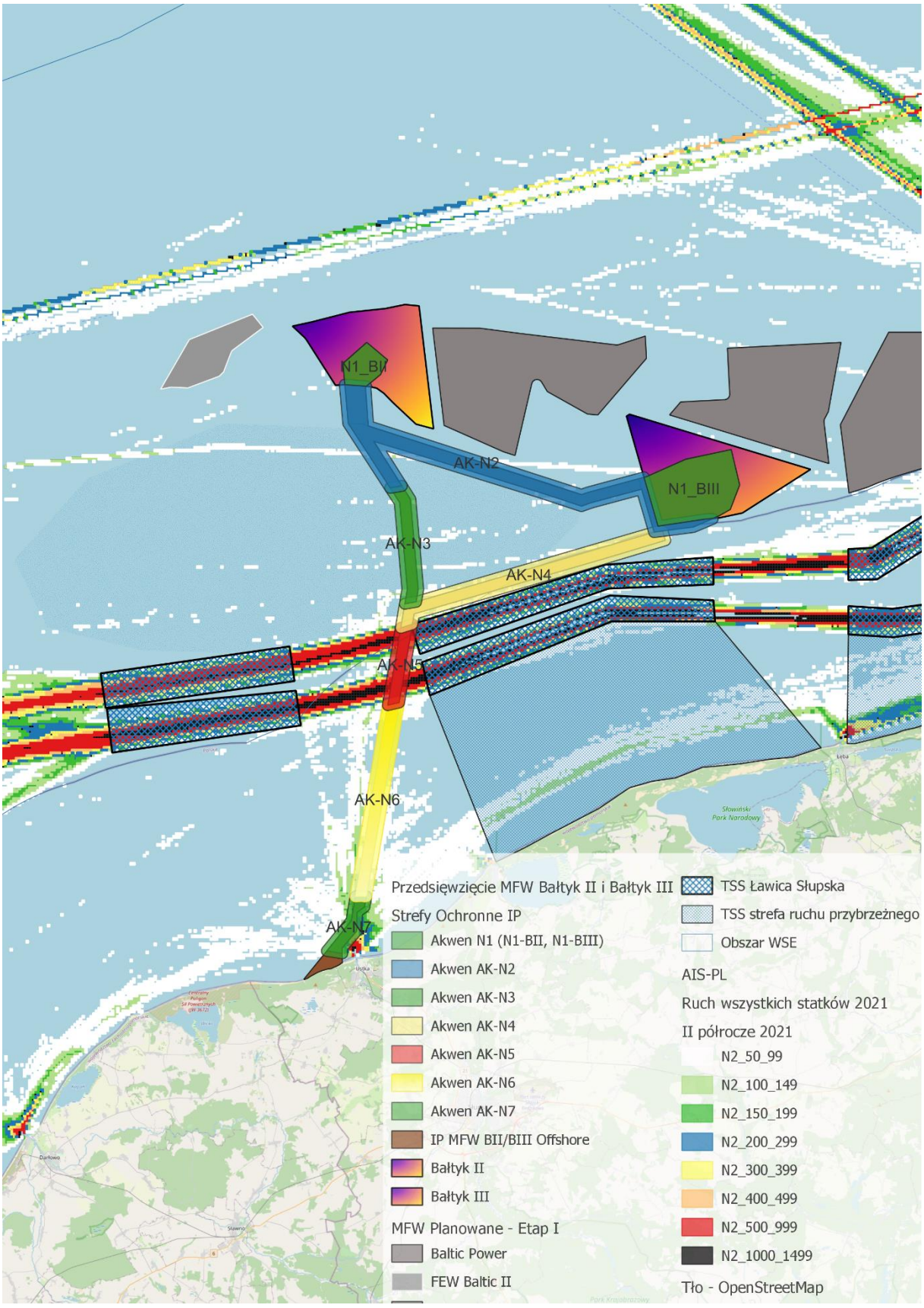

Figure 2-6. Division of the MFW-BII/BIII IP project into the implementation areas during the construction phase (source: in-house study)

Table 2-12. Risk assessment and management (source: in-house study)

Area identification	Description of vessel traffic	Potential risks	Risk							
			Primary			Risk reduction measures	Secondary			
			Fi	Ci	Ri		Fi	Ci	Ri
N1 area, connection section in the area of MFW BII, BIII	No traffic, area closed due to the MFW construction	Collision, contact	3	4	7	Area closed to boating and fishing. Protection zone 500 m. Marking and direct monitoring	1	4	5
	Limited number of MFW and ECI of IMF-BII/BIII vessels		2	3	5	Internal safety procedures (SMS)	1	2	3
AK-N2 area, connection section from the border of the MFW to Ławica Słupska, Connection of MFW BII and BIII	Multidirectional traffic of small and medium-sized commercial vessels	Collision, contact	3	4	7	1 km protection zone, indirect monitoring, Securite messages, security procedures due to violation of the zone	2	3	5
	Limited number of MFW and ECI of MFW BII/BIII vessels and traffic of vessels of MFW Baltica 2 and Baltica 3		3	3	6	Internal safety procedures (SMS)	1	3	4
AK-N3 area, connection section crossing Ławica Słupska	Variable distance from lateral vessel traffic over 300,000 DWT very rare, frequent vessel traffic over 200,000 DWT	Collision, contact	2	3	5	1 km protection zone, indirect monitoring, Securite messages, security procedures due to violation of the zone	1	3	4
	Limited number of the ECI of MFW-BII/BIII and ECI of FEW-Baltic II vessels		2	3	5	Internal safety procedures (SMS)	1	2	3
AK-N4 area, connection section parallel to the main shipping lane in a western direction passing through the vicinity of the TSS central part (W direction)	Perpendicular vessel traffic over 300,000 DWT very rare, frequent vessel traffic over 200,000 DWT	Collision, contact	4	5	9	1 km protection zone, direct monitoring, marking the area with buoys, Securite messages, safety procedures due to violation of the zone Cooperation with VTS Ławica Słupska	2	4	6
	Limited number of the ECI of MFW Baltica 2 vessels		2	3	5	Internal safety procedures (SMS)	2	2	4
AK-N5 area, connection section perpendicular to the water area connecting the western and central parts of the TSS Ławica Słupska	Lateral small vessel traffic very rare, domestic passenger shipping area for Classes A and B	Collision, contact	6	5	11	1 km protection zone, direct monitoring, marking the area with buoys, Securite messages, safety procedures due to violation of the zone Cooperation with VTS Ławica Słupska	3	5	8
	Limited number of the ECI of MFW Baltica 2 vessels		2	3	5	Internal safety procedures (SMS)	1	3	4

Area identification	Description of vessel traffic	Potential risks	Risk						
			Primary			Risk reduction measures	Secondary		
			Fi	Ci	Ri		Fi	Ci	Ri
AK-N6 area, connection section in the coastal traffic zone	Significant multidirectional small and medium vessel traffic negligible large vessel traffic	Collision, contact	5	3	8	1 km protection zone, direct monitoring, Securite and Pan-Pan messages, navigational marking with buoys, safety procedures due to violation of the zone Cooperation with VTS Ławica Słupska	3	3	6
	Limited number of the ECI of MFW-BII/BIII and ECI of FEW-		2	3	5	Internal safety procedures (SMS)	2	2	4
AK-N7 area, section of the connection in the coastal traffic zone, within 3 Mm from the shore	Large multidirectional traffic of small and medium-sized vessels, approach zone to the port of Ustka	Collision, contact	6	2	8	1 km protection zone, indirect monitoring, marking of the area with buoys, Securite messages, safety procedures due to violation of the zone Co-operation with VTS Ławica Słupska and Kapitanat Portu Ustka	3	2	5
	Limited number of the ECI of MFW Baltica 2 vessels		2	4	6	Internal safety procedures (SMS)	2	2	4

Explanations:

1. The width of the protection zone for ships laying submarine cables has been adopted on the basis of the Convention for the Protection of Submarine Cables.
2. Before starting the construction works, the Director of the Maritime Office in Gdynia will be provided with the "Navigational safety plan" for approval, which includes the location and laying schedules of particular sections of the ECI of MFW-BII/BIII.
3. The navigational safety plan shall also include:
   a) equipping the subcontractor of construction work,
   b) the risk control measures approved in the navigational expertise report,
   c) proposals for additional risk management measures, if necessary,
   d) other elements as set out in Chapter 3- Accident prevention.
   e) the exact width of the protection zone will be determined by the Director of the Maritime Office in Gdynia on the basis of the proposal of the Maritime Works Manager and the previously approved ‘navigational safety plan’.

The main risks associated with the project are collision, contact and, if working in the coastal zone, ship grounding.

Collision - a collision of ships or a striking of a ship by another ship, whether en route, anchored or moored, but excluding striking an underwater wreck. The following scenarios should be considered in relation to collision:

a) Collision of a merchant vessel on the way with another vessel - in the vicinity of the Project

b) Collision between a fishing vessel and another vessel in the area or surrounding area of the Project

c) The presence of a fishing vessel resulting in a collision of two other vessels

d) The presence of a recreational vessel causing a collision between two other vessels

e) Collision between a vessel and an anchored vessel in the vicinity or area of the Project

f) The presence of an anchored vessel resulting in a collision of two other vessels

g) The presence of a vessel carrying out construction or servicing operations resulting in a collision of two other vessels

h) Collision of two vessels carrying out construction or servicing work

i) Collision between a passing ship and two functionally connected ships carrying out construction or servicing work in the area or surrounding area of the Project

j) The presence of functionally connected construction or maintenance vessels resulting in a collision with other vessels

Contact - a violent contact between a ship and a fixed structure/impact of a ship on an external object or an impact on a ship by an external object that is neither ship nor seabed. Probable scenarios:

For N1 areas (N1-BII and N1-BIII)

a) A vessel (by type and class including small one-man vessels) under control is in contact with a floating or firmly fixed MFW object.

b) A construction or maintenance vessel is in contact with a MFW object.

c) An out-of-control (drifting) vessel is in contact with an MFW object.

For all areas:

a) A vessel (by type and class, including small one-man vessels) in control is in contact with a stabilising anchor line, a dropped cable or navigational markers.

b) The construction or maintenance vessel is in contact with a stabilising anchor line, a dropped cable or navigational markers.

c) An out-of-control (drifting) vessel is in contact with a stabilising anchor line, a dropped cable or navigational markers.

d) A vessel unknowingly or as a result of reacting to hazards, drops anchor, which catches on a cable.

Grounding, stranding - shoring of a ship on the bottom or an underwater obstacle which allows for a relatively easy release by lightening of the load, assistance of another ship (tug) or a rise of the water level/ shoring of a ship on the bottom or an underwater obstacle which does not allow for an easy release by lightening of the load, assistance of a tug or rising the water level.

a) A vessel under control runs aground and is at risk of being stranded in the Project's area.

b) A construction or maintenance vessel strands in the area of the Project.

c) An out-of-control, drifting vessel runs aground and is in danger of becoming stranded in the Project's area.

d) Absence of adequate manoeuvring room results in grounding of the vessel in the vicinity.

e) Vessels, in or around the area, run aground as a result of naturally occurring shallows.

f) As a result of erosion, a vessel in the area of or around the MFW runs aground.

As regards the location of hazards and the degree of impact on shipping, the greatest significance will be attached to the execution of the Project in areas AK-N5 and AK-N7. In the first casem it is connected with crossing of the main southern shipping route, in the second case with direct proximity of the port in Ustka.

AK-N5 area's axial length is 7.4 km. Assuming a laying speed of 250 - 350 m/h, the laying time for a single cable line will range from 20 to 30 hours. This means serious disruption to ship traffic on the TSS Ławica Słupska for a period a few days at most.

In order to safely bypass the current work area, vessels using the directional tracks will cooperate with the VTS Ławica Słupska service, the onshore coordinator of the MFW vessel traffic, as well as with the cable vessel and assisting vessels, in particular with the vessel performing direct navigational supervision.

AK-N7 area's axial length is less than 6.0 km and the laying time for a single cable line will be between 15 and 30 hours. In this case, however, the variability of the position of the cable laying team and thus the variability of sailing conditions at the approach to the port of Ustka will be of the greatest significance.

Weather conditions are important for cable laying operations. Planning for a 'weather window' allowing for 2 days of work is feasible and consequently should not prolong the duration of the project in these waters.

2.2 Operation phase

The risk analysis and risk assessment related to navigation shows that the probability of events is extremely rare, due to the maintenance-free operation of the cable (maintenance will occur on average once every 5 years).

3 Failure prevention

The failure prevention is a set of actions related to the protection of human health and life, the environment and assets, as well as the reputation of all participants of the processes associated with the construction, operation and decommissioning of the ECI of MFW BII/BIII. The highest risk of a failure resulting in a serious threat to the environment concerns the offshore works. In order to eliminate or minimise such risk various actions will be undertaken, including among others:

- the development of geological and engineering documentation optimising the course and time of laying cable lines, in particular in the area of the TSS Ławica Słupska;
- elaboration of the plans for the safe construction and operation of the ECI of MFW BII/BIII, in accordance with the applicable legal regulations for the time of the project execution;
- the development of safe navigation plans;
- the development of rescue and training plans for the crews and personnel, including the rules of updating and verifying by regular exercises, in particular specifying the procedures for using own units, external units, including helicopters;
- the preparation of a plan for counteracting threats and pollution that may occur during the construction and operation of the ECI of MFW BII/III;
- the selection of subcontractors, suppliers and certified components for the ECI of MFW BII/BIII;
- the determination of safety zones for the ECI of MFW BII/BIII, its objects and vessels moving within the zone;
- planning marine operations, in particular for a number of operations performed simultaneously (SIMOPS);
- using standards and guidelines of the International Maritime Organisation (IMO), recognised classification societies and maritime administration recommendations, including:
    - for large vessels – the Code of Safety for Special Purpose Ships (SPS Code)
    - for small vessels - certificates of compliance (CoC)
- the provision of adequate navigational support in the form of charts, navigational warnings and possibly navigational markings, cooperation with the BHMW in this respect;
- ensuring direct or indirect navigational supervision with the use of a surveillance vessel or remote radar supervision and AIS (Automatic Identification System);
- continuous monitoring of vessel traffic during construction and operation phases;
- using individual messages addressed to vessels violating the safety zone;
- the establishment of a coordination centre supervising individual phases of the investment;
- the maintenance of permanent communication lines between the ECI coordination centre of MFW BII/BIII and the coordinator of works at sea and other coordination centres (Marine Rescue Coordination Centre in Gdynia, maritime administration).

3.1 Design, technological and organisational safeguards to be applied by the Investor

The risk of a major accident, natural and construction disasters is minimal. The Investor plans to use the most modern technologies to ensure high reliability of electricity transmission and to comply with relevant environmental and economic standards and requirements.

Design, technological and organisational safeguards mainly consist of conducting navigational risk assessments and developing countermeasure plans against:

- threats to human life - evacuation plans, search and rescue plans;
- fire risks on ships involved in the construction and operation phases;
- environmental pollution risks - pollution and oil pollution prevention plan for ships involved in the construction and operation phases.

In order to maintain safety, the entity responsible for the execution of the ECI of MFW BII/BIII, prior to the commencement of installation works, will present a navigational safety plan including:

- Preliminary schedule indicating the division of labour, areas of activity and covering:
  - construction operations;
  - the names of the vessels;
  - scheduled starting and completion dates.
- For the vessels, their technical characteristics will be made available. Before each vessel is mobilised, a readiness audit will be carried out to verify the suitability and efficiency of the fleet and the documentation of the work. The audit will be carried out applying the requirements and guidelines of the Common Marine Inspection Documents (CMID) using IMCA inspection documents and the Common Marine Inspection Document database (eCMID). Vessels will be inspected for Health, Safety and Environment before and during mobilisation. A recognised organisation will conduct an independent Marine Warranty Survey on all construction vessels.
- With regard to the planning of maritime operations, the following documents will be presented:
  - an organisation chart;
  - an emergency response plan (ERP).
- Each offshore operation will include:
  - assembly procedures and analyses;
  - action-specific risk assessment (TBRA) processes;
  - a readiness review;
  - a simultaneous operations analysis (SIMOPS);
  - weather forecasting and decision support for offshore operations;
  - calibration of ship's equipment.
- For the purpose of offshore operations, the following will be defined:
  - safety zones for specific areas, construction vessels CLV and support vessels, including barges and other craft with reduced manoeuvrability;
  - safety zones in the event of encountering a UXO or CWA;
  - the use of patrol vessel or indirect monitoring;
  - principles of information (e.g. Securite messages), direct monitoring (GV) and technical monitoring (e.g. CCTV, ARPA, AIS)
  - the enforcement of violations of security restricted areas (e.g. use of individual messages addressed to offending units);
  - ERP activation procedures;
  - the principles of alert and information exchange with maritime administration and other operational services (SAR, Border Guard, Navy, BHMW).

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ENVIRONMENTAL IMPACT ASSESSMENT REPORT OF THE PROJECT: EXTERNAL CONNECTION INFRASTRUCTURE OF OFFSHORE WIND FARMS MFW BAŁTYK II AND MFW BAŁTYK III

ATTACHMENT 4 - CALCULATIONS OF NOISE EMISSIONS

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1. PERMISSIBLE SOUND LEVELS IN THE ENVIRONMENT

Issues concerning permissible noise levels in the environment are regulated in the Regulation of the Minister of Environment of 14 June 2007 on permissible noise levels in the environment [1]. The regulation sets limits on noise levels depending on the type of development surrounding the noise source. These permissible noise levels in the environment (in dB), expressed in indicators L_{AeqD} and L_{AeqN}, are presented in Table 1.

The criterion for the classification of land from the point of view of protection of the environment against noise is the permissible noise level in a specific area or a statement that the area in question does not require such protection (and thus no permissible level is assigned to it).

Table 1. *Permissible levels of noise in the environment excluding noise from power lines and aircraft take-offs, landings and overflights [1]*

No.	Land use	A-weighted equivalent continuous sound level L_{AeqT} [dB]			
		roads or railways		other noise sources (facilities and activities)	
		day	night	day	night
1	a) Health resort protection zone "A" b) Out-of-town hospital areas	50	45	45	40
2	a) Single-family housing development areas b) Development areas for permanent or long-term residence of children and teenagers c) Nursing home areas d) Hospital areas in cities	61	56	50	40
3	a) Areas of multi-family residential development and collective housing b) Areas of housing development c) Recreational and leisure areas d) Residential and commercial areas	65	56	55	45
4	A centre zone of a city with a population greater than 100,000 inhabitants	68	60	55	45

Explanations:
1) If these areas are not used, in accordance with their function, at night, the night-time noise limit does not apply.
2) The centre zone of a city with more than 100,000 inhabitants is an area of compact residential development with a concentration of administrative, retail and service facilities. In cities with districts of more than 100,000 inhabitants, a city centre zone may be designated in those districts with compact residential development and a concentration of administrative, retail and service facilities.

Many results of noise measurements conducted around substations, including 400 kV high voltage facilities, indicate that the noise level emitted from the substation

is constant, while the noise level from bus bar systems and incoming feeders is significantly lower, depending on atmospheric conditions.

Permissible noise levels emitted into the environment are set for protected areas, e.g. residential areas, leisure and recreational areas, hospitals, etc., while no permissible noise levels are set for forest, industrial and agricultural areas. Therefore, permissible noise levels are set for a particular area, depending on its function as defined primarily in the local development plan or, if there is no local plan, they depend on the actual use of the area.

The area of the analysed substations is under the provisions of the local spatial development plan (MPZP) published in the following act of municipal law (Figure 1):

- Resolution No. XLV.564.2018 of the Ustka Municipality Council of 26 October 2018 *on adopting a local spatial development plan for a part of the area located within the geodesic area of Pęplino, Ustka municipality*.

According to the MPZP, the area of the planned substations is designated as an area for the location of electrical power engineering facilities, for which no requirements for acceptable noise levels have been established.

It should be highlighted that for the majority of land surrounding the planned ONS substations, including existing and planned residential development, no local spatial development plan has been adopted to establish the land use designation in the vicinity of the substations and thus indicating the areas protected from noise. In the area of the analysed substations, the local spatial development plans published in the following acts of local law have been adopted:

- Resolution XL.514.2022 of the Ustka Municipality Council of 19 May 2022 on adopting the local spatial development plan for the area of the geodesic precinct of Pęplino, the Ustka municipality,
- Resolution No. XL.512.2022 of the Ustka Municipality Council of 19 May 2022 on adopting a local spatial development plan for the area of the Duninowo geodesic precinct and part of the Duninowo PGR geodesic precinct, Ustka municipality,
- Resolution No. XXV.330.2017 of the Ustka Municipality Council of 10 February 2017 on adopting a local spatial development plan for a part of the area located within Duninowo PGR geodesic precinct, Ustka municipality.

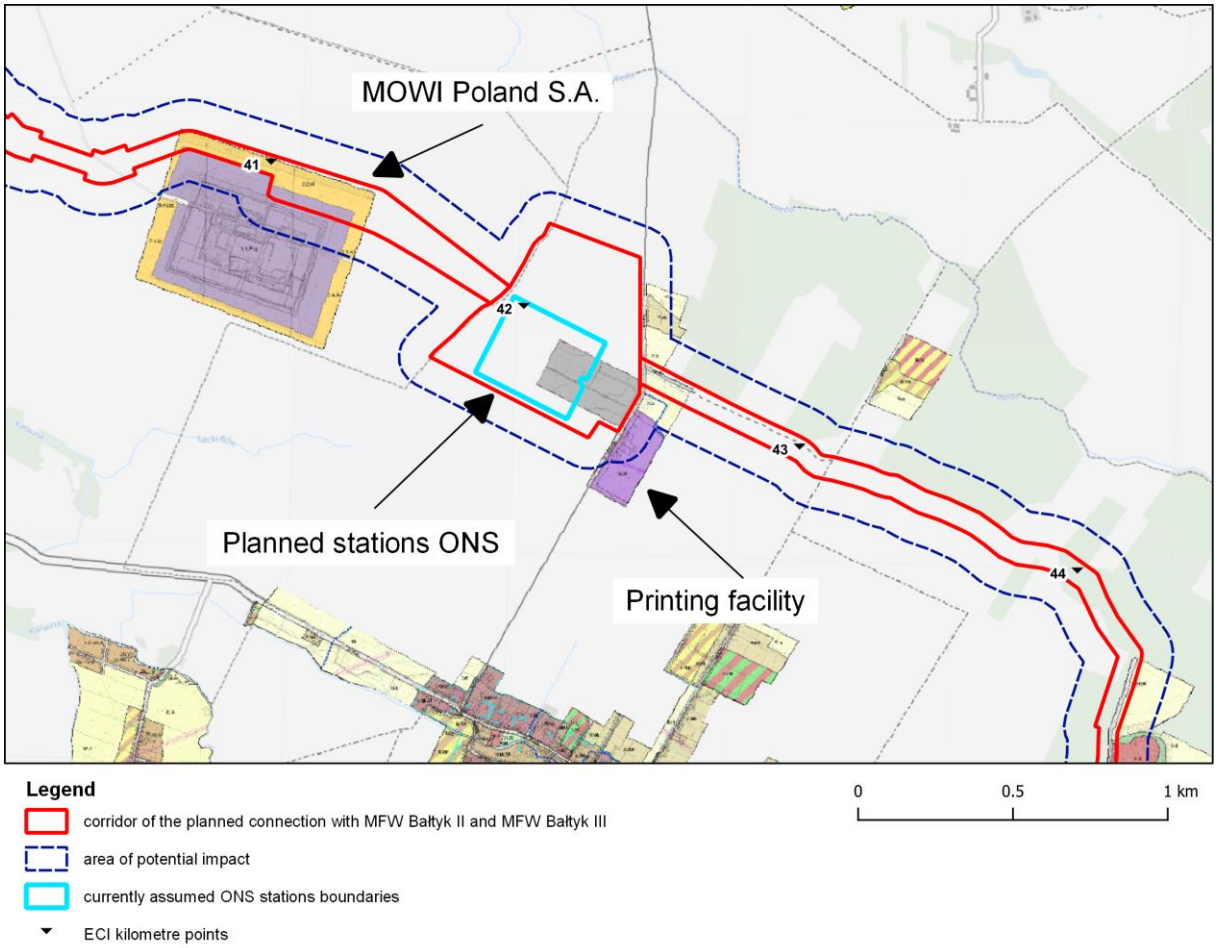

Figure 1. Location of planned ONSs against the background of local development plans

Source: In-house study

The nearest surroundings of the substations, considering the actual development of the adjacent areas, are agricultural and forest areas not acoustically protected, as well as the Poliart printing plant and the company MOWI POLAND S.A. (Figure 2).

To the northeast of the planned substations, according to the local spatial development plan, there are agricultural areas, industrial and service areas (the Poliart printing plant), and a small fragment of land designated for residential development. This area is currently overgrown with forest.

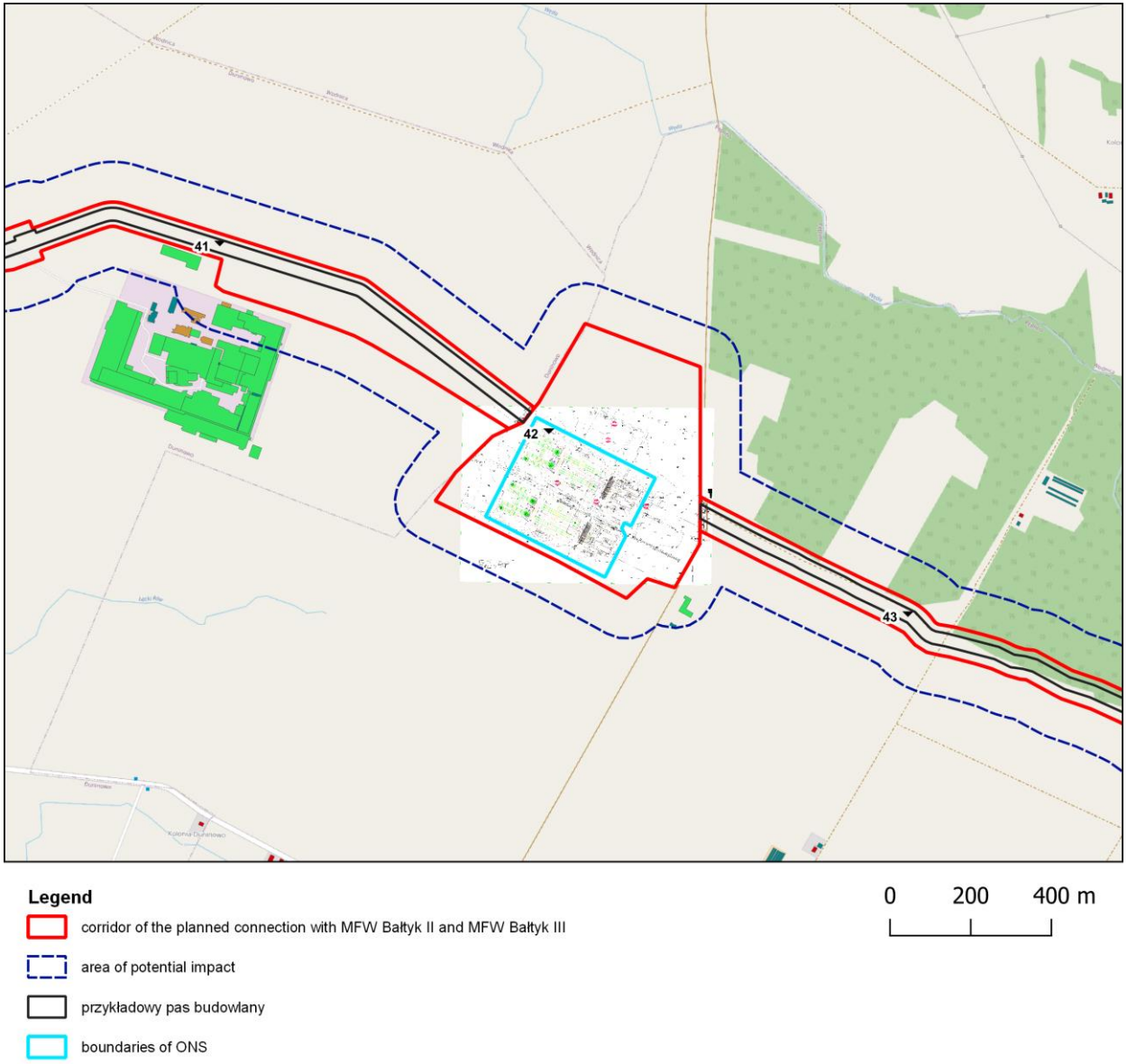

Figure 2. *Land development in the vicinity of the proposed ONS substations*

Source: In-house study

In accordance with current regulations [1], the following normative (permissible) noise levels are assumed for single-family residential development:

- 50 dB – day period (6:00–22:00)
- 40 dB – night period (22:00–6:00).

On the other hand, the following normative (permissible) noise levels are adopted for housing, residential and commercial and multi-family developments:

- 55 dB – day period (6:00–22:00)
- 45 dB – night period (22:00–6:00).

2. INDICATORS FOR ASSESSING NOISE IN THE ENVIRONMENT

The regulation [1] indicates that the following values should be used to assess the acoustic nuisance of a project or installation:

- The indicator for the assessment of noise in the environment, which is the A-weighted, equivalent continuous sound level– L_{Aeq} [dB] which is a measure of the average acoustic energy at the time of observation,
- The equivalent sound level at a particular observation point, which is defined as the sum of the (logarithmic) levels relating to the various noise sources.

A-weighted equivalent continuous sound level, for the time period over which the fluctuating sound levels were averaged (L_{AeqT}), is determined for a specific noise source according to the formula:

$$L_{AeqT} = 10\log\left(\frac{1}{T}\sum_{i=1}^{n} t_i 10^{0,1L_{Ai}}\right) \qquad \text{[dB]}$$

where:

- L_{Ai} – A-weighted sound level during time period t_i [dB],
- t_i – the duration of exposure to noise of level L_{Ai} [s],
- T – the reference period for which the value of the equivalent sound level is determined [s],
- T = 8 most unfavourable consecutive hours for the time of day and 1 most unfavourable hour of night

3. SIMULATION OF NOISE LEVEL DISTRIBUTION FROM ONS SUBSTATIONS

3.1. Acoustic model of an ONS substation

This report presents an assessment of the acoustic nuisance of the planned substations (ONSs), performed by a computational method. For the calculations, a three-dimensional acoustic model of the substation and its surroundings was created, including factors such as land and its use, as well as the relevant noise emission sources, primarily the power transformers and reactors to be installed at the substation site. Conditions related to the noise generated by the substation bus bar systems, i.e. short sections of connections operating at 400 kV voltage, which are routed from the area of the planned substations towards the PSE S.A. substation (Słupsk Wierzbięcino), were also characterised. Special attention was paid to the different character of this noise (in comparison with the noise generated by transformers and reactors) and its strong dependence on weather conditions.

An operating high-voltage substation, considered as a source of noise, is usually characterised by quite high noise levels. The main sources of this noise are the (auto)power transformers,high-power reactors and, to a much smaller extent, a corona discharge from bus bar systems and incoming feeders, if they are made using overhead technology. The level and propagation conditions of the generated noise are significantly influenced by the state of the environment and, in the case of noise whose source is the corona discharge (from bus bar systems or high-voltage overhead feeders), by atmospheric conditions.

As already stated, the sources of continuous noise emitted from an substation are mainly (auto)transformers and reactors, and above all the equipment used to cool them (fans). Noise levels of (auto)transformers and reactors are also influenced by core vibrations associated with magnetostriction phenomena, and the intensity of this phenomenon depends on both the magnetic induction changing with the load and on many other physical and structural parameters of the metal plates forming the core (of the transformer and reactor). For a power frequency of 50 Hz, the base frequency of the core vibration is 100 Hz, while the noise spectrum also contains higher order frequencies. These represent multiples of the base frequency, especially when the base frequency (or multiples thereof) is close to the natural frequency of the core vibration. The sound levels of the (auto)transformer and reactor depend on its nominal power and design, especially fan cooling systems. The possibilities of reducing the noise level of (auto)transformers and reactors are quite limited and consist of the use of

suitable metal plates and design solutions that reduce the amplitude of their vibrations, as well as the elimination of fan-based oil cooling in favour of natural cooling.

The source of the noise (acoustic noise) generated by the bus bar systems and short sections of incoming feeders is the corona and surface discharges on the electrical insulating system components. The level of noise generated by these two elements depends on their design, in particular on the type of the used cables used and bus bar systems (wire or tubular), and above all on the weather conditions. The noise level increases in bad weather, while in good weather, both the substation and 400 kV outgoing feeders are virtually inaudible.

It should be clearly emphasised that the noise emitted by the bus bars and conductors of high-voltage incoming feeders differs considerably from the noise caused by other sources - above all, those used in industry, but also from the noise generated by (auto)transformers and reactors. This is because the noise of both these substation components is determined by a corona discharge, the intensity of which - given their specific technical parameters - depends almost exclusively on atmospheric conditions, which are extremely difficult to take into account, even with measured identification of noise levels. Although it is well known that the noise of some of the extra-high voltage lines (220 and 400 kV) increases during drizzle or not very heavy rainfall - which is possible to determine when taking noise measurements in the vicinity of the line - in the case of more intense rainfall, the primary source of noise measured in the vicinity of the line is the rain itself. As there is practically no possibility of shutting down the line (and also the substation bus bars) during noise measurements, a separation of the noise from the feeders and bus bars from the noise caused by precipitation is not possible.

In national design practice, correlations have been developed on the basis of many years of research to estimate the level of corona discharge noise of overhead lines or substation bus bars already at the design stage. Experience has shown that the conductors and their arrangements used in national transmission lines and at extra-high-voltage switchgear in substations are of such dimensions that, in good weather conditions, the electric field strength at their surface is less than the strength at which a corona discharge, the main cause of noise, occurs. In a properly designed alternating current overhead line or bus bars in a substation, during good weather conditions (when the conductors, lines or bus bars are dry), the corona discharge, which is the cause of line noise, does not occur, because the maximum electric field

strength on the surface of these components, especially at 400 kV, does not exceed the critical intensity (at which the discharge starts), which is about 19-20 kV/cm. However, during bad weather, the critical intensity may drop to a level of about 10-12 kV/cm, which means that in the case of 220 kV lines or bus bars (maximum field strength at the conductor surface: about 12-15 kV/cm) and 400 kV lines (maximum field strength at the conductor surface: about 15-17 kV/cm), the development of the discharge phenomena causing noise is inevitable. In the case of 110 kV facilities (lines and substations, in particular 110 kV overhead switchgear in substations), the corona discharge phenomenon practically does not occur, irrespective of the weather conditions, as the maximum electric field strength on live conductor surfaces (irrespective of the type of conductors or lining) does not exceed a level of approximately 7-10 kV/cm. Consequently, facilities with a nominal voltage of 110 kV are generally not a source of noise with levels exceeding (irrespective of weather conditions) the background sound level.

It should be noted that in the case of 220 and 400 kV overhead lines or switchgear bus bars, the phenomenon of a corona discharge only occurs under poor weather conditions. Consequently, 220 and 400 kV power facilities are quite rarely the source of noise levels that significantly exceed background noise. However, during adverse weather conditions (drizzle, light rain, rime), 400 kV facilities in particular can be a source of noise at quite significant levels.

While analytical estimation of noise levels due to a corona discharge phenomena occurring under adverse weather conditions on 400 kV overhead lines is possible, there are no sufficiently accurate calculation tools for the analytical determination of noise levels originating from substation bus bars or incoming feeders.

Another problem is the measured assessment of noise levels from overhead lines and the strobing of extra-high voltage switchgear bus bars. The frequently encountered large discrepancies in measurement results are not only due to the different weather conditions at the time of measurements, but are also due to the acoustic climate of the area, the influence of which cannot be taken into account unambiguously. In particular, the rustling of trees, which occurs even in light winds, is difficult to eliminate and is similar to the sound of a corona discharge. There is - practically speaking - no possibility of lowering the sound level of the existing and projected components of the substation bus bars and incoming feeders, except for improving the quality of the insulating equipment, which is a source of noise under unfavourable

contamination conditions (deposition of dust and other chemical compounds on the insulators) and weather conditions.

Based on the detailed considerations outlined above regarding methods of estimating noise levels in the vicinity of high-voltage overhead lines, bus bars and incoming feeders, it may be concluded that the noise levels generated by the cables (feeders) and bus bars of 400 and 220 kV switchgear will be lower than the most stringent limit (45 dB for discharge noise) specified in the regulations [1].

3.2. Sound sources in the area of the planned ONS substations

In order to determine the nuisance of noise emitted to the environment by the designed ONS stations, the level of noise emission in the vicinity of the facility should be determined, and the analysis should take into account significant noise sources shaping the acoustic climate in the immediate vicinity.

. A summary of these sources is presented in Table 2.

Table 2. *Sources of noise emissions from onshore substations as input to acoustic analysis (model).*

No.	Source of noise emission	Sound power level per piece [dB]	Equivalent sound power level [dB]	Number of sources/shielding elements	Dimensions width x length x height [m]	Height of noise source [m]
1	Transformers 400/200 kV	97	97	4 head (2 for each station);	9,62 x 13,4 x 11,6	2,75
2	Shunt Reactors 220 kV	95	95	4 head (2 for each station);	3,25 x 6,05 x 3,60	1,8
3	Auxiliary transformers	70	70	4 head (2 for each station);	1,3 x 1,7 x 2,3	1,1
4	Air conditioning in the control building	67	67	2 pieces (1 for each station)		2,0
5	Air fans (ventilation building) at the control building	74	74	4 pieces (2 for each station)		5,4
6	STATCOM building (pump room)	74,6	74,6	4 head (2 for each station);	12,75 x x25,50 x 7,30	3,6
7	Radiators/Cooling System	78	78	4 head (2 for each station);	2,30 x 12,00 x 2,50	2,0
8	Control building	–	–	2 buildings (1 per household)	12,5 x 53 x 5,3	
9	Container transformer station 15/0,4 kV	60	60	2 head (1 per holding)	2,4 x 4,26 x 2,25	1,5
10-11	Capacitor bank and dry choke (harmonic filter) – equivalent noise source	100,3 – total for the whole filter (items 10 and 11)	100,3 – total for the whole filter (items 10 and 11)	2 head (1 per holding)	2,20 x 3,50 x 6,14	3

No.	Source of noise emission	Sound power level per piece [dB]	Equivalent sound pow-er level [dB]	Number of sources/shielding elements	Dimensions width x length x height [m]	Height of noise source [m]
15	HVAC dla STAT-COM	80	80	4 head (2 per farm)		1,5
16	Dry chokes room – source building	92,7	92,7	4 buildings (2 for each farm, 3 chokes inside)		7.3 (building height)
17	Diesel generator container	85	73	2 head (1 per holding)	3,0 x 5,0 x 3,0	1,5

Source: Investor's data

With the exception of the STATCOM building, all sources were included in the calculations as point sources and the noise emission source was assumed to be located at the geometric center of the facility's height. Constant operation of all sources was assumed 24 hours a day except for the generator, for which the equivalent sound power level was calculated using the formula below and assuming that the operation of the generator in connection with its maintenance lasts no longer than 30 minutes during the daytime.

The equivalent sound power level of the substitute source - LPAeq for time T= 8 hours of the daytime and 1 hour of the nighttime, was calculated according to the formula:

$$L_{PaeqT} = 10 \log (1/T \times t \times 10^{0,1\, L_{PA}}) \text{ [dB]}$$

where:

L_{PaeqT} – equivalent sound power level in dB,

L_{PA} – sound power level of the noise source in dB,

t – operating time of the source with power L_{PA}

T – reference time - 8 most unfavorable consecutive hours of daytime and 1 h of nighttime.

3.3. Predicted sound level calculations

The predicted sound levels in the vicinity of the facility were calculated on the basis of the acoustic power levels of the designed devices. The distribution of noise levels emitted by all noise sources was determined in accordance with Instruction 338 ITB (Institute of Construction Technology) - *Metoda określania emisji i imisji hałasu przemysłowego w środowisku* (Method of determining the emission and immission of industrial noise in the environment) [1] and Polish Standard PN-ISO 9613-2:2002. *Akustyka -- Tłumienie dźwięku podczas propagacji w przestrzeni otwartej -- Ogólna*

metoda obliczania (Acoustics - sound attenuation during propagation in space - general method of calculation) [4]. For the numerical calculations[1], the computer program HPZ'2001 Windows: version: March 2012 [4] was used.

The range of influence of the predicted noise level was determined in the x, y, z coordinate system by defining with them the location of the designed noise sources which will operate within the substation area, and the data characterising the noise sources contained in Table 2 were adopted for the calculations. The height of their geometric centre of gravity was assumed as the noise emission point.

It was also assumed that all equipment in the substation area would operate simultaneously and without interruption (24 hours a day), i.e. at maximum acoustic power, i.e. under the most unfavourable conditions from the point of view of environmental nuisance.

The sound attenuation caused by the presence of the ground surface was taken into account in the calculation model by introducing a correction for the effect of the ground according to PN-ISO 9613-2 (simplified method).

To calculate noise using a uniform methodology for industrial sources including line sources, the average noise load (unchanged sound power) is taken over the next most unfavourable 8 hours of the day and the most unfavourable hour of the night.

The sound power level of the equipment was determined on the basis of data provided by the Investor, some of which is available in the literature and some of which was verified by our own measurements. The equivalent sound power level of the noise sources was calculated according to the following formula:

$$L_{AeqT} = 10\log\left(\frac{1}{T}\sum_{k=1}^{n} t_i 10^{0,1L_{Ai}}\right) \text{ [dB]}$$

where:

- LAi – A-weighted, sound level during time period ti [dB],
- ti – duration of exposure to noise of level LAi [s],
- T – the reference period for which the value of the equivalent sound level is determined [s],
- T = 8 most unfavourable consecutive hours for the time of day and 1 most unfavourable hour of night

[1] The calculations of the predicted noise were made by M.Sc. Anna Dorota Władyczka. ARS-VITAE. Wrocław

The calculations were performed in the calculation area in a rectangular plan with sides of 2000 m x 1750 m assuming a calculation step 10 m.

The results of the calculations in graphic form - as noise impact ranges of levels: 40, 45, 50 and 55 dB - are presented in graphical form (Figures 3 and 4).

3.4. Calculation results

The calculations of noise levels show that the range of permissible noise with nighttime (40 and 45 dB) and daytime (50 and 50 dB) limit values does not include the area of existing protected development, i.e. the forest area located near the station (to the northeast) designated in the Local Development Plan for residential development. Noise observation points were located on the border of the aforementioned area, in accordance with the reference methodology given in the regulation [6].

The results of model calculations at the aforementioned observation points are presented in Table 3.

Table 3 *Results of noise calculations at observation points*

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Project description: Designed ONS MFW Bałtyk II i MFW Bałtyk III

time of day and night

Correction for ground impact according to PN-ISO 9613-2 (method simplified method)

Air temperature= 10°C Relative humidity RH = 70%

Equivalent sound level A at preset observation points

No.	Symbol	x [m]	y [m]	z [m]	L_A [dB]
1	P1	1732,7	996,7	1,5	36,9
2	P2	1732,7	1055,2	1,5	35,9
3	P3	1732,7	1098,3	1,5	38,4
4	P4	1779,2	979,0	1,5	36,1
5	P5	1843,4	956,9	1,5	35,0

3.5. Conclusions

The results of the model calculations showed that after the operating ONS stations, all of whose noise source equipment will operate non-continuously (24 hrs/day) with maximum acoustic power, will not cause exceedance of the permissible sound level set for the night time (40 dB) in the area of the nearest planned protected development (forest area located near the station, to the northeast, designated for residential development in the LSDP).

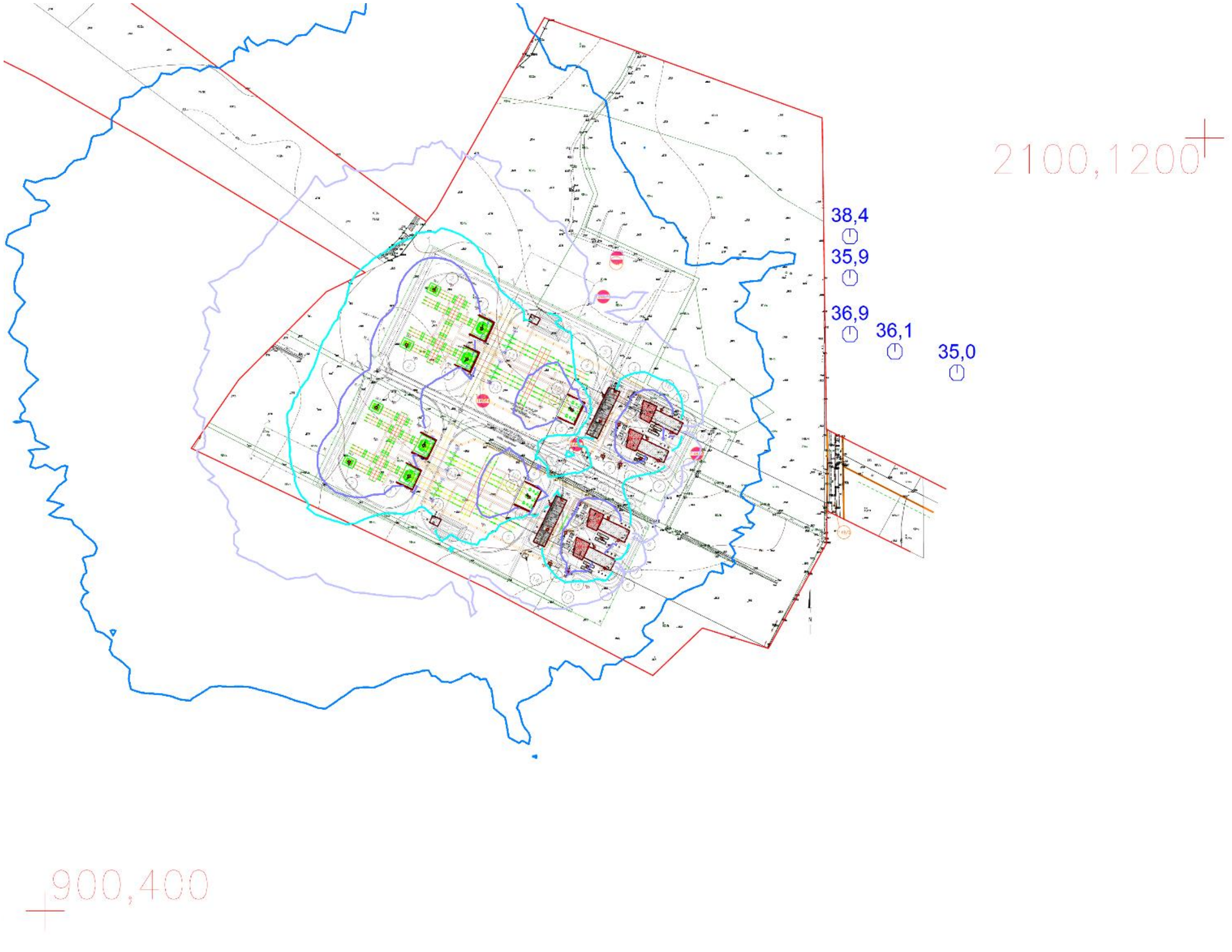

Figure 3. *Visualisation of calculation results for daytime and night time*

Source: In-house study

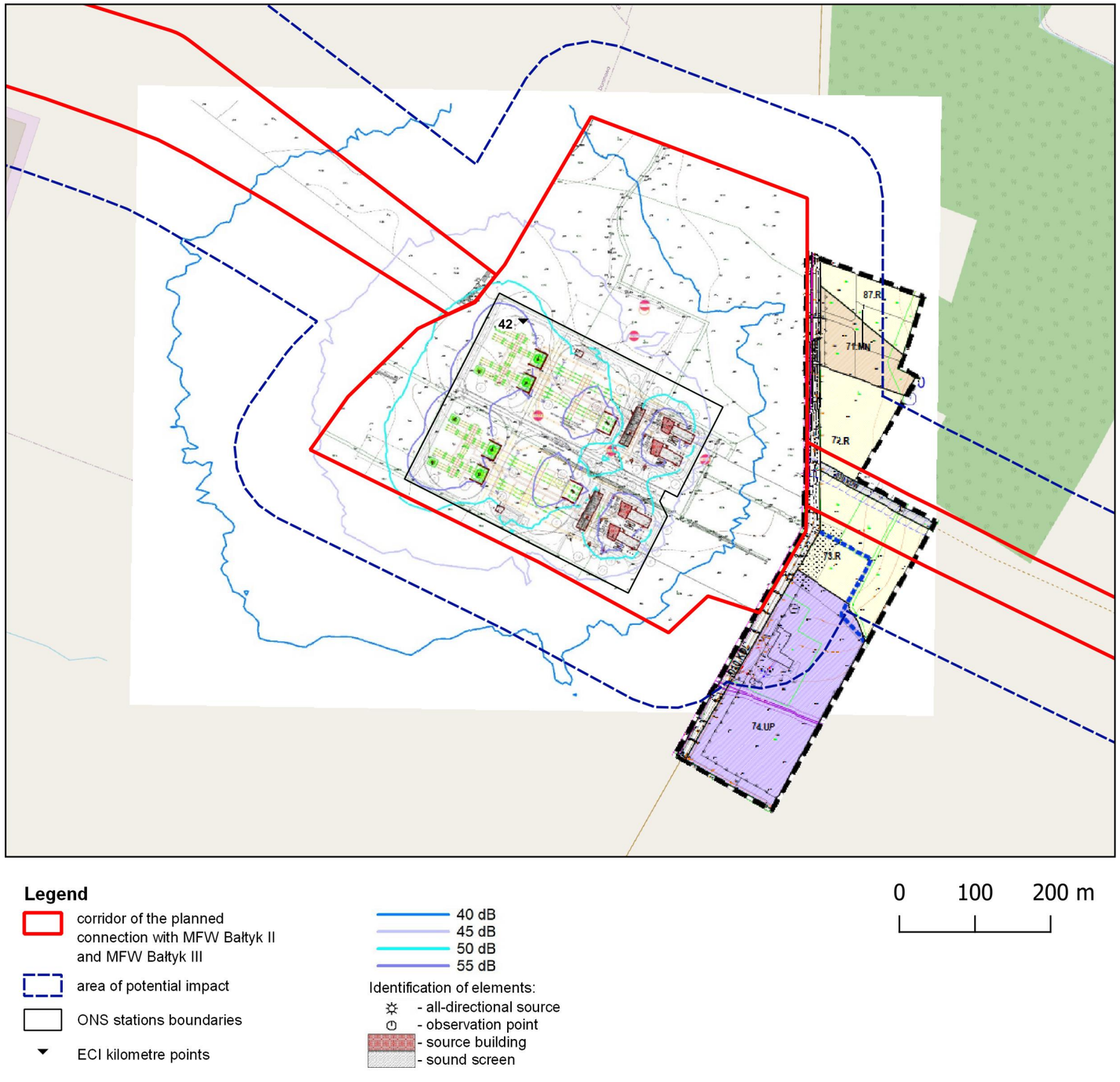

Figure 4. *Visualisation of calculation results for daytime and night time – in relation to the local development plan (MPZP).*

Source: In-house study

Industrial Noise (Outdoor)

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Project: Planned ONS substations of MFW Bałtyk II and MFW Bałtyk III
Day and night time

Specification of components:

No.	Item No.	Symbol	Description:
	All-directional sources		
1	1	TrII	Transformer Bałtyk II
2	2	TrII	Transformer Bałtyk II
3	3	TrIII	Transformer Bałtyk III
4	4	TrIII	Transformer Bałtyk III
5	5	TrPII	Transformer Bałtyk II
6	6	TrPII	Transformer Bałtyk II
7	7	TrPIII	Transformer Bałtyk III
8	8	TrPIII	Transformer Bałtyk III
9	9	ReaII	Shunt Reactor Bałtyk II
10	10	ReaII	Shunt Reactor Bałtyk II
11	11	ReaIII	Shunt Reactor Bałtyk III
12	12	ReaIII	Shunt Reactor Bałtyk III
13	13	ChlII	Cooler Bałtyk II
14	14	ChlII	Cooler Bałtyk II
15	15	ChlIII	Cooler Bałtyk III
16	16	ChlIII	Cooler Bałtyk III
17	17	BKII	Capacitor Bank Bałtyk II
18	18	BKIII	Capacitor Bank Bałtyk III
19	19	STII	Transformer Station Bałtyk II
20	20	STIII	Transformer Station Bałtyk III
21	21	WentII	Ventilation of STATCOM Bałtyk II
22	22	WentII	Ventilation of STATCOM Bałtyk II
23	23	WentIII	Ventilation of STATCOM Bałtyk III
24	24	WentIII	Ventilation of STATCOM Bałtyk III
	Sources - buildings		
25	1	STAT	STATCOM Bałtyk II building
26	2	STAT	STATCOM Bałtyk II building
27	3	STAT	STATCOM Bałtyk III building
28	4	STAT	STATCOM Bałtyk III building

Industrial Noise (Outdoor)

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Project: Planned ONS substations of MFW Bałtyk II and MFW Bałtyk III
Day and night time

Air temperaturę = 10°C Relative humidity RH = 70%

ALL-DIRECTIONAL SOURCES Number = 24

Lp	Symbol	x[m]	y[m]	z[m]	L_{WA}[dB]	K_0
1	TrII	1447,4	815,6	5,8	100,0	3
2	TrII	1463,4	846,8	5,8	100,0	3
3	TrIII	1494,7	910,5	5,8	100,0	3
4	TrIII	1511,6	942,5	5,8	100,0	3
5	TrPII	1609,2	789,8	1,1	70,0	3
6	TrPII	1596,7	764,4	1,1	70,0	3
7	TrPIII	1647,1	866,8	1,1	70,0	3
8	TrPIII	1660,0	892,7	1,1	70,0	3
9	ReaII	1385,0	832,1	1,8	95,0	3
0	ReaII	1414,4	889,5	1,8	95,0	3
1	ReaIII	1433,1	926,5	1,8	95,0	3
2	ReaIII	1461,7	984,0	1,8	95,0	3
3	ChlII	1610,5	745,2	1,3	91,0	3
4	ChlII	1623,5	769,7	1,3	91,0	3
5	ChlIII	1662,3	847,2	1,3	91,0	3
6	ChlIII	1674,7	873,1	1,3	91,0	3
7	BKII	1563,7	798,7	3,1	100,3	3
8	BKIII	1595,4	862,4	3,1	100,3	3
9	STII	1598,5	729,2	1,1	70,0	3
0	STIII	1649,3	831,2	1,1	70,0	3
1	WentII	1625,3	747,0	3,7	85,0	3
2	WentII	1636,8	773,7	3,7	85,0	3
3	WentIII	1678,3	848,6	3,7	85,0	3
4	WentIII	1690,3	874,4	3,7	85,0	3

SOURCES - BUILDINGS Number = 4

Lp	Symbol	x[m] A y[m]	x[m] B y[m]	x[m] C y[m]	x[m] D y[m]	h[m]	h0[m]	hw[m]
1	STAT	1611,9;735,4	1635,1;724,3	1640,4;737,6	1617,2;747,9	7,3	0,0	-.
	Ściana nr	1	2	3	4	dach		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	105,0	105,0	105,0	105,0	105,0		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		
2	STAT	1624,4;760,8	1648,0;749,7	1653,8;763,0	1630,2;774,2	7,3	0,0	-.-
	Ściana nr	1	2	3	4	dach		

	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	105,0	105,0	105,0	105,0	105,0		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		
3	STAT	1663,6;838,3	1686,3;826,7	1692,1;840,1	1668,9;850,3	7,3	0,0	-.-
	Ściana nr	1	2	3	4	dach		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	105,0	105,0	105,0	105,0	105,0		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		
4	STAT	1675,6;863,3	1699,7;851,7	1705,1;865,5	1681,9;875,7	7,3	0,0	-.-
	Ściana nr	1	2	3	4	dach		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	105,0	105,0	105,0	105,0	105,0		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		

OBSERVATION POINT GRID

X_{min}[m]	X_{max}[m]	Y_{min}[m]	Y_{max}[m]	dx[m]	dy[m]	z[m]	$L_{tła}$[dB]
500.0	2500.0	0.0	1750.0	10.0	10.0	4.0	0.00

External Industrial Noise

Program HPZ ' 2001 Windows: Wersja: marzec'2012 +GRUNT
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Project de- ONS MFW Bałtyk II i MFW Bałtyk III
scription:

time of day and night

The correction for soil decompaction according to PN-ISO 9613-2 (simplified method) was taken into account

Air temperature = 10°C Relative humidityRH = 70%

Equivalent sound level A at preset observation points

No.	Symbol	x [m]	y [m]	z [m]	L_A[dB]
1	P1	1732,7	996,7	1,5	36,9
2	P2	1732,7	1055,2	1,5	35,9
3	P3	1732,7	1098,3	1,5	38,4
4	P4	1779,2	979,0	1,5	36,1
5	P5	1843,4	956,9	1,5	35,0

External Industrial Noise

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Project de- ONS MFW Bałtyk II i MFW Bałtyk III
scription:

time of day and night

S p e c i f i c a t i o n o f c o m p o n e n t s :

No.	Nr el.	Symbol	Description:
	Źródła wszechkierunkowe		
1	1	TrII	Transformator 400/220 kV Bałtyk II (1)
2	2	TrII	Transformator 400/220 kV Bałtyk II (1)
3	3	TrIII	Transformator 400/220 kV Bałtyk III (1)

No.	Nr el.	Symbol	Description:
4	4	TrIII	Transformator 400/220 kV Bałtyk III (1)
5	5	DłII	Dławik kompensacyjny 220 kV Bałtyk II (2)
6	6	DłII	Dławik kompensacyjny 220 kV Bałtyk II (2)
7	7	DłIII	Dławik kompensacyjny 220 kV Bałtyk III (2)
8	8	DłIII	Dławik kompensacyjny 220 kV Bałtyk III (2)
9	9	TrII	Transformator pomocniczy Bałtyk II (3)
10	10	TrII	Transformator pomocniczy Bałtyk II (3)
11	11	TrIII	Transformator pomocniczy Bałtyk III (3)
12	12	TrIII	Transformator pomocniczy Bałtyk III (3)
13	13	KlimII	Klimatyzacja budynek sterowania Bałtyk II (4)
14	14	KlimIII	Klimatyzacja budynek sterowania Bałtyk III (4)
15	15	WenII	Wentylator budynku sterowania Bałtyk II (5)
16	16	WenII	Wentylator budynku sterowania Bałtyk II (5)
17	17	WenIII	Wentylator budynku sterowania Bałtyk III (5)
18	18	WenIII	Wentylator budynku sterowania Bałtyk III (5)
19	19	ChII	Chłodnica Bałtyk II (7)
20	20	ChII	Chłodnica Bałtyk II (7)
21	21	ChIII	Chłodnica Bałtyk III (7)
22	22	ChIII	Chłodnica Bałtyk III (7)
23	23	STrII	Stacja transformatorowa kontenerowa Bałtyk II (9)
24	24	STrIII	Stacja transformatorowa kontenerowa Bałtyk III (9)
25	25	FHII	Bank kondensatorów z dławikiem (filtr harmonicznych) Bałtyk II (10-11)
26	26	FHIII	Bank kondensatorów z dławikiem (filtr harmonicznych) Bałtyk III (10-11)
27	27	HVII	HVAC dla STATCOM Bałtyk II (15)
28	28	HVII	HVAC dla STATCOM Bałtyk II (15)
29	29	HVIII	HVAC dla STATCOM Bałtyk III (15)
30	30	HVIII	HVAC dla STATCOM Bałtyk III (15)
31	31	AgII	Agregat Bałtyk II (17)
32	32	AgIII	Agregat Bałtyk III (17)
33	33	PopII	Pompownia w budynku STATCOM Bałtyk II (6)
34	34	PopII	Pompownia w budynku STATCOM Bałtyk II (6)
35	35	PopIII	Pompownia w budynku STATCOM Bałtyk III (6)
36	36	PopIII	Pompownia w budynku STATCOM Bałtyk III (6)
	Źródła - budynki		
37	1	DłII	Pomieszczenie dławików suchych Bałtyk II (16)
38	2	DłII	Pomieszczenie dławików suchych Bałtyk II (16)
39	3	DłIII	Pomieszczenie dławików suchych Bałtyk III (16)
40	4	DłIII	Pomieszczenie dławików suchych Bałtyk III (16)
	Ekrany		
41	1	STAII	Budynek STATCOM Bałtyk II (6)
42	2	STAII	Budynek STATCOM Bałtyk II (6)
43	3	STAIII	Budynek STATCOM Bałtyk III (6)
44	4	STAIII	Budynek STATCOM Bałtyk III (6)
45	5	BudSII	Budynek sterowania Bałtyk II (8)
46	6	BudSIII	Budynek sterowania Bałtyk III (8)

No.	Nr el.	Symbol	Description:
47	7	SPII	Stacja Pomp Bałtyk II (12)
48	8	SPIII	Stacja Pomp Bałtyk III (12)
49	9	ETrII	Ekran przy transformatorze Bałtyk II (1)
50	10	ETrII	Ekran przy transformatorze Bałtyk II (1)
51	11	ETrII	Ekran przy transformatorze Bałtyk II (1)
52	12	ETrII	Ekran przy transformatorze Bałtyk II (1)
53	13	ETrII	Ekran przy transformatorze Bałtyk II (1)
54	14	ETrII	Ekran przy transformatorze Bałtyk II (1)
55	15	ETrIII	Ekran przy transformatorze Bałtyk III (1)
56	16	ETrIII	Ekran przy transformatorze Bałtyk III (1)
57	17	ETrIII	Ekran przy transformatorze Bałtyk III (1)
58	18	ETrIII	Ekran przy transformatorze Bałtyk III (1)
59	19	ETrIII	Ekran przy transformatorze Bałtyk III (1)
60	20	ETrIII	Ekran przy transformatorze Bałtyk III (1)
61	21	EFHII	Ekran przy filtrach harmonicznych Bałtyk II (10-11)
62	22	EFHII	Ekran przy filtrach harmonicznych Bałtyk II (10-11)
63	23	EFHII	Ekran przy filtrach harmonicznych Bałtyk II (10-11)
64	24	EFHIII	Ekran przy filtrach harmonicznych Bałtyk III (10-11)
65	25	EFHIII	Ekran przy filtrach harmonicznych Bałtyk III (10-11)
66	26	EFHIII	Ekran przy filtrach harmonicznych Bałtyk III (10-11)
	Punkty obserwacji		
67	1	P1	granica terenu planowanej zabudowy jednorodzinnej
68	2	P2	granica terenu planowanej zabudowy jednorodzinnej
69	3	P3	granica terenu planowanej zabudowy jednorodzinnej
70	4	P4	granica terenu planowanej zabudowy jednorodzinnej
71	5	P5	granica terenu planowanej zabudowy jednorodzinnej

External Industrial Noise

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Project de- ONSMFW Bałtyk II i MFW Bałtyk III
scription:

time of day and night

Air temperature= 10°C Relative humidityRH = 70%

OMNIDIRECTIONAL SOURCE, amount = 36

Lp	Symbol	x[m]	y[m]	z[m]	L_{WA}[dB]	K_0
1	TrII	1276,3	849,9	2,8	97,0	0
2	TrII	1291,7	881,7	2,8	97,0	0
3	TrIII	1336,3	971,1	2,8	97,0	0
4	TrIII	1351,4	1002,5	2,8	97,0	0
5	DłII	1214,3	864,7	1,8	95,0	0
6	DłII	1242,2	920,8	1,8	95,0	0
7	DłIII	1273,9	985,9	1,8	95,0	0
8	DłIII	1302,2	1042,8	1,8	95,0	0
9	TrII	1438,5	791,5	1,1	70,0	0

Lp	Symbol	x[m]	y[m]	z[m]	L_{WA}[dB]	K_0
10	TrII	1452,8	821,1	1,1	70,0	0
11	TrIII	1493,4	903,4	1,1	70,0	0
12	TrIII	1508,1	933,2	1,1	70,0	0
13	KlimII	1422,4	821,1	2,0	67,0	0
14	KlimIII	1477,6	933,4	2,0	67,0	0
15	WenII	1419,3	794,4	5,4	74,0	0
16	WenII	1434,4	825,6	5,4	74,0	0
17	WenIII	1474,1	906,5	5,4	74,0	0
18	WenIII	1489,6	937,7	5,4	74,0	0
19	ChII	1461,3	755,9	2,0	78,0	0
20	ChII	1475,6	785,3	2,0	78,0	0
21	ChIII	1516,1	868,0	2,0	78,0	0
22	ChIII	1530,6	897,6	2,0	78,0	0
23	STrII	1422,2	759,3	1,5	60,0	0
24	STrIII	1477,0	870,5	1,5	60,0	0
25	FHII	1400,5	828,3	3,0	100,3	0
26	FHIII	1445,0	918,3	3,0	100,3	0
27	HVII	1467,9	776,8	1,5	80,0	3
28	HVII	1482,6	806,6	1,5	80,0	3
29	HVIII	1523,0	888,9	1,5	80,0	3
30	HVIII	1537,7	918,3	1,5	80,0	3
31	AgII	1440,2	750,6	1,5	73,0	0
32	AgIII	1494,8	861,8	1,5	72,0	0
33	PopII	1479,1	754,5	3,6	74,6	3
34	PopII	1493,2	783,9	3,6	74,6	3
35	PopIII	1533,9	866,2	3,6	74,6	3
36	PopIII	1548,0	895,3	3,6	74,6	3

SOURCE - BUILDINGS, amount = 4

Lp	Symbol	x[m] A y[m]	x[m] B y[m]	x[m] C y[m]	x[m] D y[m]	h[m]	h_0[m]	h_w[m]
1	DłII	1455,5;763,2	1463,6;780,4	1449,7;787,0	1445,8;768,4	7,3	0,0	-.-
	Ściana nr	1	2	3	4	dach		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	92,7	92,7	92,7	92,7	92,7		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		
2	DłII	1470,2;793,4	1477,9;809,9	1464,0;816,5	1460,3;798,1	7,3	0,0	-.-
	Ściana nr	1	2	3	4	dach		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	92,7	92,7	92,7	92,7	92,7		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		
3	DłIII	1510,7;875,7	1518,6;892,5	1504,7;899,1	1500,6;880,3	7,3	0,0	-.-
	Ściana nr	1	2	3	4	dach		

	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	92,7	92,7	92,7	92,7	92,7		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		
4	DłIII	1525,0;905,1	1532,9;922,2	1519,0;928,6	1515,1;910,2	7,3	0,0	-.-
	Ściana nr	1	2	3	4	dach		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
	L wew [dB]	92,7	92,7	92,7	92,7	92,7		
	Izol.R[dB]	25,0	25,0	25,0	25,0	25,0		

NOISE BARIERS, amount = 26

Lp	Symbol	x[m] A y[m]	x[m] B y[m]	x[m] C y[m]	x[m] D y[m]	h[m]	h_0[m]	h_w[m]
1	STAII	Z1457,0;765,9	1484,7;752,4	1490,3;763,4	Z1462,5;777,2	7,3	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
2	STAII	Z1471,2;795,2	1499,2;781,6	1504,7;793,4	Z1477,0;807,0	7,3	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
3	STAIII	Z1511,6;877,6	1539,7;863,9	1545,1;875,7	Z1517,2;889,1	7,3	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
4	STAIII	Z1526,3;907,1	1554,0;893,1	1560,0;905,1	Z1531,6;918,7	7,3	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
5	BudSII	1404,8;782,0	1416,2;776,8	1439,8;824,8	1428,4;830,0	5,3	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
6	BudSIII	1459,9;893,9	1471,0;888,7	1494,6;936,9	1483,0;942,1	5,3	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
7	SPII	1297,4;802,1	1306,1;798,1	1309,7;805,2	1300,8;809,3	5,4	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
8	SPIII	1399,9;1010,6	1408,6;1006,2	1412,1;1013,0	1403,0;1017,8	5,4	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,7	0,7	0,7	0,7			
9	ETrII	Z1279,4;835,8	1279,9;835,6	1289,6;856,3	Z1289,0;856,5	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			

Lp	Symbol	x[m] A y[m]	x[m] B y[m]	x[m] C y[m]	x[m] D y[m]	h[m]	h_0[m]	h_w[m]
10	ETrII	Z1279,2;835,8	Z1279,2;836,6	1263,3;844,1	1263,1;843,4	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
11	ETrII	Z1288,3;855,8	Z1288,6;856,5	1273,2;863,9	1273,0;863,5	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
12	ETrII	Z1294,3;867,4	1295,2;867,2	1305,1;887,7	Z1304,5;887,7	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
13	ETrII	Z1293,7;867,6	Z1294,6;868,5	1279,0;875,3	1278,6;874,3	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
14	ETrII	Z1304,1;886,9	Z1304,7;887,5	1288,6;895,6	1287,9;895,1	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
15	ETrIII	Z1339,0;957,8	1339,7;957,0	1349,6;978,1	Z1348,6;978,5	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
16	ETrIII	Z1339,0;957,6	Z1339,4;958,4	1323,5;965,9	1323,1;965,3	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
17	ETrIII	Z1348,1;977,5	Z1348,6;978,5	1332,8;985,5	1332,6;985,3	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
18	ETrIII	Z1354,5;989,3	1355,6;988,6	1364,9;1009,1	Z1364,3;1009,5	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
19	ETrIII	Z1354,3;989,2	Z1354,6;989,9	1338,8;997,5	1338,4;996,5	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
20	ETrIII	Z1363,6;1008,7	Z1363,9;1009,9	1348,6;1017,2	1347,7;1016,6	6,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
21	EFHII	Z1401,9;813,0	1402,3;812,4	1414,1;836,2	Z1413,5;836,4	7,0	0,0	-.-
	Bok nr	1	2	3	4	góra		

Lp	Symbol	x[m] A y[m]	x[m] B y[m]	x[m] C y[m]	x[m] D y[m]	h[m]	h_0[m]	h_w[m]
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
22	EFHII	Z1401,5;812,8	Z1402,1;813,6	1385,6;821,3	1385,2;820,3	7,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
23	EFHII	Z1412,9;835,8	Z1412,9;836,6	1396,6;844,7	1396,3;844,1	7,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
24	EFHIII	Z1446,4;903,2	1447,2;902,8	1458,4;926,4	Z1457,6;926,8	7,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
25	EFHIII	Z1446,4;903,2	Z1446,6;903,8	1429,9;911,7	1429,6;910,7	7,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			
26	EFHIII	Z1457,6;926,8	Z1457,4;926,8	1440,2;935,1	1440,2;934,2	7,0	0,0	-.-
	Bok nr	1	2	3	4	góra		
	Wsp.odb.ß	0,5	0,5	0,5	0,5			

OBSERVATION POINTS, amount = 5

Lp	Symbol	x[m]	y[m]	z[m]	$L_{tła}$[dB]
1	P1	1732,7	996,7	1,5	0,0
2	P2	1732,7	1055,2	1,5	0,0
3	P3	1732,7	1098,3	1,5	0,0
4	P4	1779,2	979,0	1,5	0,0
5	P5	1843,4	956,9	1,5	0,0

T H E P U N C I P L E O F S E R V I C E S

X_{min}[m]	X_{max}[m]	Y_{min}[m]	Y_{max}[m]	dx[m]	dy[m]	z[m]	$L_{tła}$[dB]
500,0	2500,0	0,0	1750,0	10,0	10,0	4,0	0,00

External Industrial Noise

Program HPZ ' 2001 Windows: Wersja: marzec'2012 +GRUNT
Licencja Zakładu Akustyki ITB: HPZ-0217 ARS VITAE Wrocław

Project description: de- ONSMFW Bałtyk II i MFW Bałtyk III

time of day and night

The correction for soil decompaction according to PN-ISO 9613-2 (simplified method) was taken into account

Air temperature = 10°C Relative humidityRH = 70%

Histogram for equivalent sound level A at a point P1 = [1732,7;996,7;1,5]

Symbol	L= 36,9 dB	ΔE, dB	Screen
Omni-directional sources			
TrII	19,7	11,7	EFHIII + ETrII + DłIII
TrII	20,2	11,8	EFHIII + ETrII + ETrII

Symbol	L= 36,9 dB	ΔE, dB	Screen
TrIII	20,7	12,5	ETrIII
TrIII	21,2	12,4	ETrIII
DłII	20,5	8,0	EFHIII + ETrII + ETrII
DłII	24,5	0,0	
DłIII	25,2	0,0	
DłIII	25,8	0,0	
TrII	0,0	8,7	DłII
TrII	3,2	7,9	STAIII
TrIII	9,6	13,7	STAIII + DłIII + STAIII
TrIII	6,6	0,0	
KlimII	0,0	15,9	STAIII + BudSII + BudSII
KlimIII	0,0	14,1	BudSIII
WenII	6,2	4,6	BudSII + STAIII + STAIII
WenII	7,6	6,5	STAIII
WenIII	6,4	7,3	BudSIII + DłIII + DłIII
WenIII	12,1	0,0	
ChII	0,0	15,4	STAII
ChII	5,1	15,3	STAII
ChIII	3,7	14,8	STAIII
ChIII	13,5	15,1	STAIII
STrII	0,0	12,4	DłII + DłII + STAII
STrIII	0,0	12,1	STAIII + DłIII + STAIII
FHII	24,4	12,7	EFHII
FHIII	32,6	13,6	EFHIII
HVII	10,1	12,9	STAII
HVII	21,6	0,0	
HVIII	13,9	12,7	STAIII
HVIII	25,3	0,0	
AgII	0,0	13,6	STAII + DłII + STAII
AgIII	8,1	12,5	STAIII
PopII	0,0	15,3	STAII
PopII	0,9	15,0	STAII
PopIII	4,3	14,4	STAIII
PopIII	6,0	13,8	STAIII
Sources - buildings			
DłII	17,6	18,9	STAII
DłII	21,9	18,9	STAII
DłIII	20,9	19,1	STAIII
DłIII	25,0	18,9	STAIII

Histogram for equivalent sound level A at a point P2 = [1732,7;1055,2;1,5]

Symbol	L= 35,9 dB	ΔE, dB	Screen
Omni-directional sources			
TrII	19,7	11,4	ETrII + ETrII + EFHIII
TrII	20,1	11,4	ETrII
TrIII	20,8	12,2	ETrIII

Symbol	L= 35,9 dB	ΔE, dB	Screen
TrIII	21,4	12,2	ETrIII
DłII	24,1	4,0	ETrII
DłII	24,2	0,0	
DłIII	26,4	8,6	ETrIII
DłIII	29,3	0,0	
TrII	0,0	12,7	STAIII + DłII + DłII
TrII	0,0	9,7	STAIII
TrIII	8,9	9,9	DłIII
TrIII	7,5	0,0	
KlimII	0,0	15,4	STAIII + BudSII + BudSII
KlimIII	0,0	12,6	BudSIII
WenII	3,6	6,4	BudSII + STAIII + STAIII
WenII	4,3	6,4	STAIII
WenIII	10,7	2,2	BudSIII
WenIII	9,5	0,0	
ChII	0,0	15,6	STAII
ChII	0,8	15,6	STAII
ChIII	12,5	15,5	STAIII
ChIII	6,8	15,6	STAIII
STrII	0,0	10,6	STAIII + DłII + DłII
STrIII	0,0	12,6	DłIII
FHII	24,4	12,6	STAIII + EFHII + EFHII
FHIII	25,6	13,0	EFHIII
HVII	8,6	13,4	STAII
HVII	21,5	0,0	
HVIII	12,2	13,2	STAIII
HVIII	24,1	0,0	
AgII	0,0	13,8	STAII + DłII + STAII
AgIII	10,4	13,1	STAIII
PopII	0,0	15,4	STAII
PopII	12,2	15,4	STAII
PopIII	2,2	15,1	STAIII
PopIII	3,0	15,4	STAIII
Sources - buildings			
DłII	16,8	18,8	STAII
DłII	19,5	18,8	STAIII + STAII + STAII
DłIII	19,8	19,0	STAIII
DłIII	24,0	18,9	STAIII

Histogram for equivalent sound level A at a point P3 = [1732,7;1098,3;1,5]

Symbol	L= 38,4 dB	ΔE, dB	Screen
Omni-directional sources			
TrII	20,0	11,3	ETrII
TrII	19,9	11,3	ETrII
TrIII	20,8	12,0	ETrIII
TrIII	21,4	11,9	ETrIII

Symbol	L= 38,4 dB	ΔE, dB	Screen
DłII	23,1	0,0	
DłII	24,0	0,0	
DłIII	26,5	7,6	ETrIII + ETrIII + SPIII
DłIII	25,8	0,0	
TrII	0,0	8,9	STAIII
TrII	0,0	10,1	STAIII + DłIII + STAIII
TrIII	8,0	6,5	DłIII
TrIII	5,9	0,0	
KlimII	0,0	15,0	STAIII + BudSII + BudSII
KlimIII	0,0	11,2	BudSIII
WenII	3,1	6,2	BudSII + STAIII + STAIII
WenII	6,7	6,5	STAIII + STAIII + DłIII
WenIII	9,6	2,6	BudSIII
WenIII	8,8	0,0	
ChII	0,0	15,7	STAII
ChII	0,0	15,8	STAII
ChIII	11,8	15,8	STAIII
ChIII	5,3	15,8	STAIII
STrII	0,0	10,8	STAIII + DłII + DłII
STrIII	0,0	12,2	DłIII
FHII	31,2	12,4	EFHII + EFHII + DłIII
FHIII	34,8	12,6	EFHIII
HVII	11,5	13,6	STAIII + STAII + STAII
HVII	19,6	6,3	STAIII
HVIII	10,9	13,5	STAIII
HVIII	23,1	0,0	
AgII	0,0	13,9	STAIII + DłII + STAII
AgIII	8,3	13,6	DłIII + DłIII + STAIII
PopII	0,0	15,6	STAII
PopII	11,5	15,6	STAII
PopIII	0,8	15,5	STAIII
PopIII	14,8	15,5	STAIII
Sources - buildings			
DłII	15,7	18,7	STAIII + STAII + STAII
DłII	17,8	18,8	STAIII + STAII + STAII
DłIII	18,8	19,0	STAIII
DłIII	23,1	18,8	STAIII

Histogram for equivalent sound level A at a point P4 = [1779,2;979,0;1,5]

Symbol	L= 36,1 dB	ΔE, dB	Screen
Omni-directional sources			
TrII	18,8	11,9	ETrII
TrII	19,2	11,9	EFHIII + ETrII + DłIII
TrIII	19,6	12,6	ETrIII
TrIII	20,1	12,5	ETrIII
DłII	19,7	8,0	EFHIII + ETrII + DłIII

Symbol	L= 36,1 dB	ΔE, dB	Screen
DłII	23,6	0,0	
DłIII	25,6	3,4	ETrIII
DłIII	25,2	0,0	
TrII	4,5	10,8	DłII
TrII	4,1	0,0	
TrIII	5,5	13,5	STAIII + DłIII + STAIII
TrIII	5,1	0,0	
KlimII	0,0	16,1	STAIII + BudSII + BudSII
KlimIII	0,1	14,6	BudSIII
WenII	5,6	0,0	
WenII	5,9	4,9	STAIII
WenIII	10,1	6,0	DłIII
WenIII	11,5	0,0	
ChII	0,0	15,1	STAII
ChII	6,8	14,8	STAII
ChIII	3,3	14,0	STAIII
ChIII	16,2	14,7	STAIII
STrII	0,0	11,6	STAII + DłII + STAII
STrIII	0,0	12,6	DłIII + DłIII + STAIII
FHII	23,3	13,0	EFHII
FHIII	31,6	13,8	EFHIII
HVII	10,3	12,2	STAII
HVII	21,2	0,0	
HVIII	16,9	9,4	STAIII
HVIII	23,7	0,0	
AgII	6,6	12,8	STAII
AgIII	7,0	11,6	STAIII
PopII	0,0	14,4	STAII
PopII	0,7	14,4	STAII
PopIII	4,0	13,5	STAIII
PopIII	5,6	12,7	STAIII
Sources - buildings			
DłII	16,9	18,9	STAII
DłII	20,5	18,9	STAII
DłIII	19,9	19,1	STAIII
DłIII	23,3	18,9	STAIII

Histogram for equivalent sound level A at a point P5 = [1843,4;956,9;1,5]

Symbol	L= 35,0 dB	ΔE, dB	Screen
Omni-directional sources			
TrII	17,7	12,0	ETrII
TrII	18,0	12,0	EFHIII + ETrII + ETrII
TrIII	18,3	12,6	ETrIII
TrIII	18,7	12,5	ETrIII
DłII	18,2	8,5	ETrII
DłII	23,6	4,5	BudSIII + EFHIII + EFHIII

Symbol	L= 35,0 dB	ΔE, dB	Screen
DłIII	23,8	4,0	ETrIII
DłIII	24,0	0,0	
TrII	3,4	11,0	DłII
TrII	2,9	0,0	
TrIII	0,0	13,0	STAIII + DłIII + STAIII
TrIII	3,2	0,0	
KlimII	0,0	13,3	BudSII
KlimIII	0,0	14,9	BudSIII
WenII	6,7	4,4	DłII
WenII	5,0	0,0	
WenIII	8,5	7,0	STAIII + DłIII + STAIII
WenIII	8,0	0,0	
ChII	0,0	14,7	STAII
ChII	12,3	14,0	STAII
ChIII	3,8	12,8	STAIII
ChIII	14,8	12,1	STAIII
STrII	0,0	10,9	STAII + DłII + DłII
STrIII	0,0	11,7	DłIII + DłIII + STAIII
FHII	21,8	13,3	EFHII
FHIII	30,3	13,9	EFHIII + EFHIII + DłIII
HVII	10,9	10,8	STAII
HVII	20,1	0,0	
HVIII	22,5	5,6	STAIII
HVIII	21,8	0,0	
AgII	0,0	12,4	STAII
AgIII	0,0	9,9	STAIII
PopII	0,0	13,7	STAII
PopII	0,4	13,6	STAII
PopIII	3,4	12,4	STAIII
PopIII	5,0	11,4	STAIII
Sources - buildings			
DłII	15,9	18,9	STAII
DłII	19,2	19,0	STAII
DłIII	18,8	19,1	STAIII
DłIII	21,3	18,9	STAIII

4. ENVIRONMENTAL IMPACT OF THE HIGHEST-VOLTAGE OVERHEAD LINE NOISE

Permissible noise levels in the environment are specified in the Regulation of the Minister of Environment of 14 June 2007 on permissible noise levels in the environment [1]. These values for areas of various purpose are summarised in Table 4.

Table 4. *Permissible noise levels in areas included in the category of areas protected against noise caused by power lines - Appendix (Table 2) to the Regulation of the Minister of Environment [1]*

No.	Land use	Permissible noise level [dB]	
		$L_{Aeq\ D}$ Time of day - reference time interval of 16 hours	$L_{Aeq\ N}$ Time of night - reference time interval of 8 hours
1.	a. Protection zone "A" - health resorts b. Hospital and nursing home areas c. Development areas for permanent or temporary stay of children and youth1)	45	40
2.	a. Areas of single-family and multi-family residential buildings as well as farm buildings and collective housing b. Recreation and leisure areas[1]) c. Residential and service areas d. A centre zone of a city with a population greater than 100,000 inhabitants [2])	50	45

Explanations:
1) If these areas are not used in accordance with their function at night, the night-time noise limit does not apply.
2) The centre zone of a city with more than 100,000 inhabitants is an area of compact residential development with a concentration of administrative, retail and service facilities. In cities with districts of more than 100,000 inhabitants, a city centre zone may be designated in those districts with compact residential development and a concentration of administrative, retail and service facilities.

According to the information in Table 1 taken from the above-mentioned Regulation, in the areas of single-family and multi-family housing, farm buildings and collective housing, the following acoustic climate standards in the field of noise emitted by power lines apply:

• acceptable A-weighted sound level - time of day, reference time interval equal to 16 hours: 50 dB (A),

• acceptable A-weighted sound level - night time, reference time interval equal to 8 hours: 45 dB (A).

When assessing the potential environmental nuisance of the transmission systems designed to be built, it is important to identify the areas of development related to the permanent or temporary stay of children and adolescents (Table 4, No. 1) and housing development areas (Table 4, No. 2).

It should also be noted that the above-mentioned Regulation [1] sets the following indicators that characterise the noise level generated by the overhead power line:

• L_{DWN} (long-term average sound level determined throughout all days of the year, taking into account time of day (6-18), evening (18-22), and night (22-6),

• L_N (long-term average sound level determined during all seasons of the year). These indicators, the method of determination of which has been specified in the Regulation [2], are applicable to the pursuit of a long-term policy in the field of noise protection, and the permissible values of these indicators for overhead power lines as noise sources are listed in Table 5.

Table 5. *Permissible levels of noise in the environment, caused by power lines expressed by the L_{DWN} and L_N indices, which are applicable to the long-term noise protection policy - Appendix (Table 4) to the Regulation of the Minister of Environment [1]*

No.	Land use	Permissible long-term average A-weighted sound level in dB	
		L_{DWN} reference time interval equal to all days in a year	L_N reference time interval equal to all times of night
1	a. Protection zone "A" health resorts b. Hospital and nursing home areas c. Building areas for permanent or temporary stay of children and youth	45	40
2	a. Areas for single-family and multi-family housing, farm buildings and collective housing b. Recreation and leisure areas c. Residential and service areas d. A centre zone of a city with a population greater than 100,000 inhabitants [1])	50	45

Explanations:
1) The centre zone of a city with more than 100,000 inhabitants is an area of compact residential development with a concentration of administrative, retail and service facilities. In cities with districts of more than 100,000 inhabitants, a city centre zone may be designated in those districts with compact residential development and a concentration of administrative, retail and service facilities.

4.1. Projected impact on the acoustic climate of the environment

One of the nuisances for residents whose properties are adjacent to high-voltage overhead lines is the noise (humming) accompanying their operation. The source of noise generated by overhead power lines is the corona discharge from the conductive elements of the live lines (mainly phase conductors) and surface discharges on the elements of the electrical insulating system (insulators and accessories). These phenomena do not pose a threat to human health and can only be observed at night, as an ’electric glow’ on the line wires. A corona discharge is a phenomenon consisting of an electric discharge into space (air), which occurs when the maximum value of the electric field strength on the surface of a conductor (or other line conducting element) exceeds a critical value. In a properly designed line, during

good weather conditions (i.e. when the conductors and other live components of the line are dry), the phenomenon of the corona discharge should not occur, because the maximum electric field strength on the conductor surface is usually in the range from 15 to 17 kV / cm, while the critical current, when exceeded, is about 19-20 kV / cm. During bad weather conditions (high humidity, low rainfall, rime ice) the critical current drops even to the value of 10-12 kV / cm, which causes an intense phenomenon of the corona discharge. It may also appear on the line wires under good weather conditions, but only in the case of large unevenness occurring on the surface of the phase conductors (the so-called point contact phenomenon) or of the line equipment, caused e.g. by dirt, scratching or delamination of the conductor.

As mentioned earlier, weather conditions have a major influence on the occurrence of the glow phenomenon. The research carried out so far shows that there is a strong correlation between the level of noise emitted by power lines and air humidity, although the quantitative approach to this problem has not yet been satisfactorily described. It is known, however, that a significant increase in the level of noise emitted is observed when the value known as the dew point exceeds the so-called critical level, i.e. the conditions under which the accumulated water in the air begins to precipitate and to settle as droplets, mainly on the wires of the line.

Along the entire length of the section of the double-circuit 400 kV overhead line planned to be built in an alternative option, steel-aluminium phase conductors type 468/24-A1F / UHST-261 (equivalent to AFL-8 350 mm^2), in the form of a three-wire bundle for each phase, are planned to be used. The use of a three-wire bundle in both sections of the transmission track causes a significant decrease in the noise level generated by the overhead line in relation to the noise originating from single cables or two-wire bundle (Table 5). It is a method commonly used by designers of extra-high voltage lines both at home and abroad.

Table 3. *Averaged results of noise measurements in the vicinity of 400 kV lines operated in Poland in good and bad weather conditions*

Measured Quantity	**Good weather**			**Bad weather**					
	Distance from the line axis			All conditions			Constant rain		
				Distance from the line axis					
	15 m	30 m	60 m	15 m	30 m	60 m	15 m	30 m	60 m
Wire bundle 2x525 mm2, two-circuit line (Z52 poles)									
Standard Deviation	4.0	3.7	3.6	4.1	4.1	4.2	2.0	1.8	1.7
$L_{Aeq,\ min}$	31.7	29.8	27.7	44.3	42.8	39.5	49.5	48.5	46.5

$L_{Aeq,\ max}$	44.1	42.6	38.9	558	53.9	50.8	55.8	53.9	50.8
$L_{Aeq,\ average}$	**38.8**	**36.0**	**33.2**	**51.1**	**49.2**	**46.7**	**52.9**	**51.1**	**48.6**
Wire bundle 2x525 mm2, single-circuit line (Y25 poles)									
SD	3.4	3.1	2.8	3.8	3.9	3.8	1.9	2.3	2.7
$L_{Aeq,\ min}$	32.1	29.8	27.7	42.7	39.8	37.2	47.7	43.6	39.5
$L_{Aeq,\ max}$	41.4	38.0	34.8	53.1	51.1	48.4	53.1	51.1	48.4
$L_{Aeq,\ average}$	**37.2**	**34.2**	**31.7**	**49.4**	**46.5**	**43.7**	**51.4**	**48.6**	**45.7**
3x350 mm2 wire bundle, two-circuit line (Z33 poles)									
SD	3.0	2.1	2.3	3.1	2.9	2.8	1.2	1.4	1.2
$L_{Aeq,\ min}$	28.4	27.4	25.5	36.4	35.0	32.2	42.8	39.9	37.3
$L_{Aeq,\ max}$	38.8	36.1	32.2	47.2	44.5	41.2	47.2	44.5	41.2
$L_{Aeq,\ average}$	**32.0**	**31.1**	**27.3**	**43.6**	**41.4**	**38.9**	**45.3**	**42.4**	**39.7**

Source: In-house study

The measurement data collected during the acoustic nuisance tests on the operating 400 kV lines show that the average noise level recorded at a distance of 30 m from the 400 kV line made with the use of wire bundle, even in the worst weather conditions, does not usually exceed the values of 39.0 - 44.5 dB (A), depending on the type of bundle and the geometric configuration of the cables.

It is characteristic that the noise level decreases when moving away from the line, which is confirmed by the results of noise measurements carried out on various domestic 400 kV overhead lines, in good and bad weather conditions (Table 5). If the data contained in this table are analysed, they clearly show that in the vicinity of 400 kV double-circuit overhead lines in this country, in which three-wire bundles of phase wires are used, the noise level in bad weather exceeds the permissible value of 45 dB (A) only up to the distance 15 - 30 m from the line axis.

It should be emphasized, however, that the literature data are characterized by a large discrepancy in the measurement results, caused not only by the weather conditions that occurred during the measurements, but also by a different influence of the acoustic background. This indicates considerable difficulties in modelling the noise level distribution at the stage of designing an overhead power line, where an additional difficulty is caused by the fact that noise emission from power lines is quite strongly related to the local terrain conditions (topography).

4.2. Calculation of the noise levels

4.2.1. Calculation results for noise levels in the vicinity of a double-circuit overhead line

Calculations of the predicted sound level distribution in the vicinity of the double-circuit overhead line, to be built as an alternative to cable systems, were performed

for the characteristic (representative) line cross-sections[2] in places where the distance from the line wires to the ground is the shortest.

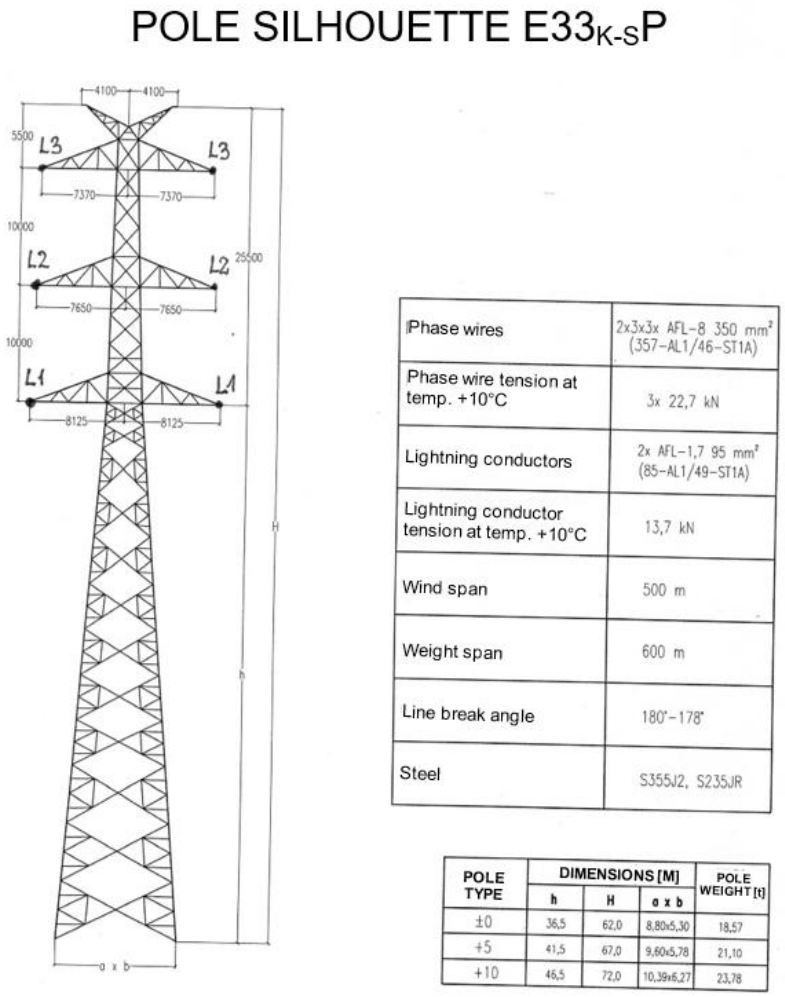
With a specific line structure (series and type of poles), assumed phase configuration, as well as with a fixed value of phase voltage and under certain atmospheric conditions (good and bad weather), the noise level in its vicinity, caused by glow phenomena, depends primarily on the distance of the phase conductors from the ground. Its level decreases with the distance from the lines wires, with the greatest value being obtained in the cross-section of the line in which the distance of the phase conductors from the ground is the smallest - usually in the middle of the span.

Due to the fact that the maximum value of the sound level in the vicinity of the line should be expected in a situation where the distance from the ground of the lowest suspended conductor is the smallest ($h = h_{min}$), the calculations were carried out for the smallest[3] designed phase conductor-earth distance of 10.0 m.

Calculations of the sound level distribution were performed at the heights: 1.5; 4 and 5 m above the ground level, taking into account, in accordance with the design assumptions, the operation of the line equipped with wire bundle/multiple conductors 68/24-A1F / UHST-26 suspended on chains attached to the structure of the E33 series lattice pole (Fig.5)

[2] The same for which the calculations of the electric and magnetic field distribution were performed.

[3] The shortest distance of cables from the ground that occurs in a given span of the line depends on many factors, the most important of which are: the height of the columns, the span, the tension of the cables, the topography and the presence of objects under the line (intersections and approaches)



Phase wires	2x3x3x AFL-8 350 mm² (357-AL1/46-ST1A)
Phase wire tension at temp. +10°C	3x 22,7 kN
Lightning conductors	2x AFL-1,7 95 mm² (85-AL1/49-ST1A)
Lightning conductor tension at temp. +10°C	13,7 kN
Wind span	500 m
Weight span	600 m
Line break angle	180°-178°
Steel	S355J2, S235JR

POLE TYPE	DIMENSIONS [M]			POLE WEIGHT [t]
	h	H	a x b	
±0	36,5	62,0	8,80x5,30	18,57
+5	41,5	67,0	9,60x5,78	21,10
+10	46,5	72,0	10,39x6,27	23,78

Figure 5. *Dimensioned silhouette of a 400 kV double-circuit line lattice pole, which is to be an alternative to cable runs of electricity transmission from substations (ONS) to the PSE S.A. substation.*

The results of the computation of the sound level distribution in the vicinity of the three analysed overhead lines (P-P, P-M3 and P-M6) are presented in Tables 6 – 8 and in a graphical form (isoline course) below. The results are presented there in the form of graphs of sound level distributions in the aforementioned cross-section, up to a distance of ± 100 m from the line axis. The determined distributions concern good and bad weather conditions (L_{Aeq}), long-term levels (L_T) and day-evening-night levels (L_{DWN}) designated in accordance with the principles set out in the Regulation [2].

Table 4. *Calculation results of the forecast distribution of discharge noise at heights of 1.5; 4.0 and 5.0 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F / UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33P span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m.*

Calculation results of the predicted noise distribution from electric discharge in the cross-section of a 2x400 kV

The height of the suspension of the lower phase **h [m]= 10,0**

Poles **E33** 400kV working cables 2x3x3 408-AL1F/34-UHST lub 408-AL1/34-UHST Span **P-P** Vertical, consistent phase arrangement

No.	dist. from axis [m]	Height 1,5 a.t.l.				4,0 m a.t.l.				5 m a.t.l.			
		$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}	$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}	$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	-100	36,2	22,3	27,6	34,0	36,3	22,3	27,6	34,0	36,3	22,3	27,6	34,0
2	-82	37,4	23,4	28,7	35,1	37,4	23,5	28,8	35,2	37,4	23,5	28,8	35,2
3	-70	38,3	24,3	29,6	36,0	38,3	24,4	29,7	36,1	38,3	24,4	29,7	36,1
4	-60	39,1	25,2	30,5	36,9	39,2	25,2	30,5	36,9	39,2	25,2	30,5	36,9
5	-50	40,1	26,1	31,4	37,8	40,1	26,2	31,5	37,9	40,2	26,2	31,5	37,9
6	-42	41,0	27,0	32,3	38,7	41,1	27,1	32,4	38,8	41,1	27,2	32,5	38,9
7	-35	41,9	27,9	33,2	39,6	42,0	28,1	33,4	39,8	42,1	28,1	33,4	39,8
8	-25	43,4	29,5	34,8	41,2	43,7	29,8	35,0	41,4	43,8	29,8	35,1	41,5
9	-18	44,7	30,8	36,1	42,5	45,2	31,3	36,5	42,9	45,4	31,5	36,7	43,1
10	-12	45,9	32,0	37,3	43,7	46,8	32,9	38,2	44,6	47,2	33,3	38,6	45,0
11	-8	46,4	32,5	37,8	44,2	47,5	33,6	38,9	45,3	48,1	34,2	39,5	45,9
12	-4	46,5	32,6	37,8	44,2	47,3	33,4	38,7	45,1	47,7	33,8	39,1	45,5
13	0	46,4	32,5	37,8	44,2	47,1	33,2	38,5	44,9	47,4	33,5	38,8	45,2
14	4	46,5	32,6	37,8	44,2	47,3	33,4	38,7	45,1	47,7	33,8	39,1	45,5
15	8	46,4	32,5	37,8	44,2	47,5	33,6	38,9	45,3	48,1	34,2	39,5	45,9
16	12	45,9	32,0	37,3	43,7	46,8	32,9	38,2	44,6	47,2	33,3	38,6	45,0
17	18	44,7	30,8	36,1	42,5	45,2	31,3	36,5	42,9	45,4	31,5	36,7	43,1
18	25	43,4	29,5	34,8	41,2	43,7	29,8	35,0	41,4	43,8	29,8	35,1	41,5
19	35	41,9	27,9	33,2	39,6	42,0	28,1	33,4	39,8	42,1	28,1	33,4	39,8
20	42	41,0	27,0	32,3	38,7	41,1	27,1	32,4	38,8	41,1	27,2	32,5	38,9
21	50	40,1	26,1	31,4	37,8	40,1	26,2	31,5	37,9	40,2	26,2	31,5	37,9
22	60	39,1	25,2	30,5	36,9	39,2	25,2	30,5	36,9	39,2	25,2	30,5	36,9
23	70	38,3	24,3	29,6	36,0	38,3	24,4	29,7	36,1	38,3	24,4	29,7	36,1
24	82	37,4	23,4	28,7	35,1	37,4	23,5	28,8	35,2	37,4	23,5	28,8	35,2
25	100	36,2	22,3	27,6	34,0	36,3	22,3	27,6	34,0	36,3	22,3	27,6	34,0

L_T - long-term level , L_{DWN} - day-evening-night level

$L_{Aeq,zp}$ - equivalent sound level A in bad weather conditions , $L_{Aeq,dp}$ - equivalent sound level A in good weather conditions

Table 5. *Calculation results of the forecast distribution of discharge noise at heights of 1.5; 4.0 and 5.0 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33M3 span of the 400 kV line, determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10m.*

Calculation results of the predicted noise distribution from electric discharge in the cross-section of a 2x400 kV line

The height of the suspension of the lower phase **h [m]= 10,0**

Poles **E33** 400kV working cables 2x3x3 408-AL1F/34-UHST lub 408-AL1/34-UHST Vertical, consistent phase arrangement

Span **P-M3**

No.	dist. from axis [m]	Height 1,5 a.t.l.				4,0 m a.t.l.				5 m a.t.l.			
		$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}	$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}	$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	-100	36,5	22,7	27,9	34,3	36,6	22,7	27,9	34,3	36,6	22,7	27,9	34,3
2	-82	37,7	23,8	29,1	35,5	37,7	23,8	29,1	35,5	37,7	23,8	29,1	35,5
3	-70	38,6	24,7	29,9	36,3	38,6	24,7	30,0	36,4	38,6	24,7	30,0	36,4
4	-60	39,4	25,5	30,8	37,2	39,5	25,6	30,8	37,2	39,5	25,6	30,9	37,3
5	-50	40,4	26,5	31,8	38,2	40,5	26,6	31,8	38,2	40,5	26,6	31,9	38,3
6	-42	41,3	27,4	32,7	39,1	41,4	27,5	32,8	39,2	41,4	27,6	32,8	39,2
7	-35	42,2	28,3	33,6	40,0	42,3	28,5	33,7	40,1	42,4	28,5	33,8	40,2
8	-25	43,8	29,9	35,1	41,5	44,0	30,2	35,4	41,8	44,1	30,3	35,5	41,9
9	-18	45,1	31,3	36,5	42,9	45,6	31,8	37,0	43,4	45,8	31,9	37,1	43,5
10	-12	46,2	32,4	37,6	44,0	47,2	33,4	38,6	45,0	47,7	33,8	39,0	45,4
11	-8	46,7	32,8	38,0	44,4	47,8	33,9	39,1	45,5	48,3	34,5	39,7	46,1
12	-4	46,6	32,8	38,0	44,4	47,4	33,6	38,8	45,2	47,8	34,0	39,2	45,6
13	0	46,6	32,7	37,9	44,3	47,2	33,4	38,6	45,0	47,5	33,7	38,9	45,3
14	4	46,6	32,8	38,0	44,4	47,4	33,6	38,8	45,2	47,8	34,0	39,2	45,6
15	8	46,7	32,8	38,0	44,4	47,8	33,9	39,1	45,5	48,3	34,5	39,7	46,1
16	12	46,2	32,4	37,6	44,0	47,2	33,4	38,6	45,0	47,7	33,8	39,0	45,4
17	18	45,1	31,3	36,5	42,9	45,6	31,8	37,0	43,4	45,8	31,9	37,1	43,5
18	25	43,8	29,9	35,1	41,5	44,0	30,2	35,4	41,8	44,1	30,3	35,5	41,9
19	35	42,2	28,3	33,6	40,0	42,3	28,5	33,7	40,1	42,4	28,5	33,8	40,2
20	42	41,3	27,4	32,7	39,1	41,4	27,5	32,8	39,2	41,4	27,6	32,8	39,2
21	50	40,4	26,5	31,8	38,2	40,5	26,6	31,8	38,2	40,5	26,6	31,9	38,3
22	60	39,4	25,5	30,8	37,2	39,5	25,6	30,8	37,2	39,5	25,6	30,9	37,3
23	70	38,6	24,7	29,9	36,3	38,6	24,7	30,0	36,4	38,6	24,7	30,0	36,4
24	82	37,7	23,8	29,1	35,5	37,7	23,8	29,1	35,5	37,7	23,8	29,1	35,5
25	100	36,5	22,7	27,9	34,3	36,6	22,7	27,9	34,3	36,6	22,7	27,9	34,3

L_T - long-term level L_{DWN} - day-evening-night level

$L_{Aeq,zp}$ - equivalent sound level A in bad weather conditions , $L_{Aeq,dp}$ - equivalent sound level A in good weather conditions

Table 6. *Calculation results of the forecast distribution of discharge noise at heights of 1.5; 4.0 and 5.0 m above ground level accompanying the operation of a double-circuit overhead line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Prodicted noise levels in the vicinity of the E33P - E33M6 span of the 400 kV line, determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10m.*

Calculation results of the predicted noise distribution from electric discharge in the cross-section of a 2x400 kV line

The height of the suspension of the lower phase **h [m]= 10,0**

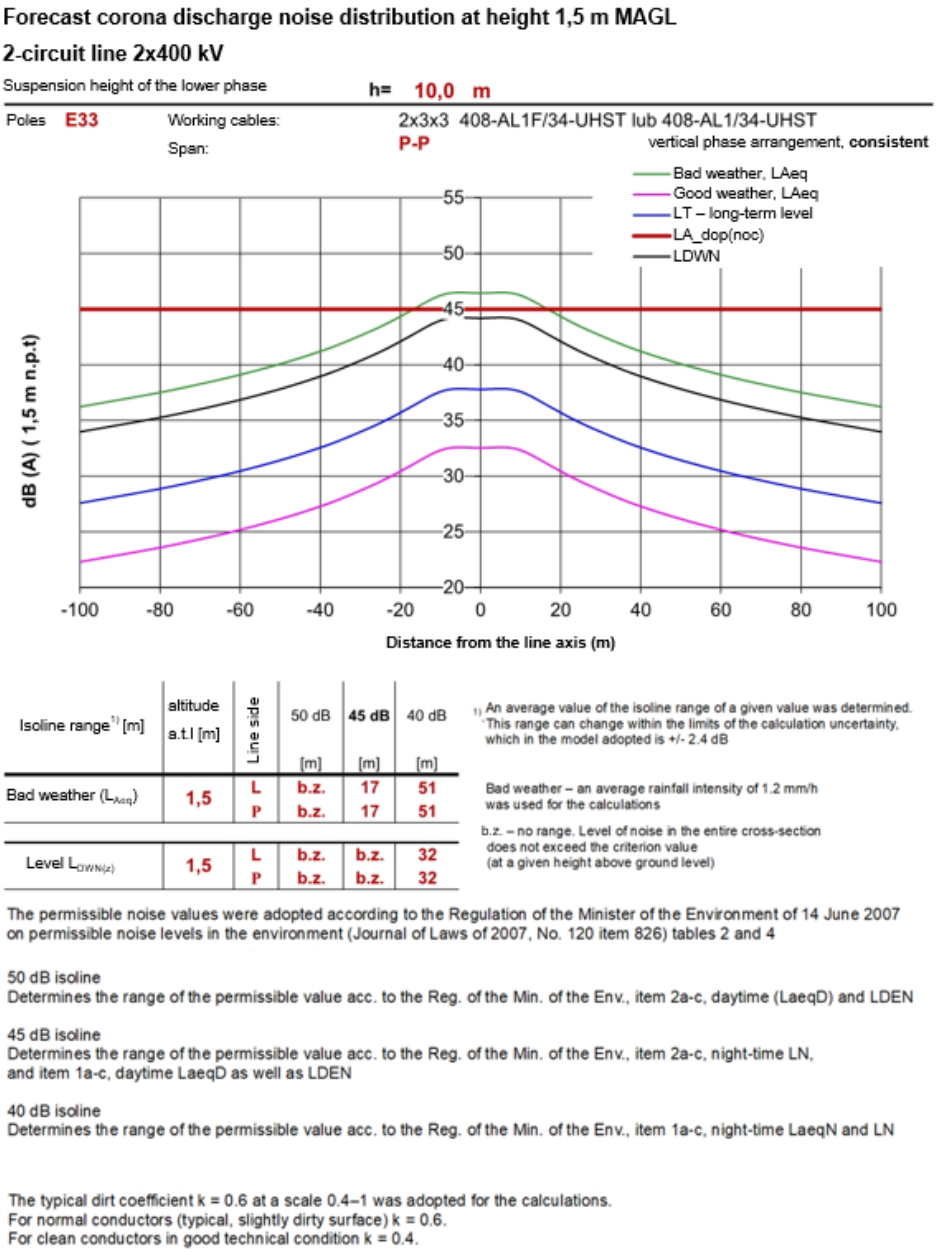
Poles **E33** 400kV working cables 2x3x3 408-AL1F/34-UHST lub 408-AL1/34-UHST Vertical, consistent phase arrangement

Span **P-M6**

No.	dist. from axis [m]	Height 1,5 a.t.l.				4,0 m a.t.l.				5 m a.t.l.			
		$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}	$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}	$L_{Aeq,zp}$	$L_{Aeq,dp}$	L_T	L_{DWN}
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	-100	36,6	22,7	27,9	34,3	36,6	22,7	27,9	34,3	36,6	22,7	27,9	34,3
2	-82	37,7	23,8	29,1	35,5	37,7	23,9	29,1	35,5	37,8	23,9	29,1	35,5
3	-70	38,6	24,7	30,0	36,4	38,6	24,8	30,0	36,4	38,7	24,8	30,0	36,4
4	-60	39,5	25,6	30,8	37,2	39,5	25,6	30,9	37,3	39,5	25,6	30,9	37,3
5	-50	40,4	26,6	31,8	38,2	40,5	26,6	31,9	38,3	40,5	26,7	31,9	38,3
6	-42	41,3	27,5	32,7	39,1	41,5	27,6	32,8	39,2	41,5	27,6	32,9	39,3
7	-35	42,3	28,4	33,6	40,0	42,4	28,6	33,8	40,2	42,5	28,6	33,8	40,2
8	-25	43,9	30,0	35,2	41,6	44,1	30,3	35,5	41,9	44,3	30,4	35,6	42,0
9	-18	45,2	31,4	36,6	43,0	45,8	32,0	37,2	43,6	46,0	32,2	37,4	43,8
10	-12	46,3	32,5	37,7	44,1	47,4	33,6	38,8	45,2	47,9	34,1	39,3	45,7
11	-8	46,6	32,8	38,0	44,4	47,6	33,8	39,0	45,4	48,2	34,4	39,6	46,0
12	-4	46,4	32,6	37,8	44,2	47,2	33,4	38,6	45,0	47,5	33,7	38,9	45,3
13	0	46,3	32,5	37,7	44,1	46,9	33,1	38,3	44,7	47,2	33,4	38,5	44,9
14	4	46,4	32,6	37,8	44,2	47,2	33,4	38,6	45,0	47,5	33,7	38,9	45,3
15	8	46,6	32,8	38,0	44,4	47,6	33,8	39,0	45,4	48,2	34,4	39,6	46,0
16	12	46,3	32,5	37,7	44,1	47,4	33,6	38,8	45,2	47,9	34,1	39,3	45,7
17	18	45,2	31,4	36,6	43,0	45,8	32,0	37,2	43,6	46,0	32,2	37,4	43,8
18	25	43,9	30,0	35,2	41,6	44,1	30,3	35,5	41,9	44,3	30,4	35,6	42,0
19	35	42,3	28,4	33,6	40,0	42,4	28,6	33,8	40,2	42,5	28,6	33,8	40,2
20	42	41,3	27,5	32,7	39,1	41,5	27,6	32,8	39,2	41,5	27,6	32,9	39,3
21	50	40,4	26,6	31,8	38,2	40,5	26,6	31,9	38,3	40,5	26,7	31,9	38,3
22	60	39,5	25,6	30,8	37,2	39,5	25,6	30,9	37,3	39,5	25,6	30,9	37,3
23	70	38,6	24,7	30,0	36,4	38,6	24,8	30,0	36,4	38,7	24,8	30,0	36,4
24	82	37,7	23,8	29,1	35,5	37,7	23,9	29,1	35,5	37,8	23,9	29,1	35,5
25	100	36,6	22,7	27,9	34,3	36,6	22,7	27,9	34,3	36,6	22,7	27,9	34,3

L_T - long-term level L_{DWN} - day-evening-night level

$L_{Aeq,zp}$ - equivalent sound level A in bad weather conditions $L_{Aeq,dp}$ - equivalent sound level A in good weather conditions



Isoline range[1] [m]	altitude a.t.l [m]	Line side	50 dB [m]	45 dB [m]	40 dB [m]
Bad weather (L_{Aeq})	1,5	L	b.z.	17	51
		P	b.z.	17	51
Level $L_{DWN(z)}$	1,5	L	b.z.	b.z.	32
		P	b.z.	b.z.	32

1) An average value of the isoline range of a given value was determined. This range can change within the limits of the calculation uncertainty, which in the model adopted is +/- 2.4 dB

Bad weather – an average rainfall intensity of 1.2 mm/h was used for the calculations

b.z. – no range. Level of noise in the entire cross-section does not exceed the criterion value (at a given height above ground level)

The permissible noise values were adopted according to the Regulation of the Minister of the Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws of 2007, No. 120 item 826) tables 2 and 4

50 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 2a-c, daytime (LaeqD) and LDEN

45 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 2a-c, night-time LN, and item 1a-c, daytime LaeqD as well as LDEN

40 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 1a-c, night-time LaeqN and LN

The typical dirt coefficient k = 0.6 at a scale 0.4–1 was adopted for the calculations.
For normal conductors (typical, slightly dirty surface) k = 0.6.
For clean conductors in good technical condition k = 0.4.

Figure 6. *Calculation results of the forecast distribution of discharge noise at a height of 1.5 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F / UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33P span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m.*

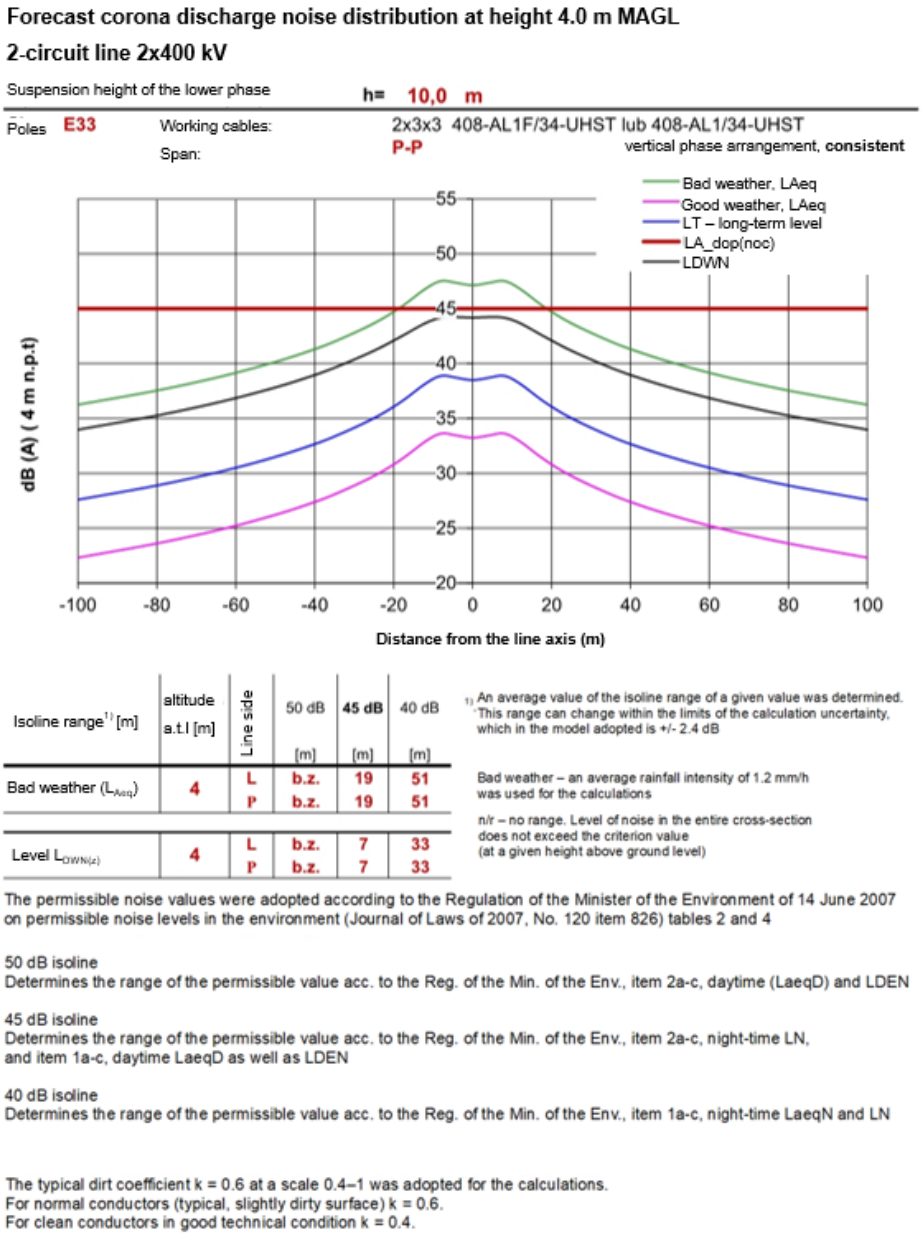


Figure 7. *Calculation results of the forecast distribution of discharge noise at a height of 4.0 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33P span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m.*

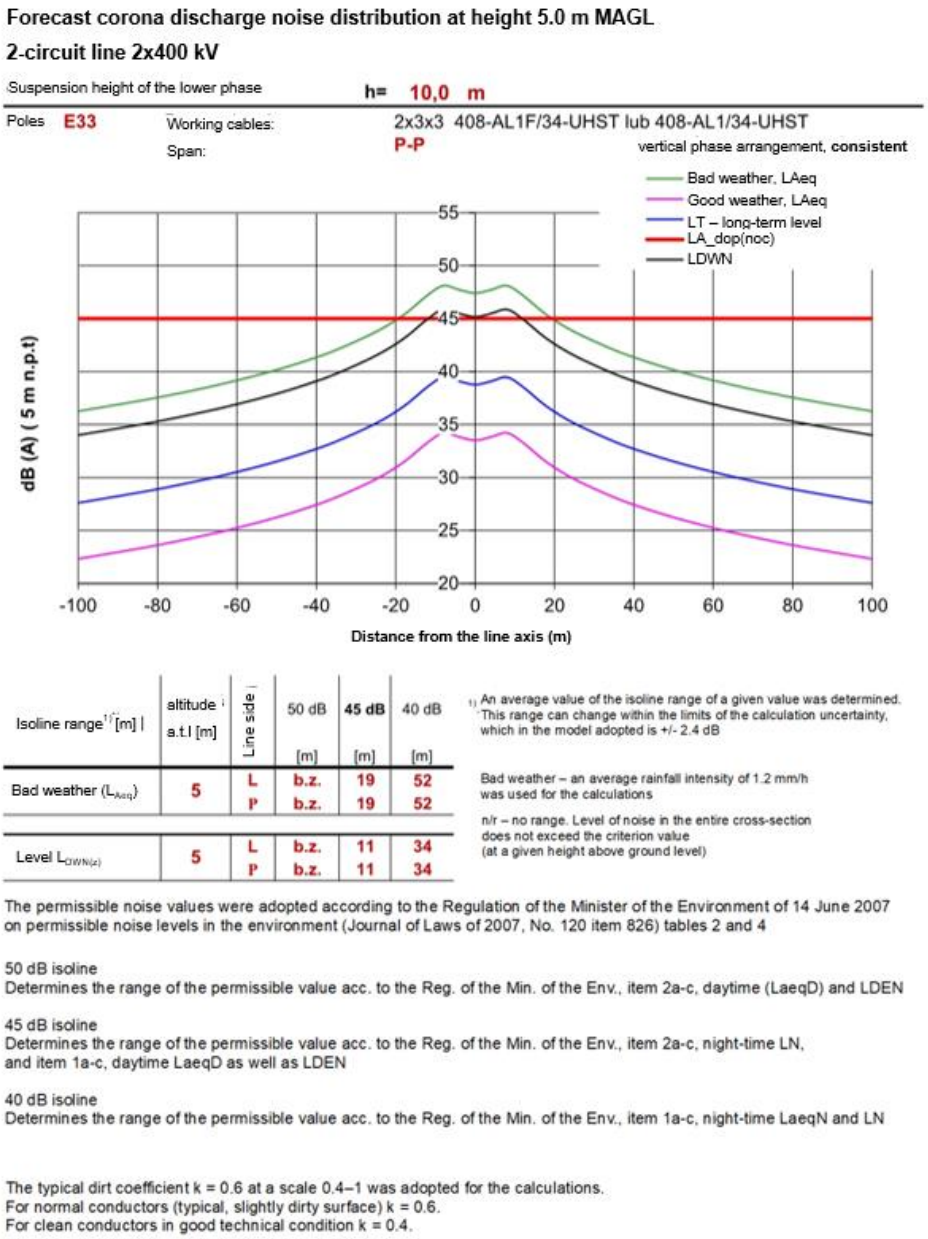


Figure 8. *Calculation results of the forecast distribution of discharge noise at a height of 5.0 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33P span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m.*

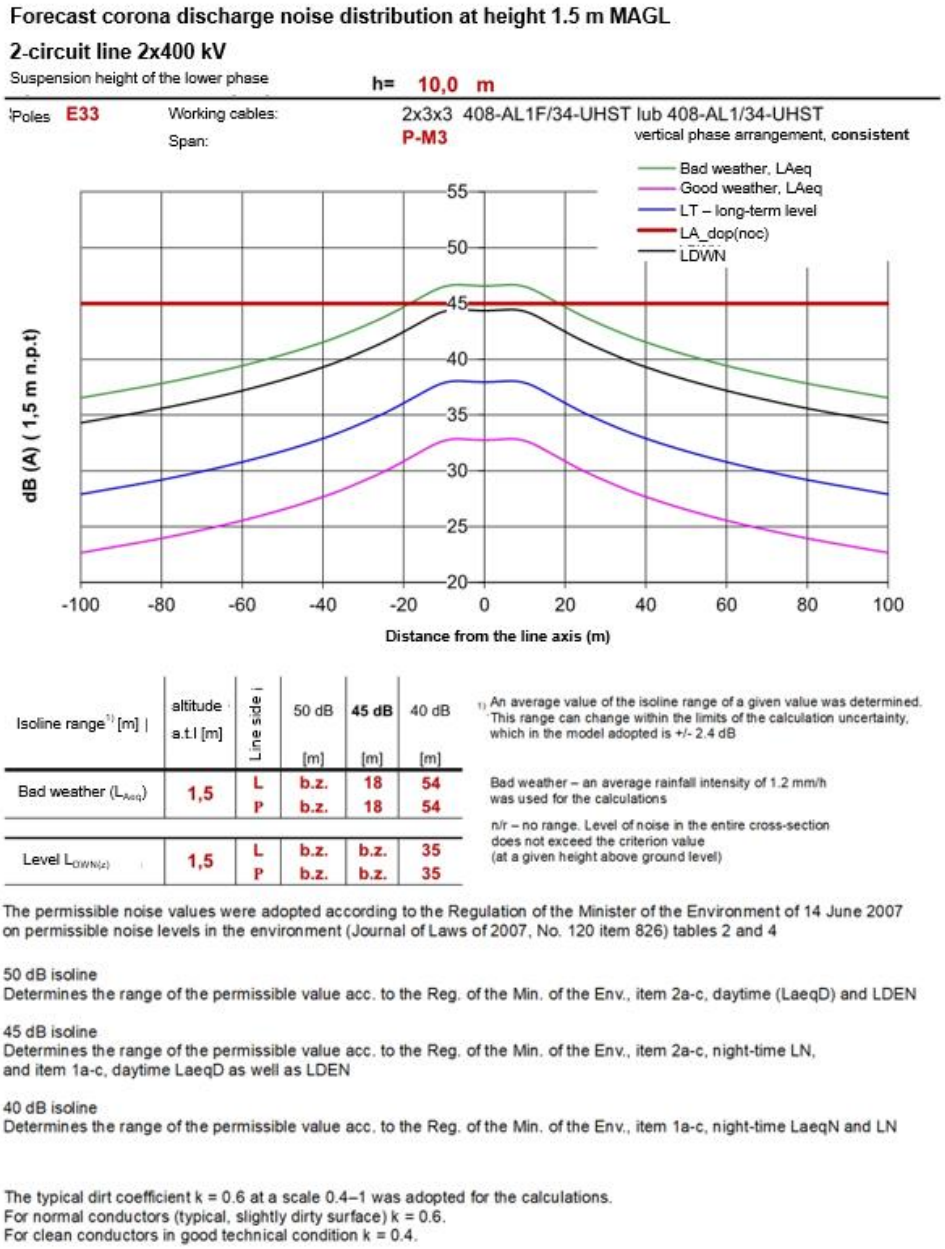


Figure 9. *Calculation results of the forecast distribution of discharge noise at a height of 1.5 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33M3 span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m.*

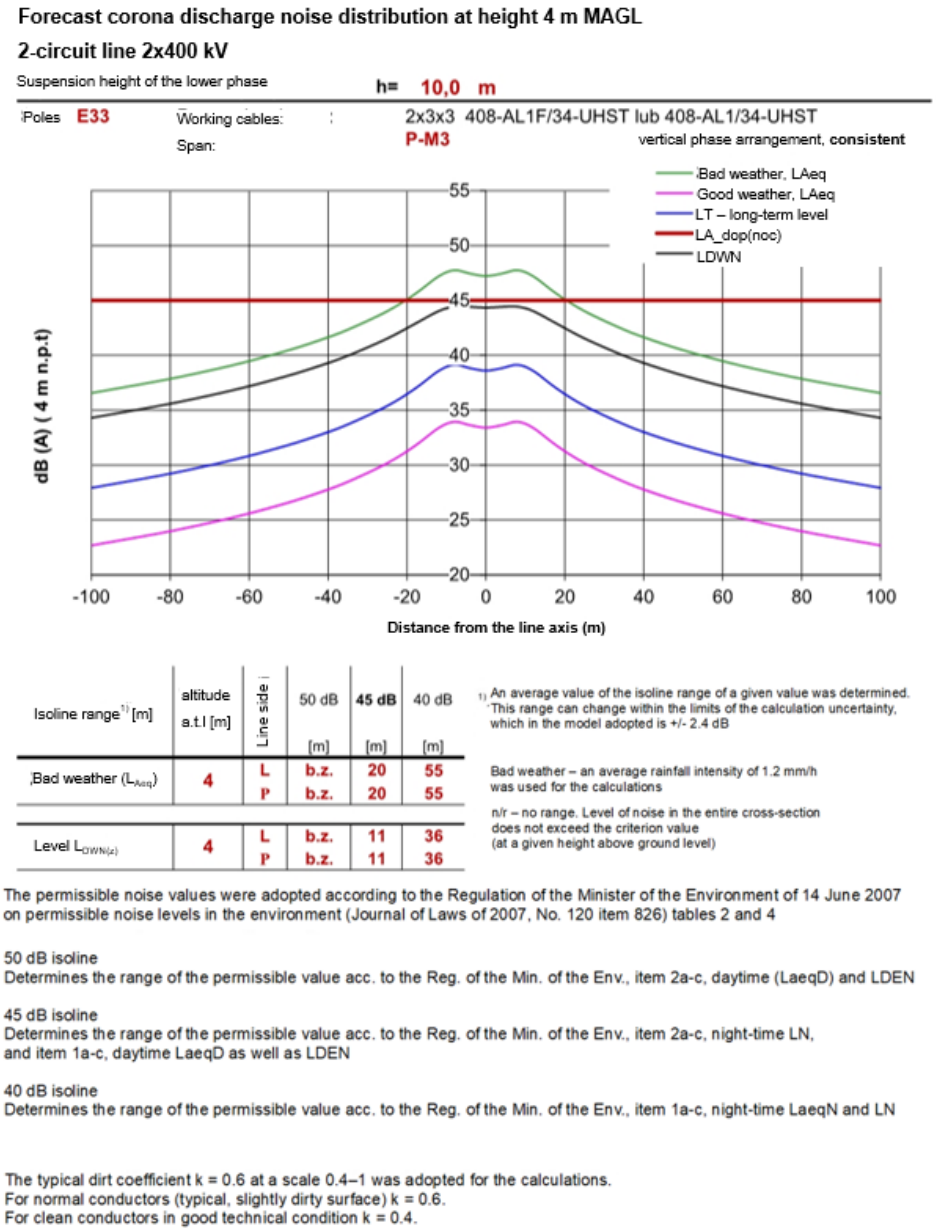
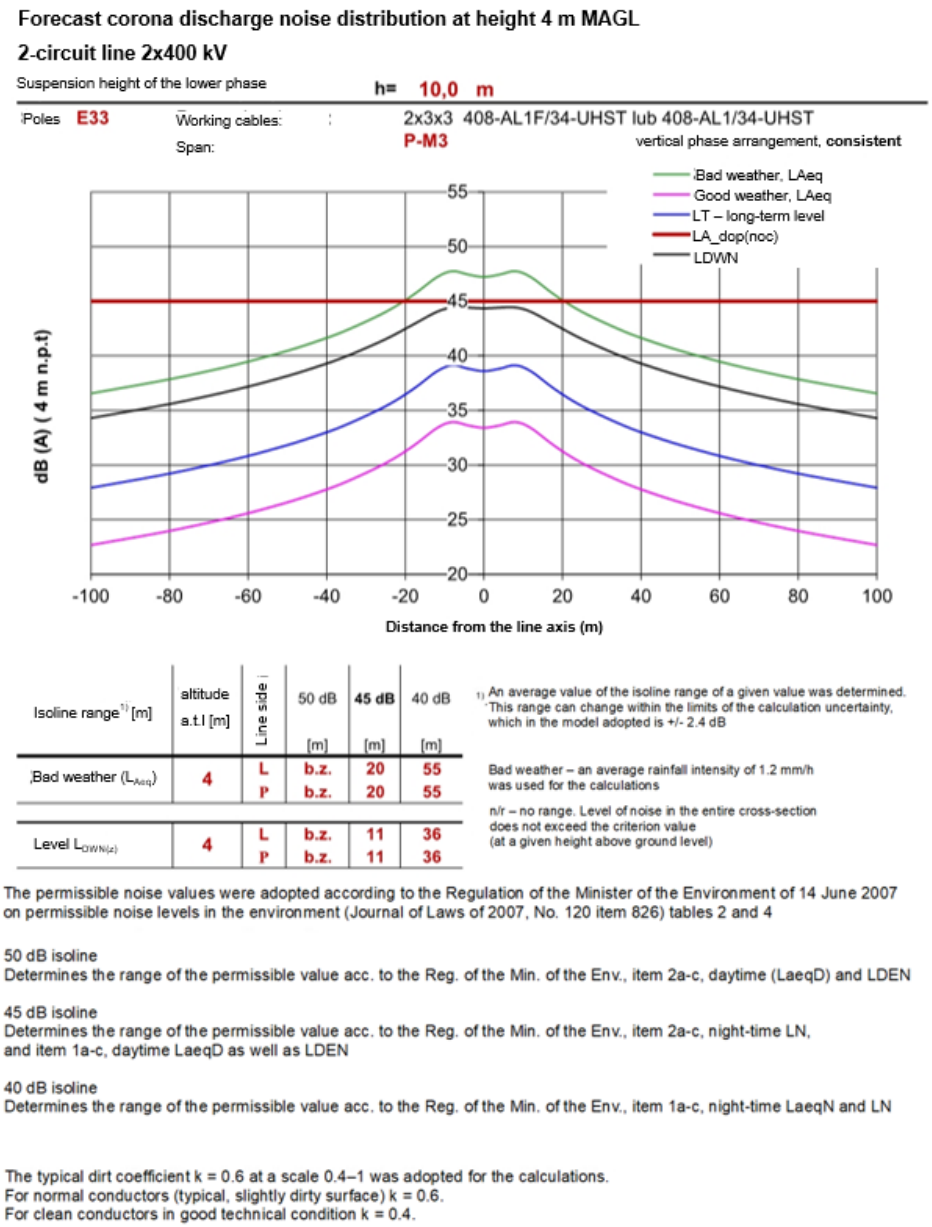


Figure 10. *Calculation results of the forecast distribution of discharge noise at a height of 4.0 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33M3 span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is hmin = 10 m.*



Isoline range[1] [m]	altitude a.t.l [m]	Line side	50 dB [m]	45 dB [m]	40 dB [m]
Bad weather (L_{Aeq})	4	L	b.z.	20	55
		P	b.z.	20	55
Level $L_{DWN(z)}$	4	L	b.z.	11	36
		P	b.z.	11	36

1) An average value of the isoline range of a given value was determined. This range can change within the limits of the calculation uncertainty, which in the model adopted is +/- 2.4 dB

Bad weather – an average rainfall intensity of 1.2 mm/h was used for the calculations

n/r – no range. Level of noise in the entire cross-section does not exceed the criterion value (at a given height above ground level)

The permissible noise values were adopted according to the Regulation of the Minister of the Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws of 2007, No. 120 item 826) tables 2 and 4

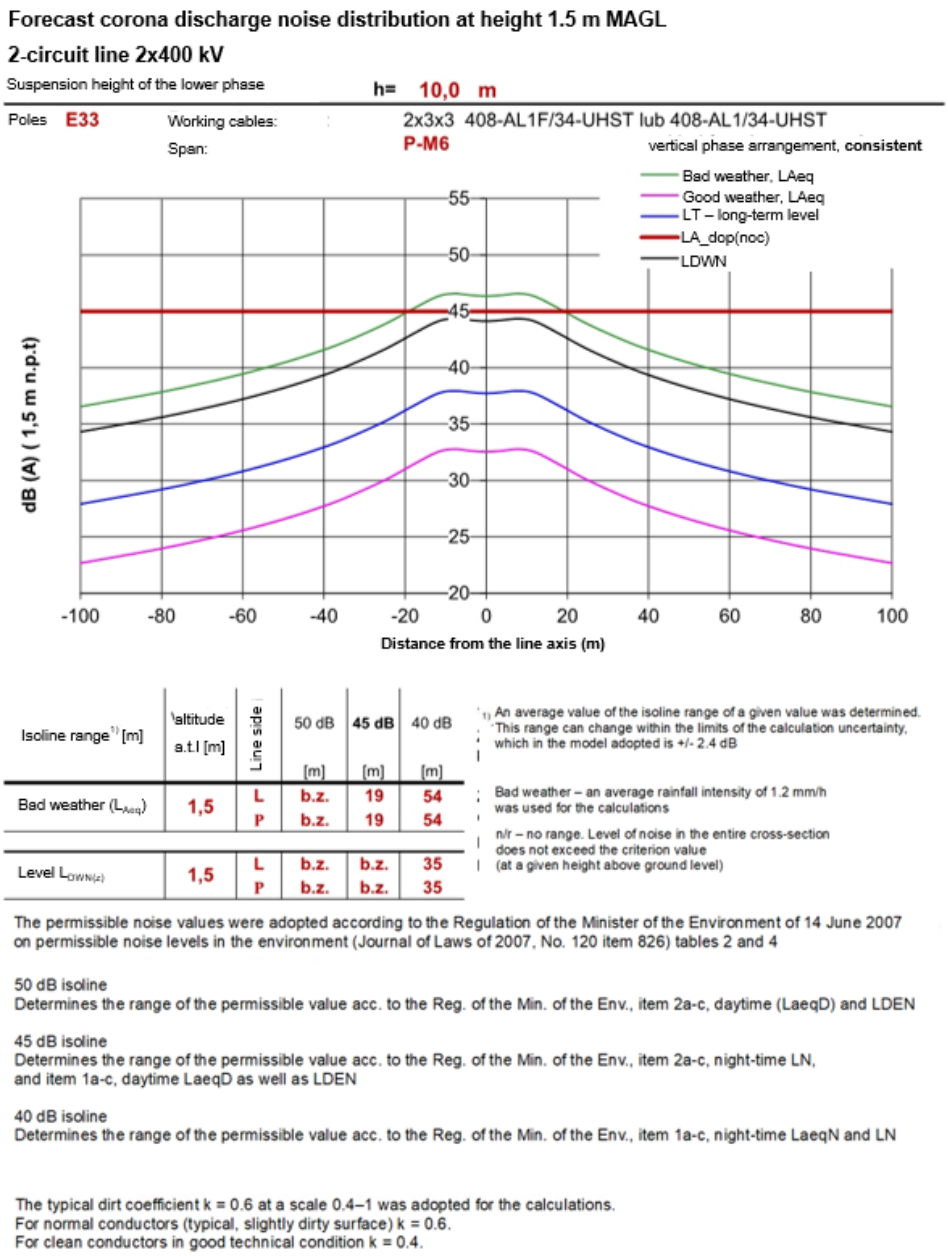
50 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 2a-c, daytime (LaeqD) and LDEN

45 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 2a-c, night-time LN, and item 1a-c, daytime LaeqD as well as LDEN

40 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 1a-c, night-time LaeqN and LN

The typical dirt coefficient k = 0.6 at a scale 0.4–1 was adopted for the calculations.
For normal conductors (typical, slightly dirty surface) k = 0.6.
For clean conductors in good technical condition k = 0.4.

Figure 11. *Calculation results of the forecast distribution of discharge noise at a height of 5.0 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F / UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33M3 span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is hmin = 10 m.*



Isoline range[1)] [m]	altitude a.t.l [m]	Line side	50 dB [m]	45 dB [m]	40 dB [m]
Bad weather (L_{Aeq})	1,5	L	b.z.	19	54
		P	b.z.	19	54
Level $L_{DWN(z)}$	1,5	L	b.z.	b.z.	35
		P	b.z.	b.z.	35

[1)] An average value of the isoline range of a given value was determined. This range can change within the limits of the calculation uncertainty, which in the model adopted is +/- 2.4 dB

Bad weather – an average rainfall intensity of 1.2 mm/h was used for the calculations

n/r – no range. Level of noise in the entire cross-section does not exceed the criterion value (at a given height above ground level)

The permissible noise values were adopted according to the Regulation of the Minister of the Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws of 2007, No. 120 item 826) tables 2 and 4

50 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 2a-c, daytime (LaeqD) and LDEN

45 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 2a-c, night-time LN, and item 1a-c, daytime LaeqD as well as LDEN

40 dB isoline
Determines the range of the permissible value acc. to the Reg. of the Min. of the Env., item 1a-c, night-time LaeqN and LN

The typical dirt coefficient k = 0.6 at a scale 0.4–1 was adopted for the calculations.
For normal conductors (typical, slightly dirty surface) k = 0.6.
For clean conductors in good technical condition k = 0.4.

Figure 12. *Calculation results of the forecast distribution of discharge noise at a height of 1.5 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33M6 span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m*

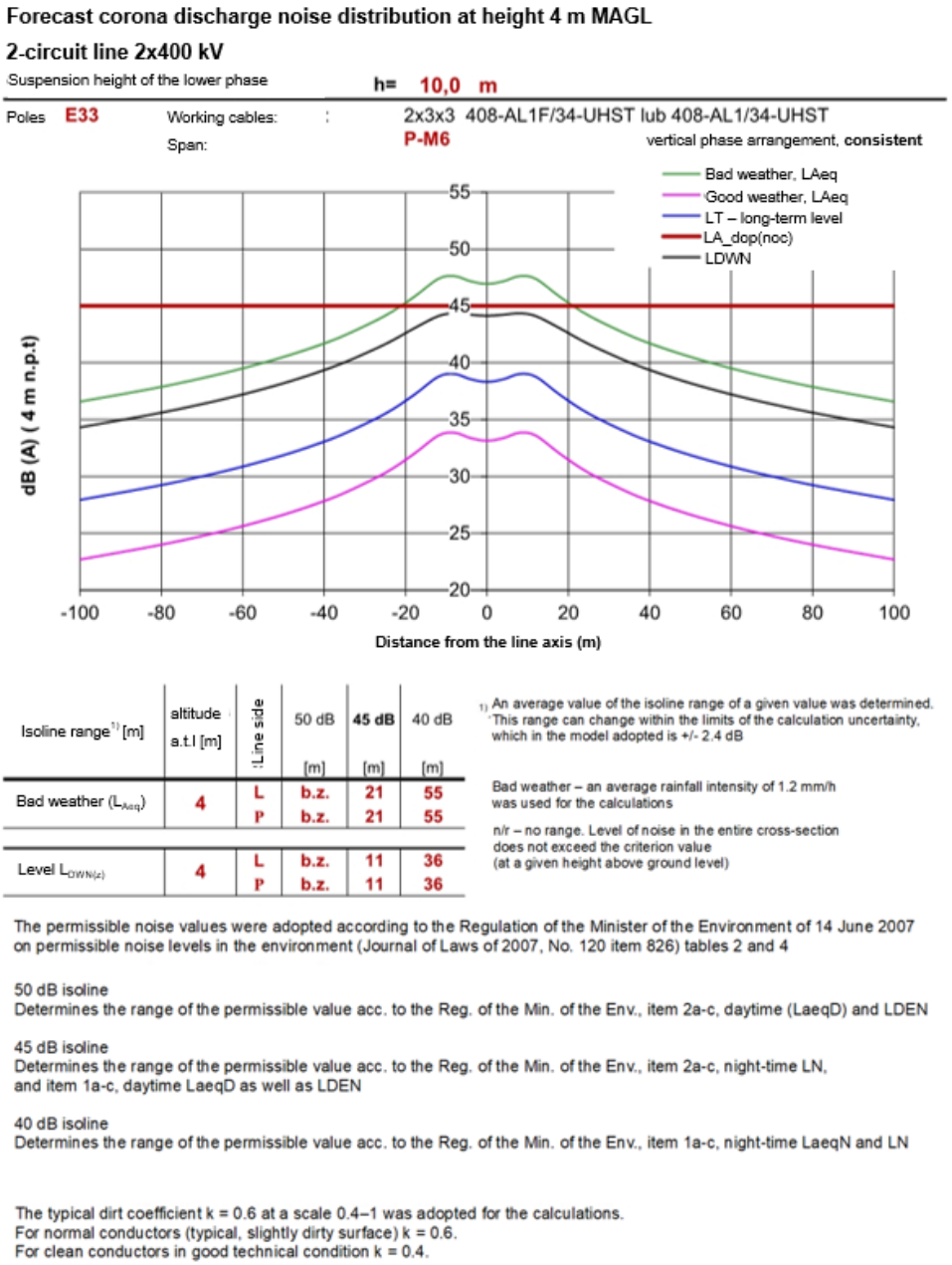


Figure 13. *Calculation results of the forecast distribution of discharge noise at a height of 4 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33M6 span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m.*

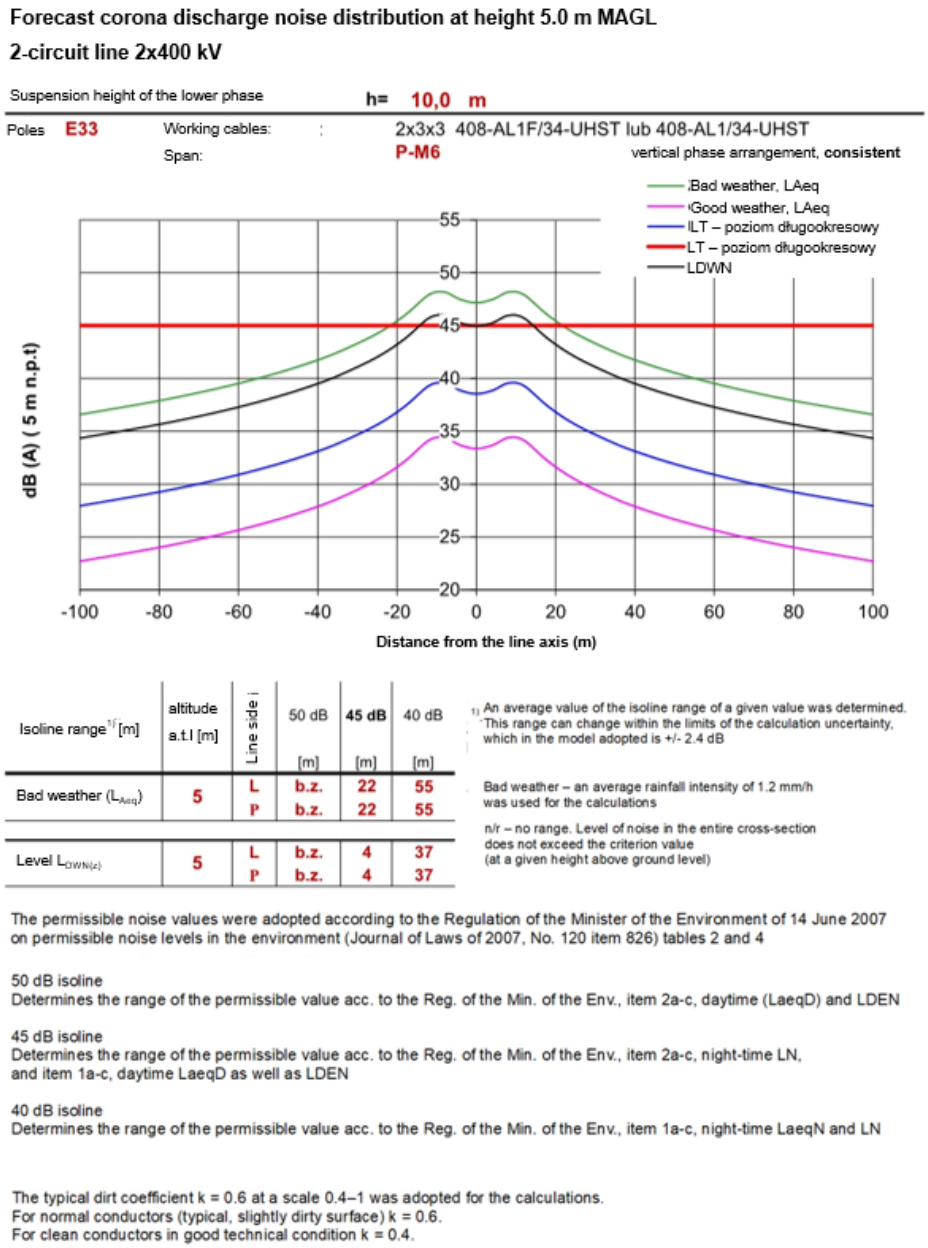


Figure 13. *Calculation results of the forecast distribution of discharge noise at a height of 5 m above ground level accompanying the operation of a double-circuit over-head line of a nominal voltage of 400 kV, built of a three-wire bundle made with 468/24-A1F/UHST-26 cables. Predicted noise levels in the vicinity of the E33P - E33M6 span of the 400 kV line determined in the cross-section where the shortest distance from the ground to the phase conductors is h_{min} = 10 m*

Figures 6-14, in the lower part of the sheet (below the graphs), provide information about the range of the isolines (from the line axis) at the levels: 40, 45 and 50 dB for all calculated parameters (L_{Aeq}, L_T, L_{DWN}). When a given value is not exceeded in any place, "b.z." – outside range is written in the item range. It should be emphasized that the isoline ranges presented in the above-mentioned figures relate to the cross-sections in which the distance between the phase conductors and the ground is the smallest (h_{min} = 10 m). In the cross-sections of the lines where the distance of the

phase conductors from the ground is greater, the ranges of the isolines are correspondingly smaller.

4.2.2 Analysis of the results of the noise level calculations for 400 kV overhead line

It has already been mentioned in earlier parts of the study that the limit value most often used in the assessment of noise accompanying the operation of overhead power lines is 40 or 45 dB at night.

Recognising that for the sake of comparison, the levels of 40 and 50 dB will also be interesting, Tables 6-8 summarize the predicted ranges of individual isolines (40, 45 and 50 dB) for all cases[4] accepted for the calculations (centre of the span, calculations in the place where the distance from the earth of the conductors is the smallest h_{min} = 10 m).

The results of the calculation of the sound level distribution in the environment designed as an alternative option of the 400 kV double-circuit overhead line show that:

- the maximum value of the sound level under the most unfavourable operating conditions of the line (bad weather) will not exceed the following values at any point below the line (at a height of 4.0 m above sea level):
  - in the span made of the E33P-E33P poles: 47.5 dB, which means a value 2.58 dB higher than the permissible value specified in the regulations [1] for residential areas as 45 dB,
  - in the span made of the E33P-E33M3 poles, 47.8 dB, which means a value 2.8 dB higher than the permissible value specified in the regulations [1] for residential areas as 45 dB,
  - in the span made of the E33P-E33M6 poles 47.6 dB, which means a value 2.2 dB higher than the permissible value specified in the regulations [1] for residential areas as 45 dB,
- the area of land under the analyzed 400 kV overhead line, where computational analyses indicate values above the permissible t.i.e. 45 dB (for the areas of residential development) is exceeded, extends (at a height of 4.0 m a.s.l.) to a maximum distance (irrespective of the span) of 18 m from the axis

[4] The most unfavourable cases in terms of the impact of noise on the environment.

of the line in both directions, and thus the area is entirely contained within the so-called "technological zone", 70 m wide (2 x 35 m).

.

- in the vicinity of the system of parallel 400 kV overhead lines, the implementation of residential buildings, due to the possibility of exceeding the permissible noise level value (45 dB), would not be possible in an area 78 m wide (2 x 39 m).

5. LITERATURE

[1] Regulation of the Minister of Environment of 14 June 2007 on the permissible noise levels in the environment (Journal of Laws 2014.112, consolidated text)

[2] Regulation of the Minister of Climate of 30 May 2020 on the method of determining the value of the noise index LDWN. (Journal of Laws 2020.1018)

[3] Instrukcja nr 338 Instytut Techniki Budowlanej. Metoda określania emisji i imisji hałasu przemysłowego w środowisku.

[4] PN-ISO 9613-2:2002. Akustyka – tłumienie dźwięku podczas propagacji w przestrzeni – ogólna metoda obliczania.

[5] Program HPZ'2001 Windows: Wersja: marzec'2012 Licencja Zakładu Akustyki ITB: HPZ-0217 dla Ars Vitae.

[6] Ordinance of the Minister of Climate and Environment dated September 7, 2021 on requirements for conducting emission measurements. Journal of Laws of 2021, item 1710, as amended.

ENVIRONMENTAL IMPACT REPORT OF THE PROJECT NAMED: CONNECTION INFRASTRUCTURE OFFSHORE WIND FARMS OWF BALTIC II AND OWF BALTIC III

ANNEX 5 - CALCULATIONS OF ELECTROMAGNETIC FIELDS EMISSIONS

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Consulting and Engineering Office

September, 2022

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1. TECHNICAL SOLUTIONS AND ENVIRONMENTAL IMPLICATIONS OF POWER EVACUATION FROM OFFSHORE WIND FARMS BALTIC II AND BALTIC III TO THE POWER STATION BELONGING TO PSE S.A. - GENERAL REMARKS

The subject of this study is the identification of individual components of the electromagnetic field related to the implementation of the land connection between the cable exit (from the sea) located in the coastal zone, to which the energy generated in the Baltic II and Baltic III Offshore Wind Farms will reach, and the end station constituting an element of the National Power System (NPS) (in Polish: Krajowy System Elektroenergetyczny (KSE)) Słupsk Wierzbięcino, owned by the national transmission system operator, i.e. Polskie Sieci Elektroenergetyczne S.A.

Possible environmental implications, and in particular their extent, depend on the technology of electric current transmission between the cable exit and the terminal station, which is outlined later in the study.

According to the design concept, electricity transmission between two power stations (LSE) and a power station belonging to PSE S.A. assumes the construction of:

- four power lines (cable lines), each approx. 8 km long, connecting OWF Bałtyk II and OWF Bałtyk III with the planned onshore power stations, consisting of underground cable tracks, each of which will be made of 3 single-core electric cables - power plants supplied with alternating current (AC) with a rated voltage of 220 kV,

  and
- two supply lines (cable lines), each approx. 6 km long, connecting the planned land power stations (LPS) with the PSE S.A. power station included in the national power system, consisting of underground cable lines, each of which will be made of 3 single-core power cables supplied with alternating current (AC) with a rated voltage of 400 kV (option 1),

  alternatively
- one double-circuit high-voltage overhead line (400 kV), connecting the planned onshore power stations (LPS) with the PSE S.A. power station part of the national power system (option 2).

2. ELECTROMAGNETIC FIELD ACCOMPANYING THE OPERATION OF OVERHEAD AND CABLE TRANSMISSION SYSTEMS

2.1. Impact of the electromagnetic field on the environment

Any conductor carrying a current, both an overhead line conductor and a power cable, is a source of an electromagnetic field, which in certain situations, with significant values of individual field components, may have a negative impact on the environment and human health.

The elements of the current lines of most power devices generate an electromagnetic field, which due to the low frequency (50 Hz - the so-called quasi-stationary field) can be identified on the basis of two separately measured components: electric (E - electric field intensity) and magnetic (H - magnetic field intensity).

Electric fields with significant intensity values are generated mainly by elements of high-voltage systems, while the magnetic component reaches relatively high values in the vicinity of high-current circuits.

High voltage power cables (220 and 400 kV), due to the presence of sheaths shielding the working conductor of the cable, are not the source of the electric field, as its normal (radial) component disappears completely due to the presence of a semiconductive screen surrounding the working conductor, copper or aluminum, and a conductive screen surrounding the insulating sheath. Consequently, estimating the levels of the electrical component outside the cable has no justification whatsoever.

On the other hand, the electric current flowing through the working conductor of the cable is the source of the magnetic field of relatively high values. The value of this field, usually determined above the cable line, to a height of 2.0 meters above ground level (in accordance with the requirements of the Regulation of the Minister of Climate of February 17, 2020 *on the methods of checking compliance with the permissible levels of electromagnetic fields in the environment* [2]), the depth of laying the cable line underground and the distance between individual conductors (phases) forming a common electric circuit (cable run) have a decisive influence.

Reports on the negative impact on living organisms of the magnetic component of the electromagnetic field have appeared in the scientific literature for quite a long time, and although the mechanism of the impact of electromagnetic fields on biological

structures is not thoroughly known, regulations have been introduced in many countries, including Poland, limiting exposure to these types of fields.

The legal act on protection against the effects of electromagnetic fields in environmental exposure is the Regulation of the Minister of Health of 17 December 2019 *on the permissible levels of electromagnetic fields in the environment* [1].

Pursuant to the provisions of this ordinance (appendix to the aforementioned ordinance), the electromagnetic field level with a frequency of 50 Hz allowed in the environment should not exceed the following limit values in places accessible to the public:

- electric field strength (E) - 10 kV / m,
- magnetic field strength (H) - 60 A / m.

Therefore, it is recognized, similarly to the provisions of the regulations in force in other countries, that fields with the above levels (and also those with lower levels) do not adversely affect any of the environmental elements (plants, animals, water or air), including humans, at the same time, not showing any cumulative and synergistic effects.

However, the cited legal act contains two important limitations regarding the above-mentioned limit values. One of them relates directly to the electric field (the electric component E of the electromagnetic field) with a frequency of 50 Hz. It stipulates that in areas designated for housing development, the electric component (E) of the electromagnetic field with a frequency of 50 Hz must not exceed the value of 1 kV/m. This limitation, which is important in the case of high-voltage overhead lines, has no significance in the case of cable lines, including high-voltage cable lines, because, as already mentioned, power cables equipped with shielding coatings are not a source of an electric field penetrating into the environment (to the ground and air).

2.2. Determination of the strength distribution of the electric and magnetic field by analytical methods - Theoretical basis of calculation methods

In the case of the designed overhead or cable lines, the distribution of electric[1] and magnetic field intensity, including the maximum value of each of the field components, is determined by calculation methods. In the same way, the width of the area in

[1] In the case of cable lines, it is difficult to talk about the determination of the electric field strength distribution outside the cable sheath. This field, identified outside the outer sheath of the cable, is negligible due to the screening properties of the cable sheaths

the vicinity of the overhead line is determined in which the electric field strength may exceed the limit value for residential areas[2] (1 kV / m).

There are many computer programs for the separate calculation of the distribution of each component of the electromagnetic field: electric (E) and magnetic (H). They most often use the so-called method of mirroring and superposition, although there are also known computational algorithms based on the so-called finite element method (FEM).

According to the principle of superposition, the electric (or magnetic) field at any point in the space surrounding the overhead line conductors or cable track is the sum of the fields from all conductors of the line or cable.

In the case of overhead lines, the mirror reflection method is used to determine the electric field generated by charged bodies that are in a heterogeneous environment, e.g. near the ground. In this method, a heterogeneous environment with different electric permittivity, in which charged bodies are placed, can be replaced with a homogeneous environment by introducing appropriate fictitious charges. When introducing fictitious charges, the condition of equality of the tangent components of the electric field intensity vector and the normal components of the electric induction vector at the boundary of the two environments must be met.

Most computer programs based on the superposition and mirror image method also use the simplifying assumption, according to which each line conductor stretched between poles or each cable line is modeled with a rectilinear, infinitely long conductor, with a diameter characteristic for a specific type of real conductor or cable.

The computational algorithms used to analyze the distribution of the electric and magnetic field generated by overhead and cable lines[3] are very complex and the authors of this study found it pointless to present them here.

It should be emphasized that for the calculations of the E or H distribution, which are most often carried out in a cross-section perpendicular to the axis of a line or a cable track (only the magnetic component), are always taken the designed, shortest distances of wires or cables from the calculation point. This means that in the case of overhead lines, calculations of the electric and magnetic field distribution (including the maximum values of individual components) are performed for the shortest distance from the ground of the phase conductors. In the case of cable tracks, calculations of

[2] And also areas (plots) where residential buildings are already located.
[3] Calculation algorithms for cable lines are used to determine only the magnetic component of the field.

the magnetic field distribution over the cable line (including the maximum value of this component) are performed for the smallest[4], designed cable insertion depth.

2.3. Power transmission on AC power supply tracks

Taking into account that the planned cable lines or overhead lines should ultimately provide power transmission of 1500-2000 MW, the maximum load of each line can be estimated at approx. 1000 A when operating 4 lines at 220 kV and approx. 1300 A for the operation of 2 lines at a voltage of 400 kV.

Although the determination of the number of AC cable tracks or the number of overhead lines ensuring the transmission of the assumed power should be preceded by appropriate reliability analyzes, for the purposes of this study, as it was mentioned before, it was assumed that 4 (at 220 kV) or 2 (at 400 kV) cable supply lines (cable tracks), in which single-core cables will be used connected to the phases: L1, L2 and L3 or - alternatively - one double-circuit 400 kV overhead line. Each of the applied solutions will result in slightly different environmental implications, which will be described later in the study.

From a technical point of view, the use of several cable tracks for the transmission of electricity means that, depending on their number, it will be necessary to use cables with different conductor cross-sections, and these may be cables with an aluminum or copper conductor. Due to the different specific resistivity of the mentioned materials, the cross-sections of the cables to be used, as well as their permissible current carrying capacity, will be different. With the maximum load capacities of individual cable lines assumed in the conceptual design, i.e. 1000 A for tacks operating at 220 kV and 1250 A for tracks operating at 400 kV, the selection of a specific type of cable (with an aluminum or copper core) has a negligible impact on magnetic field distribution in the vicinity of cable tracks. However, it should be remembered that the selection of the cable conductor cross-section, determining the possibility of its long-term loading, may be of significant importance for the natural implications, especially for the flora and fauna in the immediate vicinity of each cable.

[4] It should be remembered that along the entire length of the cable line, the depth of the cables being buried in the ground may be different, and the calculations of the distribution of the magnetic field strength are made for the smallest of these distances.

If an alternative solution for the transmission of electricity to the PSE S.A. substation is adopted, i.e. the use of the second 400 kV overhead line, the adoption of the above-mentioned current capacity of each track determines the necessity to use steel-aluminum cables of the 468/24-A1F/UHST-261 mm2 type, in the form of a three-wire bundle in every phase.

2.4. Calculations of the electric and magnetic field intensity distribution in the vicinity of the overhead line

2.4.1. Data for calculations

The analysis of theoretical dependencies determining the calculation algorithm shows that the maximum value and the distribution of the electric (E) and magnetic (H) field strength in the vicinity of the overhead line are mainly influenced by the following parameters:

- phase voltage of individual tracks of the line (affects only the distribution of electric field intensity) - 400 kV
- line load current (affects only the distribution of the magnetic field strength) - I_{max} (for each circuit) = 1250 A,
- distance from the ground of the phase conductors - h_{min} = 10 m,
- spacing between phase conductors (according to the configuration of conductors on the pole),
- phase conductor arrangement (phase configuration) in multi-circuit (double-circuit) lines.

The other construction elements of the line have a lesser influence on the electric field strength distribution. Moreover, the distribution of the electric field strength in the vicinity of the line is influenced by elements of the environment located in its immediate vicinity - such as trees (forest), buildings, etc., and determining the influence of these elements on the field distribution is generally only possible on the basis of measurements.

The distribution of both the electric and magnetic fields changes depending on the phase arrangement in the individual tracks of the overhead line. Thus, for the calculation of the distributions of both field components, the phase system in individual tracks was adopted (the same system) as proposed in the technical documentation.

With a specific line structure (series and type of poles) and the assumed phase configuration, as well as with a fixed value of the phase voltage, the electric field strength in its vicinity depends primarily on the distance between the phase conductors and the ground. The field intensity increases with the decrease in this distance, and the highest value is obtained in the cross-section of the line where the distance of the phase conductors from the ground is the smallest - usually in the middle of the span.

Calculations of the electric field distribution (similar to the magnetic field) were carried out for 3 representative spans of a double-track[5] overhead line, intended to be constructed on typical E33 lattice poles, with an exemplary dimensioned silhouette with the layout of tracks and phases shown in Figure 1. The analyzed spans are line sections composed of the following pairs of columns:

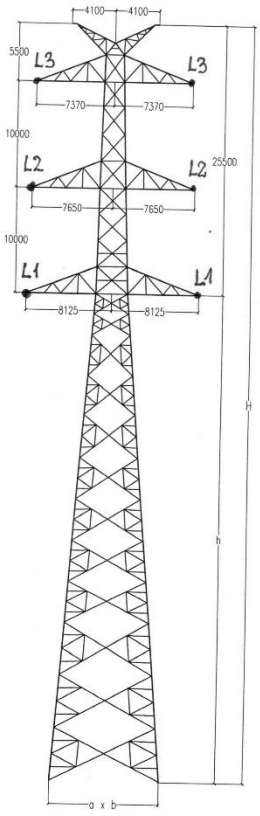
- E33P – E33P (P – through pole),
- E33P – E33M3 (M3 – strong pole),
- E33P – E33M6 (M6 strong pole).

These spans are representative as they illustrate cases (places in the vicinity of the line) in which the electric (and magnetic) field strength can reach its maximum values in the vicinity of the entire line. As a result, the intensities of both field components in any other spans of the line will certainly not be greater than those determined in the representative spans.

It should be stated here that the task of the authors of the study is to check whether, under the technical assumptions adopted in the documentation, environmental quality standards may be exceeded, also under the most unfavorable operating conditions of the line (the shortest designed distance of the phase conductors from the ground and the maximum voltage phase and line load). In such a situation, it is neither advisable nor necessary to carry out detailed calculations of the distribution of both field components in all spans of the line, if it has been shown that in the span where this distance is the smallest (according to the design assumptions: h_{min} = 10 m) the permissible levels of individual components of the field (environmental quality standards) will not be exceeded.

[5] Each track of the line is connected to an appropriate power substation (LSE).

POLE SILHOUETTE E33$_{K-S}$P



Phase wires	2x3x3x AFL-8 350 mm² (357-AL1/46-ST1A)
Phase wire tension at temp. +10°C	3x 22,7 kN
Lightning conductors	2x AFL-1,7 95 mm² (85-AL1/49-ST1A)
Lightning conductor tension at temp. +10°C	13,7 kN
Wind span	500 m
Weight span	600 m
Line break angle	180°-178°
Steel	S355J2, S235JR

POLE TYPE	DIMENSIONS [M]			POLE WEIGHT [t]
	h	H	a x b	
±0	36,5	62,0	8,80x5,30	18,57
+5	41,5	67,0	9,60x5,78	21,10
+10	46,5	72,0	10,39x6,27	23,78

Fig. 1. Dimensioned silhouette of a 400 kV double-circuit lattice pole, which is to be an alternative to cable runs, a method of transmitting electricity from power stations (LSE) to the PSE S.A substation.

As already mentioned, due to the fact that the maximum value of the electric field E_{max} and magnetic H_{max} under the line should be expected in a situation where the distance from the ground of the lowest suspended conductor is the smallest ($h = h_{min}$), the calculations were carried out for the smallest[6] designed distance of the conductor phase-earth, h_{min} = 10 m. The results of calculations of the electric (E) and magnetic (H) field strength distributions, which were carried out for the above-described cross-sections perpendicular to the line axis, are presented in Figures 2-7.

[6] The shortest distance of cables from the ground that occurs in a given span of the line depends on many factors, the most important of which are: the height of the poles, the span, the tension of the cables, the topography and the presence of objects under the line (intersections and approaches)

2.4.2. Calculations of the electric and magnetic field intensity distribution in the vicinity of the double circuit overhead line

The results of the calculations of the expected maximum values of the electric (E) and magnetic (H) field strength determined at a height of 2.0 m above the ground level, assuming the most unfavorable operating conditions of the line from the environmental point of view, i.e. rated voltage U = 400 kV and the permissible load capacity of each track with Imax = 1250 A current, is presented in table 1.

Table 1. The results of the calculations of the expected maximum values of the electric (E) and magnetic (H) field strength and the width of the area in which residential buildings are unacceptable (E> 1 kV / m) in the vicinity of the 400 kV double-circuit overhead line, at the load of each track with the current Imax = 1250 A. Calculations were made at the height of 2.0 m above area level.

Type of span	The maximum expected value of the electric field strength E. (kV / m)	Maximum expected value of the magnetic field strength H (A / m)	The width of the area under the line in which the implementation of residential development is unacceptable - the area where E> 1 kV / m)
P – P	8,2	16,1	-25 m ÷ +25 m
P – M3	8,5	16,5	-24 m ÷ +24 m
P – M6	8,2	16,1	-25 m ÷ +25 m

The results of the calculations of the distribution of the expected maximum values of both field components in the vicinity of the 400 kV double-circuit line, which is an alternative solution for connecting power stations (LSE) with the PSE S.A. substation, constituting an element of the National Power System, are presented in Figures 2 - 7.

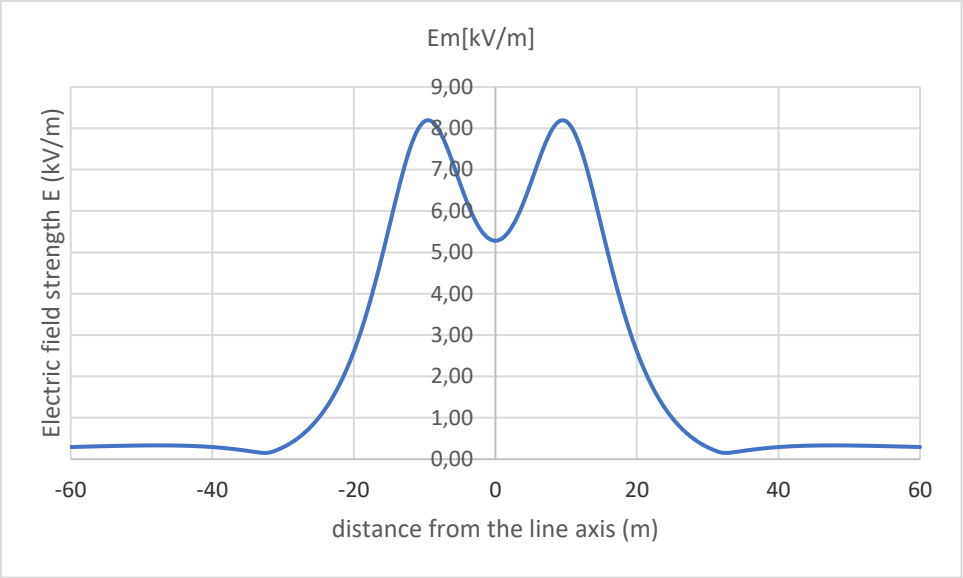


Fig. 2. The results of calculations of the electric field strength distribution E in a span composed of P-P series E33 poles **(through-line poles), in the vicinity of the designed line - power evacuation from LSE (alternative variant). The calculations were carried out in the cross-section where the distance from the ground of the lowest suspended wires is h_{min} = 10.0 m, with the most unfavorable line operating conditions (maximum wire sag, U_{rdop} = 420 kV**)

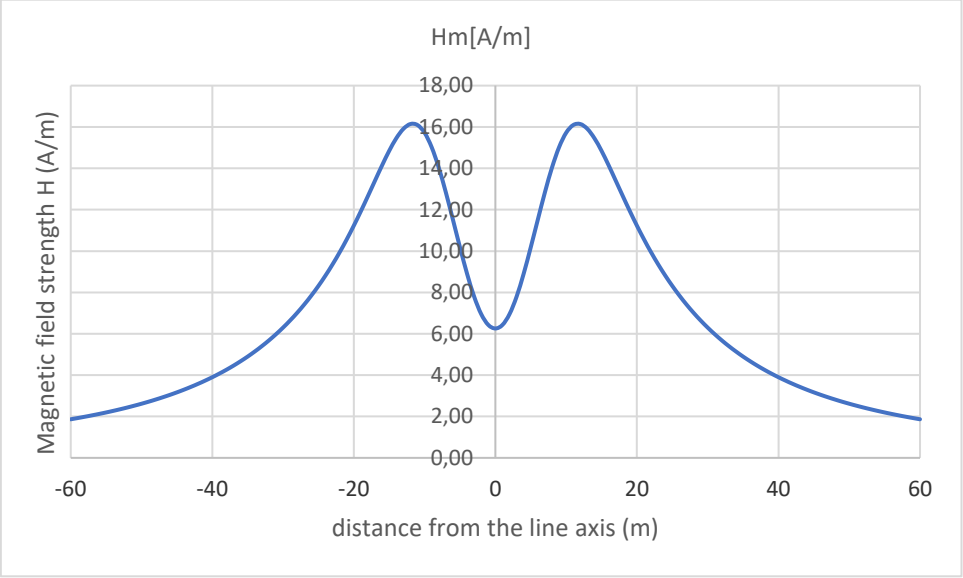


Fig. 3. The results of calculations of the magnetic field strength distribution H in a span composed of P-P series E33 poles (through-line poles), in the vicinity of the designed line - power evacuation from LSE (alternative variant). The calculations were carried out in the cross-section where the distance from the ground of the lowest suspended wires is h_{min} = 10.0 m, with the most unfavorable line operating conditions (maximum wire sag, U_{rdop} = 420 kV). Each track load I_{max}=1250A)

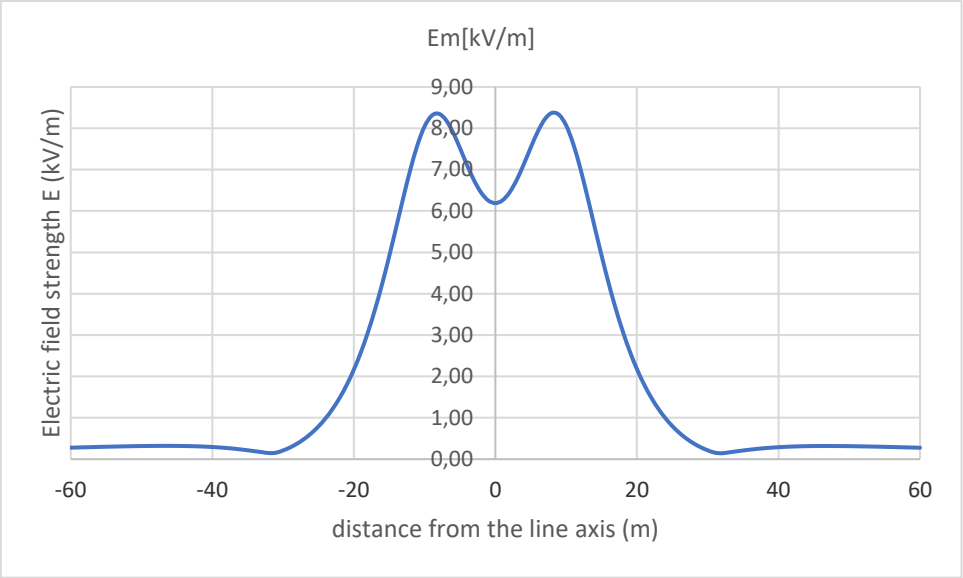


Fig. 4. The results of calculations of the electric field strength distribution E in a span composed of P-M3 series E33 poles (through pole strong pole M3), in the vicinity of the designed line - power evacuation from LSE (alternative variant). The calculations were carried out in the cross-section where the distance from the ground of the lowest suspended wires is h_{min} = 10.0 m, with the most unfavorable line operating conditions (maximum wire sag, U_{rdop} = 420 kV)

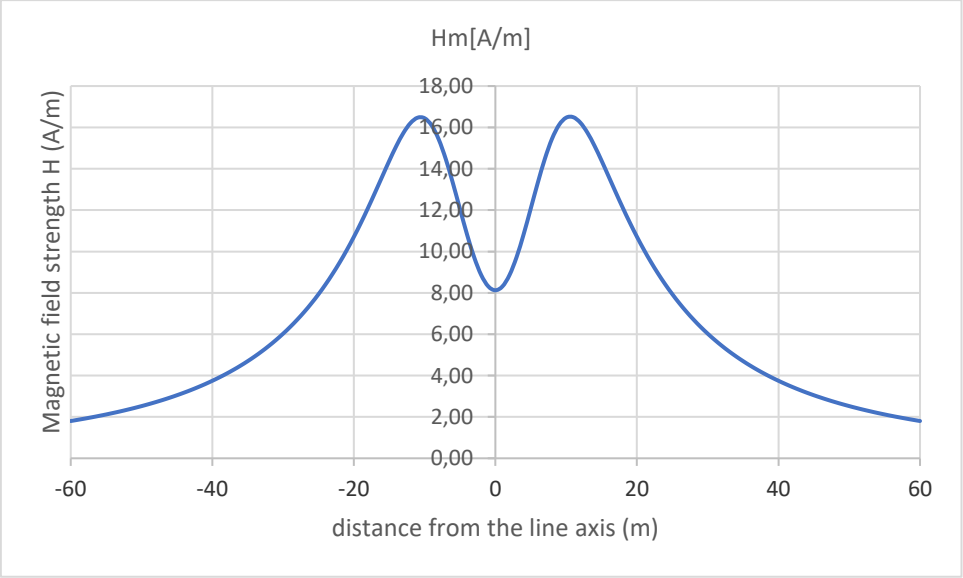


Fig. 5. The results of calculations of the magnetic field strength distribution H in a span composed of E33 series P-M3 poles (through poles strong pole M3), in the vicinity of the designed line - power evacuation from LSE (alternative variant). The calculations were carried out in the cross-section where the distance from the ground of the lowest suspended wires is h_{min} = 10.0 m, with the most unfavorable line operating conditions (maximum wire sag, U_{rdop} = 420 kV). Each track load I_{max}=1250A)

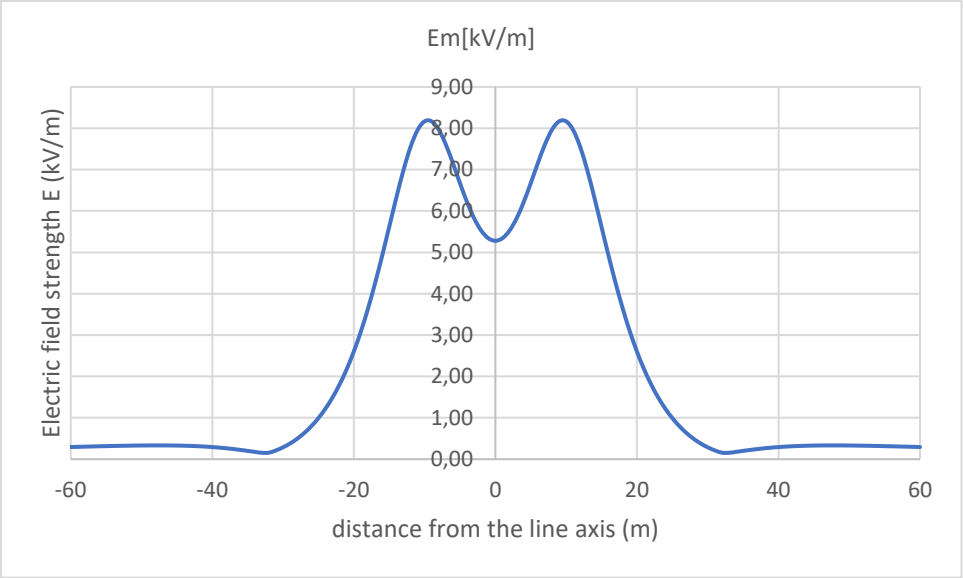


Fig. 6. The results of calculations of the E electric field strength distribution in a span composed of E33 series P-M6 poles (through pole strong pole M3), in the vicinity of the designed line - power evacuation from LSE (alternative variant). The calculations were carried out in the cross-section where the distance from the ground of the lowest suspended wires is h_{min} = 10.0 m, with the most unfavorable line operating conditions (maximum wire sag, U_{rdop} = 420 kV)

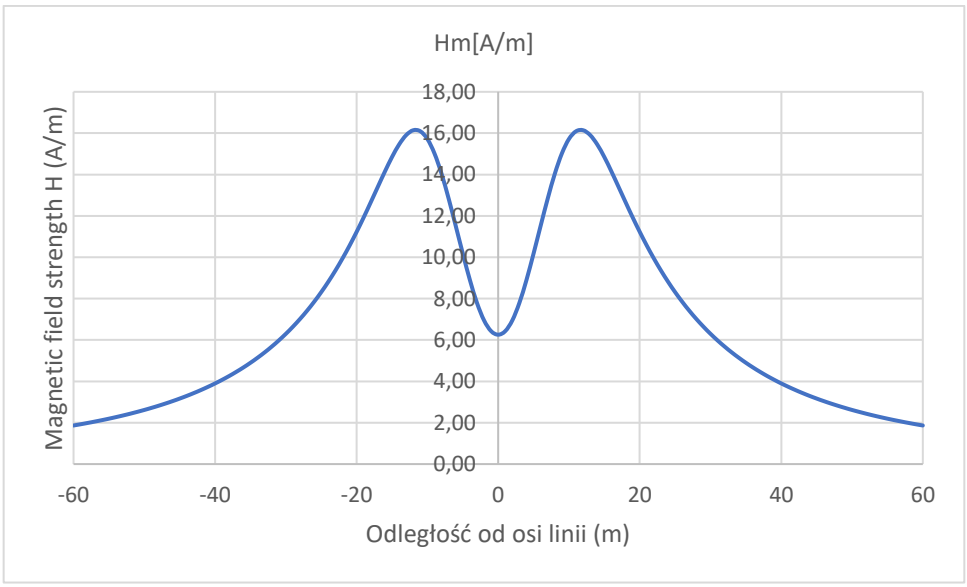


Fig. 7. The results of calculations of the magnetic field strength distribution H in a span composed of E33 series P-M6 poles (through poles strong pole M6), in the vicinity of the designed line - power evacuation from LSE (alternative variant). The calculations were carried out in the cross-section where the distance from the ground of the lowest suspended wires is h_{min} = 10.0 m, with the most unfavorable line operating conditions (maximum wire sag, U_{rdop} = 420 kV). Each track load I_{max}=1250A)

The calculations that were carried out for the shortest distance from the ground of the phase conductors (h = h_{min}) showed that the electric field strength (E) under the

line (anywhere at a height of 2.0 m above area level) will not exceed the value at any point: **8.5 kV / m**, and this value may occur only in the case of the maximum cable sag, i.e. in the most unfavorable line operating conditions. This means the expected maximum values of the electric field intensity, regardless of the span analyzed, do not exceed the limit value of this value (Edop = 10 kV / m) established in the applicable regulations for places accessible to people.

In the area up to -25 m ÷ +25 m from the line axis, the permissible value of electric field intensity determined for areas intended for residential development (1 kV / m) may be exceeded, which means that in the area under the 50 m wide line, residential buildings are not allowed. If the alternative variant, i.e. the construction of a double-circuit 400 kV overhead line, is implemented, this issue will be sanctioned by establishing a transmission easement in an area with a width of 70 m (2 x 35 m).

Calculations that were carried out for the shortest distance from the ground of the phase conductors ($h = h_{min}$) showed that the magnetic field strength (H) under the line (anywhere at a height of 2.0 m above area level) will not exceed the following values at any point: **16, 5 A / m**, and this value may occur only with the maximum sag of the conductors and its maximum current load (I_{max} = 1250 A), i.e. under the most unfavorable line operating conditions. This means the expected maximum values of the magnetic field intensity, regardless of the span under analysis, do not exceed the limit value of this size (H_{dop} = 60 A / m) established in the applicable regulations for places accessible to people and areas intended for residential buildings.

2.5. Calculations of the distribution of the magnetic field around the designed cable track

2.5.1. Data for calculations

All calculations of the magnetic field intensity distribution were made with the use of the PolE-M computer program, in which the following assumptions were made:

- Cable tracks operating on a voltage of 220 kV

  4 cable tracks, each of which consists of 3 single ones, i.e. a total of 12 cables supplied with alternating voltage with the value of U_{n1} - 220 kV with the permissible cable load capacity $I_{(220kV)}$ = 1000 A,

  - distance between cable tracks (track axes): 250 cm,

- ❖ cable insertion depth: 1.3 m below the ground surface,
- ❖ arrangement of cables in the track: triangular (cables arranged in a butt joint),
- ❖ phase arrangement in each cable track: L1 L2 L3 (counting from the left - fig. 8),
- ❖ cable outer diameter:

- approx. 129 mm for cables with a copper Cu core (cross-section approx. 2500 mm^2),

- approx. 134 mm for cables with Al aluminum conductor (cross-section approx. 3000 mm^2).

- Cable tracks operating at a voltage of 400 kV

2 cable tracks, each of which consists of 3 single ones, i.e. a total of 6 cables supplied with alternating voltage with the value of U_{n1} - 400 kV with the permissible cable load capacity $I_{(220kV)}$ = 1250 A,

- ❖ distance between cable tracks (track axes): 500 cm,
- ❖ cable insertion depth: 1.3 m below the ground surface,
- ❖ arrangement of cables in the track: triangular (cables arranged in a butt joint),
- ❖ phase arrangement in each cable track: L1 L2 L3 (counting from the left - fig. 9),
- ❖ cable outer diameter:

- approx. 142 mm for cables with a copper Cu core (cross-section approx. 2500 mm^2),

- approx. 147 mm for cables with Al aluminum conductor (cross-section approx. 3000 mm^2).

Calculations of the magnetic field distribution for individual solutions (options) were made by identifying the values of the said quantity at heights: 0.2; 1.0 and 2.0 m above area level, in accordance with the recommendation indicated in the regulation [2].

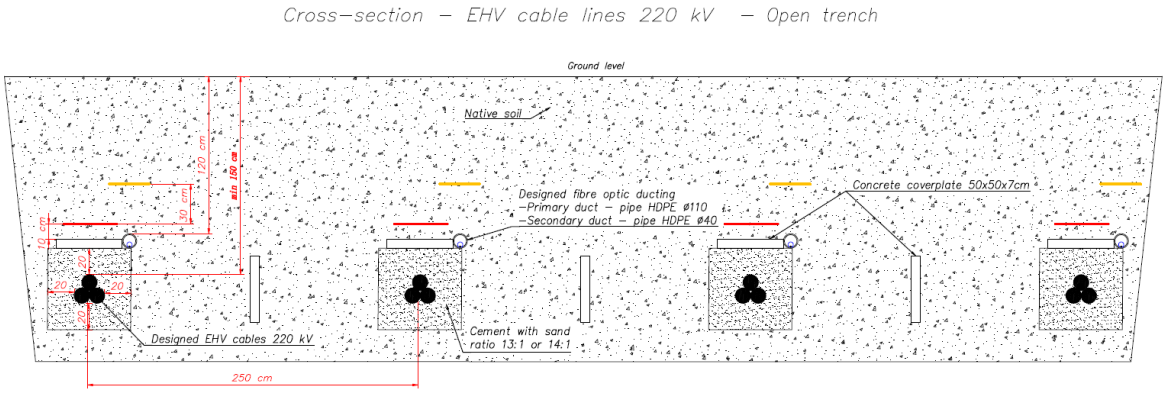


Fig. 8. View of the channel in which the cables (4 cable tracks) operating at 220 kV will be inserted. The designed depth of cables is 1.3 m below the surface. General drawing.

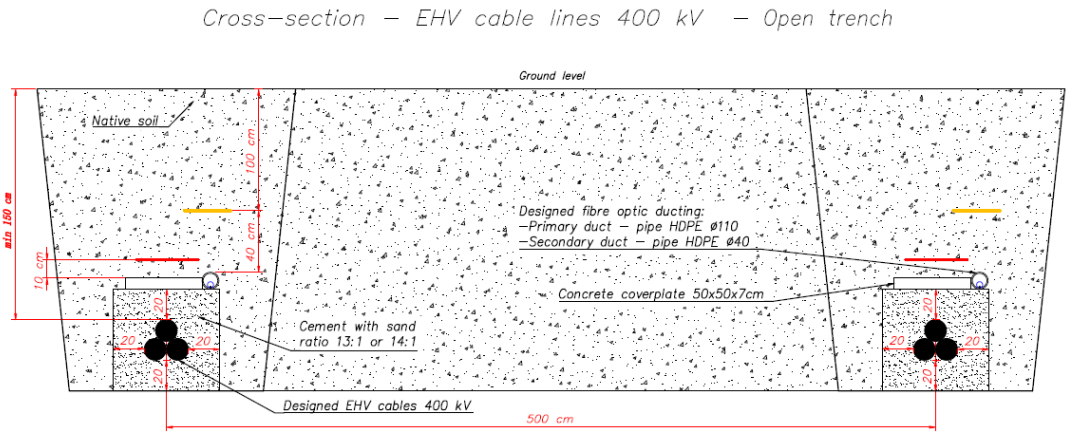


Fig. 9. View of the channel in which the cables (2 cable tracks) operating at 400 kV will be inserted. The designed depth of cables is 1.3 m below the surface. General drawing.

2.5.2. The results of calculations of the magnetic field distribution in the vicinity of the designed cable tracks

The results of calculations of the maximum values of the magnetic field strength (H) that can be expected over the supplying cable runs operating at 220 and 400 kV are presented in Table 2, while the diagrams of the magnetic field intensity (H) cross-section across the axis of the cable run are shown in Fig. 10 - 21.

Table 2. Calculation results of the expected maximum values of the magnetic field strength (H) in the vicinity of cable tracks operating at 220 kV and 400 kV, with the current load of each track with $I_{(220kV)}$ = 1000 A and $I_{(400kV)}$ = 1250 A. The calculations were made for the technical data of cable lines described in the text.

Option	Current (maximum) of cable track load $I_{(220kV)}$ = 1000 A.			Current (maximum) of cable track load $I_{(400kV)}$ = 1250 A.		
	The maximum value of the magnetic field strength H [A / m] determined at the height of: [A / m]			The maximum value of the magnetic field strength H [A / m] determined at the height of: [A / m]		
	0,2	1,0	2,0	0,2	1,0	2,0
Cables with copper Cu conductor	10,8	5,9	3,8	17,1	7,4	3,9
Cables with aluminum core Al	12,0	6,6	4,4	17,2	7,5	4,0

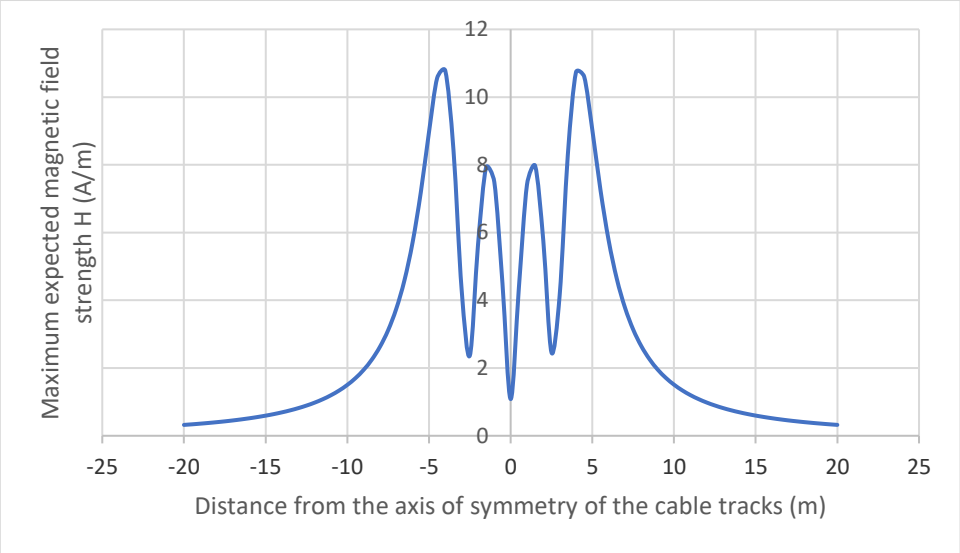


Fig. 10. The expected maximum value of the magnetic field strength (H) at a height of 0.2 m above area level as a function of the distance from the axis of the cable run consisting of 4 cable tracks, in which the distance between adjacent cable tracks is 250 cm. The calculations were made for cable tracks made of cables with copper (Cu) core, supplied with the voltage Un1 = 220 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1000 A.

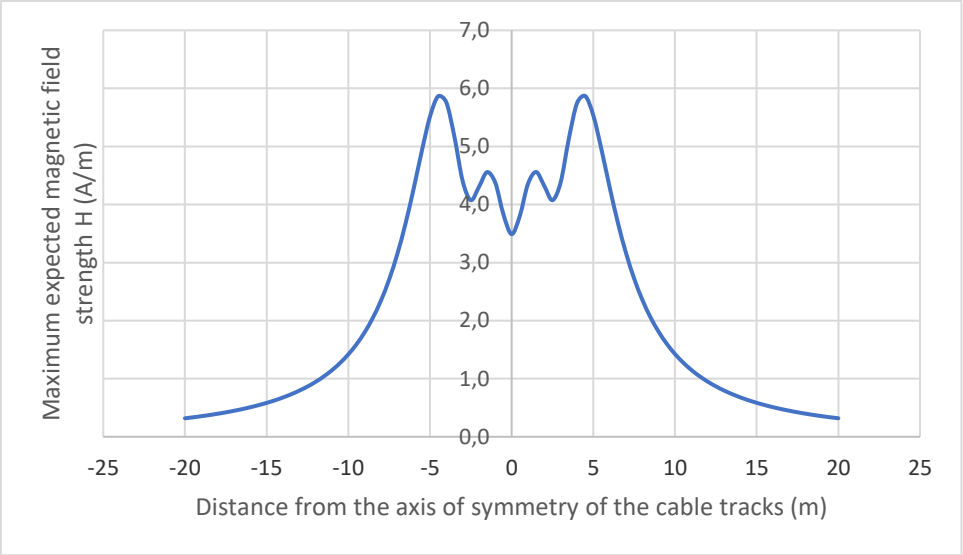


Fig. 11. The expected maximum value of the magnetic field strength (H) at a height of 1.0 m above area level as a function of the distance from the axis of the cable run consisting of 4 cable tracks, in which the distance between adjacent cable tracks is 250 cm. The calculations were made for cable tracks made of cables with copper (Cu) core, supplied with the voltage Un1 = 220 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1000 A.

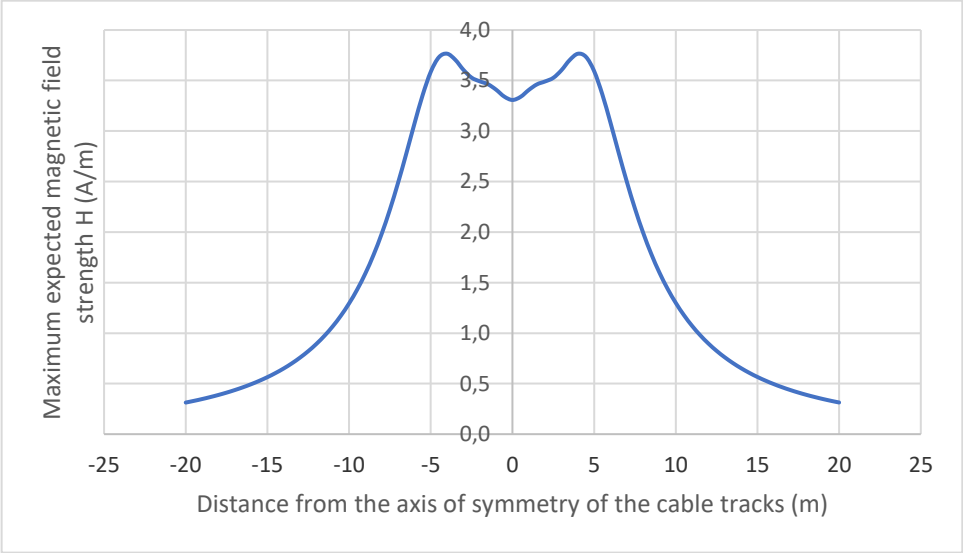


Fig. 12. The expected maximum value of the magnetic field strength (H) at a height of 2.0 m above area level as a function of the distance from the axis of the cable run consisting of 4 cable tracks, in which the distance between adjacent cable tracks is 250 cm. The calculations were made for cable tracks made of cables with copper (Cu) core, supplied with the voltage Un1 = 220 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1000 A.

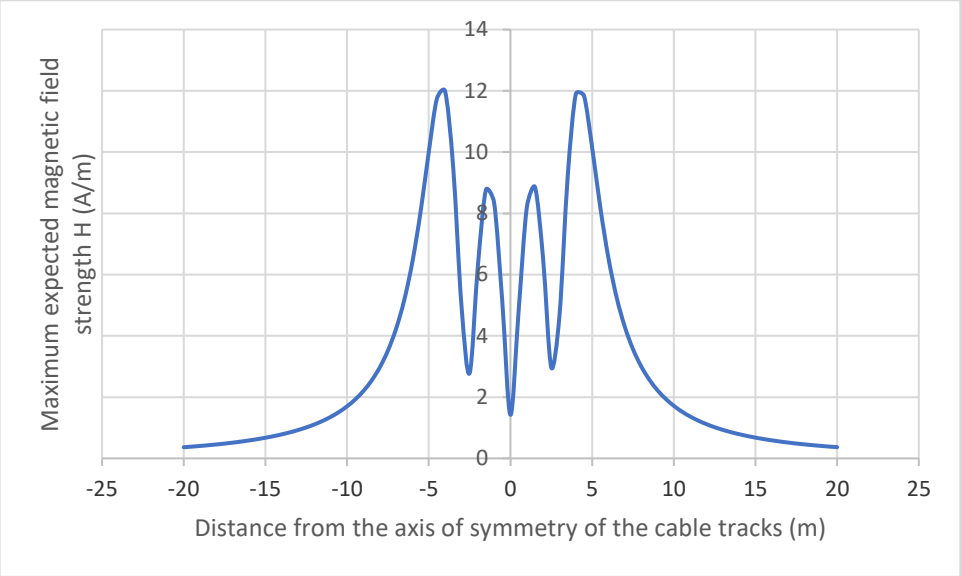


Fig. 13. The expected maximum value of the magnetic field strength (H) at a height of 0.2 m above area level as a function of the distance from the axis of the cable run consisting of 4 cable tracks, in which the distance between adjacent cable tracks is 250 cm. The calculations were made for cable tracks made of cables with aluminum (Al) core, supplied with the voltage Un1 = 220 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1000 A.

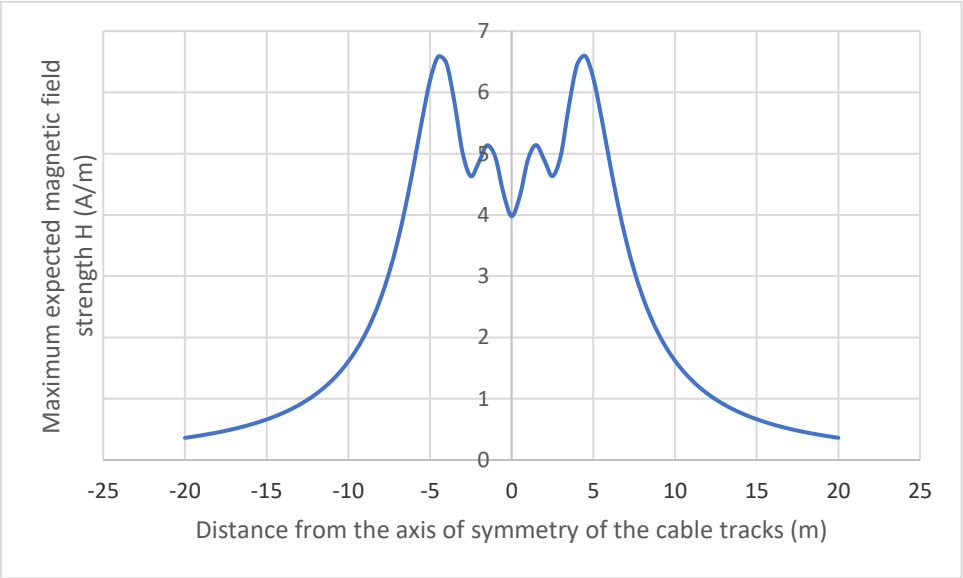


Fig. 14. The expected maximum value of the magnetic field strength (H) at a height of 1.0 m above area level as a function of the distance from the axis of the cable run consisting of 4 cable tracks, in which the distance between adjacent cable tracks is 250 cm. The calculations were made for cable tracks made of cables with aluminum (Al) core, supplied with the voltage Un1 = 220 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1000 A.

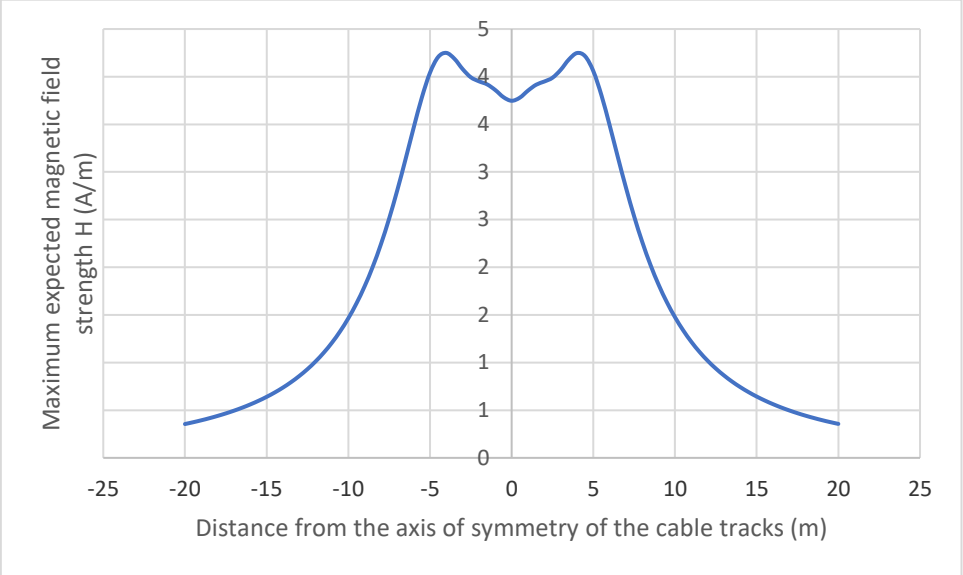


Fig. 15. The expected maximum value of the magnetic field strength (H) at a height of 2.0 m above area level as a function of the distance from the axis of the cable run consisting of 4 cable tracks, in which the distance between adjacent cable tracks is 250 cm. The calculations were made for cable tracks made of cables with aluminum (Al) core, supplied with the voltage Un1 = 220 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1000 A.

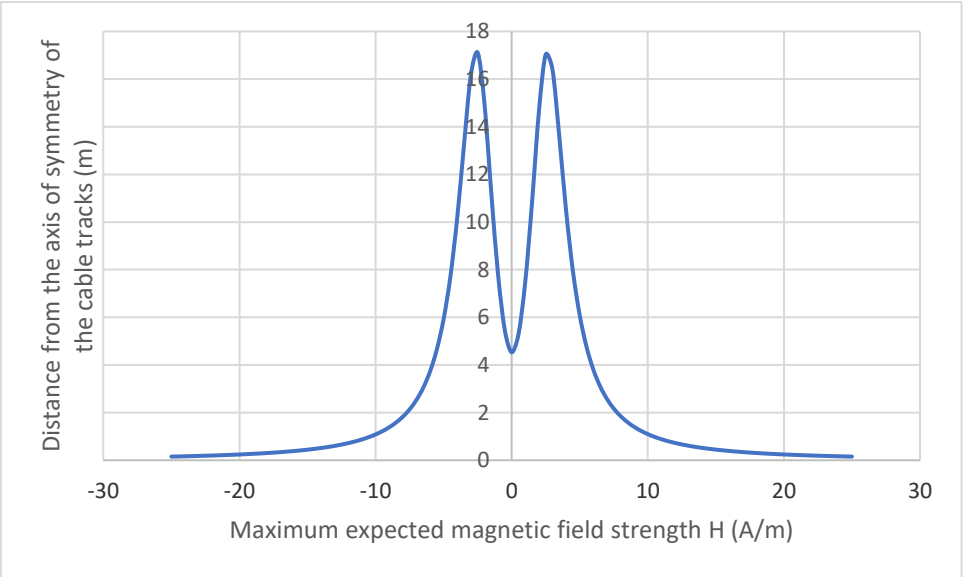


Fig. 16. The expected maximum value of the magnetic field strength (H) at a height of 0.2 m above area level as a function of the distance from the axis of the cable run consisting of 2 cable tracks, in which the distance between adjacent cable tracks is 500 cm. The calculations were made for cable tracks made of cables with copper (Cu) core, supplied with the voltage Un1 = 400 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1250 A.

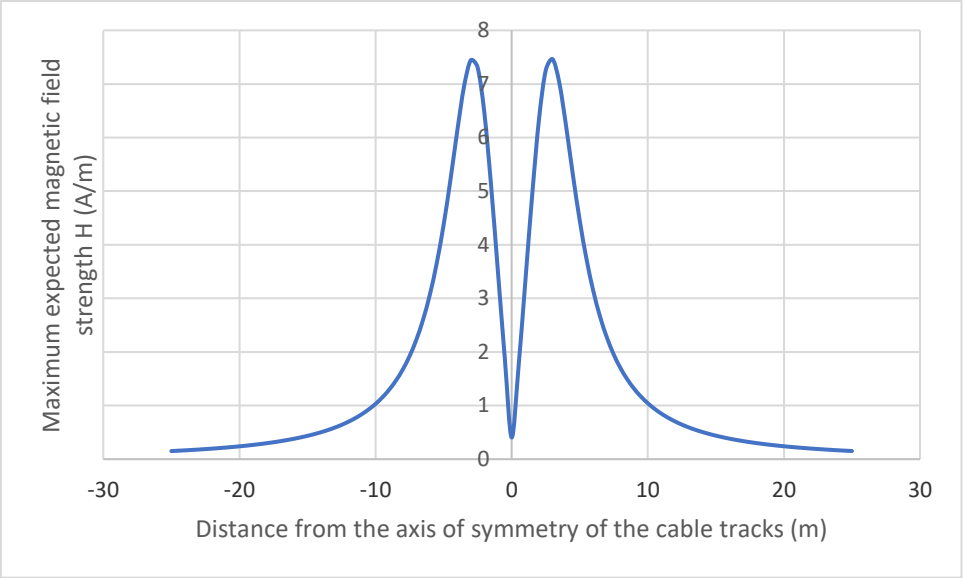


Fig. 17. The expected maximum value of the magnetic field strength (H) at a height of 1.0 m above area level as a function of the distance from the axis of the cable run consisting of 2 cable tracks, in which the distance between adjacent cable tracks is 500 cm. The calculations were made for cable tracks made of cables with copper (Cu) core, supplied with the voltage Un1 = 400 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV)}$ = 1250 A.

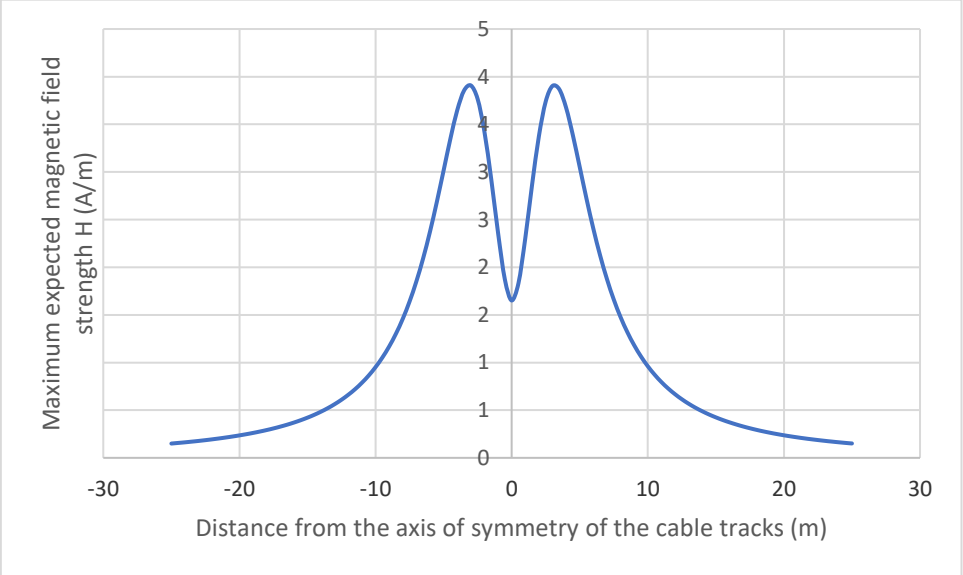


Fig. 18. The expected maximum value of the magnetic field strength (H) at a height of 2.0 m above area level as a function of the distance from the axis of the cable run consisting of 2 cable tracks, in which the distance between adjacent cable tracks is 500 cm. The calculations were made for cable tracks made of cables with copper (Cu) core, supplied with the voltage U_{n1} = 400 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1250 A.

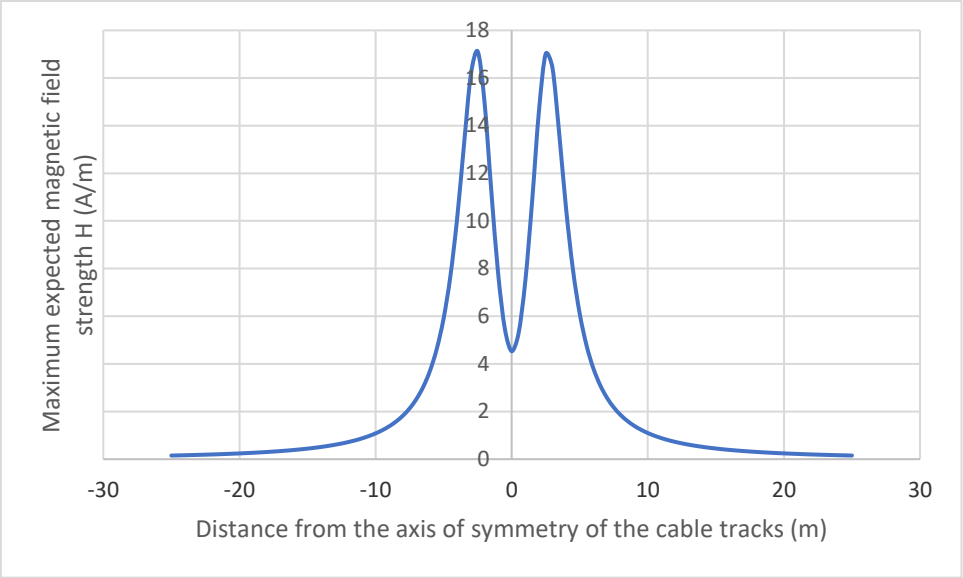


Fig. 19. The expected maximum value of the magnetic field strength (H) at a height of 0.2 m above area level as a function of the distance from the axis of the cable run consisting of 2 cable tracks, in which the distance between adjacent cable tracks is 500 cm. The calculations were made for cable tracks made of cables with aluminum (Al) core, supplied with the voltage U_{n1} = 400 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1250 A.

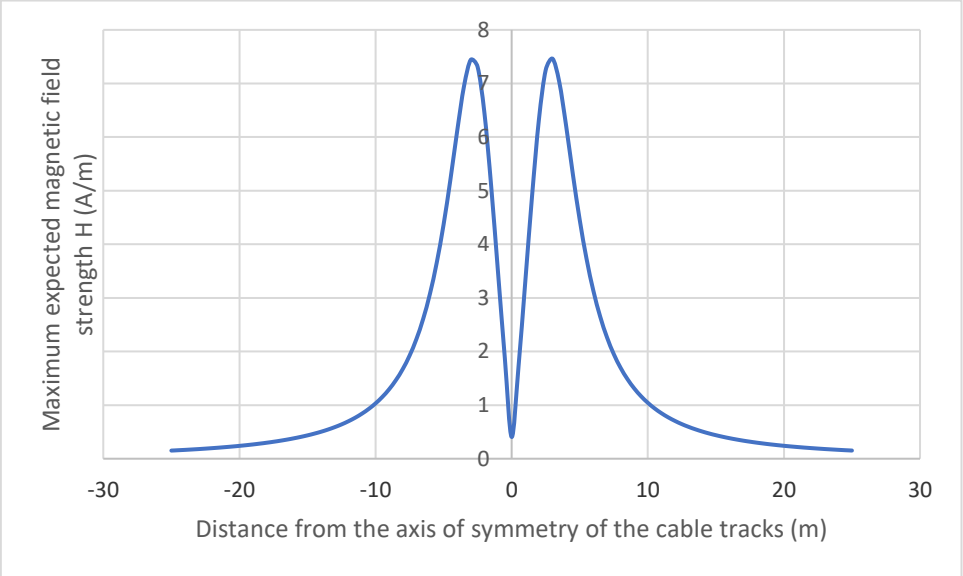


Fig. 20. The expected maximum value of the magnetic field strength (H) at a height of 1.0 m above area level as a function of the distance from the axis of the cable run consisting of 2 cable tracks, in which the distance between adjacent cable tracks is 500 cm. The calculations were made for cable tracks made of cables with aluminum (Al) core, supplied with the voltage U_{n1} = 400 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1250 A.

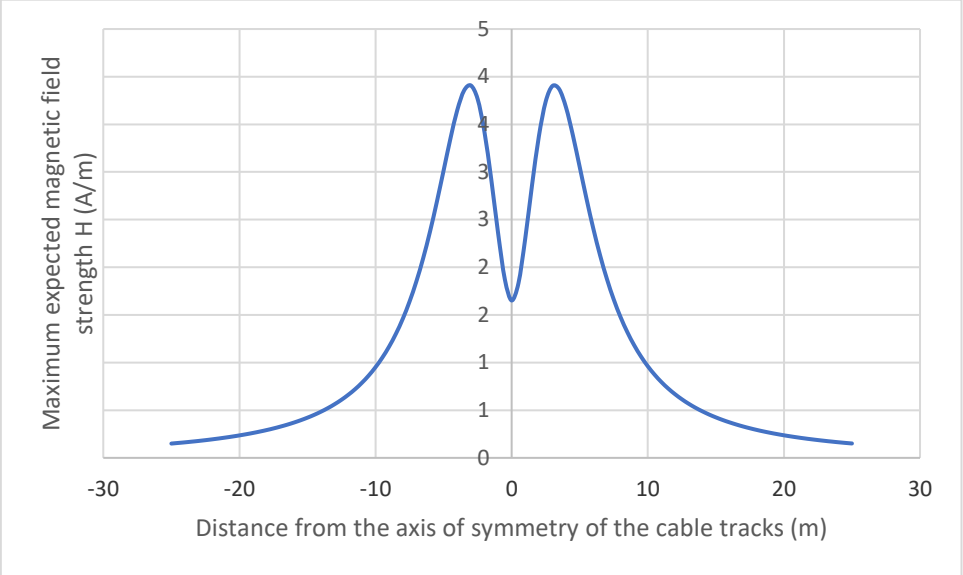


Fig. 21. The expected maximum value of the magnetic field strength (H) at a height of 2.0 m above area level as a function of the distance from the axis of the cable run consisting of 2 cable tracks, in which the distance between adjacent cable tracks is 500 cm. The calculations were made for cable tracks made of cables with aluminum (Al) core, supplied with the voltage U_{n1} = 400 kV and the maximum current-carrying capacity of the cable track ($I_{220\ kV}$) = 1250 A.

2.5.3. Comment on the calculation results

The results of the calculations show that regardless of the implementation of cable runs (4 lines operating at 220 kV or 2 lines operating at 400 kV), the highest values of the magnetic field strength over the cable route can be expected just above the ground (0.2 m above area level). At a height of 2 m above area level these values will be over three times lower.

The conducted estimates clearly indicate that even with the maximum load of individual cable lines, and consequently the entire cable run, the permissible value of the magnetic field strength (60 A / m) determined by the aforementioned regulation, will not be exceeded above the ground level, in particular at the height of 2.0 m above the area level. This means that the presence of people (environmental exposure) even directly above the cable lines will be allowed without any time limits.

LITERATURE

[1] Regulation of the Minister of Health of 17 December 2019 on the permissible levels of electromagnetic fields in the environment (Journal of Laws 2019.2448).

[2] Regulation of the Minister of Climate of February 17, 2020 on methods of checking compliance with the permissible levels of electromagnetic fields in the environment (Journal of Laws 2020.258, as amended).

Item No.	100101S.AN001.Z00-00-05
Review	00

THERMAL IMPACT

Object: **Connection infrastructure for offshore wind farms OWF Baltic II and OWF Baltic III**

Ordering party: **EKO-KONSULT Spółka z o.o.**
ul. Narwicka 6
80-557 Gdańsk

Designing party: **TD ENERGO sp. z o.o.**
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Cracow, September 2022

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1. Introduction

This analysis is a review of the available technical literature on the impact of sea cables laid on the seabed or in the seabed aimed at evacuating power from offshore wind farms. The elaboration also presents a report on calculations around power cables (export cables) that can be used to evacuate power from the OWF Baltic II and OWF Baltic III offshore wind farm laid in the onshore section.

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2. Basis of the elaboration

The analysis was made in accordance with the order No. 582.22 / TDENERGO / 2022 of 06/06/2022.

3. OWF connection infrastructure

Due to the dynamic development of renewable energy in the world and in Poland, installing offshore wind farms (OWF) in economic zones of individual countries, including Poland, is being more and more recognised. The construction of the OWF also entails the necessity to evacuate power, i.e. the construction of the connection infrastructure connecting the OWF with the National Power System (NPS). First, the power generated by individual turbines is sent to the offshore power station (OPS), then the offshore station is connected to the onshore transmission network via the so-called AC and DC offshore export cables and via an onshore electricity station (OES).

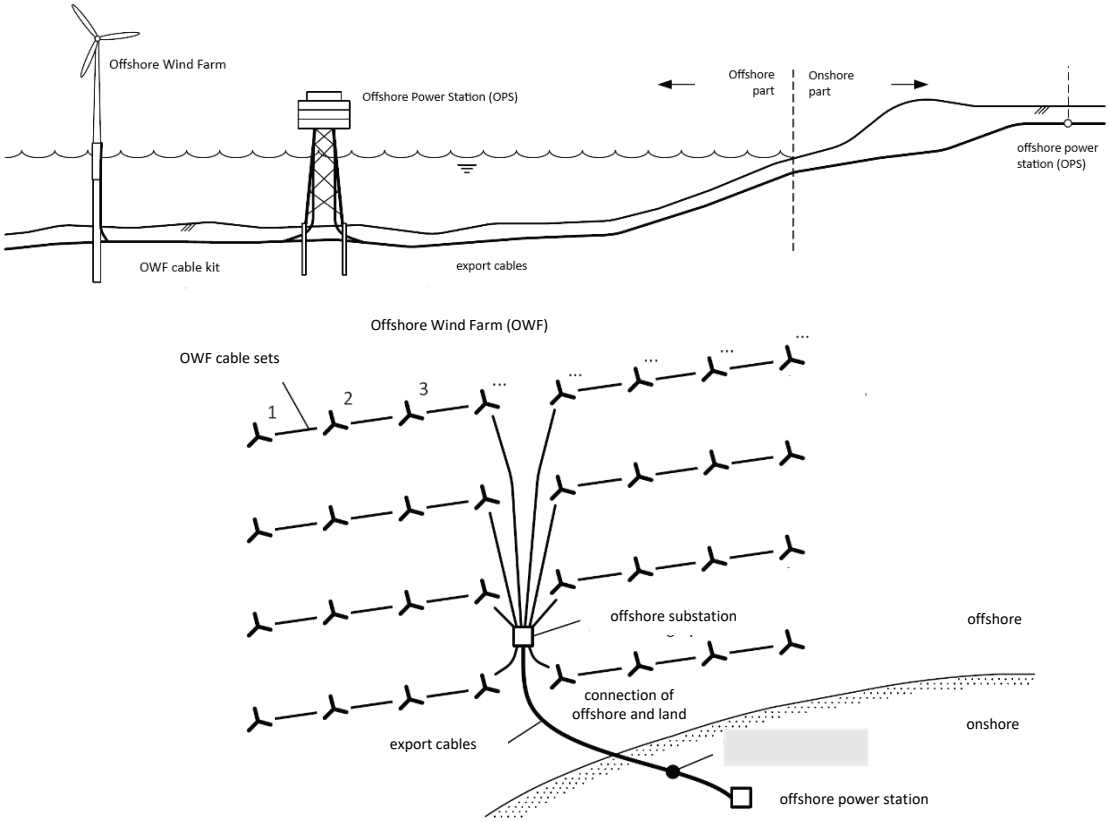

Fig. 1. Example diagrams of connections between the OWF and the onshore part [15]

The scope of this study is to determine the thermal effects caused by export cables transmitting energy, depending on the way the cables are laid on the seabed or in the seabed. The connection between OPS and OES can be divided into three basic sections: bringing the cable from the OPS station to the seabed, the sea part, i.e. cable routing in the seabed or on the seabed, and the part relating to cable routing on land.

The table below shows the benefits and risks for the installation and operation of export cables on individual sections, depending on how they are laid.

Table 1. General benefits and risks for the installation and operation of cables in the sea depending on the method of laying.

No.	Section	Way of conducting	Benefits	Threats
1.	Descend from the OPS towards the seabed	in casing pipes	– cables will not be exposed to mechanical damage	– cables conducted in protective pipes causes worse heat exchange with the environment
2.	Route in the sea	Laying on the bottom	– ease of installation (cables are simply laid on the pre-cleaned seabed) – sea current movements effectively increase the load capacity of cables by better	– cables are exposed to mechanical damage (anchors, nets, etc.) – cables may be covered with a thick layer of benthic organisms,

			removing heat from the surface of the cables	which may cause the cable to overheat in these places
		Laying on the bottom with protection against mechanical damage (rock embankment, concrete mattresses)	– rock embankments can be characterized by very high water permeability - heat dissipation from the surface of cables can be similar to laying on the seabed without an embankment.	– The installation of concrete mattresses and / or rock embankment complicates and extends the assembly time
		Laying under the seabed	– cables are not exposed to mechanical damage – The thermal reserve of the soil around the buried cable makes the cable better able to withstand short-term overloads	– heating the seabed can cause a faster growth of the layer of organic material creating the effect of thermal insulation and deterioration of thermal properties for cables
3.	Landfall	Laying in a trench	– easier execution compared to drilling	– coastal currents may shortly change the thickness of the bottom layer above the laid cable (e.g. for a cable buried at a depth of approx. 3 m, soon its distance to the bottom surface may be e.g. 9 m, or it may be completely excavated)
		Controlled drilling	– the trajectory / depth can protect the cable from accidental excavation by coastal currents.	– significant deterioration of the cable's thermal conditions due to the depth of its laying under the seabed

4. Cable laying in the seabed - possible impacts

4.1 Environment parameters

The limiting parameters for the design of an offshore cable line and the selection of the cable type are:

- thermal resistivity of the surrounding environment (sea water, soil / marine sediment),
- permeability and porosity of the seabed,
- water movement (sea currents),
- temperature penetration depth in the sea soil (depending on thermal diffusion),
- water temperature.

4.1.1 Water temperature

Water temperature in the sea fluctuates throughout the year from a few to several degrees. Larger fluctuations relate to surface waters, and are much smaller at greater depths. Some examples are presented below.

According to [14], mean water temperature in individual parts of the Baltic Sea in 2020 at a depth of approx. 30 m ranged from 5 ° C to 16 ° C.

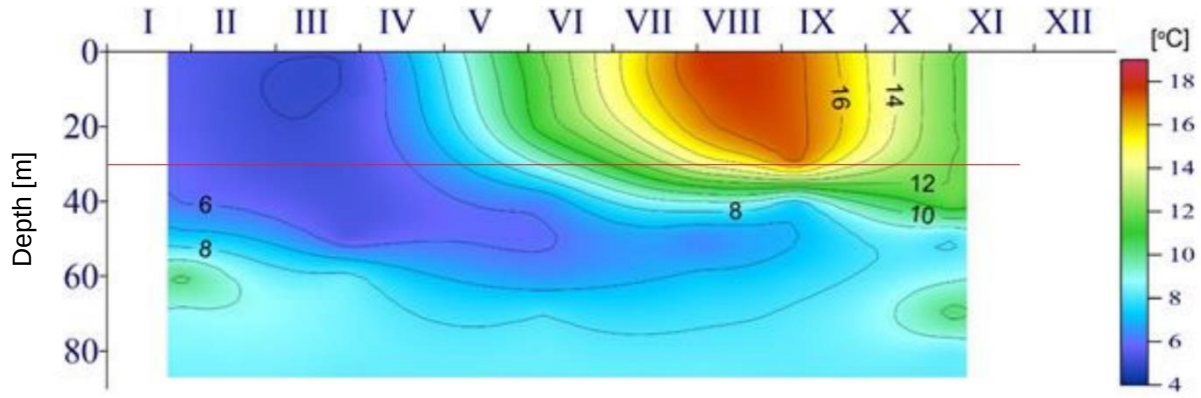

Fig. 2. Water temperature in the vertical profile in the Bornholm Deep (degrees P5C) in individual months in 2020 [14]

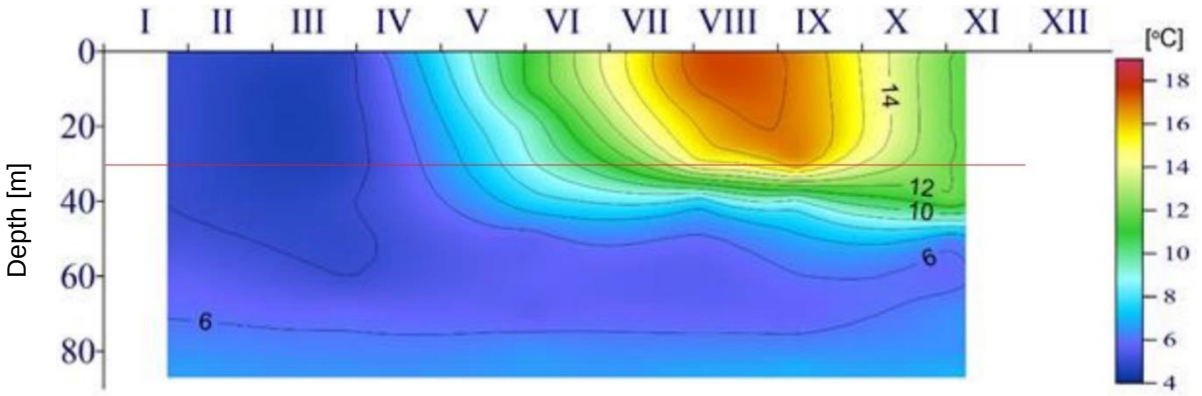

Fig. 3. Water temperature in the vertical profile in the eastern Gotland Basin (P140) in individual months in 2020 [14]

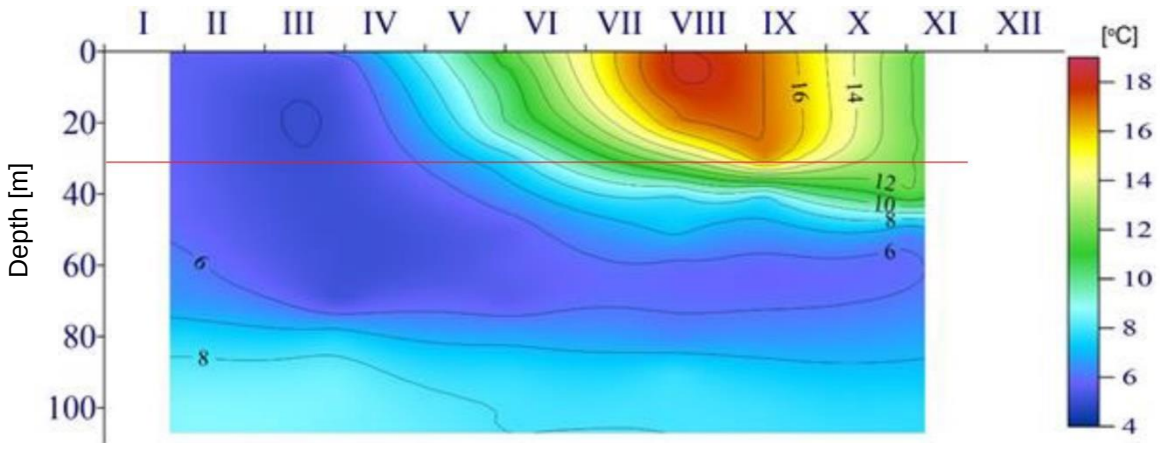

Fig. 4. Water temperature in the vertical profile in the Gdańsk Basin (P1) in individual months in 2020 [14]

On the other hand, the chart below shows the distribution of water temperature at the surface of the Baltic Sea during 2014 and the mean from the period 1990-2014 [10].

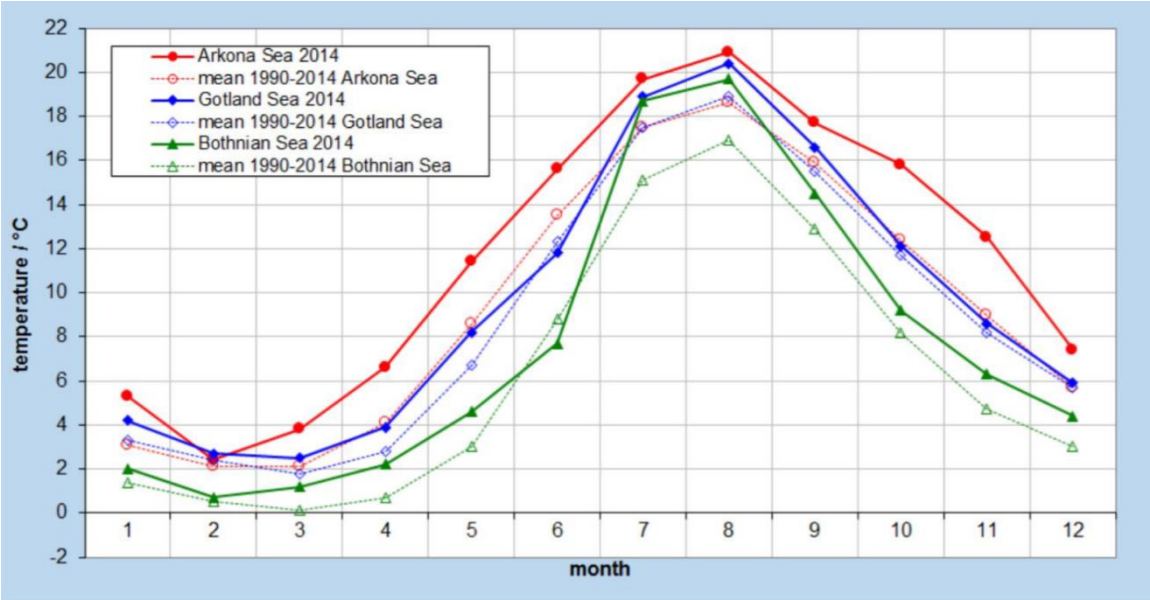

Fig. 5. The annual temperature change in the Baltic Sea [10]

According to [11], water temperature and sediment along the route of potential cable laying for OWF Baltic II and OWF Baltic III does not exceed + 10 ° C. The average sea depth along the cable route will be approx. 20 m, the maximum sea depth along the route will be approx. 33 m (according to bathymetric data).

In 2018, a report on, inter alia, thermal conditions of waters in the sea, including those at greater depths [13] was prepared for the Baltic Sea. On the basis of the measurements carried out, it was found that in May, June and August the average temperature decreased with depth in the entire water column. To the depth of 30 m, the water cooled about threefold compared to the temperature of the surface layer, reaching approx. 4 ° C in May and June, and 7 ° C in August. In colder months (September, November), the water in the 10-30 m layer was warmer than the surface water, and the temperature increase along with the depth was observed up to a depth of 15 m in September and up to 20 m in November. [13].

4.1.2 Thermal conductivity, permeability and porosity of the seabed

Most sea cables are laid by burying them in the seabed at the depth of about 1 to 3 meters. In most of the analyses described in the literature, a simplified model is assumed that the thermal conductivity of the seabed sediment is assumed to be constant and, for example, according to [10] it is 2.0 W / m * K. Some analyses take into account different values of thermal conductivity, e.g. in [5] it was assumed that the thermal conductivity of the seabed sediment ranges from 0.58 to 1.94 W / (m * K) (referring to: Tae-Wan Kim, Yang-Ki Cho, Edward P. Dever *An evaluation of the thermal properties and albedo of a macrotidal flat*). For comparison, thermal conductivity of sea water (Baltic Sea) is 0.563 W / m * K [10] or 0.6 W / m * K at 25 ° C [12]. Thermal conductivity of seawater decreases with increasing salinity and increases with increasing temperature.

According to the research results [11] for the route of the underwater cable lines for the planned Baltic II and Baltic III offshore wind farms located in the Baltic Sea, thermal conductivity ranges from 0.837 W / m * K to 3.366 W / m * K. In accordance with the DNV-RP-J301 Subsea Power Cables in Shallow Water Renewable Energy Applications standard, it has been assumed that the most favorable thermal conditions for laying the cable in a shallow (up to 50 m) sea zone is the thermal conductivity of 1.4 W / (K m) for sediment temperature + 15 ° C. Due to the fact that the water temperature, and thus the sediment temperature in the MIP area does not exceed + 10 ° C, this coefficient was reduced to 0.8 W / (K · m) [11].

In the article [5], where the influence of sea water temperature, water movements, burial depth or thermal conductivity on the temperature of the working conductor of a 220 kV sea cable was investigated for various laying methods: laying in pipes, burial in the seabed or laying the cable on the seabed, the influence of thermal conductivity on the temperature of the cable's working conductor was also analyzed.

According to the results of the calculations, the change in thermal conductivity in the range from 0.6 to 1.2 significantly affects the temperature of the working conductor and the cable itself. The diagram below shows the change in temperature inside the cable (from the middle layer to the outer layers), assuming the same current load and a variable value of thermal conductivity.

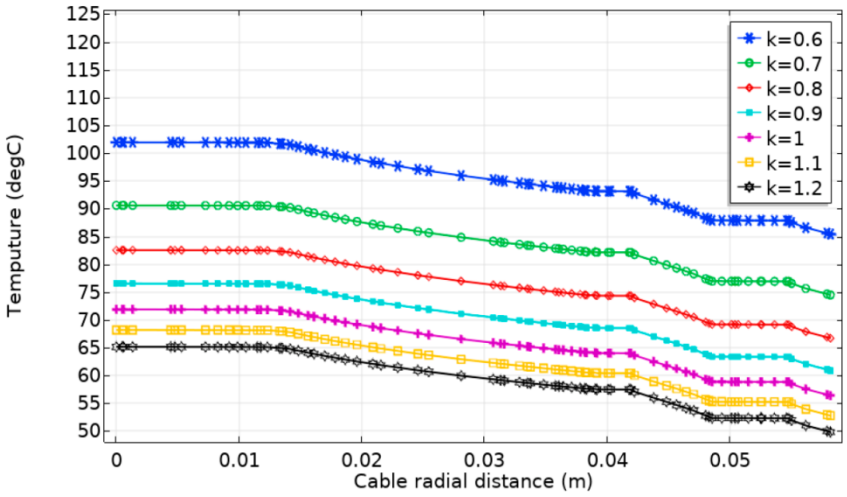

Fig. 6. The influence of thermal conductivity on the temperature of a cable buried in the seabed at the same constant load [5]

In the above-mentioned study [8], in a simulated environment, a very detailed analysis of the influence of seabed sediment parameters on the temperature distribution around cables was carried out, together with an effective comparison of the results and the developed calculation model. The study identified thermal regimes generated in typical unconsolidated shelf sediments - coarse dust (average grain diameter 0.045 mm), fine sand (average grain diameter 0.20 mm) and very coarse sand (average grain diameter 1.23 mm). The results show that the heat transfer and hence the temperature fields generated by HV submarine cables buried in different sediments are very variable. Coarse dust has

been shown to be only conductive (conduction), causing a temperature increase of> 10°C to 40 cm from the source at 60°C above the ambient temperature; fine sands show a transition from conduction to convective heat transfer between 20 and 36°C above ambient temperature, with a temperature increase of>10°C already taking place up to one meter from the source at 55°C above ambient temperature; and very coarse sands show the dominance of heat convection even at very low (7°C) operating temperatures of the source, even up to 18°C above the ambient temperature at a distance of one meter from the heat source (cable), with the source surface temperature of only 18°C above ambient temperature. These discoveries are important for the surrounding subsurface environments where such high temperatures occur and can have a significant impact on the course of chemical and physical processes operating at the grain scale and under the grain; biological activity at both the micro and macrofauna levels, as well as the operational efficiency of the cables themselves, as convective heat transport would increase the current carrying capacity of the cables, which was not included in the applicable standards. The results and graphs of the analysis contained in [8] and in [7] are described further in the study.

4.1.3 Temperature at the cable surface

Due to the power transmission in power cables, the cables increase their temperature as a result of losses (due to cable resistance). Depending on the construction of the cables and the applied insulation materials, the safe (limit) operating temperature of the cable core is 90°C. Taking into account the structure of most cables, the thickness of the insulation material and other reinforcing and sealing layers, the temperature on the outer surface of the cables is much lower than in the working conductor. The diagram below, taken from the study [1], shows the temperature change in the cable itself (the X axis section between R_c and R_a) and in the section from R_a to the seabed surface. It is quite clear from the diagram that the temperature at the surface of the cable is approx. 44°C lower than at the very center of the cable. The external temperature of the tested cable (permanently loaded with maximum power) is not more than 46°C.

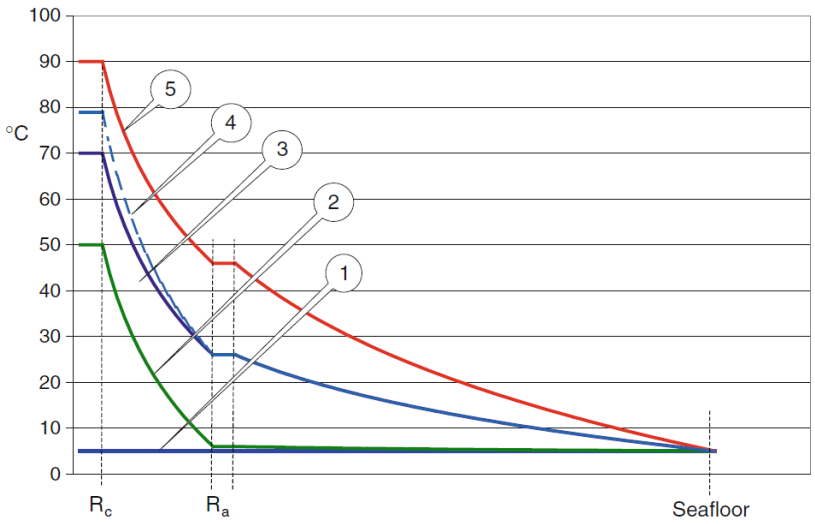

Fig. 7. Change of cable and seabed temperature as a function of the distance from the center of the cable. Curve 1 shows the beginning of the test before loading the cable, the next curves 2-4 show the temperature distribution in the cable depending on the achieved temperature of the working conductor, until the maximum allowable cable load is reached and the temperature is 90 ° C - curve 5 [1]

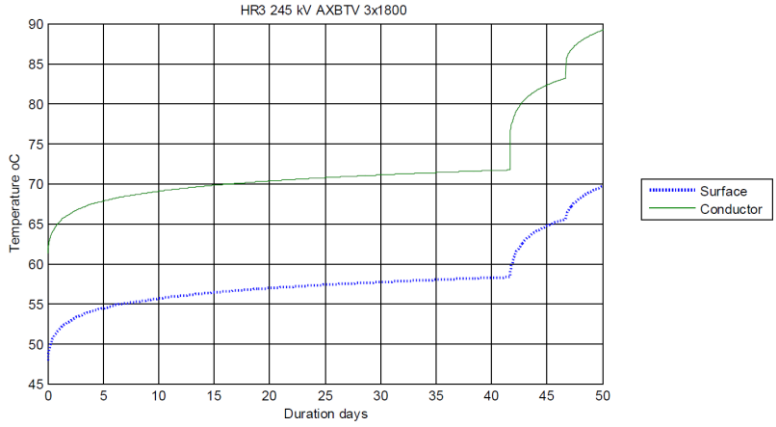

Fig. 8. Temperature of an exemplary cable - on the surface of the working conductor (green line) and on the surface of the cable itself (blue line) for different load conditions [2]

Temperature tests in the cable and its surroundings are also described in [5], where a 220 kV 3-core sea cable was used for analysis, laid in 3 different ways: in pipes, buried in the seabed at a depth of 2 m and laid directly on the seabed. The cable is in XLPE insulation, therefore it has been assumed that its limit temperature (inside the cable) cannot exceed 90 ° C. The diagram below shows the temperature distribution inside the cable, which shows that regardless of the method of cable laying, the temperature on its surface drops by approx. 10 ° C compared to the temperature on the surface of the conductor in the cable itself.

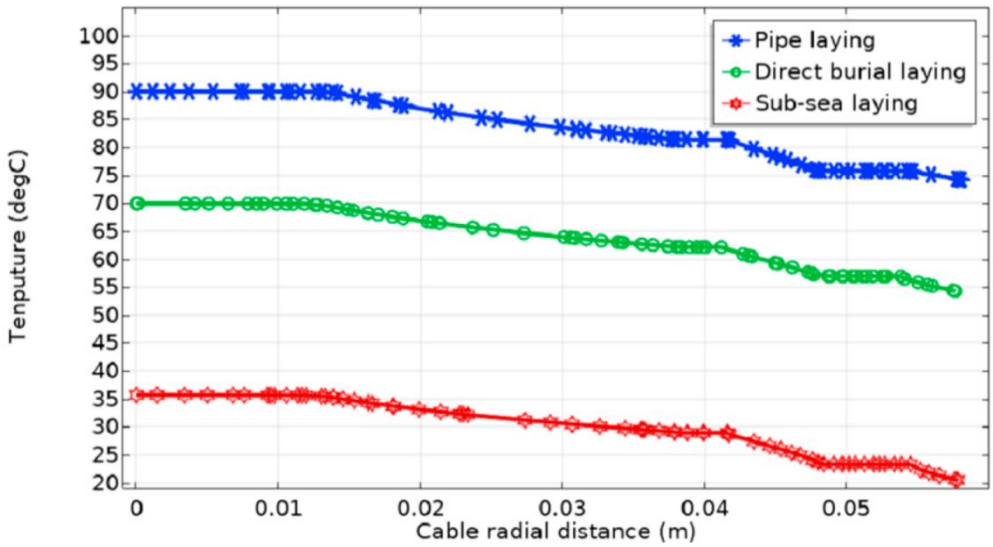

Fig. 9. Temperature distribution in a 3-core 220 kV cable laid in pipes (blue), in the seabed at a depth of 2m (green) and directly on the seabed (red), assuming the same, constant load [5].

However, the authors of the quoted article [8] at the beginning emphasize that the temperature of all "working" cables in the dynamically developing offshore wind power industry does not exceed 70°C on its surface.

4.1.4 Load profile of marine cable lines for OWF

Power generation from renewable energy sources is less predictable than in conventional power plants (coal, gas). Locating wind farms in open waters (sea, ocean) significantly increases the efficiency and stability of generation, compared to the production of energy on land. Referring to [2], 3-5 MW wind turbines are started up if the wind speed reaches a certain minimum value (e.g. 3-5 m / s), and turned off if the wind speed is too high (e.g.> 25- 30 m / s). The optimal operation of the said turbine takes place at a constant wind speed of 12-15 m / s. When the nominal value of the wind speed is reached, the generated power does not increase with the increase of this speed.

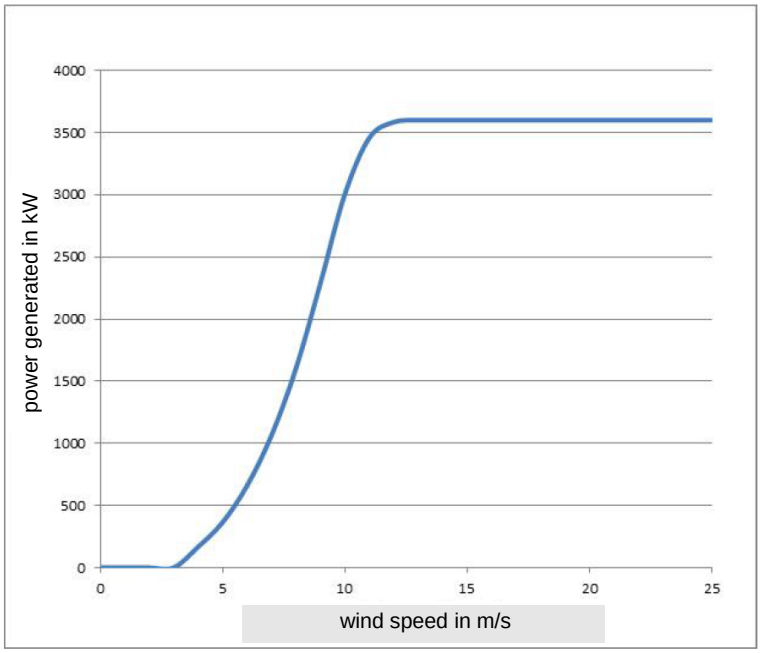

Fig. 10. Characteristics of generated power for an exemplary wind turbine [2]

The diagram below shows the value of the current intensity from an exemplary North Sea wind farm as a function of time [2]. For the chart below, the period with relatively constant and strong wind force was selected, where the generation of wind farm power was the most effective.

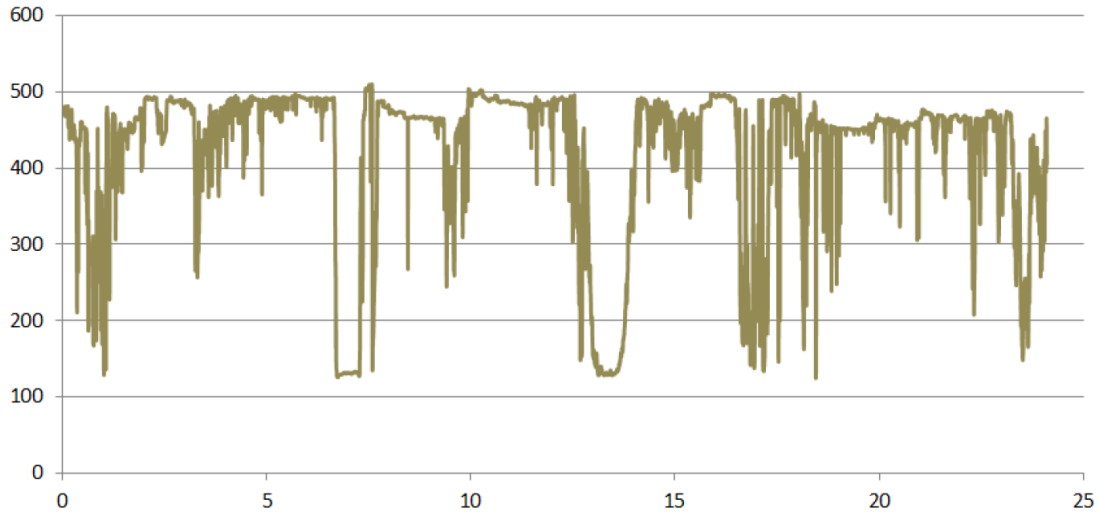

Fig. 11. Current [A] of a North Sea wind farm within 25 days (in the period with the most stable wind strength) [2]

The thermal constant of the seabed material is very high, which generates a long heating time for the seabed. Thus, it may take days, weeks or months for the target state to be reached. Thanks to this, the cables can be overloaded much higher than the rated current for a shorter period and it is possible to reduce the cross-section of the working conductors of the designed cables when we are dealing with a variable load, which is definitely the case of the evacuation of power from the OWF.

The coefficient of power utilization from the generation of a single turbine can be considered as an average value from the given time intervals. The study assumed a 7-day and 45-day load averaging period. In the graph below from 7 years of turbine operation, the 7-day indicator is blue and the 45-day indicator is red. The graph shows that the long-term power factor has only once exceeded the value of 0.8, and its average value ranges from 0.5 to 0.6, and as mentioned above, only the long-term effect causes the cable surface to heat up properly and then the heat is transferred to the environment (whereas the heat is transferred to the environment in marine conditions is a very important element discussed later in this study) [2].

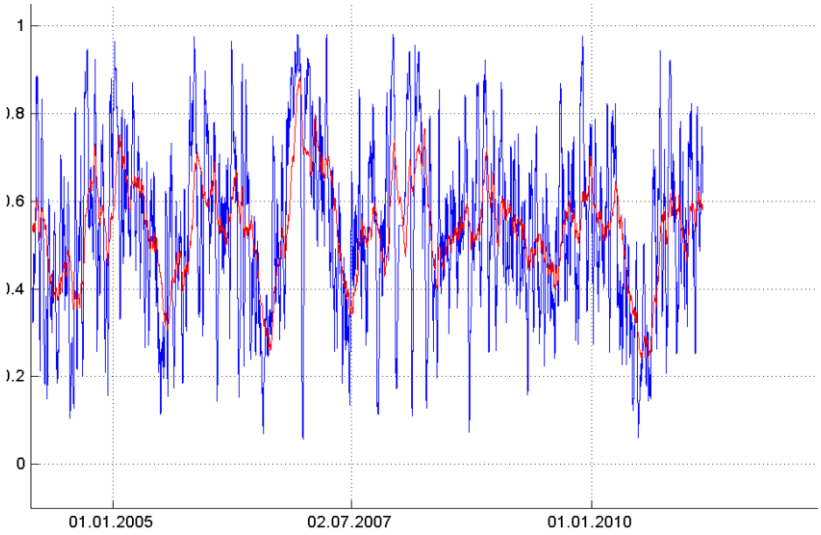

Fig. 12. The load factor generated by an exemplary wind turbine from 7 years of data. The 7-day indicator is blue and the 45-day indicator is red [2].

A very good analysis of the selection of an export cable with a voltage of 245 kV for the real wind farm, Horns Rev III (HR3), with a capacity of 400 MW is described in [2].

Fig. 13. Location of OWF Horns Rev III (HR3) [source: Google maps]

The analysis was significant due to the possibility of significant savings in the construction of the OWF Horns RevIII power evacuation infrastructure by the possibility of laying only one export cable instead of two due to the power profile generated from the Horns Rev 2 twin wind farm. Adoption for

design purposes and then for the construction of export cables of the nominal (constant) power generated by the planned OWF Rev III would result in the necessity to use two export cables, which would significantly increase the investment costs.

The data used in the example is based on production data from a nearby wind farm (Horns Reef 2, HR2) adapted to subsequent wind turbine development but checked against historical wind data and wind data models for the real area combined with "power curves" for the most modern wind turbine generators.

The resulting load curve for the "worst case load event" was included in the invitation to tender and looked like this:

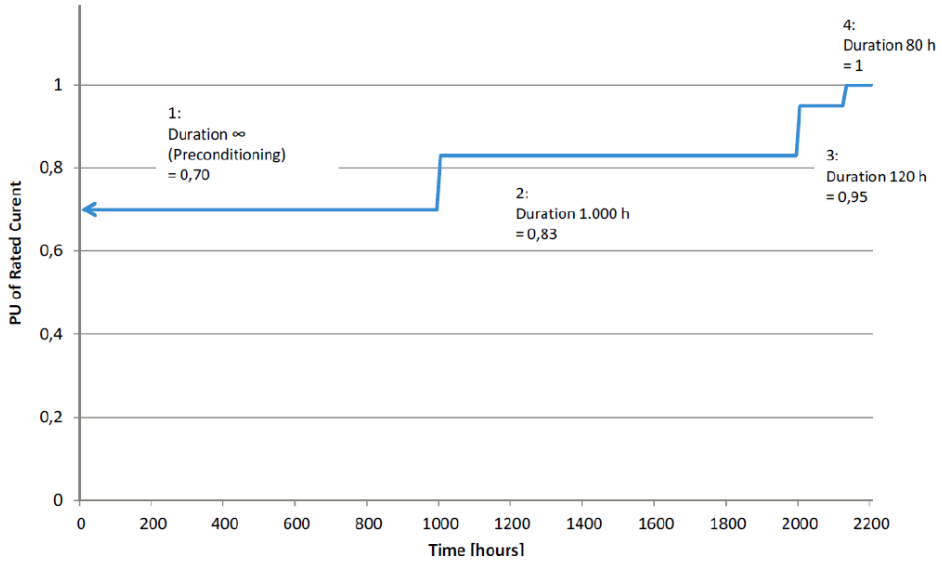

Fig. 14. The worst case of load occurrence included in the ToR for HR3 [2]

In the above diagram, the number of worst-case load plateaus should be considered for individual OWF cases, depending on the load patterns found and the ambient temperature time constants, (i.e. reaching a steady state ambient temperature as a result of locating a heat source with a certain temperature in this environment; in the analyzed cases the heat source is a loaded power cable). Typically, it is considered that the temperature time constant for the cable itself and its immediate surroundings is measured in hours, the ambient temperature time constant for a cable buried up to 1 meter deep is measured in days or even weeks, and the final temperature time constant for a deeply buried cable would be measured in months or even years.

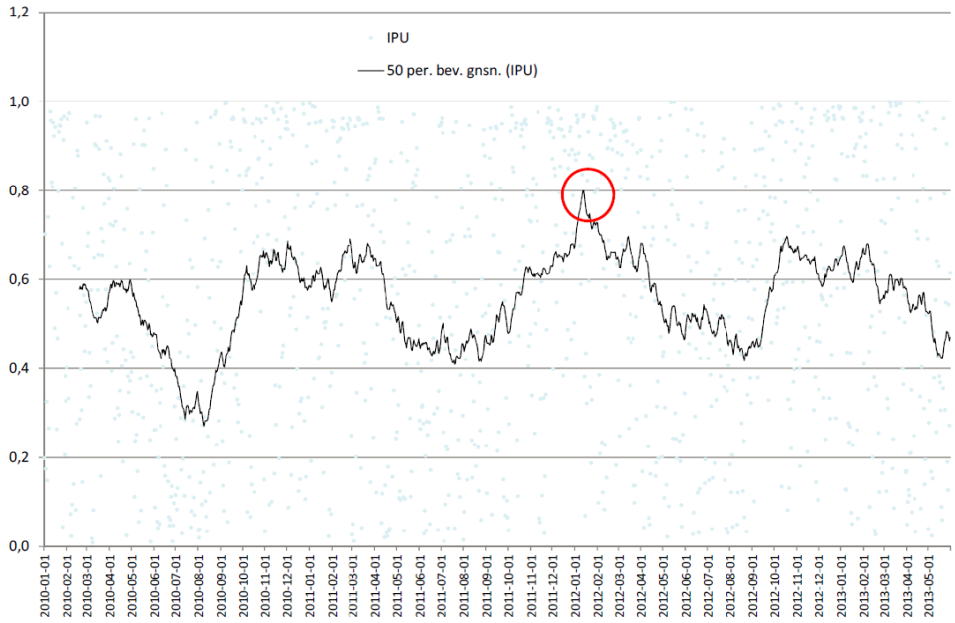

Fig. 15. 50-day average of energy production over 3.5 years of measurements for OWF HR2. The highest production factor was 0.8.

The three worst plateaus were selected for further analysis because they contain periods of generally high energy production (wind) and also contain periods with maximum or near maximum production. As a result of the analysis, described in more detail in Annex D in [2], it was concluded that for the construction of the HR3 station, with a burying depth of the export cable up to 5 meters in the section near the coast, a 25% reduction in the conductor cross-section resulted in material savings of about 10-15%, but also made it possible to use a smaller installation vessel, with possible installation cost savings of 25-50%.

At the tender stage for OWF Horn Rev III, the cable temperature was calculated by the cable manufacturer for the worst case load occurrence, as shown in Fig. 16. This analysis allowed only one export cable to be used, as it can be seen that the temperature inside the cable remains below 90°C . At the same time, it was shown that in most of the load waveform graph, the cables do not have the maximum current that could result from the maximum constant and continuous production.

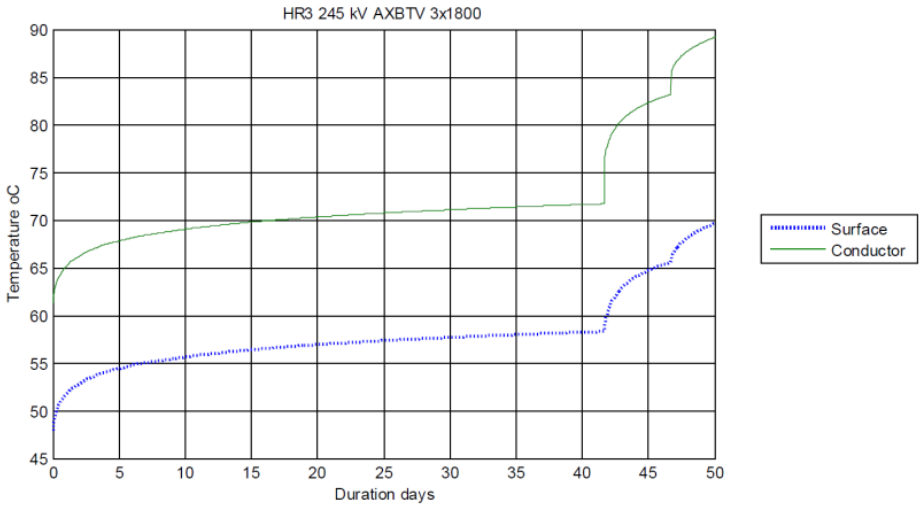

Fig. 16. Temperatures in the 245 kV 3x1800 mm2 (aluminum) submarine cable offered for HR3, calculated by the manufacturer, based on the worst case load case.

A similar subject was discussed in [4], where the flow of electricity in sea cables evacuating power from wave farms was investigated. It was found out that with the fluctuating power generation of the investigated wave farm, it is sufficient to design sea cables selected for 50% of the potential maximum power generated in the farm under consideration. It is economically justified and can significantly reduce the investment costs.

In offshore wind farms, where a large number of turbines are usually installed, not all units work simultaneously due to planned service works or occurring failures. Compulsory breaks limit the power transmitted via export cables, because even if only one unit is shut down, the nominal power of the OWF will not be achieved even in favorable weather conditions. Therefore, the actual OWF operation profile, and thus the load profile of exported cables, will always be lower than the assumed load calculated on the basis of the nominal installed capacity of the OWF.

4.1.5 The way of laying cables in the sea

Cables (mainly the cross-section of the working conductor) are selected for the worst terrain conditions that may occur on the cable line route. Based on many years of experience in building cable lines, the worst conditions for laying cables are those where the cables are laid in pipes and, in terms of land, those where the cables are laid relatively deep (e.g. directional drillings under railway tracks). Laying sea cables in pipes, especially the section of the land-sea border crossing (landfall), determines the selection of their cross-section according to the loading conditions. Various depth of cable laying in the seabed does not affect the load on the cable lines, as if it were the case for cables laid on land, due to the natural convection and saturation of the seabed with water [6].

The impact of the arrangement of a 220kV 3-core sea cable was analyzed in [5], where three ways of laying were considered: in pipes, buried in the seabed at a depth of 2 m and laid directly on the seabed. Due to the fact that the tested cable is XLPE insulated, the temperature of the working conductor (inside the cable) must not exceed 90°C. Fig. 17 shows the temperature distribution inside the cable, which shows that depending on the method of laying the cable with the same load, the temperature inside the cable and on its surface is much lower for the same cable buried in the seabed at a depth of 2 m (thermal conductivity of the soil was assumed at the level of 1.05 W / m * K) and significantly lower for the cable laid directly on the seabed. The diagram below also shows that the temperature on the surface of the cable laid on the seabed is approx. 20°C, and taking into account that in the study one of the assumptions was that seawater is also at a temperature of 20°C, this proves how colossal the importance of seawater is in absorbing the heat generated by cables from the surface of the cables. It should also be noted that the research assumed that the speed of sea water would be 1 m / s.

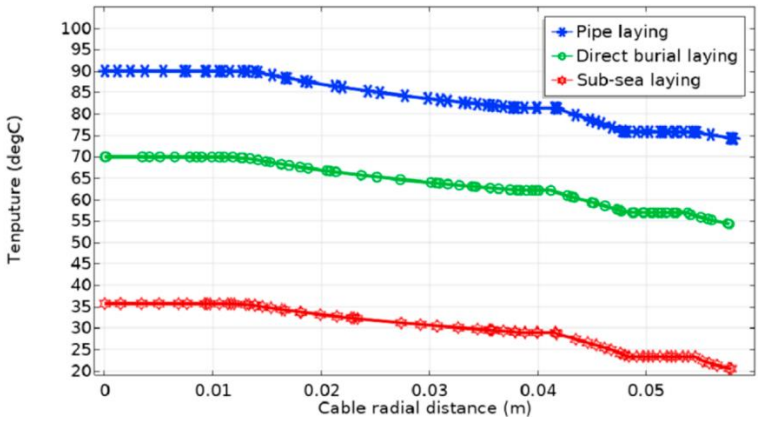

Fig. 17. Temperature distribution in a 3-core 220 kV cable laid in pipes (blue), in the seabed at a depth of 2 m (green) and directly on the seabed (red), assuming the same, constant load of 926.3 A, water temperature 20°C [5].

The same analysis also shows that if the same cable was used in different sections with a different arrangement, in the case of cables laid on the seabed, they could be loaded with approx. 48% more power and the cable would not overheat inside. The comparison of the current carrying capacity of the cable depending on the method of laying is shown in Fig. 18. The load limit is determined by the section of the cable laid in pipes, laying the same cable in the seabed (without pipes) allows to increase the load capacity by approx. 39%, while laying it on the seabed by up to 48%.

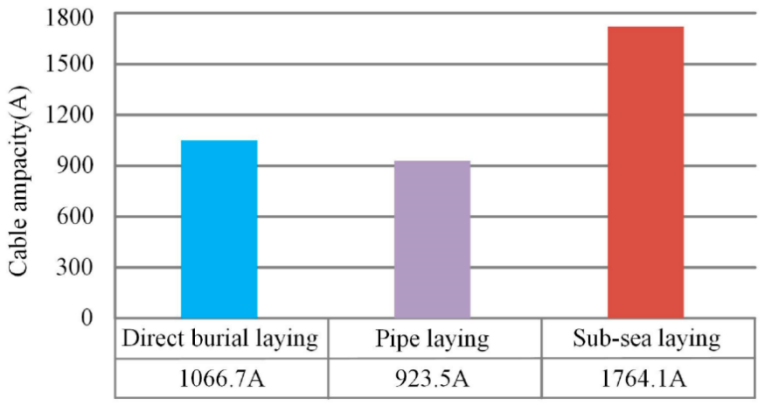

Fig. 18. Comparison of the current carrying capacity of a 220 kV sea cable depending on the method of laying [5].

The further study [5] shows changes in the temperature of the 220 kV cable working conductors with the same assumed load, but as a function of changing water temperature. The calculation results are presented in Fig. 19 below.

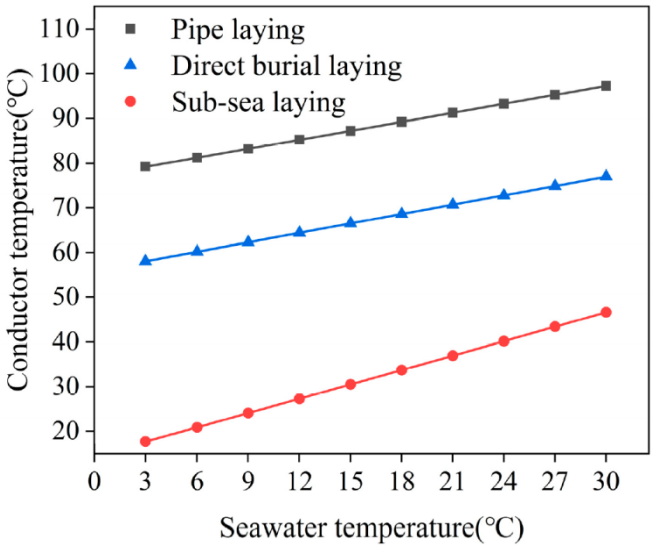

Fig. 19. Temperature change of the working conductor of the sea cable depending on the sea water temperature in three different laying methods [5].

In the same study [5], an analysis of the influence of water movement on the temperature of the working conductor of the cable was also carried out, depending on the method of laying. The authors of the analysis assumed that sea water movements do not exceed 1 m / s (citing Melchers, R.E .; Jeffrey, R. *Influence of Water Velocity on Marine Immersion Corrosion of Mild Steel*). Therefore, it was assumed for the tests that the speed of water movement varies from 0 to 1 m / s. The test results are presented in the table below which clearly shows that the smallest water movement (0.0001 m / s) significantly reduces the temperature of the working conductor of the tested cable, and thus also the temperature on the surface of the cable and in its surroundings. For a cable laid on the seabed, the temperature of its working conductor is reduced by half. It is known that for cables laid in pipes and buried in the seabed, the movement of water will not have such a large impact, but according to the

presented analysis, the temperature of the working conductor of the cable buried at a depth of 2.0 m in the seabed can decrease by 6 degrees already at minimal water movement. The table also shows that the higher speed of water movement (> 0.005 m / s) no longer reduces the temperature of the tested cable.

Laying Method	Seawater Velocity (m/s)	Conductor Temperature (°C)	Cable Ampacity (A)
Sub-sea laying	0	79.98	984.7
	0.0001	48.70	1352.0
	0.0005	43.63	1469.7
	0.005	39.69	1598.2
	0.010	38.83	1629.9
	0.100	35.78	1759.3
	1.000	35.67	1764.1
Direct burial laying	0	76.52	1008.8
	0.0001	70.27	1058.5
	0.0005	69.97	1061.5
	0.005	69.95	1061.3
	0.010	69.95	1061.2
	0.100	69.95	1061.2
	1.000	69.95	1061.2
Pipe laying	0	96.15	896.6
	0.0001	90.81	922.1
	0.0005	90.58	923.4
	0.005	90.55	923.5
	0.010	90.55	923.5
	0.100	90.55	923.5
	1.000	90.55	923.5

Fig. 20. The influence of sea water movements on the temperature of the cable's working conductor and its load capacity

According to the tests described in the above analysis [5], assuming a constant cable load of 220 kV and a constant thermal conductivity of the seabed sediment, the change in the temperature of the cable's working conductor depending on the burial depth was shown. The analysis shows that the reduction in the load capacity of the cable (increase in the temperature of the working conductor) between the cable buried at a depth of 1.5 m compared to that buried at a depth of 2.5 m is not so significant (gain of approx. 2-3°C, 10-13 A).

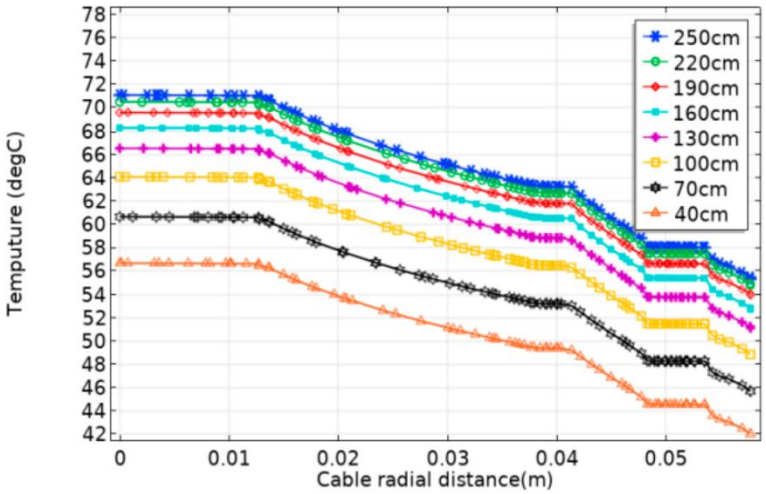

Fig. 21. Influence of the cable burial depth in the seabed on its temperature. The horizontal axis is the distance from the center of the cable to its outer layer.

4.1.6 Conduction and natural convection

In the summary of the analysis carried out in [6], it was unequivocally stated that the load capacity of cables in sea conditions cannot be modeled according to the standard approach as for onshore conditions. Sub-sea conditions, natural convection, the effectiveness of which is influenced by the permeability, porosity and thermal conductivity of the seabed, must be taken into account. The figure below shows the temperature distribution around the cable in a porous, highly water-saturated environment. Moisture migration represents the heat distribution around the cable, and "lost" moisture in the sediment is replaced with the water above. The white arrows indicate the movement of water inside the porous domains. The analysis also proved that the maximum temperature of the conductor was due to Joule losses (i.e. the amount of heat generated by the conductor depending on the resistance, current intensity and flow time) is 63.3°C as a result of the greater reception of heat generated by the environment. For comparison, with the classic approach, it would be 90 ° C. This shows the total effect of heat transfer to the conductor and makes it possible to improve the current carrying capacity [6].

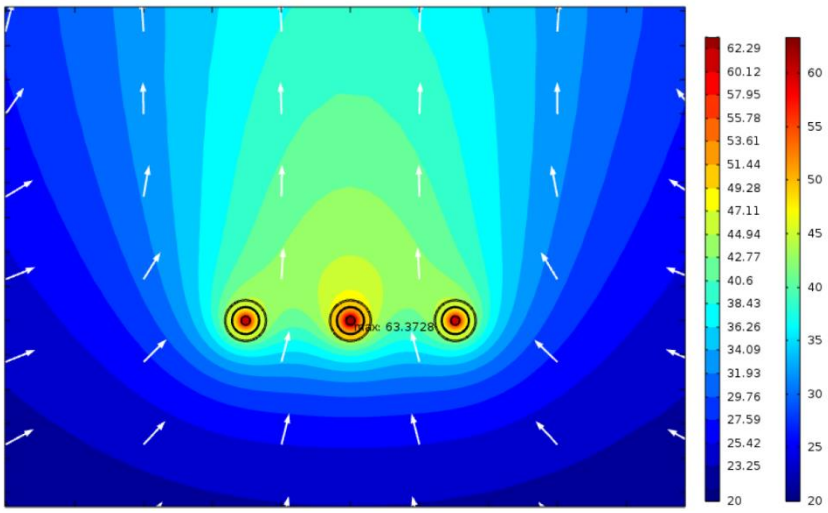

Fig. 22. Temperature distribution for a cable surrounded by a sediment with high water saturation [6]

Subsequent studies show the effect of seabed sediment permeability on temperature dispersion in the sediment. In the following list of test results for soils with different permeability, it was found that soils with medium and high permeability transfer heat from the cable environment to the upper layers of the seabed sediment. However, the test was performed in a closed tank (2 x 2.5 x 0.11 m), where the heat source was located approx. 1.0 m below the bottom [8].

However, in our opinion, like most of the studies carried out so far, not all the phenomena that may occur in the sediments of the seabed have been taken into account in this case, provided that greater or lesser permeability is taken into account. As previously shown, the slightest movement of seawater causes the temperature around the cables to drop significantly. One should be tempted to say that in real conditions, for permeable soils, the temperature of the seabed sediment will be greatly

influenced by the huge mass of water moving at a fixed temperature just above the bottom, as well as in the seabed sediments, and this phenomenon will be more intense, the higher the soil permeability value will be taken into account. However, in our opinion, this study (as well as other observations presented in this study) does not take into account all the effects that may occur on the seabed. For example, when we consider the last graph in the figure below, on which a highly permeable soil was assumed, the temperature dispersion from the source was depicted on it. However, it should be noted that if the ground is very permeable, then a large amount of seawater, acting as a cooler, penetrates the seabed and with a very high probability it should be said that such an increase in temperature (as shown in the diagram) at a depth of approx. 20 cm will not be observed. By adding even the slightest movement of water (described in another part of the study), the cooling effect of the bottom and the cable will be greatly enhanced. As a reminder, the described test was carried out in a glass tank with a limited amount of water.

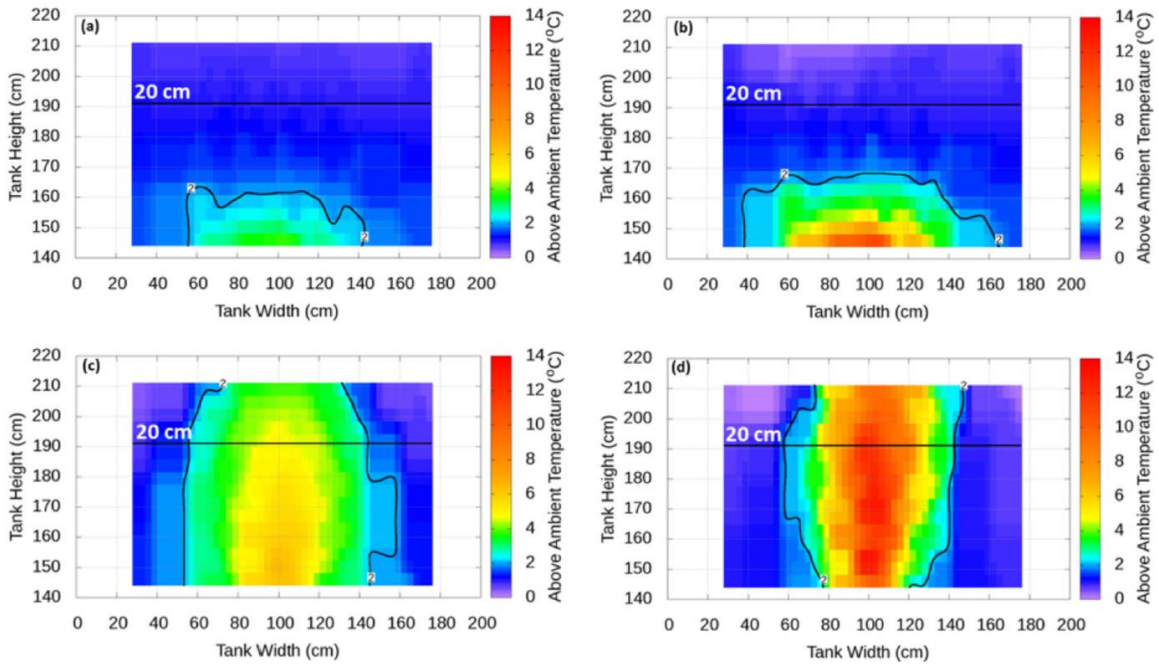

Fig. 23. Distribution of the temperature difference above the ambient temperature over the sea cable depending on the permeability of seabed sediments. Temperature distribution for the steady state for seabed sediments (~ 80 cm above the heat source) - the diagrams show the 20 cm depth mark and the 2°C contour. Graphs (a, b) for sediments with low permeability (1.41 × 10−13 m2) of conductive thermal regimes with a source (cable surface) temperature of 18 and 60°C above ambient temperature, respectively; and (c, d) high permeability (1.49 × 10−9 m2) convective thermal regimes with a source (cable surface) temperature of 9 and 18°C above ambient temperature, respectively.) [8]

In the same study [8] and [7], attention was also paid to the technique of cable burying along with the final effect, i.e. whether and how the cables will be covered with sediment, as shown in the following picture:

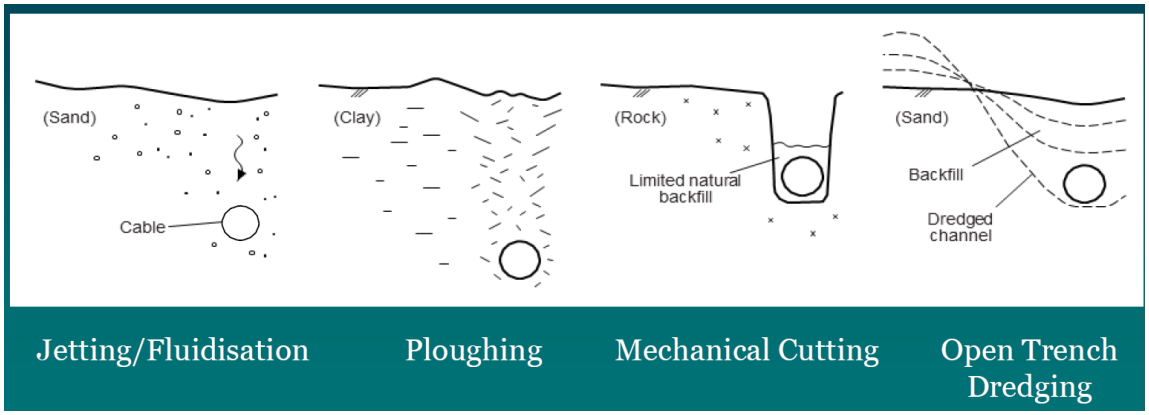

Fig. 24. The method of burying the cable in the seabed and covering it with native sediment.

In the conclusions, the authors of the study [7] and [8] unequivocally state that only accurate analyzes in the coming years, using the DTS (distributed temperature sensing) system, with an accurate diagnosis of the composition and parameters of seabed sediments, will allow to determine the impact of all phenomena on the temperature of cables and seabed sediment occurring at a depth of 20-30 cm below the seabed.

Taking into account the analyzes described above (according to [6]), as well as the chart below taken from the study [7], the parameter referred to as soil permeability has a significant impact on the temperature of the working conductor of the cable (through the phenomena of receiving heat from its surface).

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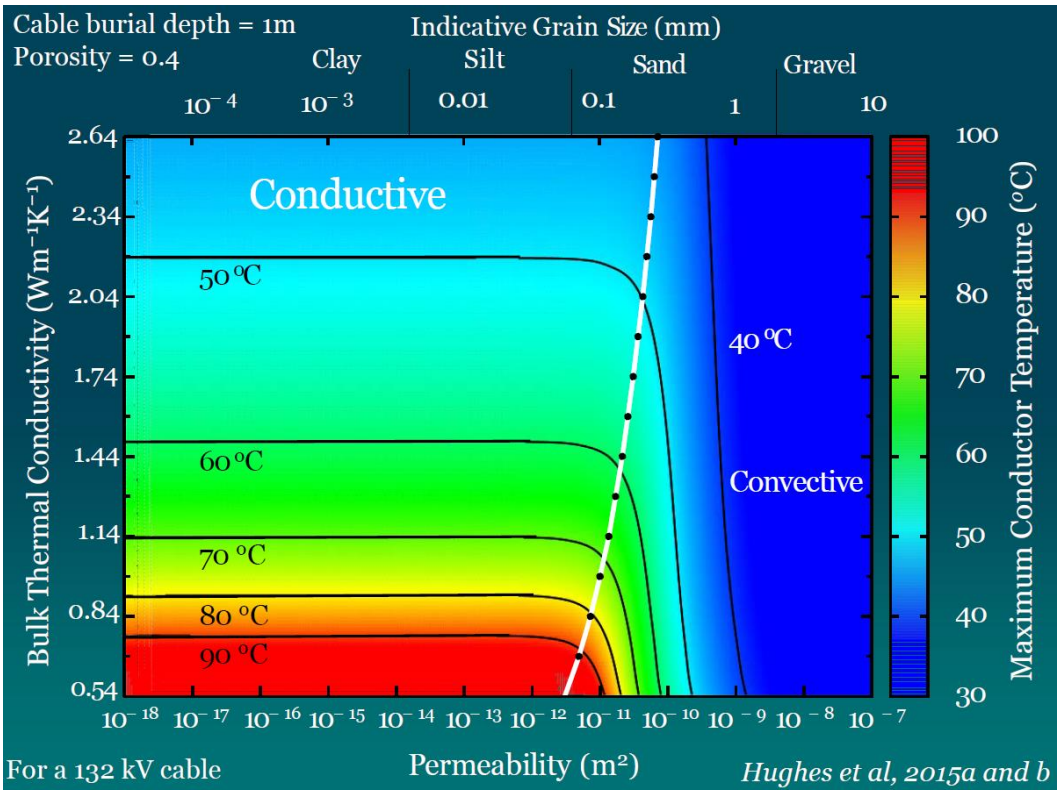

Fig. 25. The effect of the type of seabed sediment (granulation, permeability and thermal conductivity) on the temperature of the cable's working conductor [7]

Another conclusion that emerges from the analyzed studies is that in most simulations and studies, where the thermal conductivity of the ground and in some also the permeability of the seabed are taken into account, parallel phenomena are not taken into account. The simulations introduce new parameters to the environment, leaving the temperature of the tested medium at the same level. On the other hand, as it would appear from the diagram above, for a cable selected for the "bad" laying conditions (in the bottom with very low water permeability and thermal conductivity), the working conductor of the cable would be ~ 90°C, and with increasing values of thermal conductivity or permeability, the temperature of the working conductor of the cable is significantly lower (assuming no increase in load). These phenomena again lead to the conclusion that under these "good" conditions the cables are oversized (designed with too much reserve), but with the advantage of their thermal effects on the environment.

The results of the research on the modeling of seabed heating [17] include an assessment of the thermal impact caused by various types of cables installed under the bottom of the North Sea. The study concluded that even in the worst case, the temperature rise would be limited to a very narrow band over the installed cable with negligible lateral heat transfer. The width of such an effect will be very narrow, it will be a strip of land less than 1 m above the cable line.

4.1.7 Dynamics of the southern Baltic seabed

In the prepared report on the research on the recovery of the seabed after sand extraction, it was found that the dynamics of the seabed [16], due to wind and storm wave currents, is at a relatively high level. The seabed surveys were carried out for an area approx. 5 km from the shore and the seabed depth up to 20 m. The scanning of the seabed was carried out during three cruises of the research vessel: March 2009, May 2009 and April 2010. In the report published in 2014 [16] it was stated that that the thickness of the currently moving sand layer, based on the measurements, ranges from 0.4 to 0.8 m and depends on the sand grain size distribution.

The dynamics of the seabed is also confirmed by the study by Dr. Magdalena Stella from the Institute of Hydroengineering of the Polish Academy of Sciences in Gdańsk [17]. The study concluded that the synergy of wind current with storm waves is able to create conditions for more intensive transport of sediments by generating the so-called sand waves on the seabed up to a depth of 20m. According to the observations carried out, in the studied area with a depth of 16 to 20 m, bottom ripples with a height of several to twenty centimeters were found.

4.2 2K Criterion

Taking into account the available articles on the environmental impact of marine cables, the so-called 2K Criterion, which is a kind of guidance developed by the German Federal Agency of Nature

Conservation (BfN). The criterion specifies that the cross-section of sea cables and the burial depth should be selected so that the temperature of the sea soil, directly above the buried cable at a depth of approx. 20-30 cm from the seabed surface, increases by a maximum of 2°C in relation to the temperature that the ground would have itself without the cable installed. This value has been established to protect benthic organisms and benthic habitats from temperature change.

According to the theory, Criterion 2K can be met thanks to:

• reduction of losses generated in cables by increasing the cross-section of the working conductor of the installed cables,

• increasing the burial depth of power cables in the seabed / sediment.

On the other hand, referring to the opinion of Mr. Thomas Worzyk, author of the book *Submarine Power Cables, Design, Installation, Repair, Environmental Aspects*, [1], the above solutions aimed for fulfilling the BfN guidelines require consideration from a broader perspective.

In the cases under consideration, the cable was originally buried at a depth of approx. 1.0 m, which did not allow for the fulfillment of the above-mentioned criterion. Increasing the cable burial in the seabed to 1.6 m allows the requirement of the 2K criterion to be met. Burying the cable deeper, on the other hand, causes further negative effects, such as:

- extension of cable installation time (ship traffic, noise, higher fuel consumption);
- widening the trench and thus disturbing the benthos to a greater and greater extent;
- deterioration of the thermal conditions of the cables, and thus the need to increase the cross-section of the cable's working conductor (if it met the limit load capacity criterion for burial at a depth of 1.0 m);
- extended time of cable disassembly after the period of operation.

The second remedial tool, also considered at the same point in the book by Thomas Worzyk, is to leave the assumed cable burying depth of 1.0 m while increasing the cross-section of the cable's working wire. The book states that in order to meet the 2K criterion, the cross-section of the cable's working conductor should be increased by about 61%. Increasing the cross-section of a cable's working conductor has the following effects:

- a significant increase in the ecological footprint (increase in the time and cost of cable production, increase in the amount of material needed for the working conductor and cable insulation material);
- extending the installation time of the cable in the seabed (increasing the thickness of the cable increases the weight of the cable and shortens the assembly sections that can be loaded onto ships (CLV), which also translates into the need to install a greater number of couplings connecting the cables).

Considering the above, it should be noted that striving to meet the 2K Criterion could potentially cause a greater impact on the environment.

From the research carried out in the study [10], for which it was assumed that the simulated cables are loaded with a constant current value (constant maximum power generation from OWF), they heat the seabed at a speed depending on the thermal conductivity of the seabed. The study showed that heating the seabed soil to the maximum temperature assumed in the calculations takes a very long time (several dozen days) and only in the case of cables loaded with a constant maximum power (for which they are selected).

4.2.1 Conclusions for the offshore part

1) Currently, the Polish legislation does not contain explicitly defined permissible values for the temperature rise of the seabed in which power cables were laid that evacuate power from offshore wind farms.

   In foreign regulations, for example in the guidelines of the German Federal Agency of Nature Conservation (BfN), they refer to the so-called "Criterion 2K". The criterion specifies that the cross-section of sea cables and the burial depth should be selected so that the temperature of the sea soil, directly above the buried cable at a depth of about 20-30 cm from the seabed surface, increases by a maximum of 2 degrees compared to the temperature of the same soil without cable installed.

   This value has been established to protect benthic organisms and benthic habitats from temperature change. Considering the above-mentioned criterion, when we take into account the studies and analyses [16] and [17] described in chapter 4.1.7, it does not seem justified, considering that on the bottom of the Baltic Sea, mainly in its southern part, there are large movements of bottom sediments (sand) up to 80 cm. The analysis of the hypothetical case of the sediment temperature change below the bottom at a depth of 20-30 cm and the determination of the impact of these temperature changes on the benthos above the cables is practically impossible, because the seabed sediment layer and the benthos are cyclically displaced.

2) Various examples of approaches to thermal modeling of high voltage offshore power cables can be found in the literature. In the analyzed materials, no studies were found considering the sum of all phenomena occurring on the seabed that affect the temperature of the seabed and the cable itself. In most studies, the authors present models based on finite element analysis. There are also studies based on the IEC 60287 standard. Some authors compare the results of these two methods and show their high convergence in terms of the temperature distribution around cables embedded in the seabed, while adopting some simplifications for the thermal model in terms of the boundary condition for calculations, which is the temperature of the seabed.

In the calculations, all the authors introduce some simplifications to the methods used, most of them assume in their calculations: a constant temperature of the seabed (boundary condition) at the place of cable installation in the seabed and homogeneous thermal conductivity of the seabed soil or its inverse, i.e. the thermal resistivity of the soil, disregarding the phenomenon penetration of sea water into the soil of the bottom and the movement of water masses at the bottom, i.e. the occurrence of the so-called convection phenomenon (the phenomenon of heat exchange in liquids) and the migration of moisture in the ground.

3) All the above-mentioned studies show that when cables in the seabed are embedded in materials with higher specific thermal resistivity (clays and fine sands), the area of thermal impact of the cable is practically no longer present at a distance of 0.4-0.5 m from the outer cable shell. On the other hand, in materials with lower specific thermal resistivity (coarse sands and gravel), the cable itself is better cooled, but the displacement of heated moisture layers reaches higher levels.
4) The actual load characteristics of the cables have a very large impact on the thermal impact of sea power cables. The experience from the identified installations shows that the cable loads only in short time sections are close to the maximum load capacity of 100% of the assumed values. The average load values of such cables vary between 60% -80% of the maximum values, which has a significant impact on the temperature of the working conductors of the cables and, therefore, on the amount of heat emitted to the environment.
5) It should also be borne in mind that if, in order to meet the "2K" condition, it is necessary to bury the cables to an increasing depth (e.g. to a depth of 3.0 m below the seabed), the process of installing the cable in the seabed will have a bigger impact on the natural environment of the seabed than the possible local impact at a depth of 20 cm below the bottom level, resulting from exceeding the conventional temperature of two Kelvin degrees (2K Criterion) in relation to the water temperature, given that the temperature of the water at the depth of approx. 30 m changes during the year to a much greater extent (from a few to a dozen degrees).
6) On the basis of the conducted literature query, it can be concluded that there is no single adopted model in the literature that would allow to determine the thermal effect of cables buried in the seabed. It is important to determine how the types of cables (cross-sections of working conductors) have been selected in relation to the characteristics of their permissible loads, i.e. what temperature output values will be reached by the outer layers of the cables. The parameters of the soil in which the cables are to be buried, such as thermal resistivity and permeability, and whether there are even minimal displacements of water masses over the cables in a given area, also have a large impact on the final thermal effect of cables.

5 Thermal impact of onshore export cables

5.1 Introduction

The flow of electricity through cable power lines is not a lossless process, energy losses are generated in the form of heat released, in particular in the working conductor of the cable (they are related to the current flow and conductor resistance) and the main insulation of the cable (dielectric losses). The occurrence of energy losses in power cables causes the cables to heat up and the phenomenon of thermal influence on the environment when the temperature of the cable (its outer sheath) rises above the ambient temperature.

The magnitude of the thermal impact depends on many factors, the most important of which are: technical parameters of the cables used, the value of the current flowing, the method and depth of laying cable lines in the ground, the presence of other heat sources (e.g. other cable lines), soil parameters (e.g. thermal resistivity), humidity, degree of compaction, ground temperature, etc.) in which the cable lines are laid.

In this document, an example of the temperature distribution around underground cable lines is presented for the assumptions defined in section 5.2 of this study.

5.2 Assumptions for calculations

Based on the materials received from the Ordering Party, in particular the document no.C256-EP-Z-RZ-00001_C2 - Appendix 10 pt. "Cable technical specification", which is an appendix to the feasibility study for power evacuation from OWF Bałtyk II and OWF Bałtyk III offshore wind farms on the onshore section, information on the load value of cable lines and the minimum laying depth, the calculation of the temperature distribution around underground cable lines was based on the following assumptions:

a) the output of power from the offshore station to the onshore power stations (LSE) will be at 220 kV for 3-phase alternating current with a frequency of 50 Hz:

- the number of 220 kV cable lines (tracks): 4 (2 OWF Baltic II lines and 2 OWF Baltic III lines)
- cable laying in the track: triangular (cables of individual phases are touching)
- distance between track centers: 2,5 m
- laying depth: 1.3 m (minimum laying depth)
- load current for each track: 1000 A
- cable lines load factor: 1 *)
- track and cable load: symmetrical
- cable insulation type: XLPE
- cable working conductor material: copper / aluminum

- acceptable long-term temperature of cable working conductors: 90°C
- temperature on the ground surface: 20°C (boundary condition)
- average thermal resistivity of the soil: 1 m*K/W

b) the power output from onshore power stations (LSE) to the National Power System will be conducted at a voltage of 400 kV of 3-phase alternating current with a frequency of 50 Hz:

- number of 400 kV cable lines (tracks): 2 (1 OWF Baltic II circuit and 1 OWF Baltic III circuit)
- cable laying in the track: triangular (cables of individual phases are touching)
- distance between track centers: 5,0 m
- laying depth: 1,3 m (minimum laying depth)
- load current for each track: 1250 A
- cable lines load factor: 1 *)
- track and cable load: symmetrical
- cable insulation type: XLPE
- cable working conductor material: copper / aluminum

- acceptable long-term temperature of cable working conductors: 90°C
- temperature on the ground surface: 20 °C (boundary condition)
- average thermal resistivity of the soil: 1 m*K/W

**) Load factor (LF) - it is the ratio of the average value of the load current to the maximum value occurring in a given period of time. The long-term current carrying capacity with the LF = 1 coefficient means a constant average value of the load current in a given time interval, which is equal to the maximum value of the load current.*

The soil conditions (temperature and average thermal resistivity of the soil) in accordance with the IEC 60287-3-1 standard for the territory of Poland were adopted for the calculation of the temperature distribution around underground cable lines. The thermal resistivity of soil depends to a large extent on the humidity, density and type of the fraction of a given soil type. Soil humidity, as well as temperature, change periodically throughout the year. On the route of the planned cable lines, there may be different soil fractions with different degrees of compaction and thickness. The ground conditions on the route of the line may be different.

Therefore, in the case of cable lines, it is recommended to test the thermal resistivity of the soil at the stage of preparing the documentation of the construction design and detailed design in order to find out its actual value at the place of cable laying. The thermal resistivity of the soil has a significant influence on the selection of the cross-section of the working conductor of the cables. On the other hand,

regardless of the ground conditions or the cross-section of the cable's working conductor used, the maximum permissible long-term temperature of the working conductors in cables with XLPE insulation may not exceed 90 °C, and the cable's return conductor should not exceed 80 °C.

Computational models

The calculation models used for the purposes of this analysis were made on the basis of the IEC 60287 standard, and the temperature distribution in the study was made on the basis of the so-called the mirror reflection method, which assumes the existence of two linear heat sources: a real source representing the power losses due to the resistance of the working conductor and dielectric losses in the insulation of the basic cable line and its symmetrical representation with respect to the earth's surface with the same power value as the real source, but with a negative sign. In this method, it is also assumed that for a homogeneous medium, the thermal resistance of the soil is constant and does not depend on the distribution of the temperature field in the soil itself. In order to determine the cumulative thermal impact for the considered arrangement of cable lines, the superposition principle was applied for thermal fields from individual cable lines.

In calculations, on the basis of documentation no. C256-EP-Z-RZ-00001_C2 - Appendix 10 pt. "Cable technical specification", for 220 kV cable entries, single-phase cables with a copper working conductor of XRUHKXS-WTC-2T4FS type 1x1600RMS 127/220 (245) kV and aluminum type XRUHAKXS-WTC-2T4FS 1x2500 RMS / 125 127/220 (245) kV were modeled, and for the 400 kV line, single-phase cables with copper working conductor XRUHKXS-WTC-2T4FS 1x2000RMS / 215 220/400 (420) kV and aluminum XRUHAKXS-WTC-2T4FS 1x3000 RMS / 215 220/400 (420) kV were modeled. These are cables with the smallest cross-section of the working conductors (copper or aluminum) for individual voltage levels, which at the present early stage of design works are expected to be the source of the maximum thermal impact of the cables on the environment. In order to determine the maximum thermal effects of cables on the biologically active layer of the soil (soil layer), cables should be laid at the minimum depth in the ground, i.e. at a depth of 1.3 m.

At the stage of execution of construction designs or detailed designs, the final cable sections will be selected. Several types of cables with XLPE insulation will be used along the route of cable lines, which will differ in the cross-section of the working conductor in individual sections of the line. However, the maximum long-term temperature of the working conductors in these cables will not exceed 90°C.

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5.3 Analysis results

Calculations of the temperature distribution around 220 kV and 400 kV cable lines (tracks) were made for the following geometric configurations of the cable system:

- **Example No. 1A.** Laying cables directly in the ground at a minimum depth of 1.3 m
  - 1 cable track 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Cu, current 1000 A;

- **Example No. 1B.** Laying cables directly in the ground at a minimum depth of 1.3 m
  - 1 cable track 220 kV, single-core cables in XLPE insulation with a working core of 2500 mm^2 Al, current 1000 A;

- **Example No. 2A.** Laying cables directly in the ground at a minimum depth of 1.3 m
  - 2 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Cu, current 1000 A;

- **Example No. 2B.** Laying cables directly in the ground at a minimum depth of 1.3 m
  - 2 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 2500 mm2 Al, current 1000 A;

- **Example No. 3A.** Laying cables directly in the ground at a minimum depth of 1.3 m
  - 4 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Cu, current 1000 A. This example reflects the planned investment in the field of power evacuation from the Baltic II and Baltic III wind farms at full power generation in the farms;

- **Example No. 3B.** Laying cables directly in the ground at a minimum depth of 1.3 m
  - 4 cable tracks 220 kV, XLPE insulated single-core cables with 2500 mm2 Al working conductor, 1000 A current. This example reflects the planned investment in power evacuation from the Baltic II and Baltic III wind farms at full power generation in the farms;

- **Example No. 4A.** Laying cables directly in the ground at a minimum depth of 1.3 m
  - 1 cable track 400 kV, single-core cables in XLPE insulation with a working core of 2000 mm2 Cu, current 1250 A;

- **Example No. 4B.** Laying cables directly in the ground at a minimum depth of 2.0 m
  – 1 cable track 400 kV, single-core cables in XLPE insulation with a working core of 3000 mm2 Al, current 1250 A;

- **Example No. 5A.** Laying cables directly in the ground at a minimum depth of 1.3 m
  – 2 cable tracks 400 kV, single-core cables in XLPE insulation with a working conductor of 2000 mm2 Cu, current 1250 A. This example reflects the planned investments in the field of power evacuation from onshore power stations Baltic II and Baltic III and the power station of Polskie Sieci Elektroenergetyczne (PSE);

- **Example No. 5B.** Laying cables directly in the ground at a minimum depth of 1.3 m
  – 2 cable tracks 400 kV, single-core cables in XLPE insulation with a working conductor of 3000 mm^2 Al., current 1250 A. This example reflects the planned investments in the field of power evacuation from onshore power stations Baltic II and Baltic III and the power station of Polskie Sieci Elektroenergetyczne (PSE).

5.3.1 Calculation example no. 1A – results

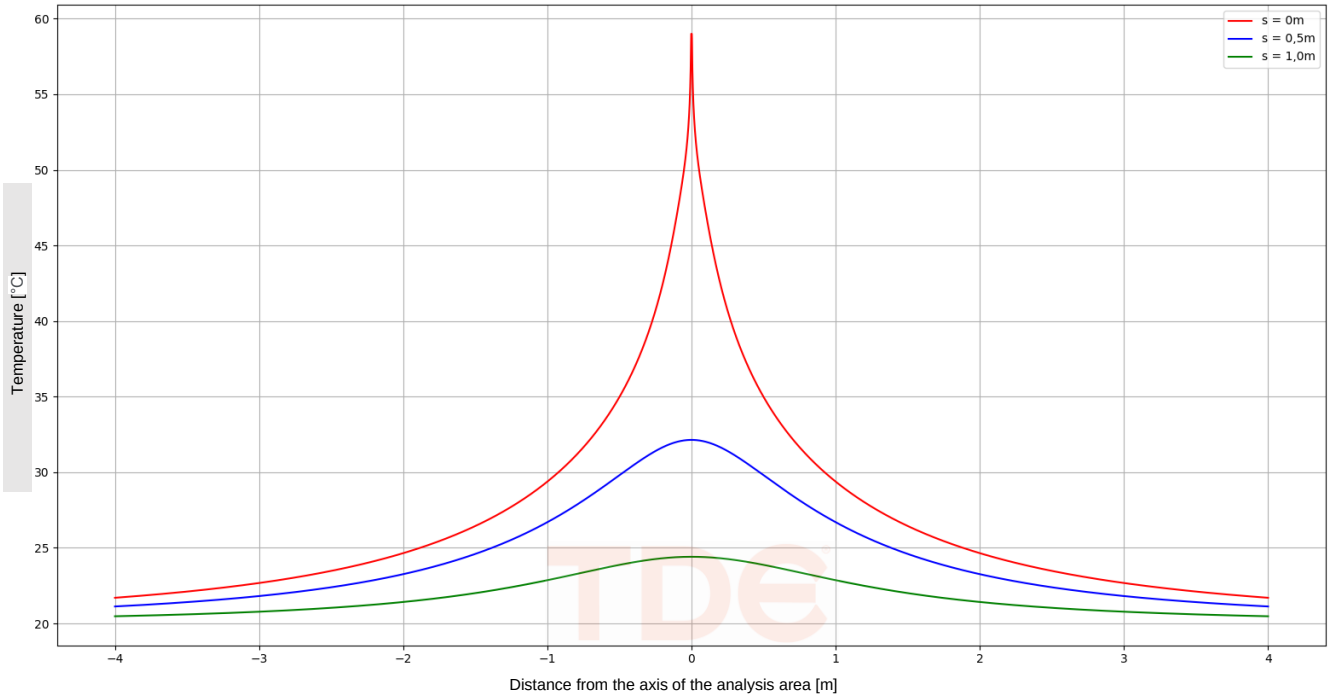

Fig. 26. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for calculation example No. 1A (1 cable track 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Cu, current 1000 A), where "s" is the distance of the horizontal plane from the cable axis on which the soil temperature values are determined.

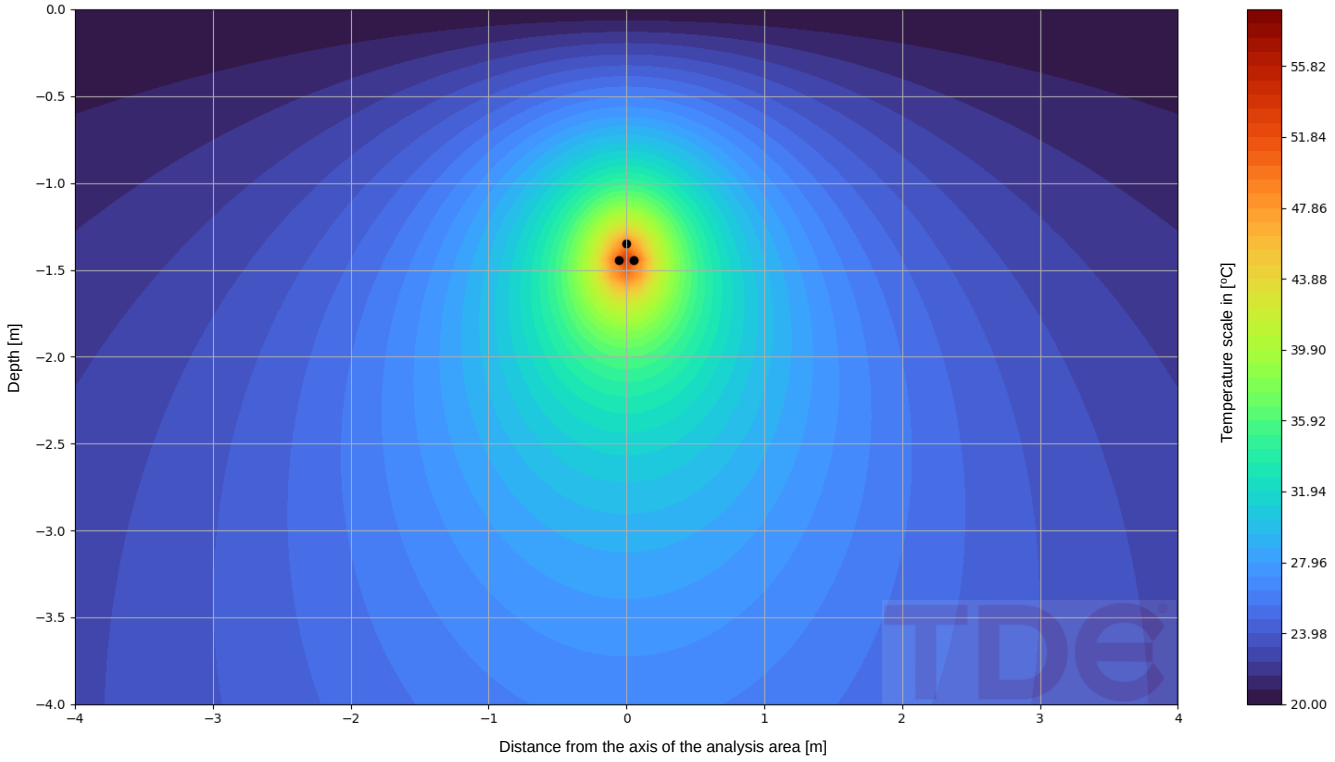

Fig. 27. The spatial distribution of the temperature field in the ground around the cable system for the calculation example No. 1A (1 cable track 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Cu, current 1000 A)

5.3.2 Calculation example no. 1B – results

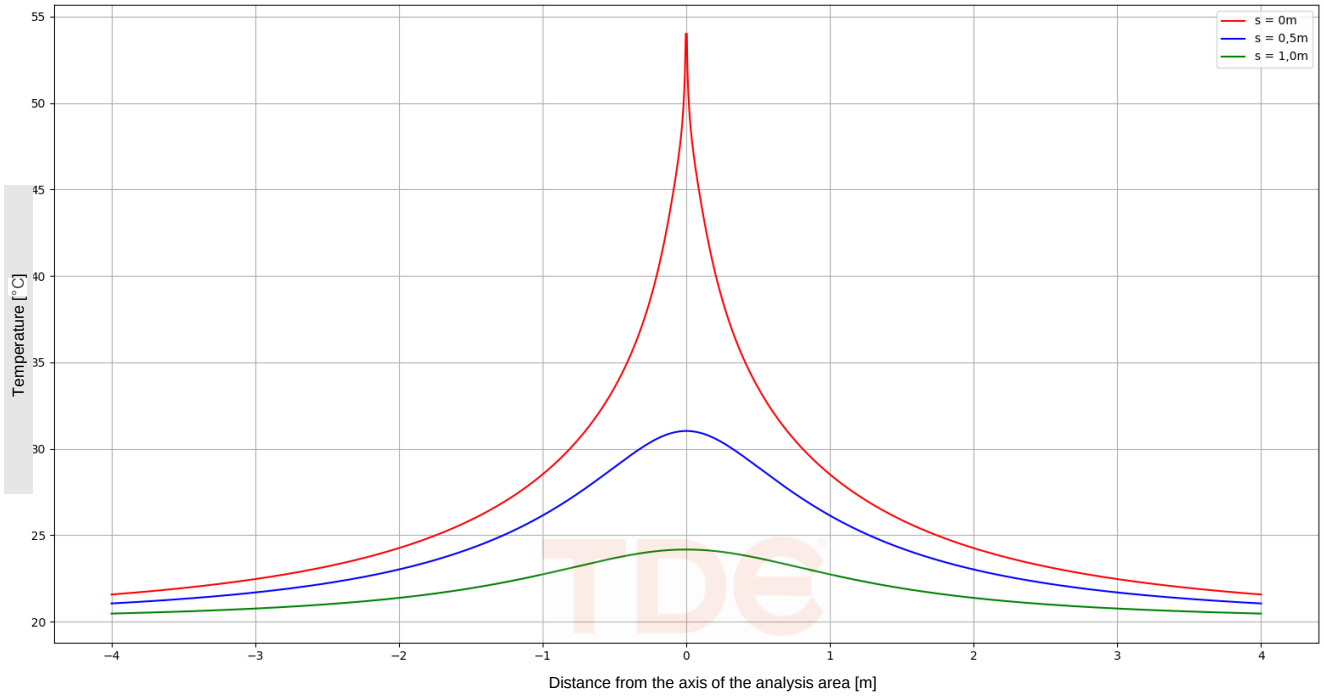

Fig. 28. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for calculation example No. 1B (1 cable track 220 kV, single-core cables in XLPE insulation with a working core of 2500 mm2 Al, current 1000 A), where "s" is the distance of the horizontal plane from the cable axis on which the soil temperature values are determined.

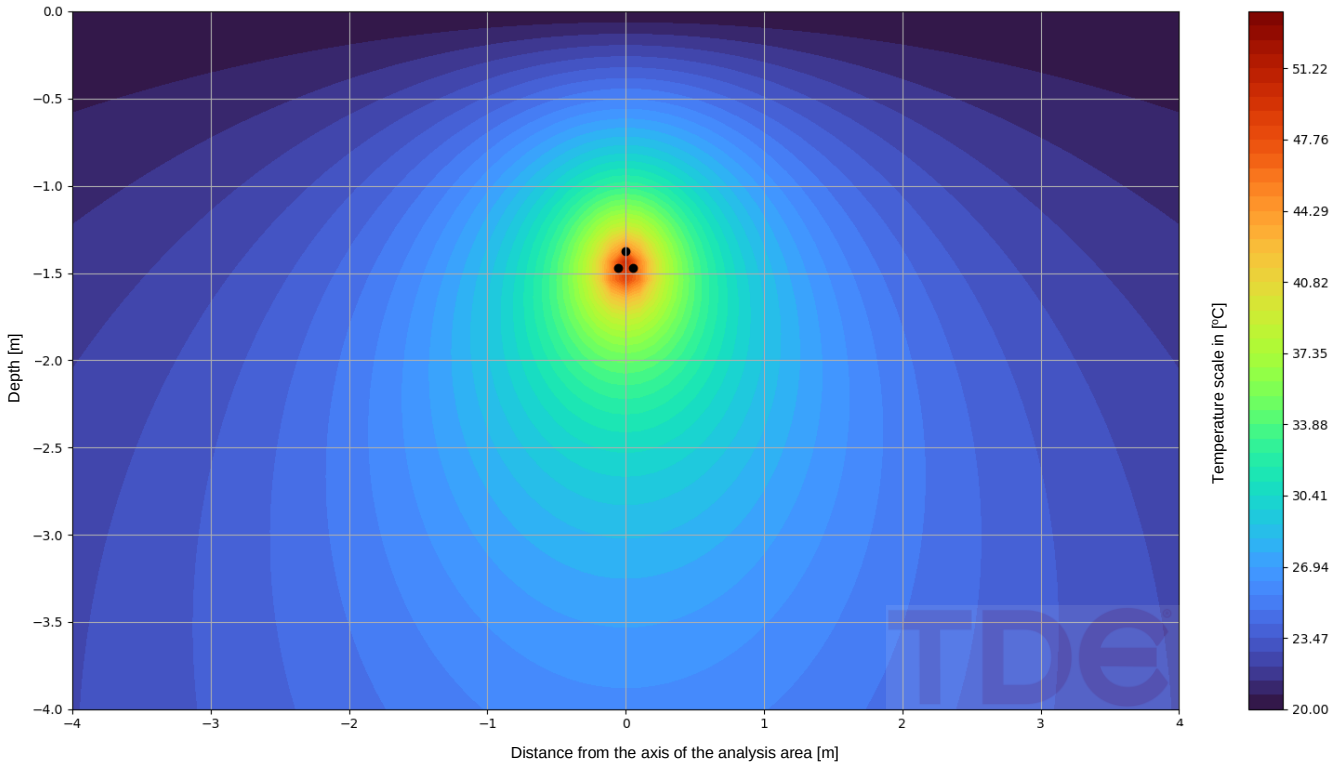

Fig. 29. The spatial distribution of the temperature field in the ground around the cable system for the calculation example No. 1B (1 cable tray 220 kV, single-core cables in XLPE insulation with a working core of 2500 mm2 Al, current 1000 A).

5.3.3 Calculation example no 2A – results

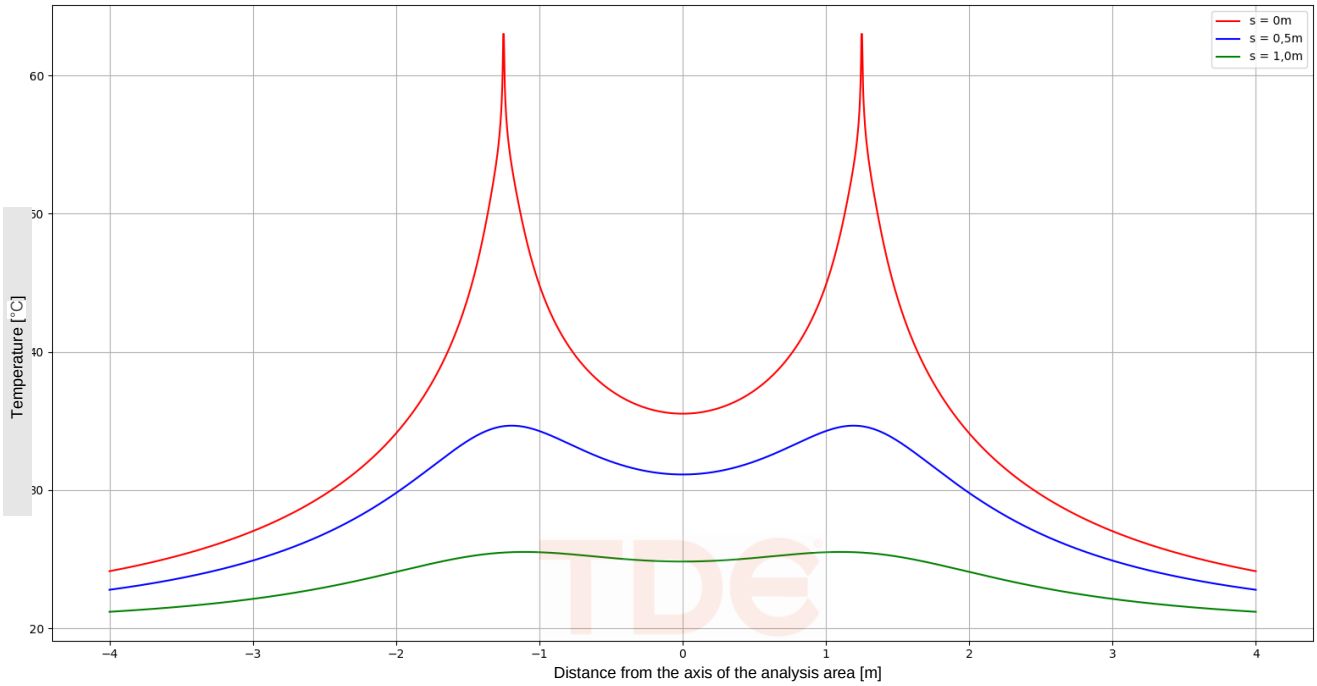

Fig. 30. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for calculation example No. 2A (2 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 16f00 mm2 Al, current 1000 A), where "s" is the distance of the horizontal plane from the cable axis on which the soil temperature values are determined.

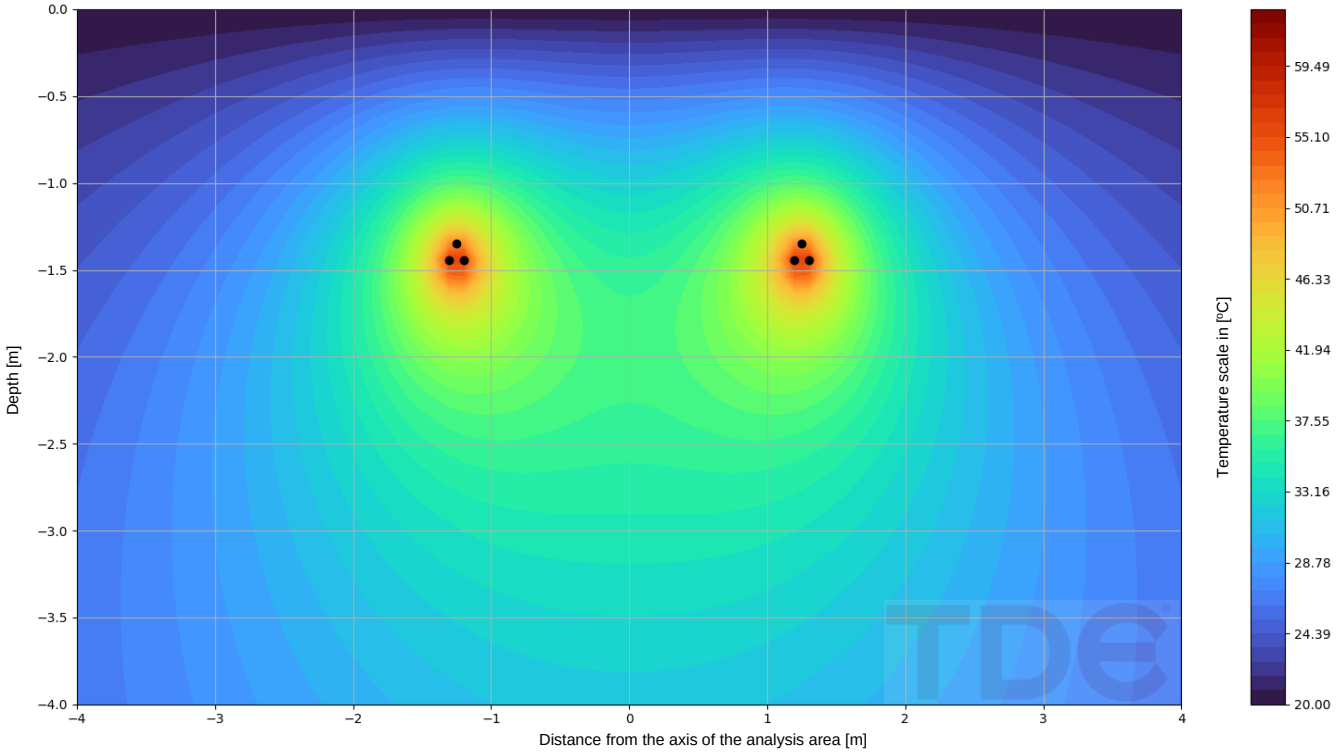

Fig. 31. The spatial distribution of the temperature field in the ground around the cable system for the design example no. 2A (2 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Al, current 1000 A).

5.3.4 Calculation example no. 2B – results

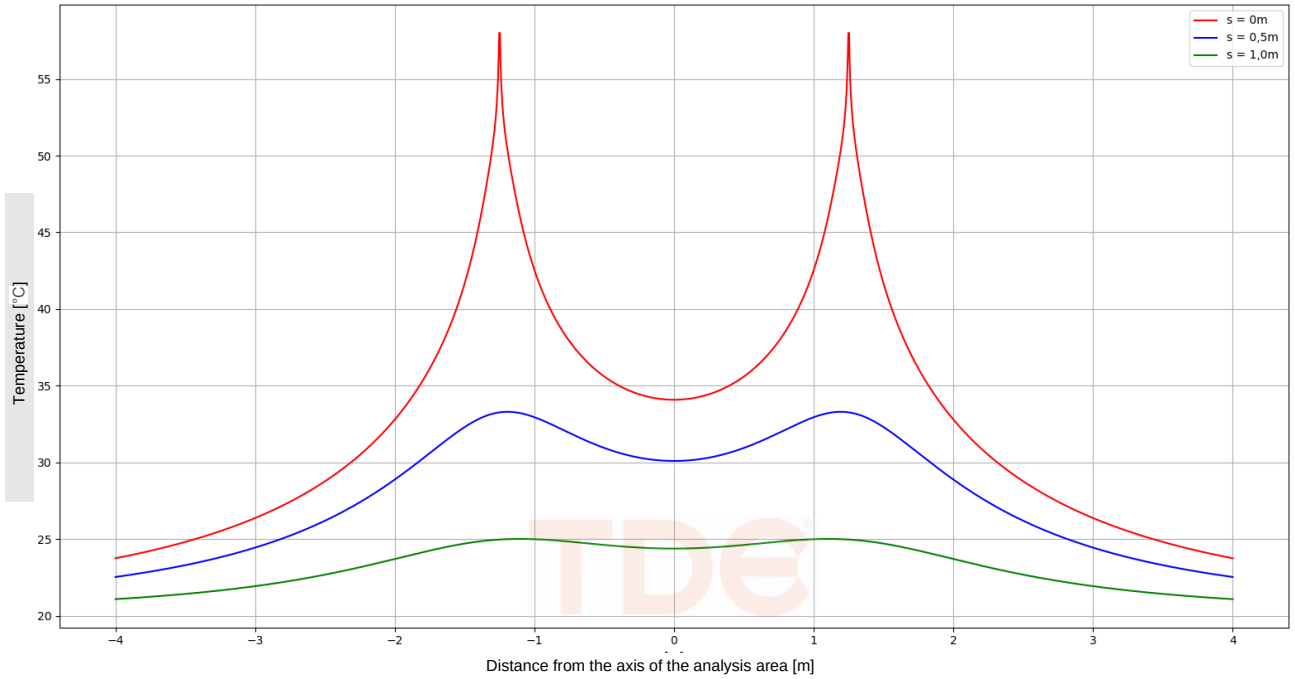

Fig. 32. The spatial distribution of the temperature field in the ground around the cable system for the design example no. 2B (2 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 2500 mm2 Al, current 1000 A).

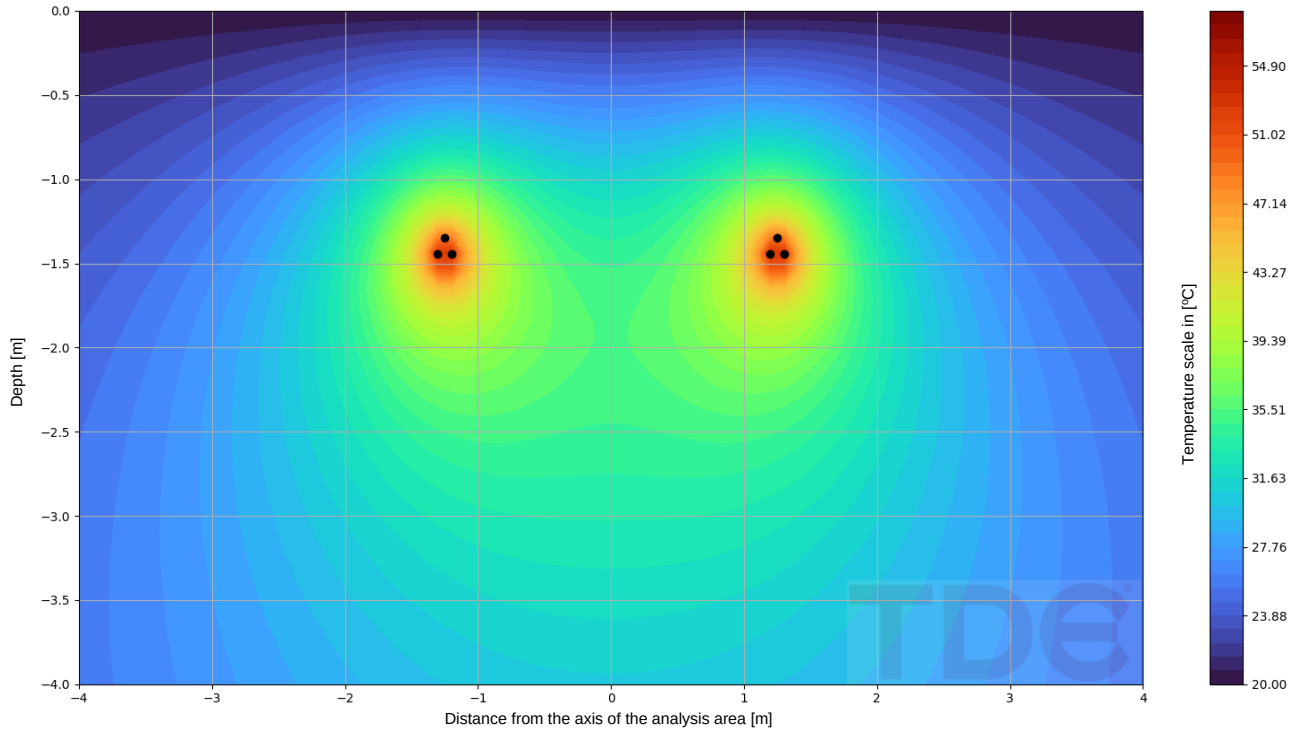

Fig. 33. The spatial distribution of the temperature field in the ground around the cable system for the design example no. 2B (2 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 2500 mm2 Al, current 1000 A).

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5.3.5 Calculation ex ample no. 3A – results

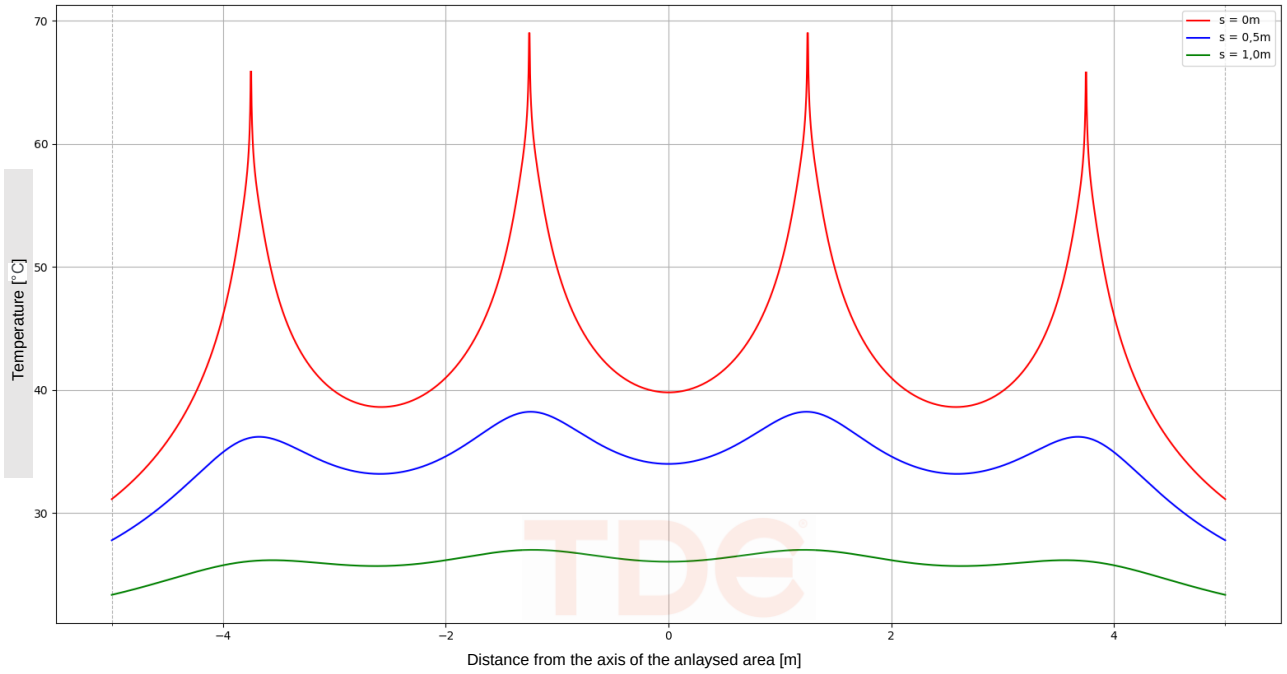

Fig. 34. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for the calculation example No. 3A (4 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Cu, current 1000 A), where "s" is the distance of the horizontal plane from the cable axis on which the soil temperature values are determined. Power take off point from the OWF Baltic II and the OWF Baltic III.

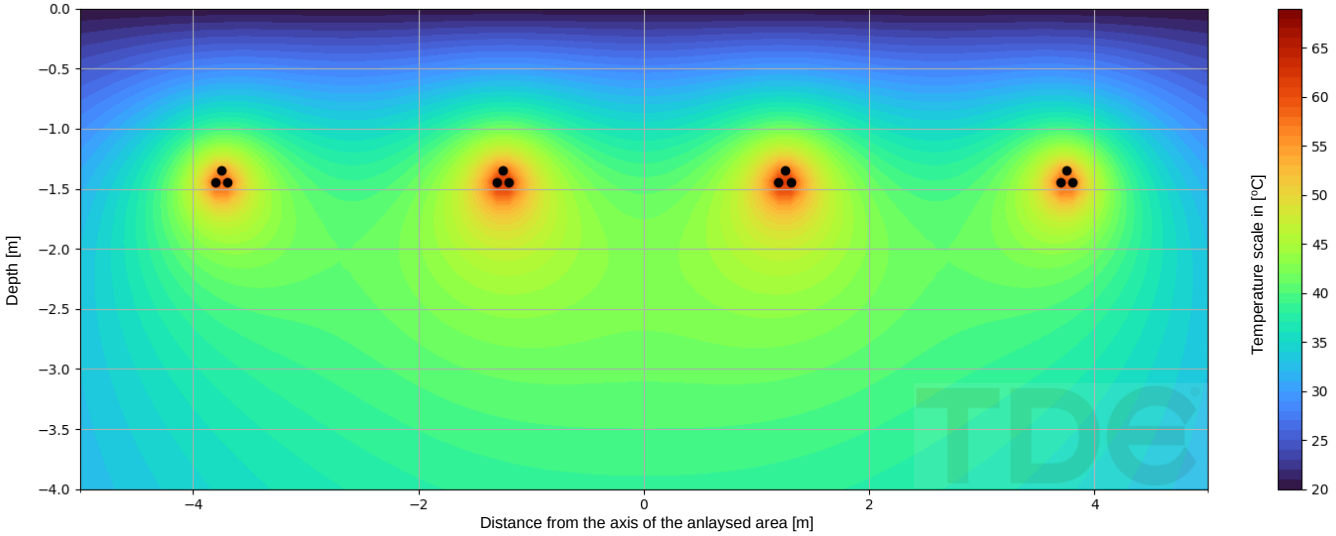

Fig. 35. The spatial distribution of the temperature field in the ground around the cable system for the design example no. 3A (4 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 1600 mm2 Cu, current 1000 A). Power take off point from the OWF Baltic II and the OWF Baltic III.

5.3.6 Calculation example no. 3B – results

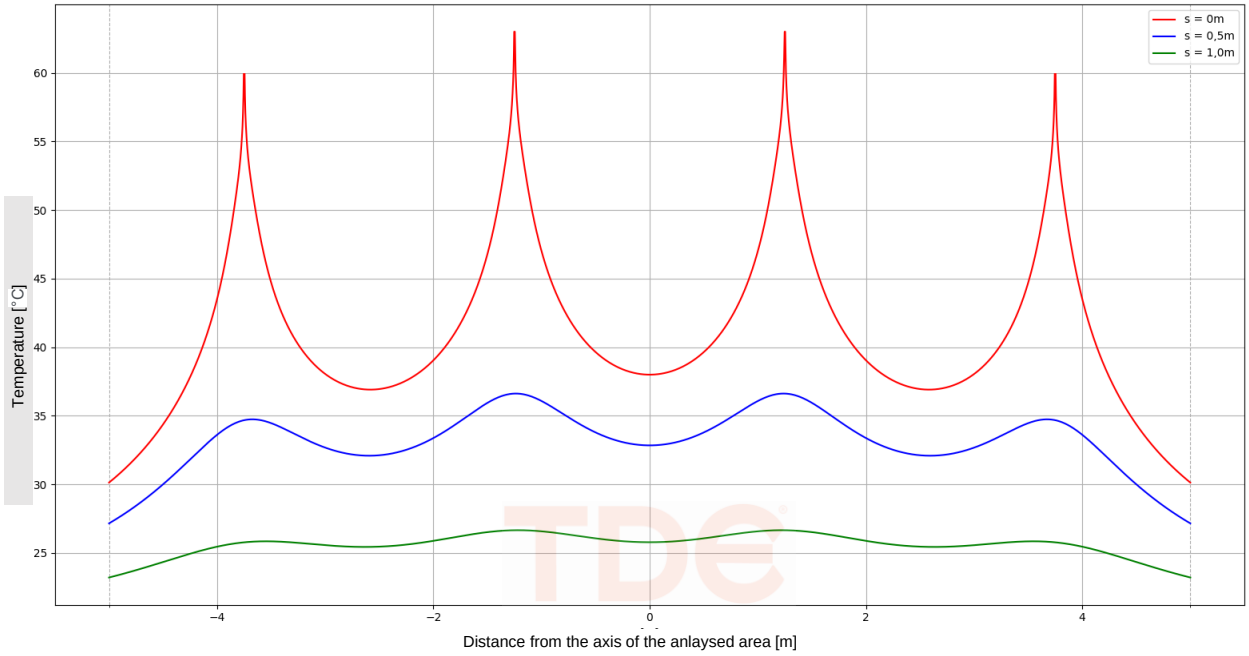

Fig. 36. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for calculation example No. 3B (4 cable tracks 220 kV, single-core cables in XLPE insulation with a working core of 2500 mm2 Al, current 1000 A), where "s" is the distance of the horizontal plane from the cable axis on which the soil temperature values are determined. Power take off point from the OWF Baltic II and the OWF Baltic III.

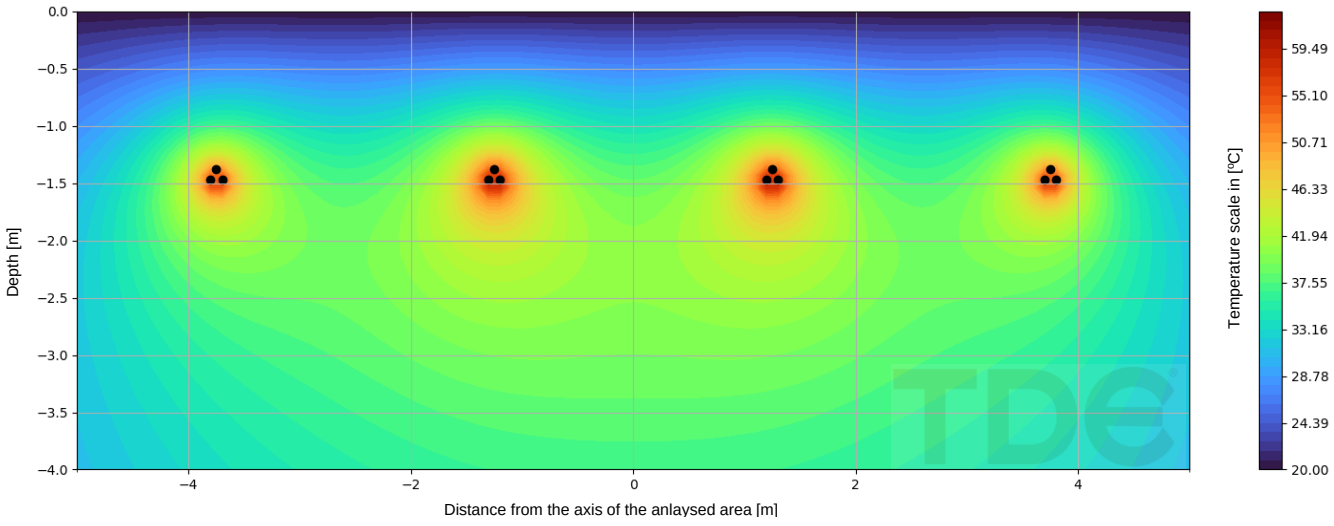

Fig. 37. The spatial distribution of the temperature field in the ground around the cable system for the calculation example no. 3B (4 cable tracks 220 kV, single-core cables with XLPE insulation with a working core of 2500 mm2 Al, current 1000 A). Power take off point from the OWF Baltic II and the OWF Baltic III.

5.3.7 Calculation example no. 4A – results

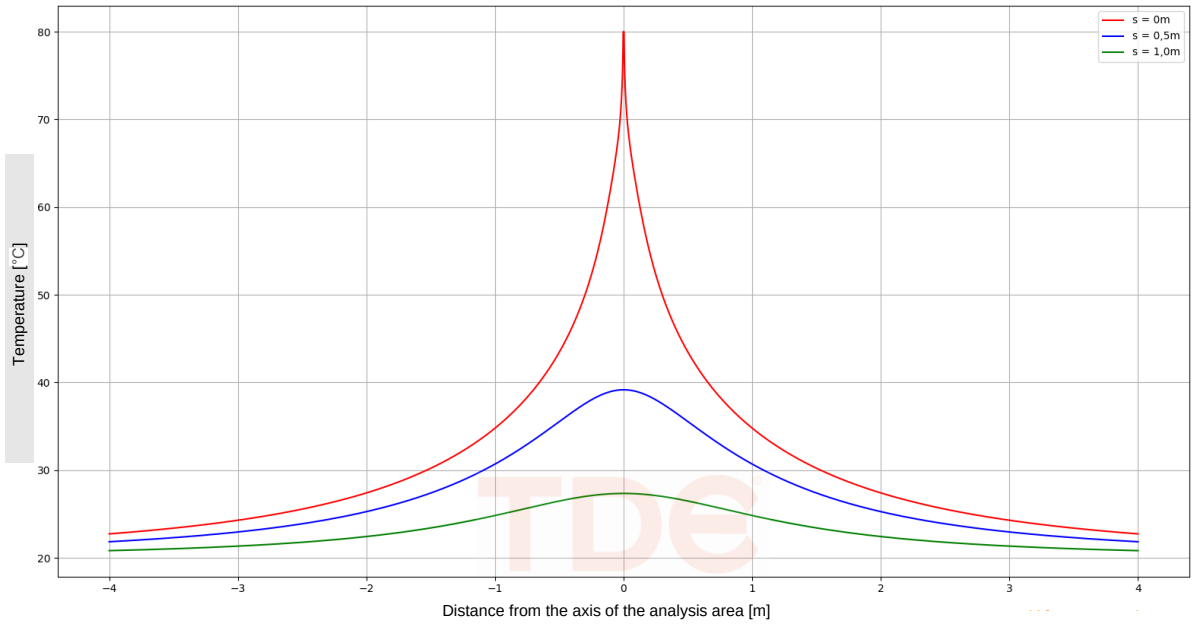

Fig. 38. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for calculation example No. 4A (1 cable track 400 kV, single-core cables in XLPE insulation with a working core of 2000 mm2 Cu, current 1250A), where "S" denotes the distance of the horizontal plane from the cable axis on which the soil temperature values are determined.

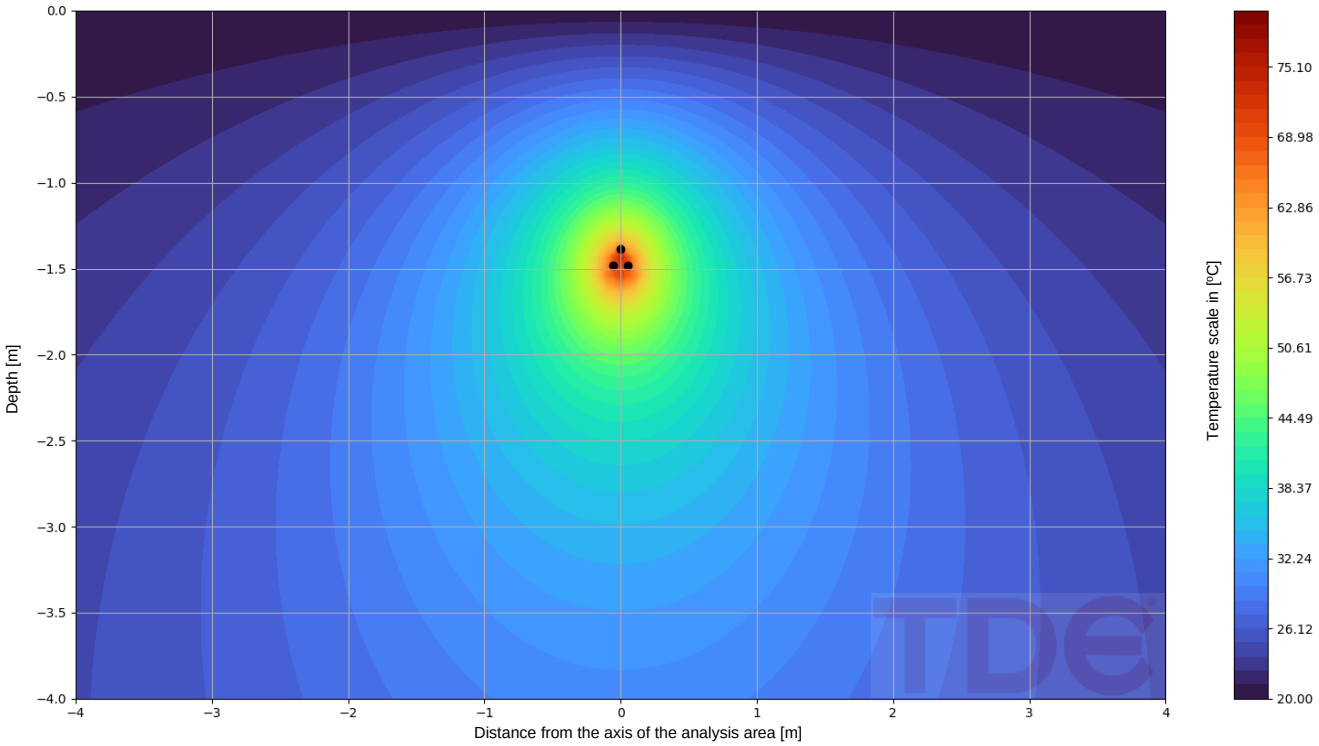

Fig. 39. The spatial distribution of the temperature field in the ground around the cable system for the calculation example No. 4A (1 cable track 400 kV, single-core cables in XLPE insulation with a working core of 2000 mm2 Cu, current 1250 A).

5.3.8 Calculation example no. 4B – results

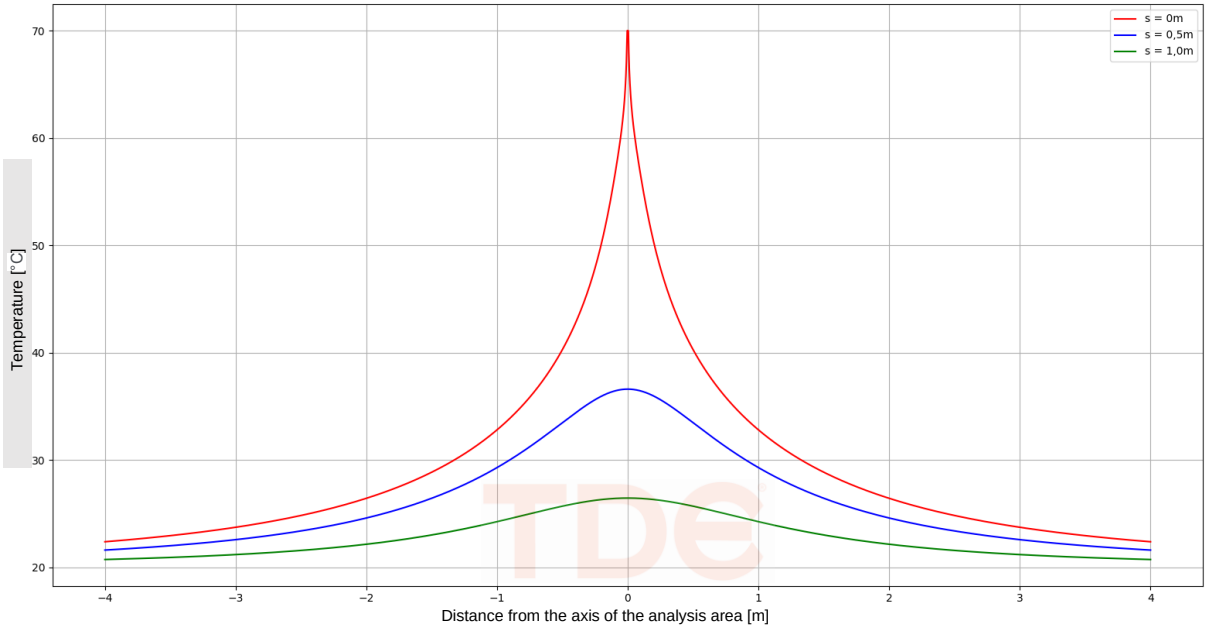

Fig. 40. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for calculation example No. 4B (1 cable track 400 kV, single-core cables in XLPE insulation with a working core of 3000 mm2 Al, current 1250A), where "S" denotes the distance of the horizontal plane from the cable axis on which the soil temperature values are determined.

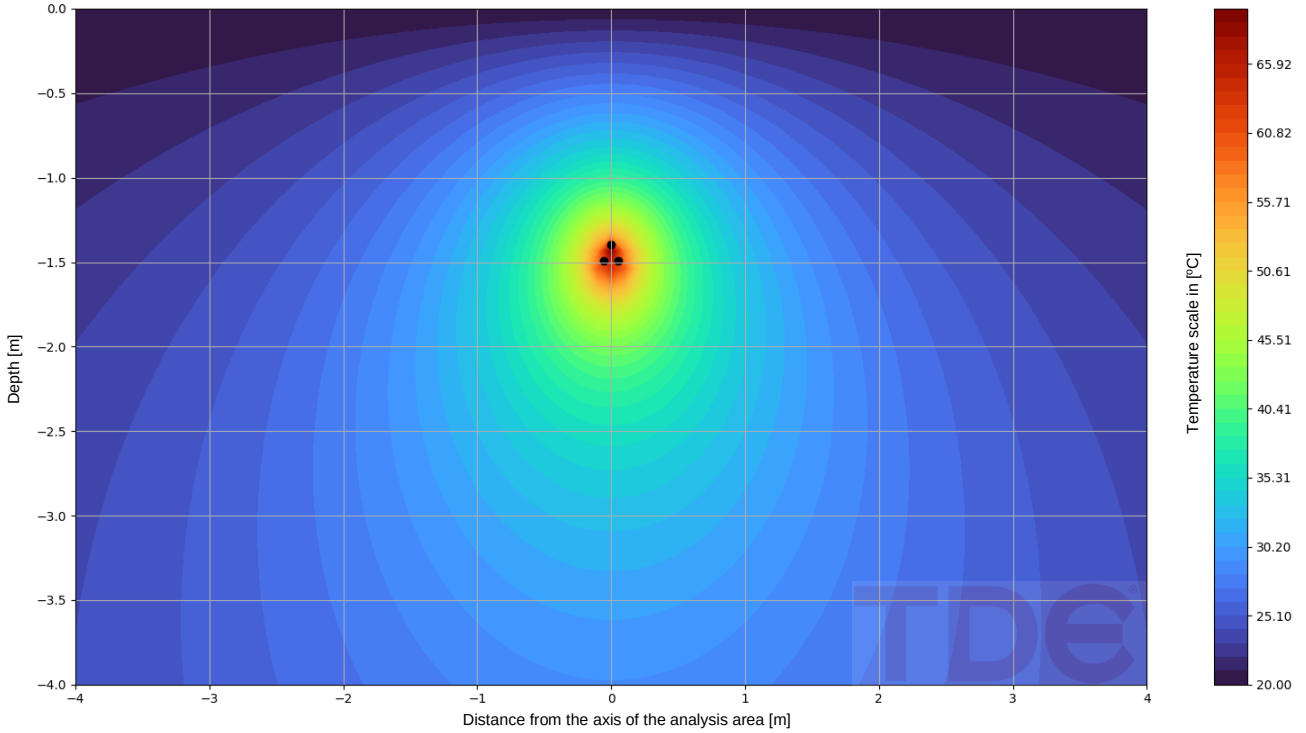

Fig. 41. The spatial distribution of the temperature field in the ground around the cable system for the calculation example No. 4B (1 cable track 400 kV, single-core cables in XLPE insulation with a working core of 3000 mm2 Al, current 1250 A).

5.3.9 Calculation example no. 5A – results

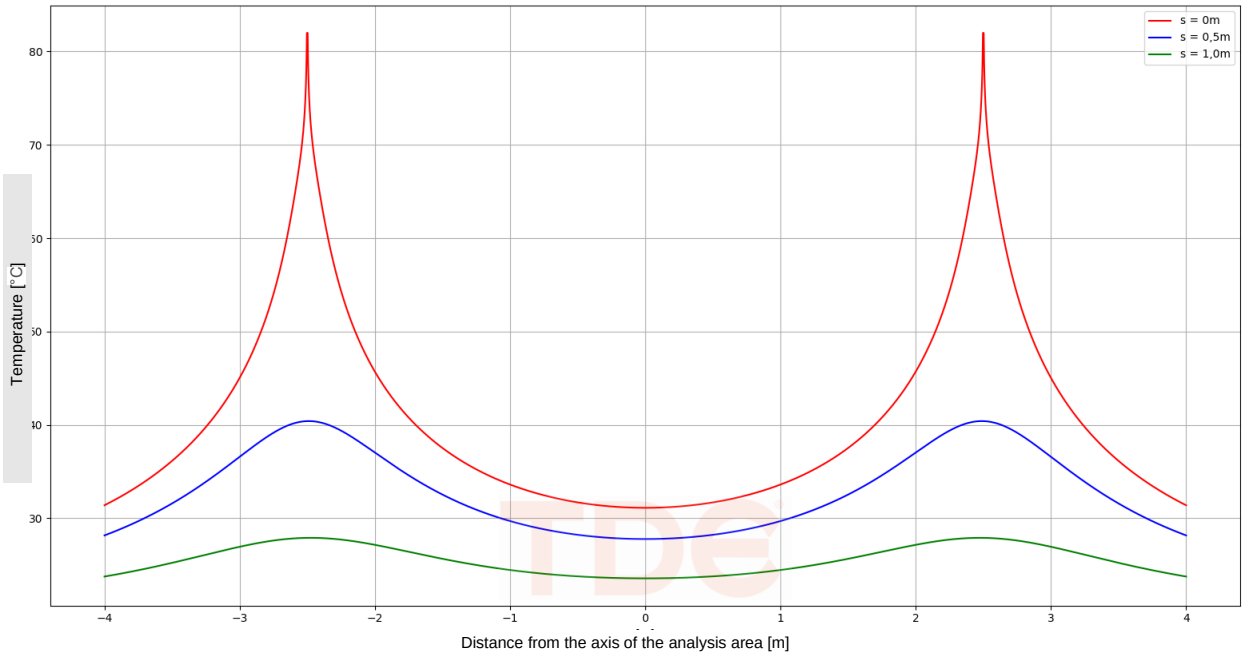

Fig. 42. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for the calculation example No. 5A (2 cable tracks 400 kV, single-core cables in XLPE insulation with a working core of 2000 mm2 Cu, current 1250 A). Connection between the land stations Baltic II and Baltic III and the station of the Polish Transmission Networks.

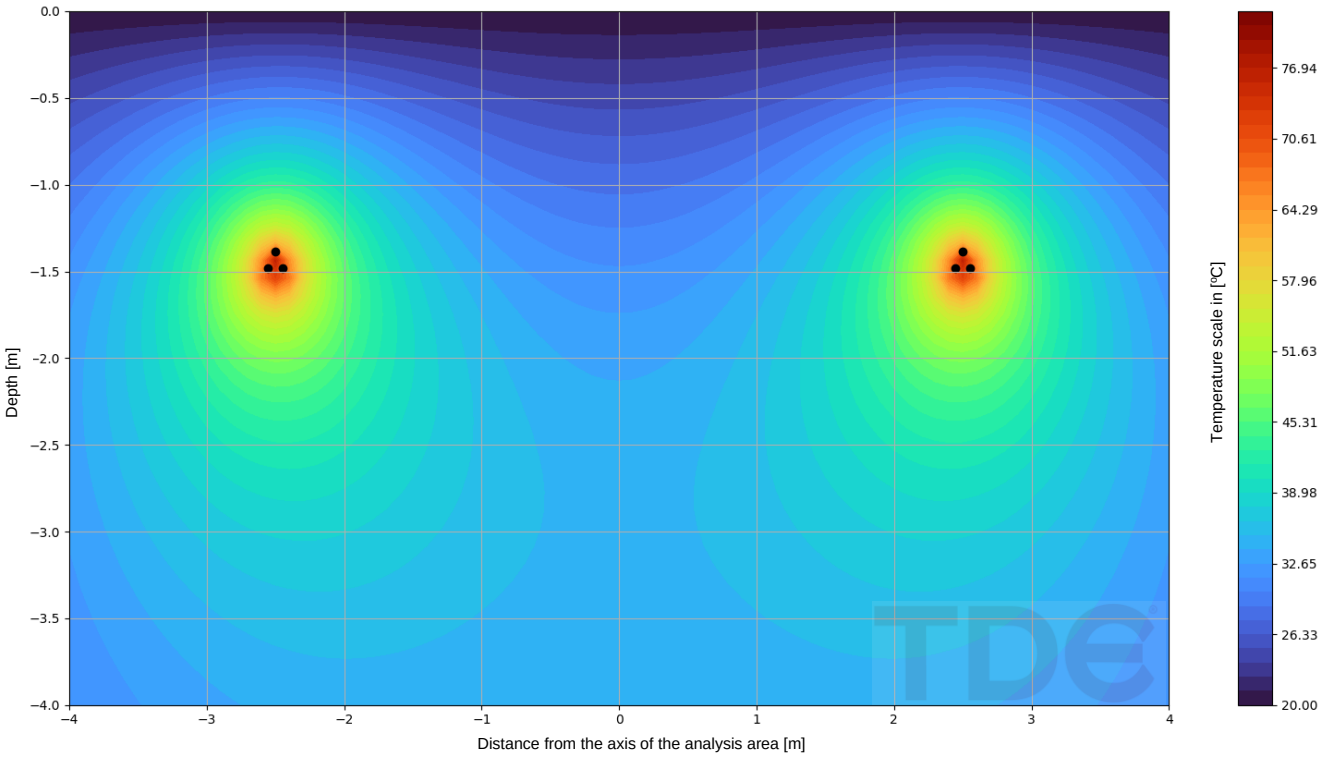

Fig. 43. The spatial distribution of the temperature field in the ground around the cable system for the calculation example No. 5A (2 cable tracks 400 kV, single-core cables in XLPE insulation with a working core of 2000 mm2 Cu, current 1250 A), where "s" is the distance of the horizontal plane from the cable axis on which the soil temperature values are determined. Connection between the land stations Baltic II and Baltic III and the station of the Polish Transmission Networks.

5.3.10 Calculation example no. 5B – results

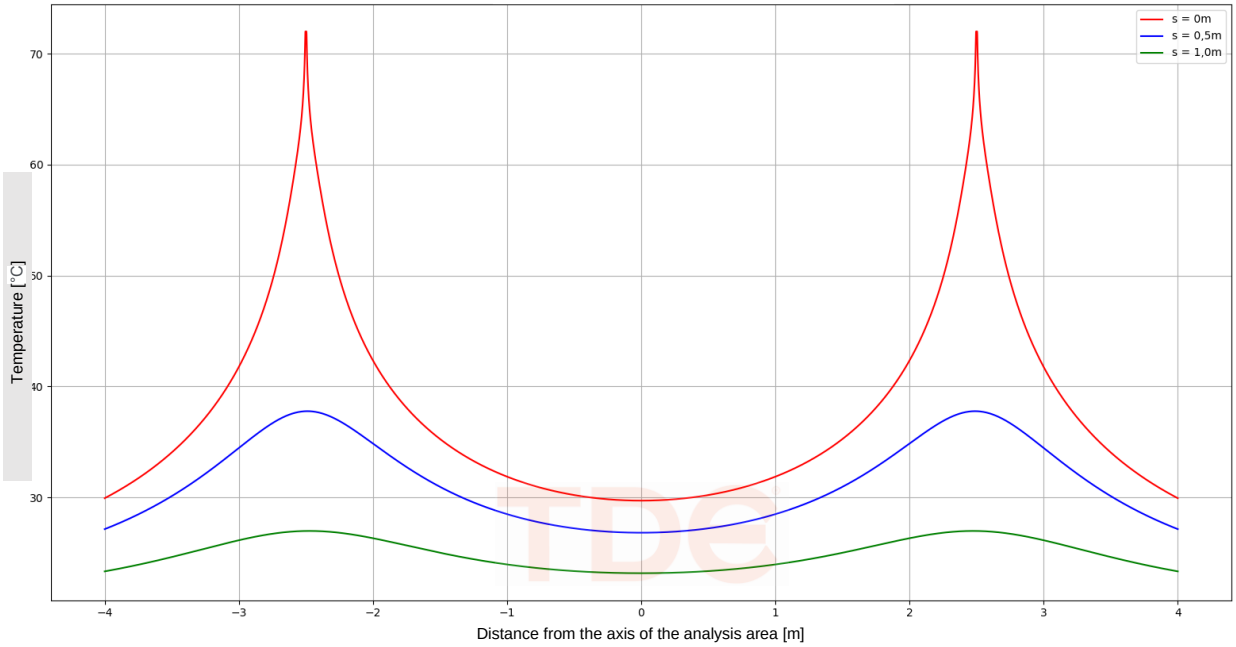

Fig. 44. Distribution of the soil temperature field for selected distances (marked "s") over the cable system for calculation example No. 5B (2 cable tracks 400 kV, single-core cables in XLPE insulation with a working core of 3000 mm2 Al, current 1250 A). Connection between the land stations Baltic II and Baltic III and the station of the Polish Transmission Networks.

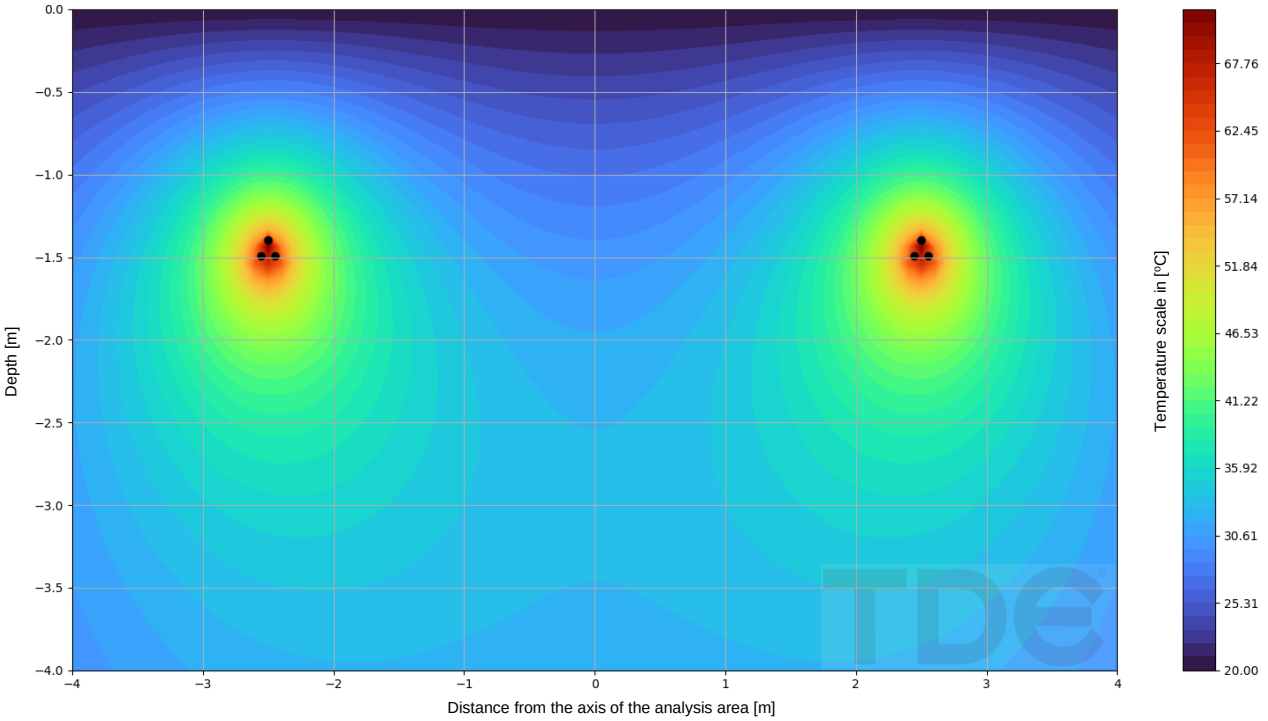

Fig. 45. The spatial distribution of the temperature field in the ground around the cable system for the calculation example No. 5B (2 cable tracks 400 kV, single-core cables in XLPE insulation with a working core of 3000 mm2 Al, current 1250 A), where "s" is the distance of the horizontal plane from the cable axis on which the soil temperature values are determined. Connection between the land stations Baltic II and Baltic III and the station of the Polish Transmission Networks.

5.4 Conclusions for the onshore part

The performed calculations for the assumed conditions for laying cable lines with a voltage of 220 kV and 400 kV show that the thermal effect of the cables introduces slight changes in temperature at the ground surface in the area above the cables. Taking into account that the performed calculations were made for a maximum load factor of 1, which assumes continuous transmission of maximum power through the designed cable lines, it can be concluded that the actual thermal impact of the designed cable lines will be smaller, as the actual power generation of the wind farm is closely related to weather conditions (depending on the wind speed) and reaches the maximum generation only for short periods of the year.

6 Literature

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Assessment of impacts on Natura 2000 sites

1. **Ławica Słupska PLC990001**
2. **Przybrzeżne wody Bałtyku PLB990002**
3. **Przymorskie Błota PLH220024**
4. **Jezioro Wicko i Modelskie Wydmy PLH320068**
5. **Dolina Słupi PLH220052**

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INTRODUCTION

The planned Project is located **within two marine** Natura 2000 **sites**. These are (Figure 1) Natura 2000 sites:

- Ławica Słupska PLC990001
- Przybrzeżne wody Bałtyku PLB990002

In addition, there are Natura 2000 sites in the vicinity of the planned project on land (Figure 2):

- Przymorskie Błota PLH220024 - **approximately 300 m** away,
- Jezioro Wicko i Modelskie Wydmy PLH320068 Lake Wicko and Modelskie Wydmy - **approximately 1.4 km away**,
- Dolina Słupi PLH220052 - at a distance of **approx. 1.5 km**.

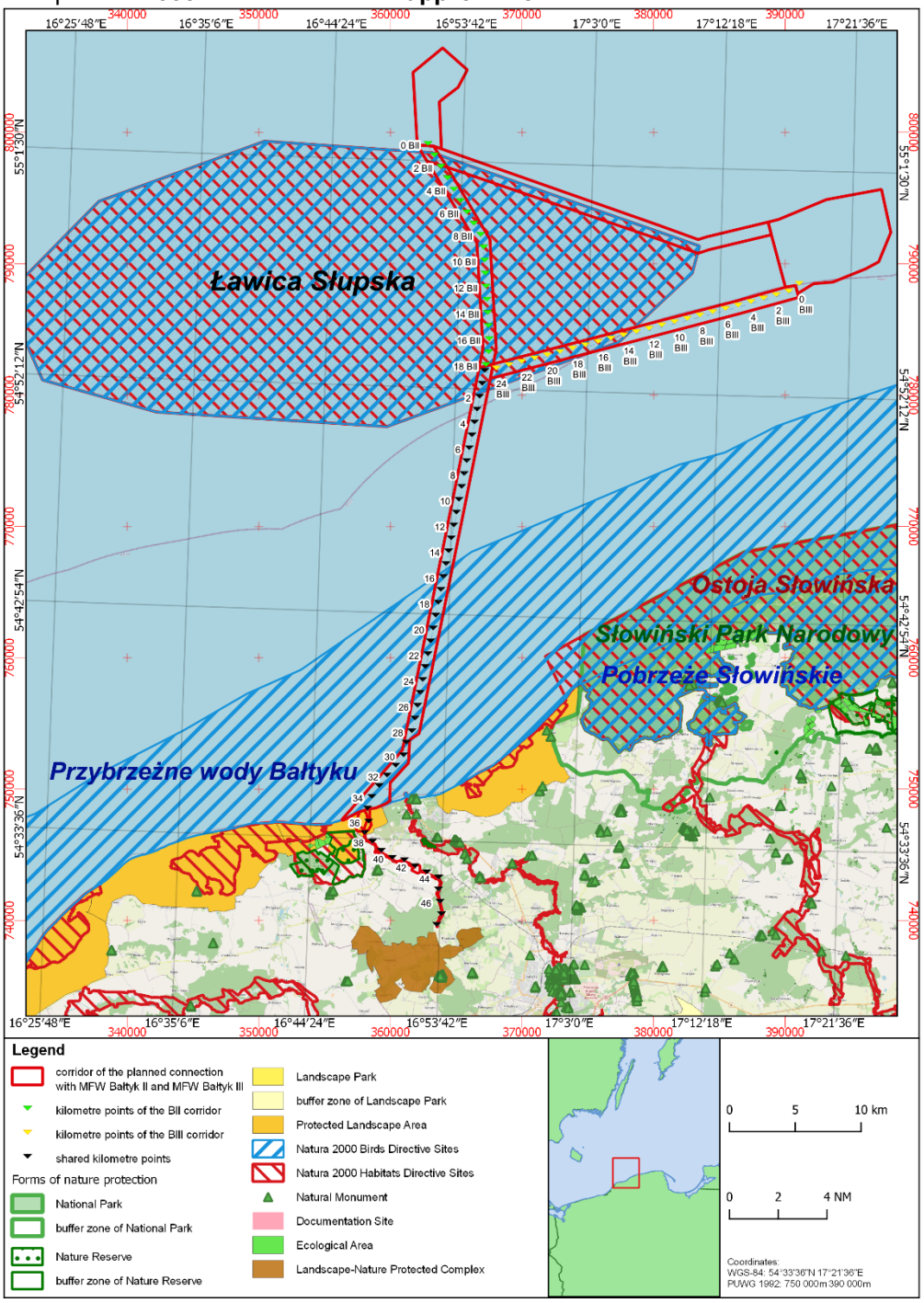

Figure 1. *Location of the marine part of the planned Project in relation to protected areas*

Source: Own elaboration based on geosewis.gdos.gov.pl

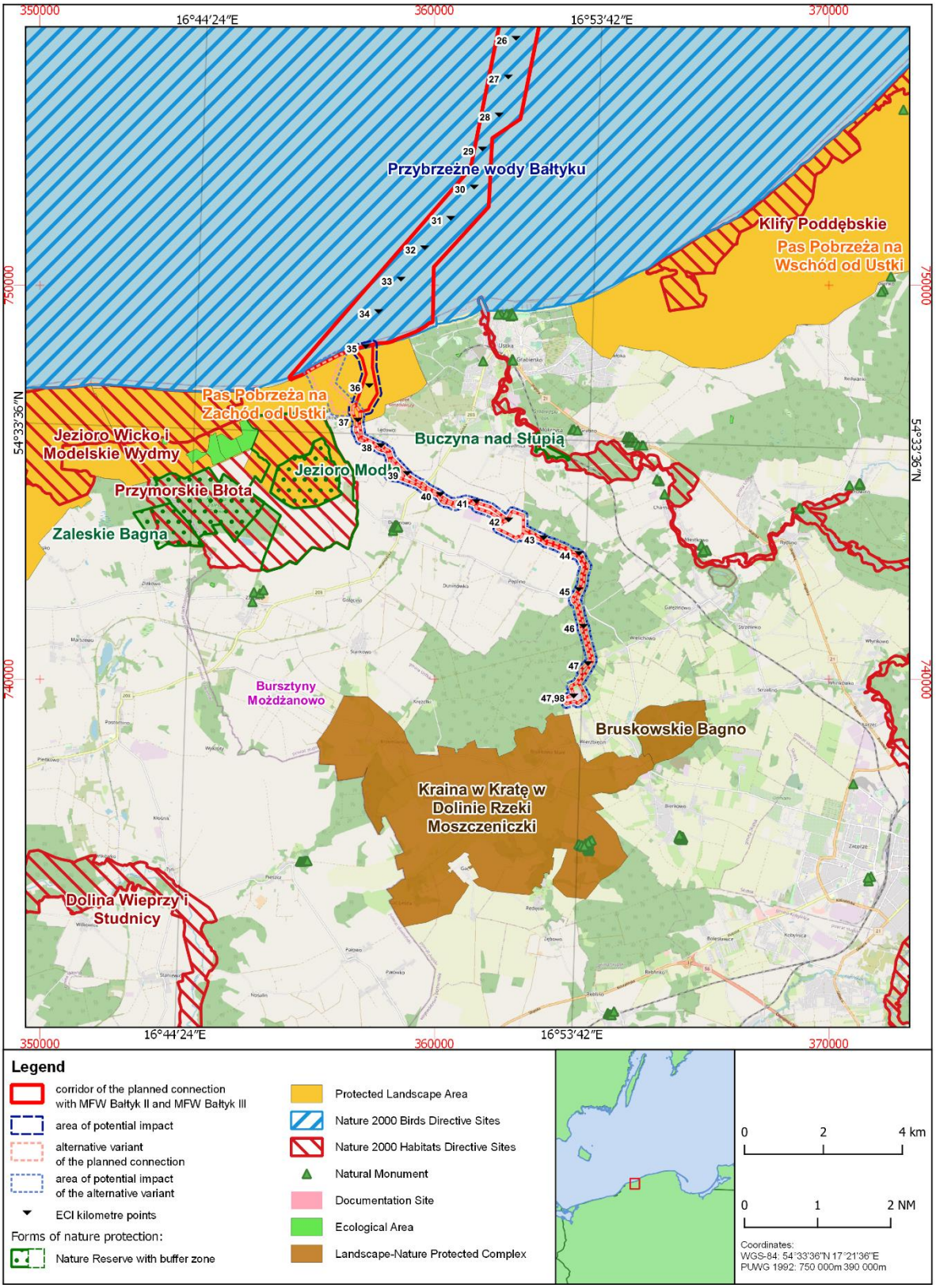

Figure. 2. *Location of the onshore part of the planned Project against the background of protected areas*

Source: Own elaboration based on geosewis.gdos.gov.pl

The assessment of the impact of the planned project on Natura 2000 sites was carried out taking into account the recommendations of the European Commission's manual "Assessment of plans and

projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC", European Commission DG Environment, 2001.

According to the guidelines, the Natura 2000 impact assessment can be divided into 4 stages:
Stage 1: Screening:

- Management of the site,
- Description of the project,
- Characteristics of the site,
- Assessment of significance,
- Outcomes;

Stage 2: Appropriate assessment:

- Information required,
- Impact prediction,
- Conservation objectives,
- Mitigation measures,
- Outcomes;

Stage 3: Assessment of alternative solutions

- Identifying alternative solutions,
- Assessing alternative solutions,
- Outcomes;

Stage 4: Assessment where no alternative solutions exist and where adverse impacts remain

- Identifyng compensatory measures,
- Assessment of compensatory measures,
- Outcomes.

As the assessment did not identify the potential for significant adverse impacts on Natura 2000 sites that cannot be eliminated or minimised, the assessment was completed at Stage 2 Appropriate Assessment.

Pursuant to the Nature Conservation Act (Journal of Laws 2022.916, as amended), in the Natura 2000 site, it is prohibited to have a significant negative impact on the conservation objectives of the Natura 2000 site, including in particular:

- significant deterioration of natural habitats or the habitats of plant and animal species for whose conservation a Natura 2000 site has been designated;
- significant negative impact on species for whose protection the Natura 2000 site has been designated;
- significant deterioration of the integrity of the Natura 2000 site or its connection to other sites.

In accordance with EU guidelines, the potential negative impact on the integrity of the Natura 2000 site, understood as the coherence of structural and functional factors determining the sustainable persistence of populations of species and natural habitats for the protection of which the Natura 2000 site was designed or designated (Article 5 point 1d of the Nature Conservation Act), was assumed as the key.

In assessing whether the impact on the objects of protection would be significant, reference was made to favourable conservation status as defined in the Nature Conservation Act:

- **favourable conservation status of a species** - the sum of the impacts on a species which may affect in the foreseeable future the distribution and abundance of its population within the country or the Member States of the European Union or the natural range of that species, where data on the population dynamics of that species indicate that the species is a stable component of the habitat suitable for it, the natural range of the species is not diminishing or will not be diminished in the foreseeable future and a sufficiently large habitat for the maintenance of the population of that species exists and is likely to continue to exist (Article 5(24) of the Nature Conservation Act);
- **favourable conservation status of a natural habitat** - the sum of the impacts on a natural habitat and its typical species likely for the foreseeable future to affect the natural distribution, structure,

functions or survival of its typical species within the national or European Union Member States or the natural range of that habitat, at which the natural range of the natural habitat and the areas occupied by that habitat within its range do not change or increase. The structure and functions which are necessary for the long-term maintenance of the habitat exist and are likely to continue to exist and the species typical of that habitat are in a favourable conservation status (Art. 5(25) of the Nature Conservation Act);

and to the integrity of the Natura 2000 site and the coherence of the Natura 2000 network.

The appropriate conservation status of species and habitats was assumed for the following studies and documents:

- draft Regulation on the establishment of a protection plan for the Natura 2000 site Ławica Słupska PLC990001 (https://www.ums.gov.pl/projekty_unijne/natura2000_LS/Natura_2000_LS.pdf);
- Documentation of the Plan of Conservation Tasks of the Natura 2000 site Lake Wicko i Modelskie Wydmy PLH320068,
- Order of RDOŚ in Gdańsk and RDOŚ in Szczecin of 25 September 2015 on the establishment of a conservation task plan for the Natura 2000 site Przymorskie Błota PLH220024 and:
  complementary knowledge of natural habitats 6410 and 6510 in the Natura 2000 site Przymorskie Błota PLH220024, Snopowiązalka Foundation, Polkowo 2021,
  draft SDF update of the Przymorskie Błota Natura 2000 site,
- draft order of RDOŚ in Gdańsk and RDOŚ on the establishing a plan of protective tasks for the Natura 2000 area Dolina Słupi PLH20052 (material made available on the website of the RDOŚ in Gdańsk 25.03.2022 https://www.gov.pl/web/rdos-gdansk/plh220052-dolina-slupi).

For the area Przybrzeżne wody Bałtyku , no draft plan of protection tasks or conservation plan has been developed so far, so the basis for the assessment was the SDF.

1. ŁAWICA SŁUPSKA PLC990001

1.1 STAGE I. SCREENING

1.1.1. Management of the site and project description (Step 1 and 2)

Is the undertaking directly related or necessary to the management of the site in question?

NO

Description of the project

Below is the screening matrix for the project consisting of the construction of transmission infrastructure from offshore wind farms MFW Bałtyk II and MFW Bałtyk III together with a connector.

Table 1. *Impact matrix of ECI offshore wind farms j MFW Bałtyk II and MFW Bałtyk III within Ławica Słupska PLC990001*

Brief description of the project:	The planned Project relates to the connection infrastructure from the offshore wind farms **MFW Bałtyk II and MFW Bałtyk III together with the planned connector** between the wind farms within the Natura 2000 site and includes the laying and burial of high-voltage AC three-core subsea export cables: - two cables from the **MFW Bałtyk II** - at a length of approx. **19.4 km** (the entire offshore section is approx. 60 km long); - two cables from the **Bałtyk III offshore wind farm** - at a length of approx. **12.4 km** (with the entire offshore section at a length of approx. 67 km); - two **connector** cables between MFW Bałtyk II and MFW Bałtyk III (considered for future implementation) - at a length of approx. **21.2 km** (with the entire offshore section at a length of approx. 30 km). Cables within the Natura 2000 site will be burial at a depth of up to approximately 1,5 m; the distance between cables of the same connection will be approximately 25 m, between cables of two different connections (between BII and BIII) minimum 50 m. During the construction phase, interference with the Natura 2000 site will be associated with the need to clear the bottom in the area where the cable is to be laid (removal of lying artefacts, boulders, etc.), followed by the excavation of a trench about 1.5 m wide and from approximately 1,5 m deep using a method known as jetting (soil scouring) or mechanical cutting (in places where the ground will be harder). It is assumed that the bottom interference associated with the construction phase, including, but not limited to, cleaning of the bottom, movement of cable laying equipment and excavation of the trench, will not exceed a strip of approximately 5 m for each cable. The cables will be laid one after the other starting with the offshore wind farm that gets the planning permission first. In the case of the connector, its implementation is not currently envisaged. When laying the cable, two methods can be used: jetting (soil scouring) and mechanical cutting. In addition, in areas where there will be large concentrations of boulders that cannot be avoided by adjusting the cable route, alternative cable protection i.e. laying the cables on the bottom and protecting them by covering them with stone surcharge or concrete mattress. For the purpose of this Report, modelling of the spreading of suspended solids was carried out, assuming the most unfavourable hydro-meteorological conditions for the so-called jetting method, which causes the greatest agitation of bottom sediments (Modeling results are

	included in Volume IV in Appendices 2a and 2b). The modelling results indicate that during cable burial, the predicted instantaneous water turbidity values will be comparable to concentrations of suspended solids that are recorded during heavy storms (i.e. approx. a few dozen to a few hundred mg/l). On completion of the works, the maximum sediment thickness for one cable line that will deposit will be i.e. approx. 1 mm and will be deposited in in the immediate vicinity; in the remaining area, within the spreading range of the suspension, the thickness of the layer will be < 1 mm. During the operational phase, the cable remains buried in the bottom sediments or under a layer of stone bedding or concrete mattress. Impacts of the operational phase are a slight increase in sediment temperature in the immediate vicinity of the cable and magnetic radiation of low value and minimal range (estimated EMF emissions are analyzed in Volume VI in Appendix 5, and thermal emissions in Appendix 6).
Description of the various components of the project that are likely to cause environmental impacts:	The elements of the Project that will cause environmental impacts within the Natura 2000 site are: • the laying of a total of 6 subsea cables (2 from MFW Bałtyk II, 2 from MFW Bałtyk III and 2 inter-farm connector cables) during the construction phase, which are necessary: - bottom cleaning in the axis of the planned cable run, - laying the cable and plunging it into a trench about 1.5 meters wide and 1.5 meters deep, - covering the cable with stone surcharge or concrete mattress (only in places where clusters of stones and boulders will prevent excavation), - vessel/equipment traffic such as a cable ship, support vessels (approximately 4 boats) and a trenching rig; • in operation: - the operation of the subsea cable does not require any action other than periodic technical inspections. Anticipated physical changes that will occur to the environment as a result of the Project: - temporary occupation of the site and periodic re-shaping of the ground within the limits of the works to be carried out, i.e. approx. to 5 m wide strip for each cable; - vegetation removal over an area of approx. 0.1 km² (of which: approx.. 0.09 km² for BII; approx. 0.01 km² for the connector) - removal of biomass over an area of approx. 0.2 km² (of which: approx. 0.14 km² for BII; approx. 0.06 km² for the connector) - increased periodic movement of vessels (cable vessel, trenching vessel, support and positioning vessels) and cable laying equipment moving along the bottom. During the operational phase of subsea cables, the following changes will occur permanently: - local small changes in the temperature of the sediment in the immediate vicinity of the cable, small emissions of magnetic fields generated by the cables, whose values are several times lower than the naturally occurring magnetic field of the Earth
A description of any possible direct, indirect or secondary impact of the project on the Natura 2000 site that can be predicted as a simple	Size and scale of the planned project within the Natura 2000 site *Land occupation*: • the corridor envisaged for the laying of cables within the boundaries of the Natura 2000 site covers a total area of approx. **5 300 hectares,** including: - from the **OWF Bałtyk II** - approx. **1 940 ha**;

consequence of the following features: **- size and scale** **- land occupation** **- distance from a Natura 2000 site or parts thereof of key conservation interest** **- resource requirements** **- emissions** **- requirements relating to the excavation of earth masses** **- transport requirements** **- duration of construction, operation, decommissioning**	- from the **OWF Bałtyk III** - approx. **1 240 ha**; - **connector** between MFW Bałtyk II and MFW Bałtyk III (considered for future implementation) - **approx. 2 120 ha**. • the actual bottom encroachment (about 5 m for each cable) will be significantly less than the corridor covered by the environmental decision application and is estimated to total up to **approximately 52 ha,** including: - from the **OWF Bałtyk II** - approx. **19,4 ha;** - from the **OWF Bałtyk III** - approx. 1**2,4 ha;** - **connector** between the MFW Bałtyk II and the MFW Bałtyk III (considered for future implementation) - maximum of **approx. 21,2** ha. • The possible interference/disturbance of the seabed will affect a total of **approximately 0.065% of** the Ławica Słupska Natura 2000 site, including: - from the **OWF Bałtyk II** - **approx. 0.02%**; - from the **OWF Bałtyk III** - **approx. 0.015 %;** - **connector** between MFW Bałtyk II and MFW Bałtyk III (considered for future implementation) - max. approx. **0.03 %.** *Resource requirements:* • construction phase requirements: fuel to power ships and machinery, machinery consumables, construction materials; • operating stage requirements: periodic maintenance. *Emissions* The following emissions and waste are expected to be generated during the construction phase: • waste - typical ship waste, • air pollution from the combustion of fuels in ship engines and construction equipment, • underwater noise from ships and equipment. *Construction time* Estimated time required to lay one cable within the Ławica Słupska area: • **approx. 2,5 days (24 hours)** for each of the two cables from the **Bałtyk II offshore wind farm**, • **approx. 1,5 days (24 hours)** for each of the two cables from the **Bałtyk III offshore wind farm**, • **approx. 2,5 days (24 hours) for** each of the two cables of the MFW Bałtyk II and MFW Bałtyk III **connector.** A total of 13 days , with the works not being carried out at one time. *Lifespan:* • expected life of the cable is a minimum of 50 years Liquidation: • decommissioning of the planned Project is not currently envisaged; it is possible that the cable could be left in the seabed or removed, with the assumption that pulling the cable out will take less time than laying it.
Distance to Natura 2000 sites:	The project is located within the boundaries of the Natura 2000 site Ławica Słupska PLC990001.

Source: own elaboration based on data from the Investor

1.1.2 Natura 2000 site description (Step 3)

The entire protected area of approx. 800.5 km^2 is located within the Polish areas maritime boundaries. The location of the planned Project against the borders of the Ławica Słupska PLC990001 area is shown in Figure 3.

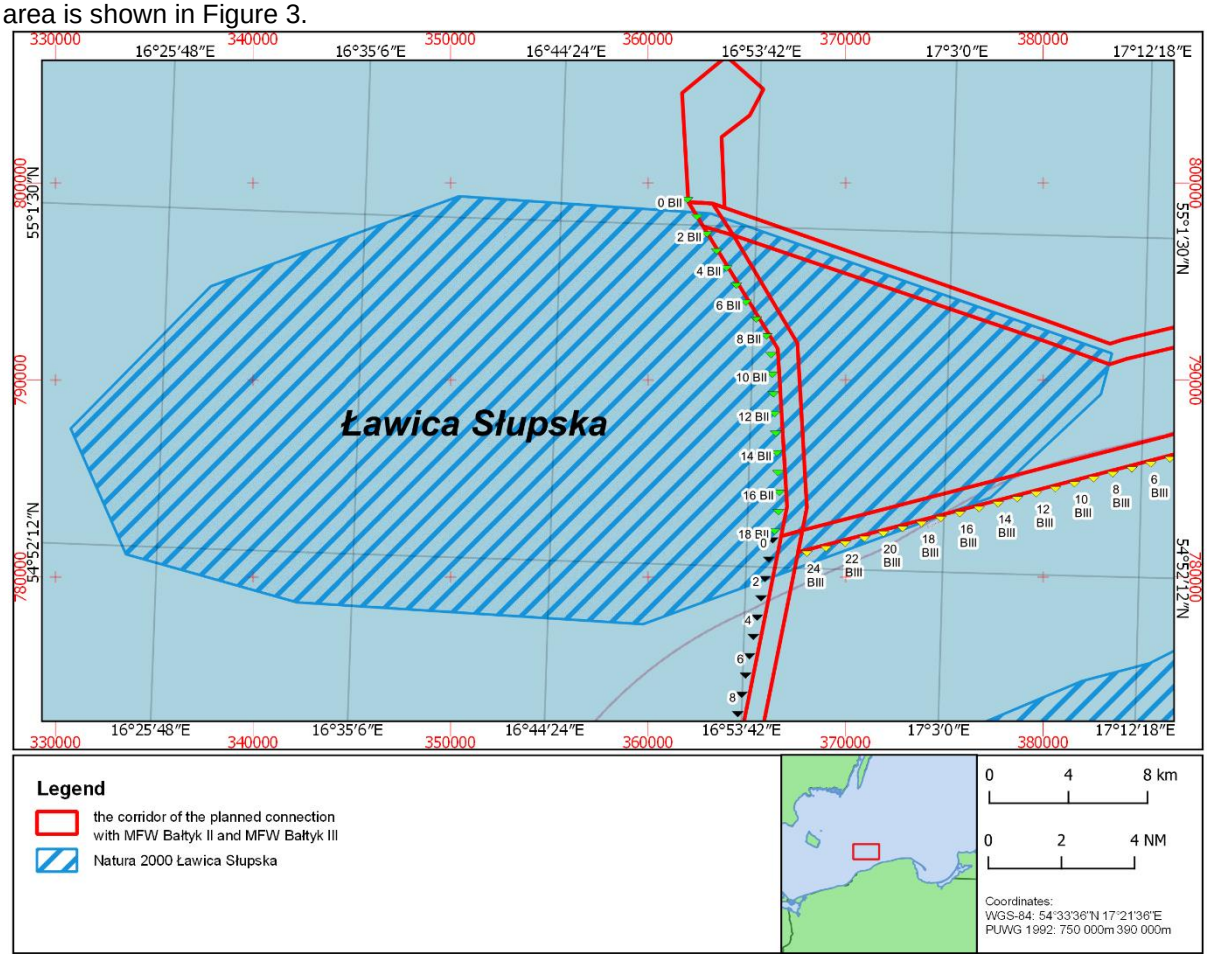

Figure 3. *Location of the planned project within the boundaries of the Ławica Słupska PLC990001 area*

Source: own elaboration based on Investor's data and GDOŚ data

The site has been designated under the Regulation of the Minister for the Environment of 21 July 2004 on Natura 2000 special bird protection areas and the Commission Decision of 12 December 2008 adopting, pursuant to Council Directive 92/43/EEC, a second updated list of sites of Community importance for the Continental biogeographical region (notified under document number C(2008) 8039)(2009/93/EC).

The Ławica Słupska (Słupsk Shoal) area is located in the open waters of the Proper Baltic in the Polish economic zone, approximately 22 km from the coast at the level of Ustka. Its boundaries are marked by a 20 m isobath. The bedform in this area is very variable. Depths vary from 8 to 35 m. The shallowest parts of the seabed are located in the northern and western parts and include elevations of the so-called "boulder field" and parts of sandy seabed.

The Ławica Słupska Natura 2000 site is a bird sanctuary of European rank E79. During the wintering and migration period in spring and autumn, at least 1% of the migratory route (C3) of the following species are present: long-tailed duck, black guillemot, velvet scoter, and water and marsh birds occur in concentrations of over 20,000 individuals (C4). During the winter period, there are between approximately 101,000 and 231,000 individuals of long-tailed ducks, approximately 5,500 to 23,600 velvet scoters, 98 to 556 black guillemots and black-throated divers (97 - 173 individuals) and red-throated divers (28 - 66 individuals). During the migration period, on the other hand, there are between 76 and 214 thousand long-tailed ducks, 910 to 1,789 velvet scoters and 72 to 461 black guillemots. Two

marine habitats and three species of wintering and migrating birds are protected in the area (Tables 2 and 3):

Table 2 *Habitats protected in the Natura 2000 site Słupska Ławica PLC990001*

Habitat type			Assessment of the area			
Code	**Habitat type**	**Surface [ha]**	**Representativeness**	**Relative surface area**	**State of preservation**	**Overall assessment**
1110	offshore sandbanks	30926.65	A	A	A	A
1170	rocky and stony seabed, reefs	13814.64	A	A	A	A

Source: own elaboration based on SFD Natura 2000: update 03-2022.

Table 3. *Species constituting the object of protection of the Natura 2000 site Słupska Ławica PLC990001*

Code	Species	Population in the area					Assessment of the area			
		Type	Size		Unit	Category	Population	State of preservation	Insulation	Overall assessment
			Min.	Max.						
A202	black guillemot *Cepphus grylle*	Overwintering	98	556	Individuals	Rare	C	A	C	C
		Transient	72	461			C	A	C	C
A064	long-tailed duck *Clangula hyemalis*	Overwintering	101148	231180	Individuals	Common	B	A	C	B
		Transient	76440	214374			B	A	C	B
A066	velvet scoter *Melanitta fusca*	Overwintering	5565	23611	Individuals	Common	B	A	C	B
		Transient	910	1789			C	A	C	C

Source: own compilation based on SFD Natura 2000: update 03-2022.

In addition, the SDF mentions the harbour porpoise *Phocoena phocoena as well as the* black-throated diver *Gavia arctica* and the red-throated diver *Gavia stellata,* but they are not protected subjects of the site (D rating).

For the Ławica Słupska Natura 2000 site, the Maritime Office in Szczecin developed a draft conservation plan in 2020, which is available on the website of the Maritime Office in Gdynia (http://www.ums.gov.pl/projekty_unijne/natura2000_LS/Natura_2000_LS.pdf). For the development of the draft plan, an analysis of available data was carried out and surveys were performed, which enabled, among other things, the mapping of protected habitats within the boundaries of the site. The results are presented in a study by Michałek M., Osowiecki A., Barańska A., Wróblewski R., Rydzkowski P., Kośmicki A., Strzelecki D., Meissner W., Pieckiel P., Kuczyński T., Gajewski L ., titled " Dokumentacja przyrodnicza, tj. opis tekstowy, zestawienia tabaryczne, przedstawienie graficzne, kartograficzne oraz dane stanowiące podstawę do sformułowania projektu planu ochrony obszaru Natura 2000 Ławica Słupska PLC990001 " ("Nature documentation, i.e. textual description, tabular summaries, graphical representation, cartographic representation and data underlying the formulation of the draft Natura 2000 Ławica Słupska PLC990001 site conservation plan"), October 2020. The conclusions of the above mentioned study are referred to in this chapter.

1.1.3. Assessment of the significance of the impacts (Step 4)

The project will be carried out within the boundaries of a Natura 2000 site, therefore the possibility of interference with fragments of protected habitats and habitats of wintering and migratory birds is anticipated, which may cause disturbances such as temporary fragmentation of habitats and deterioration of their quality.

On the basis of the surveys carried out for the draft site protection plan, the boundaries of the two protected habitats: i.e. subsea sandbanks and rocky and stony seabed were delimited. Based on the maps provided and the corridor alignment of the planned subsea cables, it can be concluded that the planned project:

- does not interfere with habitat 1170 *Rocky and stony seabed, reefs (Skaliste i kamieniste dno morskie, rafy)* (Figure 4)
- crosses a fragment of habitat 1110 *Offshore Sandbanks (Piaszczyste ławice podmorskie)* - only the connection with MFW Bałtyk II at a distance of approx. 3 km (from km 9BII m to km 12BII) – Figure 7; therefore only for this habitat an impact assessment (Stage II) was conducted as presented in further Section 1.2.

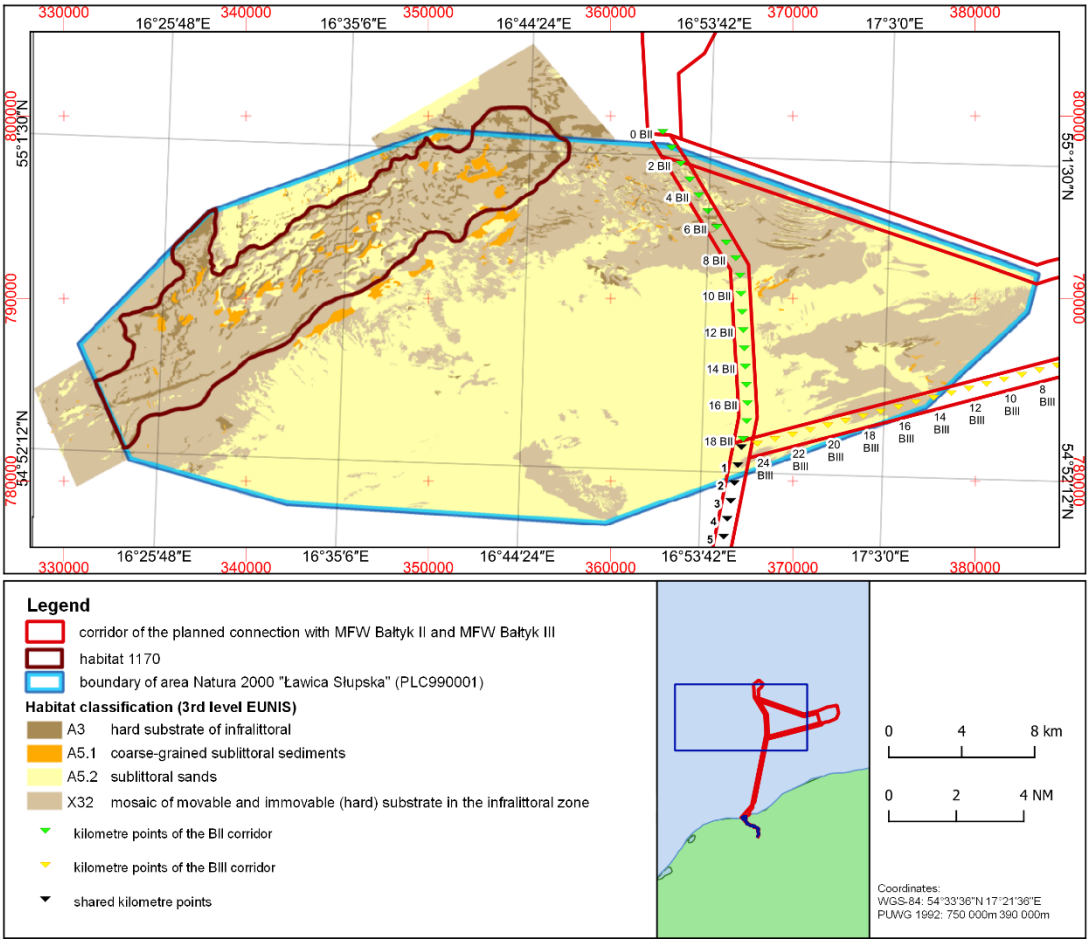

Figure 4. *Planned Project against habitat 1170 Rocky and stony seabed, reefs*

Source: own elaboration based on data for the draft of Ławica Słupska protection plan posted at http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

The analysed area provides important habitat for migratory and wintering birds, i.e. for:

- black guillemot *Cepphus grylle,*
- velvet scoter *Melanitta fusca,*
- long-tailed duck *Clangula hyemalis*.

In the draft Ławica Słupska Protection Plan, an analysis of the density and distribution of **black guillemot** in the area between 2013 and 2019 was carried out (Figure 5). Its maximum density was 0.3 os./km^2 , and the average for the area was set at 0.1 os./km^2 . On the other hand, during the migration

period from 2012 to 2014, the maximum was 0.6 os. / km^2, and the average for the area was 0.1 os. / km^2. Based on the results of the interpolation, the total abundance of the species in the area during the wintering period was estimated at 98 - 556 individuals during the wintering period and 72 - 461 individuals during the migration period, where the lower value characterises the multi-year average and the higher value the maximum abundance obtained[1] .

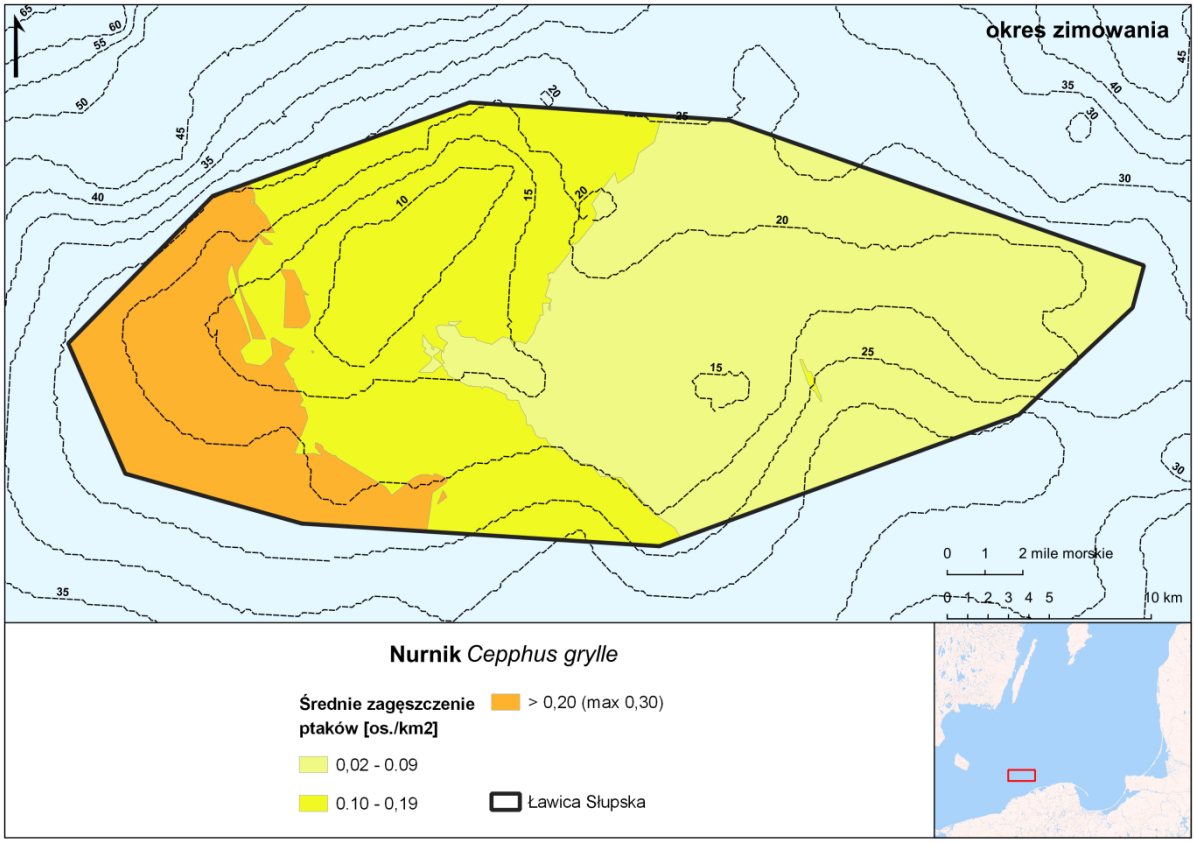

Figure 5. *Distribution of black guillemot Cephus grylle in the area Ławica Słupska PLC990001 during wintering period*

Source: Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

The analysis of the distribution of the black guillemot, indicates its presence mainly in the western part of the area of Ławica Słupska, i.e. outside the place where the planned Project will be implemented. During the wintering period in 2013 - 2014, a single individual was found on transects crossing the area of the planned Connection Infrastructure with the MFW Bałtyk II. This represents less than 0.1% of the proportion of seabirds within the area of the planned project. Therefore, it can be assumed that the construction and operation of the planned Project should not significantly affect this species.

The analysis of the distribution and density of **velvet scoter** in 2013-2019, carried out as part of the work on the draft Ławica Słupska Protection Plan, indicates that the maximum density during the wintering period is at 65 individual/km^2 , while the average density for the area was determined at 7.0 individual/km^2. (Figure 6). In contrast, during the migration period from 2012 to 2014, the maximum values were 8 individual/km^2, and the average for the area was 1,1 individual/km^2.

[1] *Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).*

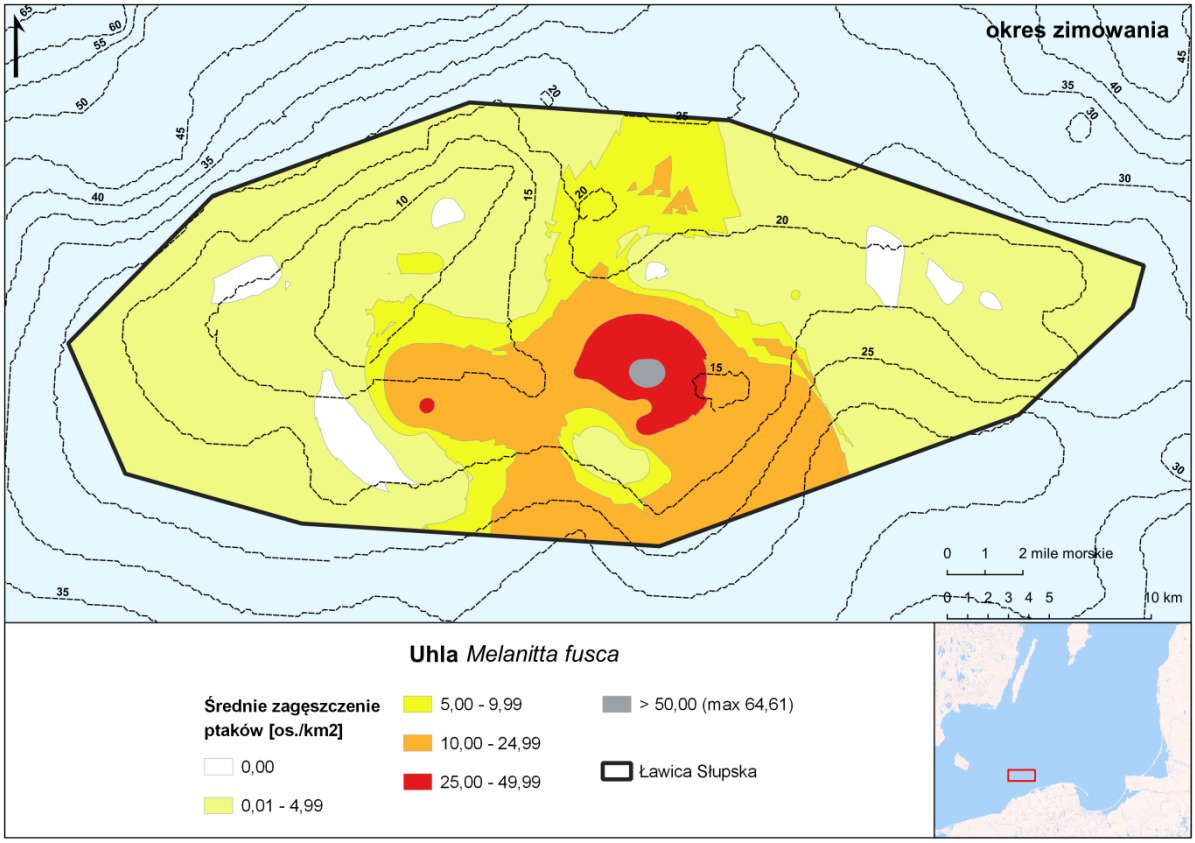

Figure 6. *Distribution of velvet scoter Melanitta fusca in area Ławica Słupska PLC990001 during wintering period*

Source: Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

Based on the results of the interpolation, the total abundance of the species in the area of Ławica Słupska during the wintering period was estimated at 5,565 - 23,611 individuals during the wintering period and 910 - 1,789 individuals during migration. The lower value characterises the long-term average and the higher one - the maximum obtained abundance[2]. The analysis of the distribution of the velvet scoter, indicates its presence mainly in the central, sandy part of the Ławica Słupska area during the wintering period in 2013 - 2014, 6 specimens of the velvet scoter were found on transects crossing the area of the planned Connection Infrastructure to the MFW Bałtyk II and MFW Bałtyk III. This represents a 0.5% share of the seabird grouping within the area of the planned project.

The velvet scoter within the area of the planned offshore wind farm connection infrastructure of MFW Bałtyk II and MFW Bałtyk III, is an extremely rare species, not exceeding 1% in the seabird group. Therefore, the construction and operation of the planned project should not cause negative impacts on the species.

The long tailed duck *Clangula hyemalis* is a small duck with very variable colouration (white, grey, black, brown and russet). The male is distinguished by its long rectrices. It is the most abundant wintering duck in the Baltic, with an estimated 1.5 million individuals[3] . Most long-tailed ducks overwinter in sea depths of up to 35 m, and the most numerous are in areas up to a depth of 30 m[4] . However,

[2] *Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).*
[3] *Skov H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J. J., Kube J., Kuresoo A., Larsson K., Luigujoe L., Meissner W., Nehls H. W., Nilsson L., Petersen I. K., Roos M. M., Pihl S., Sonntag N., Stock A., Stipniece A. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers. Copenhagen. p. 201.*
[4] *Durinck J., Skov H., Jensen F. P., Pihl S. 1994. Important marine areas for wintering birds in the Baltic Sea. Ornis Consult Report, Copenhagen.*

diving is an energetically costly activity, and in bentophagous birds diving time increases with depth[5] . Therefore, it is most energetically profitable for birds to forage in shallower, food-rich water bodies and only a decrease in prey density forces them to move to other locations[6]. On wintering grounds it feeds mainly on bivalves, less frequently on polychaetes, echinoderms, crustaceans, small fish and fish eggs[7, 8] . Diving ducks exert very strong pressure on their prey populations[9]. Stempniewicz[10] estimated that diving ducks residing in the western Gulf of Gdansk consume 6,350 tonnes of bivalves annually. A migratory species, arriving in November and departing in April[11] . It is most abundant in the Pomeranian Bay, the Bay of Puck and the Ławica Słupska, and occasionally in the eastern part of the Gulf of Gdansk, between Rozewie and Kuźnica and east of Łeba. Between Kołobrzeg and Łeba long-tailed ducks overwinter in low numbers. There is currently a significant decline in the abundance of the Baltic Sea long-tailed duck, which has declined by 65% from the 1980s to 1990s. The most significant decline, as much as 82%, is observed at the largest wintering site in the Pomeranian Bay[12] .

In the draft Conservation Plan for Ławica Słupska, an analysis of the density and distribution of the long-tailed duck in the area between 2013 and 2019 was carried out (Figure 7). It had a maximum value of 553 per km^2 , and the average for the area was determined to be 126.2 per km^2 . On the other hand, during the migration period between 2012 and 2014, the maximum values were 285 individual/km^2 , and the average for the area was 95.4 individual/km^2 . Based on the results of the interpolation, the total abundance of the long-tailed duck in the area during the wintering period was estimated at 101,148 - 231,180 individuals during the wintering period and 76,440 - 214,374 individuals during the migration period. The lower value characterises the multi-year average and the higher value- the maximum abundance obtained[13].

Higher densities of **long tailed duck** were also found in the area of the planned Project, which is also confirmed by the Investor's surveys conducted in 2012 - 2014. Therefore, a specific assessment was conducted for **long tailed duck** in the following section.

[5] Stephenson R. 1994. diving energetics in Lesser Scaup(Aythyta affinis, Eyton). J. exp. Biol. 190:155-178
[6] Kirk M., Esler D., Iverson S.A., Boyd W.S. 2008. Movements of wintering surf scoters: predator responses to different prey landscapes. Oecologia 155: 859-867.
[7] Bauer H.G., Bezzel E., Fiedler W. 2005 Das Kompendium der Vögel Mitteleuropas. Band 1: Nonpasseriformes - Nichtsperlingsvögel. Aula Verlag, Wiebelsheim
[8] Skov H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J. J., Kube J., Kuresoo A., Larsson K., Luigujoe L., Meissner W., Nehls H. W., Nilsson L., Petersen I. K., Roos M. M., Pihl S., Sonntag N., Stock A., Stipniece A. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers. Copenhagen. p. 201.
[9] Guillemette M., Reed A., Himmelman J.H. 1996 Availability and consumption of food by common eiders wintering in the Gulf of St. Lawrence: Evidence of prey depletion. Can. J. Zool. 74: 32-38.
[10] Stempniewicz L. 1995. Feeding ecology of the Long-tailed Duck Clangula hyemalis wintering in the Gulf of Gdańsk (southern Baltic Sea). Ornis Svecica 5: 133-142.
[11] Meissner W. 2010. Seasonal changes in the abundance and distribution of the long-tailed duck Clangula hyemalis, the common scoter Melanitta nigra and the velvet scoter M. fusca in the Cape Rozewie area. Ornis Polonica 51: 275-284.
[12] Bellebaum J., Kube J., Schultz A., Skov H. 2014. Decline of Long-tailed Duck Clangula hyemalis numbers in the Pomeraniam Bay revealed by two different survey methods. Ornis Fennica 91: 129-137.
[13] Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

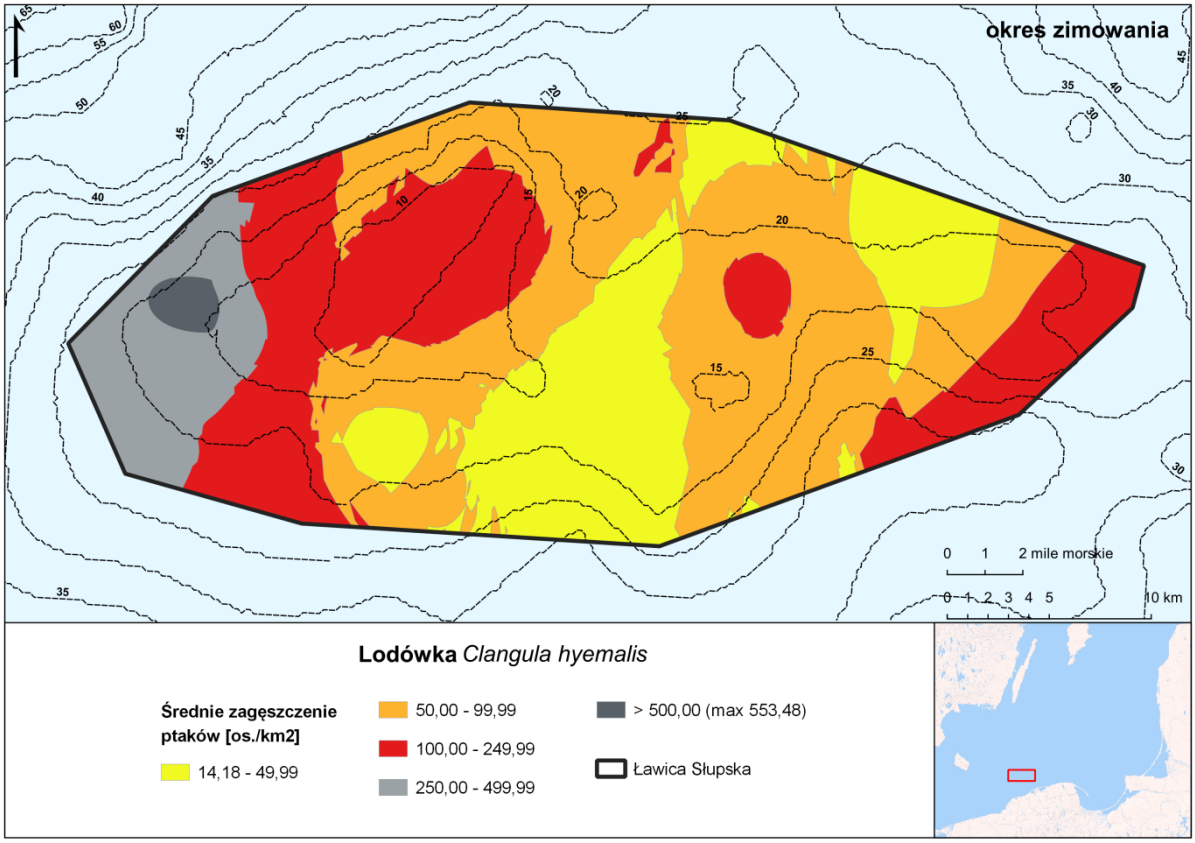

Figure 7. *Distribution of the Long-tailed duck Clangula hyemalis in the area of Ławica Słupska PLC990001 during the wintering period.*

Source: Draft Plan of Conservation of Ławica Słupska posted on http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

On the basis of the reconnaissance conducted above, only two objects of protection that may be affected by the planned Project, i.e.., the Project, were subjected to further evaluation (Phase. II. Appropriate evaluation):

- habitat Offshore Sandbanks 1110,
- long-tailed duck.

1.2 STAGE II. PROPER EVALUATION

1.2.1. Habitat Offshore Sandbanks 1110

As defined by Warzocha (2004), they are "sandbanks in the sublittoral, permanently submerged under water". They are elongated, rounded or irregularly shaped shallows, permanently submerged under water and mostly surrounded by deeper water. They are mainly composed of sandy sediments, but sediments of a larger (boulders and pebbles) or smaller (silts) grain size may also be present. Sandbanks where sandy sediments occur on a hard bottom are considered sandbanks if the resident benthic fauna is dependent on the sand rather than the underlying stony bottom. The conventional boundary of habitat 1110 is the 20 m isobath. Most of the habitat lacks benthic vegetation, with the exception of algae growing on individual pebbles or mussel aggregations lying on the sand. However, benthic invertebrate assemblages of high diversity with species typical of the entire sandy sublittoral bed, such as Bathyporeia pilosa, Pygosio elegans, Cerastoderma glaucum, are characteristic of these sites.[14]

[14] *https://morskiesiedliska.gios.gov.pl/pl/o-programie/19-siedliska-powierzchnie-monitoringowe/48-piaszczyste-lawice-podmorskie-1110*

Habitat 1110 is characterised by a high degree of naturalness. The relatively shallow depth and exposure to wave action prevents deposition of organic matter. The remoteness from land-based sources of pollution preserves natural conditions for benthic faunal assemblages.[15]

In Polish offshore areas the criteria for habitat 1110 are met by: Ławica Odrzyna and the predominant part of Ławica Słupska (Warzocha 2004). In addition, the Ławica Środkowa should be considered as habitat 1110.[16]

In the Ławica Słupska area, habitat 1110 occupies an area of 30,926.65 ha according to the SDF (updated March 2022) i.e. 39% of the area. The overall assessment of the habitat is A (favourable status).

Of the threats identified for habitat 1110 in the draft Site Protection Plan, only the following can relate to the planned Project:

- D02 Utilities and service networks - where the risks associated with laying cables from offshore wind farms are indicated, while also advising that the infrastructure corridor identified in the POM Plan passes through the area.

The other threats identified in the Draft Plan for the PLC990001 area do not relate to the planned Project and are related to pollution of the Baltic Sea, climate change, aggregate extraction, maritime transport, etc.

Of the proposed conservation measures for the assessed habitat, only three (out of nine) relate to habitat 1110, of which only one relates to bottom interventions:

"Counteracting anthropogenic/unnatural reduction of habitat area and integrity, maintenance of the proper status of habitat-typical taxa and macrozoobenthos biomass (i.e. food base for birds)".

The planned project has been planned within the boundaries of the infrastructure corridor defined in the POM Plan, i.e. where the interference with the habitat is least. The planned interference with the habitat relates to the need to lay and bury two subsea cables that export energy at the Bałtyk Sea II MFW. To this end, it is estimated that the seabed will be periodically disturbed over an area of approximately 9.1 ha (with the corridor established for the environmental decision covering habitat 1110 over an area of approximately 294 ha).

[15] *https://morskiesiedliska.gios.gov.pl/pl/o-programie/19-siedliska-powierzchnie-monitoringowe/48-piaszczyste-lawice-podmorskie-1110*

[16] *Łomniewski i in. 1975*

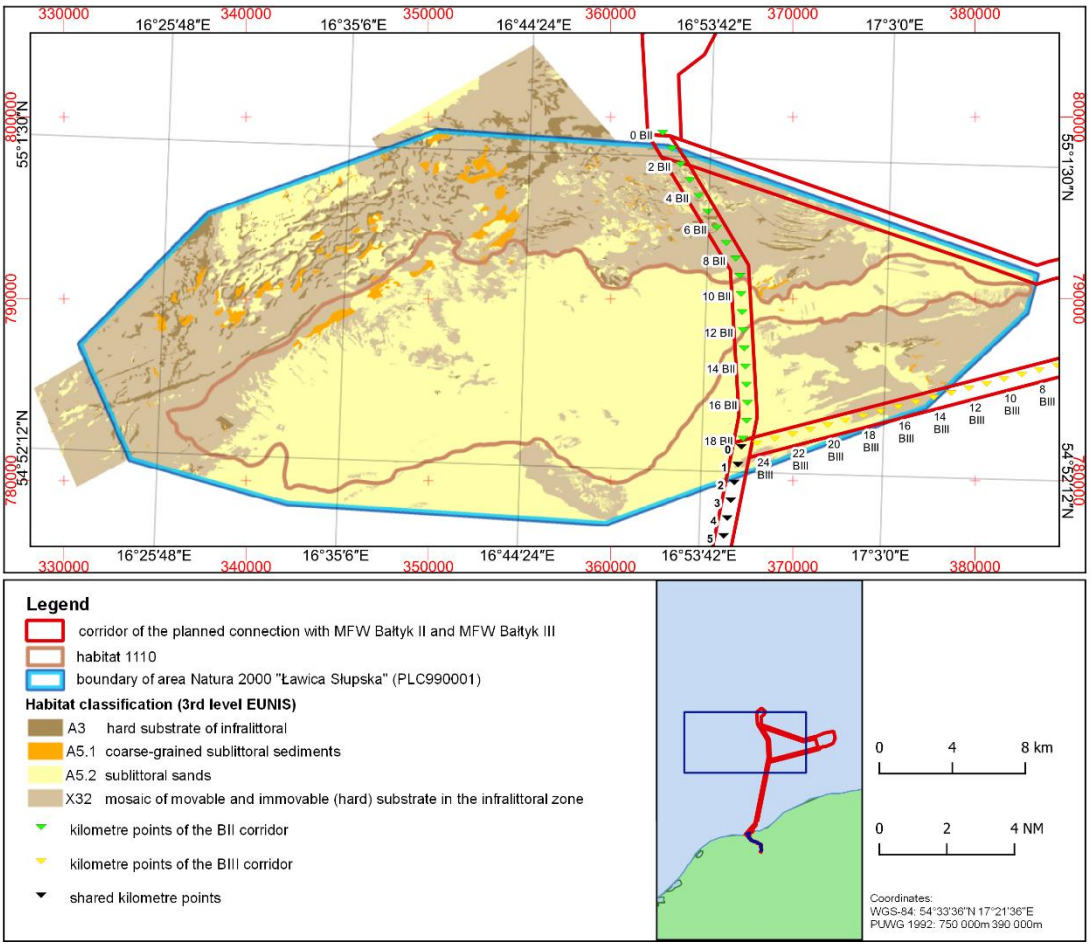

Figure 8. *Planned Project in the background of habitat 1110 Sandbanks*

Source: own elaboration based on data for the draft Ławica Słupska protection plan posted at http://natura2000umsl.eu/o-projekcie/o-projekcie (material posted 26.03.2020).

The planned project has been planned within the boundaries of the infrastructure corridor designated in the POM Plan, i.e. where interference with the habitat is least. The direct interference with the habitat relates to the need to lay and bury two undersea cables that lead out energy at the OWF Bałtyk II over a length of about 2.3 km. For this purpose, it is estimated that the bottom will be periodically disturbed over an area of about 2.27 hectares.

The bottom interference during the construction phase will consist of:

- clearing the bottom of lingering artefacts,
- plunging the cable into a trench about 1.5 m wide and 1.5 m deep (jetting method).

The laying of the subsea cable involves interference with the seabed over a width approx.. 5 m for each cable over a length of approximately 2,3 km (length of the cable section on a the OWF Bałtyk II within habitat 1110). Assuming that the area of intermittent bottom disturbance within the habitat will be approximately 2,27 ha, the habitat interference affects approximately 0.007% of the area of habitat 1110 (Figure 8).

The small scale of the habitat disturbance (up to approximately 0.07% of the habitat area) and the fact that it will be a reversible and medium-term impact - it is assumed that the site will be recolonised by benthic organisms within approximately 2 years - allow to consider the impact of the planned Project on the environment as insignificant. However, the condition for insignificant impact is the execution of cable passage through the habitat using the jetting method. In this section, protection of the cables by stone surcharge or concrete slabs should be ruled out, as this will permanently change the nature of the habitat in this section. However, the use of such protection is unlikely.

There will be no impact during the operational phase that could result in permanent loss of habitat.

Measures to minimise impacts on the habitat

No minimisation measures are envisaged.

Monitoring programme

No monitoring is foreseen

Summary of impacts on habitat 1110

Due to the periodic disturbance of habitat *Piaszczyste ławice podmorskie 1110 (Offshore Sandbanks)* associated with the need to lay two subsea cables from the MFW Bałtyk II offshore wind farm for a total length of approximately 2,275 m, which involves an interference of approximately 0.03% of the habitat, it can be concluded that the impact on the habitat, if the interference will not change the nature of the habitat if the cable is laid on the bottom and buried, will be insignificant.

Summary of impacts on habitat *Piaszczyste ławice podmorskie* 1110

Impact	Possibility of minimising
Construction stage	
The planned project interferes with the habitat in an area of approximately 2,27 ha i.e. 0.007% of the habitat area, but due to the short-term impact and the ability of benthic organisms to recolonise after the laying of the two cables, the negative impact was considered insignificant.	No minimising action proposed - insignificant impact provided that alternative methods of cable protection t.i.e. stone surcharge, concrete mattresses, etc. are not used in the habitat crossing section.
Operation stage	
No impact on habitat is expected during the operational stage	No minimising action proposed - no impacts

1.2.2. Long tailed duck Clangula hyemalis

During the wintering period in 2013 - 2014, 1,156 individuals of the long-tailed duck were found on transects crossing the area of the planned Connection Infrastructure to MFW Bałtyk II and MFW Bałtyk III. This represents a 98.9% share of the seabird grouping within the planned Project. This represents from **1.44 to 3.29% of the population of long-tailed duck** in the crossed Natura 2000 site[17] . It should be emphasised that this is not the size of the population lost but impacted and only in case of execution of works in the whole corridor simultaneously in the period of presence of long-tailed ducks in the area, i.e. from the beginning of November to the end of April. The likelihood of such an event is low as the contractors performing the works will be moving along the corridor. In order to minimise impacts, it is recommended that works likely to impact on long-tailed ducks are carried out between the beginning of May and the end of October. During this time, the risk of impact will be much lower, due to the absence of overwintering long-tailed ducks.

Of the threats identified for the long-tailed duck in the draft Site Protection Plan, only the following can be referred to the planned Project:

- D02 Utilities and service networks - where the risks associated with laying cables from offshore wind farms are indicated, while also advising that the infrastructure corridor identified in the POM Plan passes through the area.

The other threats identified in the Draft Plan for the PLC990001 area are not relevant to the planned Project and are related to pollution of the Baltic Sea, climate change, aggregate extraction, maritime transport, fishing, etc.

Of the proposed conservation measures for the assessed habitat, only one relates to bottom interventions:

"To counteract the anthropogenic/unnatural reduction in the area and integrity of habitats, to maintain the favourable status of the taxa typical of the habitats and the macrozoobenthos biomass (i.e. the food base for birds)". For this purpose, it is proposed not to carry out investment activities interfering with the

[17] *Standard Data Form for the area Ławica Słupska PLC990001 (updated 2021-10).*

seabed, with the exception of investments for which a legally valid decision has been issued. The planned Project has obtained the consent of the Maritime Office in Gdynia to lay and maintain the cables; moreover, the cable lines will be laid in the sub-basin of the POM Plan designated for this purpose.

The projected impacts on the long-tailed duck relate to the construction phase only and concern:

- periodic bird scaring as a result of increased vessel traffic during cable laying,
- periodic reduction in access to the food base (macrozoobenthos) as a result of water turbidity and periodic depletion of the food base.

In order to eliminate the possibility of frightening the long-tailed duck (and other wintering and migrating species in the area), it is recommended that any work be carried out between early May and late October, i.e. outside the wintering and migration period of this species.

Measures to minimise the impact on the long-tailed duck

- carrying out cable laying works from 1 May to 30 October, i.e. outside the migration and wintering period;
- carrying out construction work using modern vessels that meet modern noise emission standards.

Monitoring programme

No monitoring was proposed during the construction and operation phases.

Summary of the impact on the long-tailed duck *Clangula hyemalis*

Impacts associated with the implementation of the proposed development on the long-tailed duck have been assessed as moderate and are primarily associated with:

- local and periodic seabed intervention works - causing agitation of the seabed sediments and increasing the suspended solids content of the water, during land clearing, for laying lines and during the laying and burial of cable lines, which can affect the food base of the long-tailed duck,
- periodic disturbance of birds wintering and resting in the water area during migration periods as a result of increased ship traffic.

These impacts can be easily eliminated by (conducting works outside the period of wintering and migration of long-tailed ducks in the Natura 2000 area). No significant impacts on the long-tailed duck are expected during the operational phase of the connection.

Summary of the impact on the long-tailed duck *Clangula hyemalis*

Impact	Possibility of minimising
Construction stage	
• seabed intervention works (temporary interference with food availability) • periodic disturbance of birds wintering and resting in the water area during migration periods	• carrying out the works within Ławica Słupska outside the migration and wintering period of the long-tailed duck, i.e. between 1 May and 30 October, will eliminate impacts related to bird scaring; • ornithological surveillance of work dates; • carrying out construction work using modern vessels with internal combustion engines that meet modern emission standards.
Operation stage	
No impact on the species is expected during the operation stage	No minimising action proposed - no impacts

1.2.3. Summary of the assessment

Assessment of impacts on the integrity of Natura 2000 site PLC990001

All identified potential impacts of the planned Project on the objects of protection of the site, i.e., for habitat 1110 Sandbanks submarine and long-tailed duck, will be:

- local, i.e. affecting the immediate vicinity of the Project;
- short-term - their effects will be noticeable for a relatively short period after the completion of the works associated with the planned Project (recolonisation of benthic organisms is assumed to occur about 2 years);

- reversible - i.e. on its own, the receptor will be able to return to its original state.

In addition, the proposed minimisation measures will eliminate disturbance of birds through appropriate timing of the works. Therefore, they will not result in an increase in bird mortality and deterioration of the conservation status of the species in the Natura 2000 site in question. As these impacts will be local and of short duration, they will not be cumulative with similar impacts in the POM.

In addition, the course of the cable corridor of the water bodies established in the POM Plan meets the condition of the draft Plan for the Protection of Ławica Słupska (PLC990001) Therefore, no impacts are expected in the integrity of the area PLC990001 Ławica Słupska. The planned Project is in accordance with the findings of the draft Conservation Plan of the PLC990001 Slupsk Shoal area.

Assessment of impacts on the coherence of Natura 2000

In the context of the protection of seabird populations within the Natura 2000 network, the salient features of the Ławica Słupska PLC990001 area are:

- the location of these areas on the migration route of Eurasian seabird populations to their wintering sites;
- the availability of these areas for populations of wintering and resting birds during migration;
- suitable habitat conditions that make these areas attractive as wintering grounds or resting places during the autumn or spring migration of seabirds.

The distribution and the abundance of birds on the sea is mainly due to the availability of food. Seabirds show a strong attachment to their wintering site and are reluctant to move longer distances[18, 19, 20] . This fact is also confirmed by migration studies of local birds wintering at nearby offshore wind farms. Radar surveys of migrating birds have shown that bird species wintering in this part of the Baltic Sea move in all directions without a clear pattern, indicating short flights to feeding grounds rather than long-distance movements. The highest number of recorded flights was documented in the strip between the Natura 2000 sites PLC990001 Ławica Słupska and PLB990002 Przybrzeżne Wody Bałtyku[21] .

In the context of maintaining coherence within the Natura 2000 network, it is particularly important to maintain the possibility of movement between areas of seabird populations, without threatening significant depletion of population status or significant energetic inputs that may affect the ecology and biology, including survival of individuals from these populations. The project characteristics do not envisage the construction of permanent structures protruding from the water that would act as a barrier to the long-tailed ducks as they migrate between feeding and/or resting areas during migration. In addition, it is recommended to carry out works that may frighten birds outside the period of migration and wintering of birds. Therefore, no impacts on the coherence of the Natura 2000 network are anticipated.

[18] Iverson S.A., Esler D., Site fidelity and the demographic implication of winter movements by a migratory bird, the harlequin duck Histrionicus histrionicus. Journal of Avian Biology 2006, 37, 219-228.

[19] Kirk M., Esler D., Iverson S.A., Boyd W.S., Movements of wintering surf scoters: predator responses to different prey landscapes. Oecologia 2008, 155, 859-867.

[20] Oppel S., Powell A.N., Dickson D.L., Timing and distance of king eider migration and winter movements. Condor 2008, 110, 296-305.

[21] Opioła, R., Gajewski, J., Kaczmarek,N., Barańska, A., Bojke, A., Brocławik, O., Brzezińska, A.,Celmer, Z., Cuttat, F., Dembska, G., Drgas, A., Druzd, N., Dworniczak, J., Dziaduch, D., Edut, J., Eisen, M., Fey, D., Flasińska, A, Gajewski, Ł., Galer-Tatarowicz, K., Grygiel, W., Horbowa, K., Jasper, B., Kałas, M., Kapiński, J., Kołakowska, E., Kubacka, M., Kunicki, M., Kuzebski, E., Lisimenka, A., Littwin, M., Marcinkowski, T., Meissner, W., Mirny, Z., Misiewicz, E, Mortensen, L., Nermer, T., Nocoń, M., Olenycz, M., Olszewski, T., Ostrowska, D., Pazikowska-Sapota, G., Pick, D., Radtke, K., Rydzkowski, P., Sadowska, U., Sarnocińska, J., Schack, H., Schmidt, B., Schönberger, L., Skov, H, Strzelecki, D., Stöber, U., Suska, M., Szczepańska, K., Szymanek, L., Thomsen, F., Tuhuteru, N., Wróblewski, R., Wyszyński, M., Załęski K., Raport o oddziaływaniu Morskiej Farmy Wiatrowej Baltic Power na środowisko, Warszawa 2020.

2. PRZYBRZEŻNE WODY BAŁTYKU PLB990002

2.1 STAGE I. SCREENING

2.1.1. Management of the site and project description (Steps 1 and 2)

Is the undertaking directly related or necessary to the management of the area in question?

NO

Description of the project

Below is the screening matrix for the project consisting of the construction of transmission infrastructure from the offshore wind farms MFW Bałtyk II and MFW Bałtyk III together with a connector.

Table 4. *Matrix of ECI impacts of offshore wind farms MFW Bałtyk II and MFW Bałtyk III within PLB990002 Baltic coastal waters*

Brief description of the project:	The planned Project concerns the connection infrastructure from the offshore wind farms MFW Bałtyk II and MFW Bałtyk III within the Natura 2000 site and includes: • laying of four high-voltage AC three-core subsea export cables: two cables from offshore Bałtyk II and two cables from offshore Bałtyk III (in a trench along a stretch of about 18.5 km); • trenchless coastal crossing in the offshore section along the entire stretch of the sub-bank to the exit beyond the last revetment in the using HDD (Horizontal Direct Drilling) over a length of up to about 1.2 km) - the Investor's preferred method; • optionally, in the event that the trenchless passage is shorter and exits before the last revetment, a deeper subsea excavation of up to 800 m to the exit beyond the last revetment (as specified in the POM Plan - a minimum of 3 m below the inter-revetment depression) will be carried out on the subsea section, including the placement of spoils from the bottom dredging. The distance between the cables from one wind farm will be approximately 25 m and the distance between the connection from MFW BII and MFW BIII will be approximately 50 m. During the construction phase, interference with the Natura 2000 site will be associated with the need to clear the bottom in the area where the cable is to be laid (removal of lying artefacts, boulders, etc.), followed by the excavation of a trench approximately 1.5 m wide and 1,5 m deep, using a method known as jetting (soil scouring) or if harder ground is encountered mechanical cutting. In places where there will be large clusters of boulders that cannot be avoided by correcting the cable route, methods of alternative cable protection will be used, i.e. laying cables on the bottom and protecting them by covering them with stone surcharge or concrete mattress. In the case of implementation of a shorter trenchless passage, deeper excavations will be carried out in a strip of approximately 20 m wide and up to 5 m deep in the section up to 800 m (up to the exit beyond the last revetment). A small dredger will be used to dredge the trenches (maximum payload up to about 2,500 m³), and the excavated spoils will be deposited within the IP corridor in the form of small piles at a depth of 10-12 m (between 32 and 30 km of the IP corridor), east of the OWF MFW Bałtyk II cable lines and/or east of the OWF MFW Bałtyk III cable lines. It is assumed that the bottom interference associated with the construction phase, including, but not limited to, cleaning of the bottom,

	movement of cable laying equipment and excavation of the trench, will not exceed a strip of approximately 5 m for each cable. The cables will be laid one after the other starting with the offshore wind farm that gets the planning permission first. In the case of the connector, this is not currently envisaged. For the purpose of this Report, modelling of the spreading of suspended solids was carried out, assuming the most unfavourable hydro-meteorological conditions for the so-called jetting method, which causes the greatest agitation of the bottom sediments. The modelling results (shown in Attachments 2a and 2b in Volume IV) indicate that during cable laying, the predicted instantaneous water turbidity values will be comparable to concentrations of suspended solids that are recorded during heavy storms. After completion of the works, the maximum sediment thickness for one cable line that will deposit will be to approx. 1 mm and will be deposited in the immediate vicinity of the excavation; in the remaining area, within the spreading range of the suspension, the layer thickness will be < 1 mm. Optionally, turbidity of the water tone may also occur as a result of the storage of dredged material from excavation in the shallow coastal zone (only if a shorter trenchless passage is implemented). The resulting suspended solids will spread to neighboring areas according to the current field. Turbidity of the water tone will be limited to the region and duration of the works. Given the lithological nature of the dredged material (fine and very fine-grained sands) and the size of a single sediment discharge with a volume of up to about 2,500 m³, the sediment will sink to the bottom in a very short time, leaving a short-lived, slight turbidity of the water tone. The range of maximum spreading of dredged material will be within the IP corridor. During the operational stage, the cable remains buried in the bottom sediments. The impacts of the operational phase are a negligible increase in sediment temperature in the immediate vicinity of the cable and magnetic radiation of low value and minimal extent. Estimates of EMF emissions are analyzed in Volume VI in Appendix 5, and thermal emissions are analyzed in Appendix 6.
Description of the various components of the project that are likely to cause environmental impacts:	The elements of the Project that will cause environmental impacts within the Natura 2000 site are: • the laying of a total of 4 subsea cables (2 from MFW Bałtyk II, 2 from MFW Bałtyk III) during the construction phase: - bottom cleaning in the axis of the planned cable run, - plunging/burying the cable in an excavation of about, 1.5 wide and about 1.5 m deep (for shorter trenchless passage of up to about 800 m, excavation of up to 20 m wide and up to a maximum depth of about 5 m) - cable laid and backfilled or left to backfill on its own, - vessel/equipment traffic such as a cable ship, support vessels (approximately 4 boats) and a trenching rig (optional small dredge); • in operation: - the operation of the subsea cable does not require any action other than periodic maintenance. Anticipated physical changes that will occur to the environment as a result of the Project:

	- temporary occupation of the site and periodic re-shaping of the ground within the limits of the works to be carried out, i.e. a 5 m wide strip for each cable; - removal of biomass (macrozoobenthos including mussel biomass) over an area of approx. 0026 km^2 , - increased periodic movement of vessels (cable vessel, trenching vessel, support and positioning vessels) and cable laying equipment moving along the bottom (optional small dredge). During the operational phase of subsea cables, the following will occur permanently: - local small changes in the temperature of the sediment in the immediate vicinity of the cable, - small emissions of magnetic fields generated by the cables, whose values are several times lower than the naturally occurring magnetic field of the Earth
A description of any possible direct, indirect or secondary impact of the project on the Natura 2000 site that can be predicted as a simple consequence of the following features: **- size and scale** **- land occupation** **- distance from a Natura 2000 site or parts thereof of key conservation interest** **- resource requirements** **- emissions** **- requirements relating to the excavation of earth masses** **- transport requirements** **- duration of construction, operation, decommissioning**	Size and scale of the planned project within the boundaries of the Natura 2000 site *Land occupation*: • the corridor envisaged for the laying of cables within the boundaries of the Natura 2000 site, occupies a total area of **approximately 1 970 ha.** • of which the actual interference with the bottom will be much smaller- estimated to be about **37 hectares**, including: - from the **OWF Bałty II - approx. 18,5 ha** - from the **OWF Bałtyk III - approx. 18,5 ha** These values may increase slightly with the optional implementation of a deeper excavation, in which case it will be up to about **43.4 hectares (21.7 hectares for each connection);** • possible interference/disturbance **of** the seabed will affect a total of **approximately 0.02% of** the area within the Baltic Coastal Waters Natura 2000 site, including: - from the **OWF Bałtyk II - approx. 0.01%** - from the **OWF Bałtyk III - approx. 0.01%** These values may increase slightly with the implementation of the shorter HDD landfall option (with a deeper trench to exit for the last rev). • for the implementation of the optional shorter HDD with deeper excavation - the maximum assumed area for the storage of dredged material from the excavation for the 4 cables will cover a bottom area of about 10 ha, which is 0.005% of the area of the Natura 2000 area Przybrzeżne Wody Bałtyku; • implementation of the HDD trenchless crossing, which will be carried out from the land (the trenchless crossing construction site of about 0.8 ha will be located about 120 - 100 m from the shore), may require minor works on the side of the can, including minor sub-cleaning works. *Resource requirements:* • Construction stage requirements: fuel to power ships and machinery, machinery consumables, construction materials; • Operating stage requirements: periodic maintenance. *Emissions:* The following emissions and waste are expected to be generated during the construction stage: • waste - typical ship waste,

	• air pollution from the combustion of fuels in ship engines and construction equipment, • underwater noise from ships and equipment. *Construction time* Estimated time required to lay one cable within the area, assuming a laying speed of 250 m/h): • **approximately 2,5 days** for each of the two cables from the **Bałtyk II offshore wind farm** • **approximately 2,5 days**for each of the two cables from the **Bałtyk III offshore wind farm** A total approx. 10 days. Optionally, if a shorter HDD is implemented and deeper excavations are made, the additional time for dredging the bottom and storing the excavated material will be: • **approx. 8 days for each of the two cables from the OWF Bałtyk II** • **approx. 8 days for each of the two cables from OWF Bałtyk III** Total approx. 32 days *Lifespan:* • expected life of the cable not less than 50 years *Duration of liquidation:* • decommissioning of the planned project is not currently envisaged; it is possible to leave the cable in the ground or remove it, with the assumption that pulling out the cable will take less time than laying it.
Distance to Natura 2000 sites:	Project located within the boundaries of the Natura 2000 site Przybrzeżne wody Bałtyku PLB990002

Source: own elaboration based on data from the Investor

2.1.2. Natura 2000 site description (Step 3)

The Natura 2000 PLB990002 Baltic Coastal Waters Natura 2000 site includes a belt of coastal waters of the southern Baltic Sea with depths ranging from 0 to 20 m and a length of approximately 200 km, starting from the tip of the Hel Peninsula to the Pomeranian Bay. The seabed here is uneven, with denivelations of up to 3 m. The benthic fauna is dominated by small crustaceans. Sea ducks winter in the area in large numbers. Approximately 12% of velvet scoters, 2% of common scoters and 35% of long-tailed ducks in Polish sea areas congregate here. black-throated diver, red-throated diver and horned grebes are also recorded in the reservoir, although in smaller numbers[22]. During winter, more than 1% of the migratory path population of long-tailed duck and at least 1% of the migratory path population of black guillemot and velvet scoter occur here. The wintering populations of long-tailed duck, velvet scoter, razorbill and silver-backed gull are protected. It is estimated that 90-120,000 individuals of long-tailed duck, 14-20,000 individuals of velvet scoter, 8-15,000 individuals of black-backed gull winter in this area[23]. On the other hand, the wintering population of auks in this area is estimated at 500-1000 individuals[24]. In the area Coastal Baltic Waters the wintering and passage population of common scoter and the wintering population of black guillemot are also protected. There is no protection plan for this area. The alignment of the planned Project within the site is presented in Figure 9 and the conservation subjects are listed in Table 5.

[22] *Meissner W. 2010b. Coastal waters of the Baltic Sea. [in:] T. Wilk, M. Jujka, J. Krogulec, P. Chylarecki (eds.) Bird refuges of international importance in Poland. OTOP, Marki: 531-532.*

[23] *Wilk T., Jujka M., Krogulec J., Chylarecki P. (eds.), Bird refuges of international importance w Polsce. Ogólnopolskie Towarzystwo Ochrony Ptaków, Marki 2010: 531-532.*

[24] *General Directorate for Environmental Protection (GDOŚ), Standard Data Form (SDF) for Natura 2000 site PLB990002 Przybrzeżne wody Bałtyku. Date of elaboration: 2002-05, Date updated: 2020-10; available at: https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=PLB990002.*

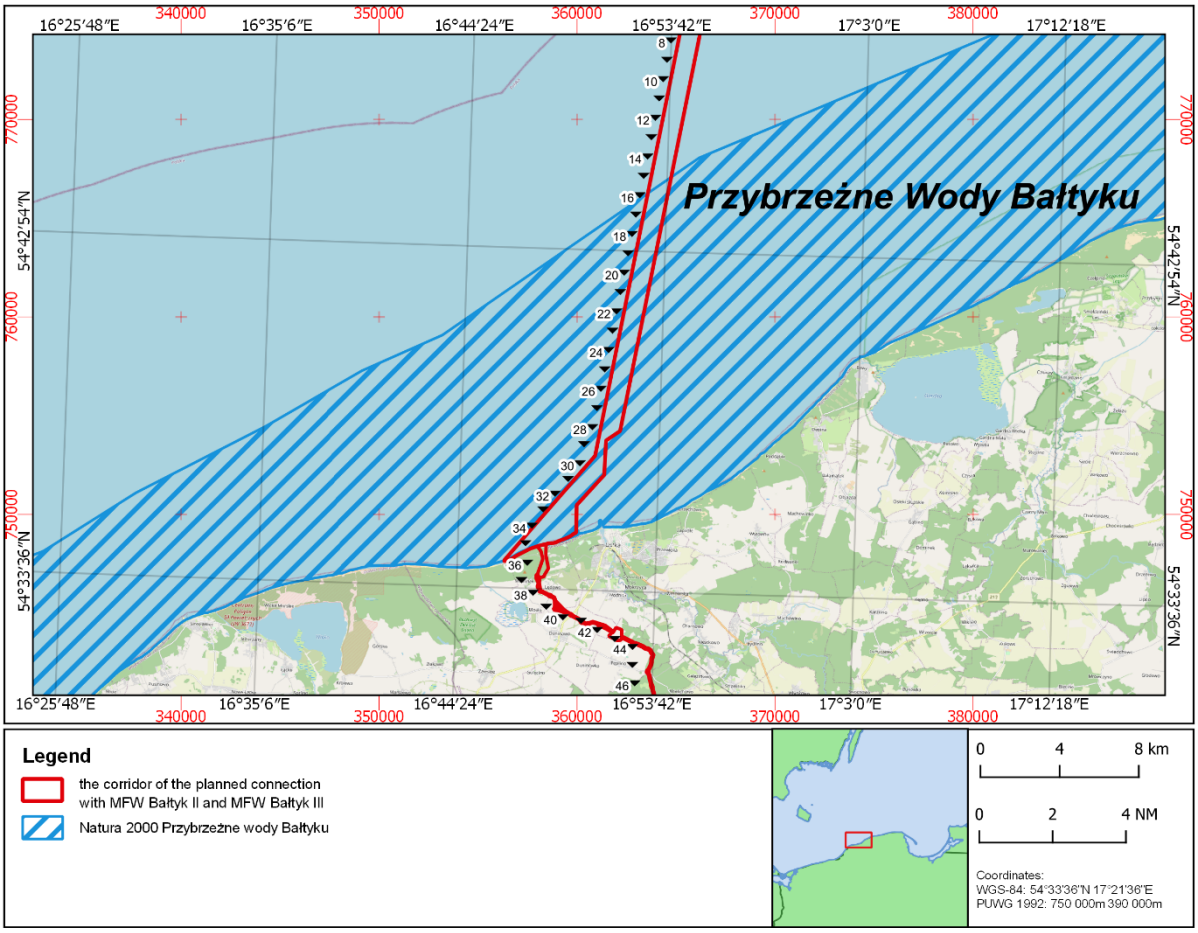

Figure 9. *Location of the planned project on the borders of the Przybrzeżne wody Bałtyku PLB990002 site*

Source: own elaboration based on data from the Investor and data from GDOŚ

Table 5. *Species which constitute the object of protection of Natura 2000 site Przybrzeżne wody Bałtyku PLB990002*

Code	Species	Population in the area				Assessment of the area			
		Type	Size		Unit	Population	State of preservation	Isolation	Overall assessment
			Min.	Max.					
A200	*Razorbill Alca Torda*	Overwintering	500	1000	Individuals	C	C	C	C
A202	*black guillemot Cepphus grylle*	Overwintering	1500	1500	Individuals	B	B	C	B
A064	*Long-tailed duck Clangula hyemalis*	Overwintering	90000*	120000*	Individuals	B	C	C	B
A184	European herring gull *Larus argentatus*	Overwintering	8000	15000	Individuals	C	C	C	C
A066	Velvet scotter *Melanitta fusca*	Overwintering	14000*	20000*	Individuals	C	C	C	C
A065		Overwintering	5000	8000	Individuals	C	B	C	C

Code	Species	Population in the area				Assessment of the area			
		Type	Size		Unit	Population	State of preservation	Isolation	Overall assessment
			Min.	Max.					
	Common scotter *Melanitta nigra*	Transient	3000	3000		C	B	C	C

Source: Standard Data Form for Przybrzeżne wody Bałtyku PLB990002 (updated 2020-10)

** the SDF form incorrectly states the population size. The values quoted here are from BirdLife International (http://datazone.birdlife.org/site/factsheet/central-polish-coastal-waters-iba-poland/details; accessed 20-08-2022) containing the data provided for the SDF form*

In addition, the SDF mentions the black-throated diver *Gavia arctica and the red-throated diver Gavia stellata, as well as the common gull Larus canus,* which are not protected objects of the site (D rating).

Razorbill *Alca torda*

A bird of the family *Alcidae* (alcids), order *Charadriiformes*. Body length 38-43 cm, wingspan 60-69 cm, body mass 370-890 g. Beak thick, laterally sheathed, black with a white vertical stripe in front of the tip. Colouration of head and top of body black, underside white. Underside of wings white. Prominent polyphenism (throat and cheeks white in resting coat). Nests colonially on steep rocky cliffs on the northern coasts of Europe. In the non-breeding season, the most abundant species of the Alcidae family off the Polish Baltic coast, but usually in deeper waters. Migratory species, flights VIII-II, some individuals winter in the country. Fish-eating[25, 26] .

Black guillemot Cepphus grylle

An *Alcidae* bird, smaller than the coot. In mating coat black with white spots on the wings. In the resting coat white on the underside and black striped on the top. A species found in the Baltic, it occurs sparsely in Polish coastal waters during the non-breeding season. Nests among rock slumps on seashores. Feeds mainly on small benthic or bentopelagic fish and crustaceans[27] . A migratory species, arriving in November and departing in April.

European herring gull *Larus argentatus*

A bird of the family *Laridae* (gulls), order *Charadriiformes* (plovers). Body length 54-60 cm, wingspan 123-148 cm, body mass 720-1500 g. A large white gull with an ash-coloured body top. It nests in colonies. It produces one brood per year. Migratory species, flights in III-IV and VII-X, some individuals winter in the country. Feeds on: fish and other small vertebrates, eggs, chicks, berries, waste. Abundance in Poland estimated at 1200-1500 pairs. Partially protected species[28, 29] .

Velvet scoter *Melanitta fusca*

A species of large duck. The male is black with a white patch around the eye and a white 'mirror' and a yellow-orange beak, the female is brown. Velvet scoters are more abundant in bodies of water 10-30 m deep, where they can dive to the bottom in search of food[30] more easily. For the birds, it is most energetically profitable to forage in shallower, food-rich water bodies and only a decrease in prey density

[25] *Svensson L. 2012 Birds. Collins Guide. Multico, Warsaw*
[26] *Cramp S. (ed.) 1977-1994 The Birds of the Western Palearctic. VOL. I-IX. Oxford University Press, Oxford*
[27] *Durinck J., Skov H., Jensen F. P., Pihl S. 1994. Important marine areas for wintering birds in the Baltic Sea. Ornis Consult Report, Copenhagen.*
[28] *Svensson L. 2012 Birds. Collins Guide. Multico, Warsaw*
[29] *Sikora A. et al. (ed.) 2007. Atlas of the distribution of breeding birds of Poland 1985-2004. Bogucki Wyd. Nauk., Poznań.*
[30] *Durinck J., Skov H., Jensen F. P., Pihl S. 1994. Important marine areas for wintering birds in the Baltic Sea. Ornis Consult Report, Copenhagen.*

forces them to move elsewhere[31] . Food on the wintering grounds consists mainly of marine bivalves[32] . In addition, it takes small fish, polychaetes, snails and crustaceans. Diving ducks exert a very strong pressure on their prey populations[33] . Approximately 373,000 velvet scoters currently winter in the Baltic Sea, of which about 148,000 along the coasts of Latvia and Lithuania, and about 125,000 in the Pomeranian Bay[34] . There are no estimates of the size of the wintering population in the Polish Baltic area. Migratory species, arriving in November and departing in April[35] . The GIOŚ monitoring results indicate that the velvet scoter is the second most abundant species of sea duck wintering in the Polish Baltic Sea zone in terms of numbers and prevalence. It was found on 84% of transects within the Monitoring of Wintering Sea Birds[36] , with a prevalence of over 75%. According to the Chief Inspectorate of Environmental Protection, large groupings of birds were observed annually in the Pomeranian and Gdańsk Bays. In some years, velvet scoters appeared in large numbers on Ławica Słupska (*ibidem*) and in the belt of waters between Władysławowo and Łeba. In the area between Kołobrzeg and Ustka, velvet scoters occurred in small numbers. Currently, there is a significant decline in the number of velvet scoters wintering in the Baltic Sea. Since the late 1980s and early 1990s, it has decreased by 60%, with a decrease of up to 65% in the area of the Pomeranian Bay[37] .

Common scotter *Melanitta nigra*

A bird of the family *Anatidae* (ducklings), order *Anseriformes* . Body length 44-54 cm, wingspan 70-84 cm, body mass 600-1450 g. Clear sexual dimorphism only during the breeding season. Male completely black. Black beak with a bump at the base and a yellow spot on top. Female brown with light brown cheeks. Nests in northern Eurasia. Inhabits mainly sea coasts. In Poland found only in migration. Migratory species, flies in the period X-IV, some individuals winter in the country. During the breeding season, it forms large aggregations at sea, often far from land. Food: mainly marine molluscs sometimes crustaceans[38, 39] .

Long-tailed duck *Clangula hyemalis*

A small duck with highly variable coloration (white, gray, black, brown and rust). The male is distinguished by its long rudders. It is the most numerous wintering duck in the Baltic, with an estimated 1.5 million individuals[40]. Most refrigerators winter in seas up to 35 meters deep, and the most numerous are in bodies of water up to 30 meters deep[41]. However, diving is an energetically costly activity, and in bentophaguses, diving time increases with depth[42]. Therefore, for birds it is most energetically profitable to forage in shallower, food-rich bodies of water, and only a decrease in prey density forces them to

[31] *Kirk M., Esler D., Iverson S.A., Boyd W.S. 2008. Movements of wintering surf scoters: predator responses to different prey landscapes. Oecologia 155: 859-867.*
[32] *Fox, A.D. 2003: Diet and habitat use of Scoters Melanitta in the Western Palaearctic - a brief overview. Waterfowl 54: 189-208*
[33] *Guillemette M., Reed A., Himmelman J.H. 1996 Availability and consumption of food by common eiders wintering in the Gulf of St. Lawrence: Evidence of prey depletion. Can. J. Zool. 74: 32-38.*
[34] *Skov H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J. J., Kube J., Kuresoo A., Larsson K., Luigujoe L., Meissner W., Nehls H. W., Nilsson L., Petersen I. K., Roos M. M., Pihl S., Sonntag N., Stock A., Stipniece A. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers. Copenhagen. p. 201.*
[35] *Meissner W. 2010. Seasonal changes in the abundance and distribution of the long-tailed duck Clangula hyemalis, the scoter Melanitta nigra and the scoter M. fusca in the Cape Rozewie area. Ornis Polonica 51: 275-284.*
[36] *Chylarecki P., Chodkiewicz T., Neubauer G., Sikora A., Meissner W., Woźniak B., Wylegała P., Ławicki Ł., Marchowski D., Betleja J., Bzoma S., Cenian Z., Górski A., Korniluk M., Moczarska J., Ochocińska D., Rubacha S., Wieloch M., Zielińska M., Zieliński P., Kuczyński L. 2018. Trends in bird abundance in Poland. GIOŚ, Warsaw, p. 471.*
[37] *Skov H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J. J., Kube J., Kuresoo A., Larsson K., Luigujoe L., Meissner W., Nehls H. W., Nilsson L., Petersen I. K., Roos M. M., Pihl S., Sonntag N., Stock A., Stipniece A. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers. Copenhagen. p. 201.*
[38] *Svensson L. 2012 Birds. Collins Guide. Multico, Warsaw*
[39] *Cramp S. (ed.) 1977-1994 The Birds of the Western Palearctic. VOL. I-IX. Oxford University Press, Oxford*
[40] *Skov H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J. J., Kube J., Kuresoo A., Larsson K., Luigujoe L., Meissner W., Nehls H. W., Nilsson L., Petersen I. K., Roos M. M., Pihl S., Sonntag N., Stock A., Stipniece A. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers. Kopenhaga. p. 201.*
[41] *Durinck J., Skov H., Jensen F. P., Pihl S. 1994. Important marine areas for wintering birds in the Baltic Sea. Ornis Consult Report, Copenhagen.*
[42] *Stephenson R. 1994. Diving energetics in Lesser Scaup(Aythyta affinis, Eyton). J. exp. Biol. 190:155–178*

move to other places[43]. On wintering grounds it feeds mainly on bivalves, less often on polychaetes, echinoderms, crustaceans, small fish and fish eggs[44,45] Diving ducks exert very strong pressure on their prey populations[46]. Stempniewicz[47] estimated that diving ducks residing in the western part of the Gulf of Gdansk consume 6,350 tons of mussels annually. It is a migratory species, arriving in November and departing in April[48]. It is most abundant in the Pomeranian Bay, the Bay of Puck and the Slupsk Shoal, and sometimes in the eastern part of the Gulf of Gdansk, between Rozewie and Kuznica and east of Leba. Between Kolobrzeg and Leba, icefish overwinter in low numbers. Currently, there is a significant decline in the abundance of the Baltic Sea icefish, which has decreased by 65% relative to the 1980s-90s. The most significant decline, as much as 82%, is observed at the largest wintering site in the Pomeranian Bay[49].

2.1.3. Assessing the significance of impacts (Step 4)

The project will be implemented within the boundaries of the Natura 2000 area, so the possibility of interference with fragments of habitats of wintering and migratory birds is expected, which may cause such disturbances as temporary fragmentation of habitats and deterioration of their quality.

Surveys conducted at different times within the framework of PMŚ and by different Investors on selected sections of the seashore within PLB990002 Przybrzeżne wody Bałtyku indicate the possibility of occurrence within the IP corridor with MFW Bałtyk II and MFW Bałtyk III Among all 6 bird species of conservation concern.

During the winter of 2018-2019, for the purpose of developing the EIA Report for the MFW Baltic Power, counts of wintering birds were made both in the field of the future wind farm and for comparison in Natura 2000 areas, including the Baltic Coastal Waters in the area of the planned connection with MFW Bałtyk II and MFW Bałtyk III (Figure 10).

During transect counts conducted in 2018 - 2019 in addition to the species, which are the subject of protection in the area, the following were also found: Common Guillemot *Uria aalge*, Great Black-backed Gull *Larus marinus*, Red-throated Loon *Gavia stellata*, Common scoter *Melanitta nigra*, Baltic Gull *Larus fuscus*, Common Eider *Somateria mollissima*, Great skua *Stercorarius skua*, horned grebe *Podiceps auritus* and Red-necked Grebe *Podiceps grisegena*. The numbers and densities of birds found in the Baltic Coastal waters in 2019 were significantly higher than in 2012 -2013 when surveys were conducted for the Bałtyk II and Bałtyk III offshore connection. The most abundant species in 2019 were Velvet scoter (average abundance of 10,716 individuals per survey campaign), Long-tailed duck (5,265 individuals/campaign), Herring Gull (568 individuals/campaign) and razorbill (260 individuals/campaign). The highest densities of seabirds in general, were registered in the spring and winter, which reached 500 per sq.km. However, the lowest densities were registered in spring - up to 100 individuals·km^2.[50] The highest densities of the long-tailed duck were observed during the wintering period and reached up to 500 individuals·km^2, during spring and autumn migration, the densities of the above species did not

[43] Kirk M., Esler D., Iverson S.A., Boyd W.S. 2008. Movements of wintering surf scoters: predator responses to different prey landscapes. Oecologia 155: 859–867.

[44] Bauer H.G., Bezzel E., Fiedler W. 2005. Das Kompendium der Vögel Mitteleuropas. Band 1: Nonpasseriformes – Nichtsperlingsvögel. Aula Verlag, Wiebelsheim

[45] Skov H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J. J., Kube J., Kuresoo A., Larsson K., Luigujoe L., Meissner W., Nehls H. W., Nilsson L., Petersen I. K., Roos M. M., Pihl S., Sonntag N., Stock A., Stipniece A. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers. Kopenhaga. p. 201.

[46] Guillemette M., Reed A., Himmelman J.H. 1996. Availability and consumption of food by common eiders wintering in the Gulf of St. Lawrence: Evidence of prey depletion. Can. J. Zool. 74: 32–38.

[47] Stempniewicz L. 1995. Feeding ecology of the Long-tailed Duck Clangula hyemalis wintering in the Gulf of Gdańsk (southern Baltic Sea). Ornis Svecica 5: 133–142.

[48] Meissner W. 2010. Sezonowe zmiany liczebności i rozmieszczenia lodówki Clangula hyemalis, markaczki Melanitta nigra i uhli M. fusca w rejonie Przylądka Rozewie. Ornis Polonica 51: 275–284.

[49] Bellebaum J., Kube J., Schultz A., Skov H. 2014. Decline of Long-tailed Duck Clangula hyemalis numbers in the Pomeraniam Bay revealed by two different survey methods. Ornis Fennica 91: 129–137

[50] Barańska A. i in., 2020, Raport z inwentaryzacji zasobów abiotycznych i biotycznych obszaru badań MFW Baltic Power (Załącznik 1 do Raportu o oddziaływaniu na środowisko Morskiej Farmy Wiatrowej Baltic Power na środowisko), MEWO Subsea Solutions

exceed 50 individuals·km^2. The cited results refer to the entire study area in the Baltic coastal waters, i.e. from Ustka to Rozewie. The sites of the highest densities of seabirds are located in the vicinity of Leba, outside the boundaries of the planned Project.

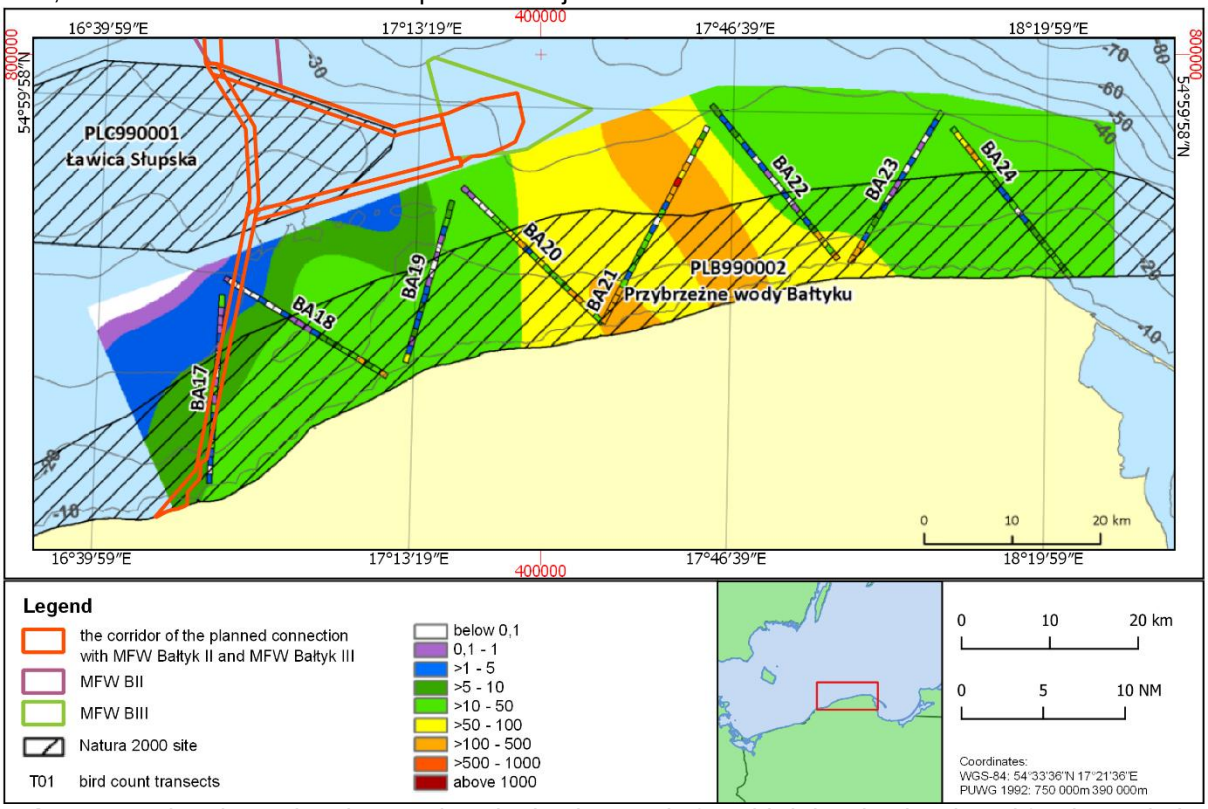

Figure 10. *The planned project against the background of seabird density developed for the period 2018 - 2019 for the EIA Report for the Baltic Power OWF*

Źródło: Barańska A. i in., 2020

Summary of selected Investor studies for the preparation of the EIA reports for the OWF (BC - Wind) and the available results of selected cycles of Monitoring of Wintering Seabirds from the years: 2013, 2014, 2018, 2019, 2020 are presented in the table below (Table 6). These results cannot be compared without appropriate commentary. The PMS allows assessments of population changes over many years, but does not allow knowing the exact number of individuals, for example, in the area of the planned Connector. Nevertheless, this summary is quite sufficient to confirm the presence of the species in the area in question.

Table 6. *Comparison of abundance of selected bird species (objects of protection) from different sources (PMŚ, investors' data)*

Species	**Number of individuals sitting on the water in the Natura 2000 area Przybrzeżne wody Bałtycku PLB990002**					
	Inventory for BC - Wind of 2019 **Transects BA17 to BA24 (average of 5 survey campaigns in winter)**	**PMŚ MZPM** **Transects from BA15 to BA20***				
		2013	**2014**	**2018**	**2019**	**2020**
long-tailed duck *Clangula hyemalis*	604	558 (2)	43 (2)	47 (-)	592 (-)	122 (-)
velvet scoter *Melanitta fusca*	2576	1490 (5)	266 (-)	495 (1)	972 (1)	800 (14)
European herring gull *Larus argentatus*	21	24 (-)	5 (-)	4 (2)	9 (-)	27 (10)
Razorbill *Alca torda*	9	- (-)	- (-)	3 (-)	- (-)	1 (-)

Species	Number of individuals sitting on the water in the Natura 2000 area Przybrzeżne wody Bałtycku PLB990002					
	Inventory for BC - Wind of 2019 Transects BA17 to BA24 (average of 5 survey campaigns in winter)	PMŚ MZPM Transects from BA15 to BA20*				
		2013	2014	2018	2019	2020
Common scotter *Melanitta nigra*	28	2 (-)	- (-)	- (-)	7 (-)	- (-)
black guillemot *Cepphus grylle*	-	- (-)	- (-)	- (-)	- (-)	- (-)

** in parentheses the number of individuals in the sections crossing the IP corridor from OWF BII and OWF BIII;*

*** average of 5 survey campaigns in winter*

Therefore, with the precautionary principle in mind, an assessment specific to all species was carried out, birds (below).

2.2 STAGE II. PROPER EVALUATION

The implementation of the planned Project will involve impacts during the construction phase. During the operation phase, no impacts on birds are expected - the operation of the submarine cables is unmanned and requires only periodic maintenance.

The potential construction impact of the planned Project on seabirds will be related to:

- scaring away birds wintering and resting in the basin during migration periods because of increased ship traffic;
- an increase in the concentration of suspended solids in the water due to the necessary intervention in the seabed during the clearing of the area and during the laying and burial of the cable lines;
- noise emissions from vessels and equipment necessary for laying the cable line;
- exhaust emissions from vessels engaged in cable laying.

The crowding of birds wintering and resting in the basin during migration periods due to ship traffic

Installation of transmission cables will result in local and short-term bird scaring in the area of the works. The construction work requires the presence of various types of vessels: a cable carrier, support vessels (about 4 boats) and a trenching device, optionally - a small dredger, which may frighten birds (physical presence, noise and light emission at night).

The scale of the impact will depend on the number of vessels involved, their size, the way they are illuminated, the intensity of light sources depending on the possibility of working after dark. Assuming that 1 cable vessel (large vessel), 1 excavation vessel (medium vessel) and 4 support vessels (small vessels), and optionally a dredger, are planned to be involved in the laying of one cable line. The effect of crowding will be local, short-term and reversible, as the impact will cease as soon as construction is completed, and the increased vessel traffic associated with the construction work will not significantly differ from the standard traffic prevailing in the area.

Increase in suspended solids concentration

During the construction of the ECI, there will be an uplift of bottom sediments and an increase in the concentration of suspended solids in the water due to cable laying. These factors may impact on the ability of the long-tailed duck and other resident birds to obtain food in the area of the works. Direct sediment agitation and resuspension will result in reduced water clarity.

Water turbidity may cause difficulties for birds using their eyes to hunt while foraging underwater. Based on the results of the suspended solids spread modelling prepared for this Report (Volume IV, Attachment 2), it was estimated that the duration of water turbidity could be a maximum of approximately 16 hours during the laying of one cable. Therefore, the resulting turbidity may result in a temporary impact on bird feeding areas and therefore possible movements of birds within the water basin.

However, displacement of sea ducks is common as they exert a very strong influence on their prey populations.[51,52]

The concentration of suspended solids and the extent of water turbidity will depend on several factors, including the direction of currents, wave action and the volume and fraction of disturbed sediment. Based on model calculations, the highest concentration of suspended solids will occur at the cable laying site. Under the most unfavourable conditions (cable-laying speed of 350 m/h), the extent of turbidity may range from approximately 1 to approximately 8 km from the site, depending on the type of bottom sediments disturbed during the works. The greatest turbidity will occur directly offshore, in a section of the Natura 2000 site PLB990002 Przybrzeżne wody Bałtyckie, as well as in the eastern part of the Natura 2000 site PLC990001 Ławica Słupska. These areas, and especially Ławica Słupska, are important locations for bird concentrations during winter and migration.[53]

Turbidity of the seabed may also occur as a result of depositing dredged material from excavation in the shallow coastal zone if a shorter trenchless passage is implemented. The dredged material is planned to be deposited in a bottom area of about 0.1 km², between km 32 and 30 of the IP corridor, at a depth of 10-12 m, east of the MFW Bałtyk II cable lines and/or east of the MFW Bałtyk III cable lines. The slurry created during dredged material dumping will spread to neighboring areas, which may temporarily limit access to food. However, bearing in mind that the dredged material disposal site and the range of potential impact is outside the range of preferred feeding grounds, moreover, it occurs in an area where bird abundance is low, it will not affect the reduction of the food base of ornithofauna.

Sediment deposition associated with cable laying may affect benthic communities within and around the ECI area. A layer of uplifted sediment will be deposited on benthic organisms, which may interfere with their ability to exchange gas and take up nutrients. The predicted thickness of the sediment deposited after the completion of the works (for one cable line) will be up to a maximum of approx. 1 mm in the trench axis and less than 1 mm in the remaining area. Due to the small thickness of the sediment, there will be no reduction in benthic resources and therefore no impact on the food base of bird species present in the area, most notably the long-tailed duck. The impact on benthos and fish is predicted to be insignificant and will not disturb organisms being bird food.

In conclusion, due to the complexity of natural processes and the need to consider many aspects of biology, both benthic organisms and seabirds, the impact has been determined to be negative, direct, and secondary. The impact on water transparency and benthic communities in the Project area will be local and short-term as it will cease upon completion of the works and will return to its original state after some time. It will be fully reversible - the process of recolonisation of benthic organisms and self-purification of waters will occur gradually, resulting in the restoration of the food base for, among others, the long-tailed duck.

Noise emissions

The presence and movement of vessels will be a major source of noise and a major cause of disturbance to seabirds in the area affected by the construction of the ECI.

This impact is much more significant for ichthyophages than for benthophages (long-tailed ducks), due to a periodic reduction in fish density in the area of the works. However, the population of ichthyophages around the planned Project is extremely low and the proximity of neighbouring water basins, rich in ichthyofauna, is low.

Given the above, this impact was determined to be negative, direct and simple. The installation of the transmission cable will result in the frightening of birds from the work area, and it is assumed that the laying of one cable in the seabed will last within the analyzed Natura 2000 area for about 10 days in total (about 2.5 days for each of the four cables). However, the effect of crowding will be local, short-term and reversible, as the impact will cease immediately after construction, and the noise caused by the Project will be no different from the noise generated by the numerous vessels operating in the Baltic Sea.

Exhaust emissions from vessels

[51] *Guillemette et al. 1996*

[52] *Lewis et al. 2007*

[53] *Wilk et al. 2010*

During the construction works, the number and type of emitters, i.e., the internal combustion engines powering the vessels, will not be significantly different from the emissions generated by vessels navigating on the water basin. The impact associated with increased emissions will be ecoloniz using modern vessels that meet current emission standards.

Atmospheric emissions of gases and particulates are not significant to bird populations, including the long-tailed duck, and therefore the impact has been assessed as neutral, direct and simple. Increased emissions will be local, short-term, and reversible as the impact will cease immediately after the construction completion.

2.2.1. Razorbill *Alca torda*

During the wintering period in 2013 - 2014, a single individual was found on transects crossing the area of the planned MFW Bałtyk II and Bałtyk III Connection Infrastructure. This represents a less than 0.1% share of the seabird grouping within the planned project. Alka was also found as part of the PMA on transects BA15 to BA20* in the PLB990002 Baltic Coastal Waters area in some winters, e.g. 2018 and 2020, and in reference survey areas for BC - Wind.

Both individuals and their habitats are found in many places in this Natura 2000 area. The area of bottom interference in the connection with the implementation of the Planned Project will include the following corridor is 2.2% area of the PLB990002 Przybrzeżne Wody Bałtyku, and works within this area will be carried out for a total of 10 days (2.5 days per cable) and an optional additional 8 days for one cable, in case a deeper excavation is required for a trenchless crossing. Therefore, the construction and operation of the planned project will not affect the species.

2.2.2. Black guillemot *Cepphus grylle*

During the wintering period in 2013 - 2014, a single individual was found on transects crossing the area of the planned Bałtyk II and Bałtyk III MFW Connection Infrastructure. This represents a less than 0.1% share of the seabird grouping within the planned project. The black guillemot was not found as part of the PMA on transects BA15 to BA20* in the PLB990002 Baltic Coastal Waters area in some winters, e.g. 2013, 2014, 2018, 2020, 2021, and in the reference survey areas for BC – Wind and Baltic Power.

Individuals of the guillemot are highly dispersed within the Natura 2000 area. The area of bottom interference in connection with the implementation of the Planned Project will cover 0.02% of the area of PLB990002 Przybrzeżne wody Bałtyku, and works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one cable, in case it is necessary to excavate deeper for the trenchless passage. Therefore, the construction and operation of the planned project will not affect the species.

2.2.3. Long-tailed duck *Clangula hyemalis*

During the wintering period in 2013 - 2014, 1 156 individuals of the Long-tailed duck were found on transects crossing the area of the planned Connection Infrastructure to the MFW Bałtyk II and MFW Bałtyk III. This represents a 98.9% share in the seabird grouping within the area of the planned project. This represents a small percentage of the population of the long-tailed duck in the crossed Natura 2000 site[54].

This species has also been found, sometimes in large numbers, as part of the PME on transects BA15 to BA20* in the PLB990002 Baltic Coastal Waters area every winter, e.g. 2013, 2014, 2018, 2019, 2020, and in the reference survey areas for BC – Wind and Baltic Power.

Both individuals and their habitats are found in many places in this Natura 2000 area. The area of bottom interference in connection with the implementation of the Planned Project will cover 0.02% of

[54] *Standard Data Form for the area PLC990001 Slupsk Shoal (updated 2021-10).*

the area of PLB990002 Przybrzeżne wody Bałtyku, and works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one cable, in case it is necessary to excavate deeper for the trenchless passage.

A draft site protection plan has not yet been drawn up for the area in question, so it is not possible to address the threats identified and the favourable conservation status. Due to the nature of the impacts during the construction phase and the low densities of the species in the study area, the impact on the refrigerator was considered insignificant.

2.2.4. European herring gull *Larus argentatus*

During the wintering period in 2013 - 2014, a single individual was found on transects crossing the area of the planned Bałtyk II and Bałtyk III MFW Connection Infrastructure. This represents a less than 0.1% share of the seabird grouping within the planned project.

This species was also found as part of the PME on transects BA15 to BA20* in the PLB990002 Przybrzeżne Wody Bałtyku every winter, e.g. 2013, 2014, 2018, 2019, 2020, and in the reference survey areas for BC - Wind and Baltic Power.

Both individuals and their habitats are present in many places in this Natura 2000 area. The area of seabed interference in connection with the implementation of the Planned Project will cover 0.02% of the area of the PLB990002 Przybrzeżne Wody Bałtyku area, and works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one cable, in case a deeper excavation is required for the trenchless passage. Therefore, the construction and operation of the planned project will not affect the species.

2.2.5. Velvet scoter *Melanitta fusca*

Analysis of the distribution of this species, indicates its presence mainly in the central, sandy part of the Ławica Słupska area. During the wintering period in 2013 - 2014, 6 individuals of the *Melanitta fusca* were found on transects, crossing the area of the planned Connection Infrastructure to the MFW Bałtyk II and MFW Bałtyk III. This represents a 0.5% share of the seabird grouping within the planned project.

Velvet scoter have also been found, sometimes in large numbers, as part of the PME on transects BA15 to BA20* in the PLB990002 Przybrzeżne wody Bałtyku each winter, e.g. 2013, 2014, 2018, 2019, 2020, and in reference survey areas for BC – Wind and in the Baltic Power study.

Both individuals and their habitats are found in many places in this Natura 2000 area. The area of bottom interference in connection with the implementation of the Planned Project will cover 0.02% of the area of PLB990002 Przybrzeżne wody Bałtyk, and works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one cable, in case it is necessary to excavate deeper for the trenchless passage. Therefore, the construction and operation of the planned project will not affect the species.

2.2.6. Common scotter *Melanitta nigra*

This species was not found during the wintering period in 2013 - 2014, on transects crossing the area of the planned Bałtyk II and Bałtyk III Offshore Connection Infrastructure.

Common scotters were found in small numbers, also within the framework of the PME on transects from BA15 to BA20* in the PLB990002 Przybrzeżne wody Bałtyku each winter, e.g. 2013, 2019 and in the reference survey areas for BC – Wind and in the Baltic Power study.

Both individuals and their habitats occur in a wide dispersion in many places in this Natura 2000 area. The area of seabed interference in connection with the implementation of the Planned Project will cover 0.02% of the area of the PLB990002 Przybrzeżne Wody Bałtyku area, and works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one

cable, in case a deeper excavation is required for the trenchless passage. Therefore, the construction and operation of the planned project will not affect the species.

2.2.7. Summary

Impacts on the objects of protection of the PLB990002 Przybrzeżne wody Bałtyku area are considered insignificant, mainly due to the fact that the species of conservation concern are spread over a wide area and due to the nature of impacts caused by the planned Project, which will be local, short-term and reversible. The area of interference with the seabed in connection with the Planned Project will cover 0.02% of the area of PLB990002 Przybrzeżne wody Bałtyku, and the works within this area will be carried out for a total of 10 days (2.5 days per cable), and an optional additional 8 days for one cable, in case it is necessary to excavate a deeper trench for the trenchless passage.

With a view to reducing the impact of the construction phase as much as possible, minimization measures have been proposed that will apply to all species of conservation concern.

Actions to minimize the impact on the objects of protection

- reduce the possibility of impact on the objects of protection (migratory and wintering birds) by increasing the intensification of the pace of work during the period when the number of birds in the Baltic coastal waters is the lowest, i.e. from May 1 to September 30;
- conducting construction work using modern vessels that meet modern noise emission standards.

Monitoring program

No monitoring was proposed during the construction and operation phases.

Summary of impacts on wintering and migratory species in the area

Impact	Possibility of minimizing
Construction phase	
• interference with the seabed (temporary disruptions related to food availability) • periodic disturbance of birds wintering and resting on the water body during migration periods	• reducing the possibility of impact on the objects of protection (migratory and wintering birds) by increasing the intensification of the pace of work during the period when the number of birds in the Baltic coastal waters is the lowest, i.e. from May 1 to September 30 • carrying out construction work with the use of modern vessels, equipped with internal combustion engines that meet modern emission standards.
Functioning phase	
No impact on the species is expected during the operational phase	No minimization measures proposed - no impacts

Assessment of impacts on the integrity of Natura 2000 site PLB990002

The planned connection infrastructure of the MFW Bałtyk II and MFW Bałtyk III, crosses the Natura 2000 Przybrzeżne Wody Bałtycku PLB990002 site. The conservation status of bird species, which are the objects of protection in the Ławica Słupska area, i.e. black guillemot, common scoter and is good - grade B and average - grade C for razorbills, long-tailed duck, silver-backed gull, velvet scoter. The overall assessment for the area reached good status - B for black guillemot and long-tailed duck and significant status - C for razorbill, silvery gull, common scoter and velvet scoter[55] .

[55] *General Directorate for Environmental Protection (GDOŚ), Standard Data Form (SDF) for Natura 2000 site PLB990002 Przybrzeżne wody Bałtyku. Date of elaboration: 2002-05, Date updated: 2020-10; available at: https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=PLB990002.*

All identified potential impacts of the planned Project on the objects of protection of the site, will be:

- local, i.e. affecting the immediate vicinity of the Project;
- short-term - their effects will be noticeable for a relatively short period after the completion of the works associated with the planned Project (recolonisation of benthic organisms is assumed to occur within 2 years);
- reversible - i.e. on its own, the receptor will be able to return to its original state.

Therefore, they will not result in an increase in bird mortality and a deterioration of the conservation status of species in the Natura 2000 site in question. As these impacts will be local and of short duration, they will not cumulate with similar impacts in the POM.

In addition, the course of the power line will follow an established corridor, in the water bodies indicated in the approved spatial development plan of the Polish Marine Areas (POM) (Journal of Laws 2021, item 935). This is a necessary condition to prevent fragmentation of the Natura 2000 site, which will be fulfilled[56]. Therefore no impacts are expected in the integrity of the Przybrzeżne Wody Bałtyku PLB990002 area.

Assessment of impacts on the coherence of Natura 2000

In the context of the protection of seabird populations within the Natura 2000 network, important features of the Przybrzeżne Wody Bałtyku PLB990002 site are:

- the location of these areas on the migration route of Eurasian seabird populations to their wintering sites;
- the availability of these areas for populations of wintering and resting birds during migration;
- suitable habitat conditions that make these areas attractive as wintering grounds or resting places during the autumn or spring migration of seabirds.

The Baltic Coastal Waters area is located on the migration route of Eurasian seabird populations to their wintering grounds. The distribution along them and the abundance of birds is mainly due to the availability of food. Seabirds show strong attachment to their wintering site and are reluctant to move longer distances[57, 58, 59] . This fact is also confirmed by migration studies of local birds wintering at nearby offshore wind farms. Radar surveys of migrating birds have shown that bird species wintering in this part of the Baltic Sea move in all directions without a clear pattern, indicating short flights to feeding grounds rather than long-distance movements. The highest number of recorded flights was documented in the strip between the Natura 2000 sites Ławica Słupska PLC990001 and Przybrzeżne Wody Bałtyku PLB990002 [60].

In the context of maintaining coherence within the Natura 2000 network, it is particularly important to maintain the possibility of movement between areas of seabird populations, without

General Directorate for Environmental Protection (GDOŚ), Standard Data Form (SDF) for the Natura 2000 site PLC990001 Slupsk Shoal. Date of elaboration: 2002-10, Date updated: 2021-10; available at: https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=PLC990001.

[56] Michałek M., Mioskowska M., Kruk-Dowgiałło L. Environmental Impact Assessment of the Draft Spatial Development Plan for Internal Sea, Territorial Sea and Exclusive Economic Zone on a Scale of 1: 200 000 Gdańsk. 2019, Wydawnictwa Wewnętrzne Instytutu Morskiego w Gdańsku, no. 7289

[57] Iverson S.A., Esler D., Site fidelity and the demographic implication of winter movements by a migratory bird, the harlequin duck Histrionicus histrionicus. Journal of Avian Biology 2006, 37, 219-228.

[58] Kirk M., Esler D., Iverson S.A., Boyd W.S., Movements of wintering surf scoters: predator responses to different prey landscapes. Oecologia 2008, 155, 859-867.

[59] Oppel S., Powell A.N., Dickson D.L., Timing and distance of king eider migration and winter movements. Condor 2008, 110, 296-305.

[60] Opioła, R., Gajewski, J., Kaczmarek,N., Barańska, A., Bojke, A., Brocławik, O., Brzezińska, A.,Celmer, Z., Cuttat, F., Dembska, G., Drgas, A., Druzd, N., Dworniczak, J., Dziaduch, D., Edut, J., Eisen, M., Fey, D., Flasińska, A, Gajewski, Ł., Galer-Tatarowicz, K., Grygiel, W., Horbowa, K., Jasper, B., Kałas, M., Kapiński, J., Kołakowska, E., Kubacka, M., Kunicki, M., Kuzebski, E., Lisimenka, A., Littwin, M., Marcinkowski, T., Meissner, W., Mirny, Z., Misiewicz, E, Mortensen, L., Nermer, T., Nocoń, M., Olenycz, M., Olszewski, T., Ostrowska, D., Pazikowska-Sapota, G., Pick, D., Radtke, K., Rydzkowski, P., Sadowska, U., Sarnocińska, J., Schack, H., Schmidt, B., Schönberger, L., Skov, H, Strzelecki, D., Stöber, U., Suska, M., Szczepańska, K., Szymanek, L., Thomsen, F., Tuhuteru, N., Wróblewski, R., Wyszyński, M., Załęski K., Raport o oddziaływaniu Morskiej Farmy Wiatrowej Baltic Power na środowisko, Warszawa 2020.

threatening significant depletion of population status or significant energetic inputs that may affect the ecology and biology, including survival of individuals from these populations. The project characteristics do not envisage the construction of permanent structures protruding from the water that would act as a barrier to the birds as they migrate between feeding and/or resting areas during migration. Therefore, no impacts on the coherence of the Natura 2000 network are anticipated.

3. PRZYMORSKIE BŁOTA PLH220024

3.1 STAGE I.SCREENING

3.1.1. Management of the site and project description (Step 1 and 2)

Is the project directly related to or necessary for the management of the Natura 2000 site in question?

NO

Description of the project

Below is the screening matrix for the project involving the construction of the planned ECI of the MFW Bałtyk II and MFW Bałtyk III in the vicinity of the Natura 2000 site PLH220024 Przymorskie Błota.

Table 7. *Matrix of ECI impacts of offshore wind farms j MFW Bałtyk II and MFW Bałtyk III within Przymorskie Błota PLH220024*

Brief description of the project:	The Project will be implemented outside the area, at a distance of approximately 580 m westward from the border of the Natura 2000 site. The Project will involve the construction of 4 cable lines (2 lines from the MFW Bałtyk II and 2 lines from the MFW Bałtyk III) consisting of 3 separate single-core cables each. The cables will be laid partly in an open trench and partly trenchless, including at the crossing of Struga Lędowska , which flows into Lake Modła. All of the above mentioned works will take place within the construction corridor - outside the Natura 2000 site. During the operation phase, the planned Project will involve tree felling in a strip of approximately 10-31 m for the 220 kV line and up to 20 m for the 400 kV line. Restrictions on use, i.e. prohibition of residential development and tree plantings, apply to the area at a considerable distance from the Natura 2000 site
Description of the individual elements of the project that are likely to cause environmental impacts	The trenchless HDD crossing of the Struga Lędowska eliminates the potential for the planned project to impact on Lake Modła and wetland habitats.
A description of any possible direct, indirect or secondary impact of the project on the Natura 2000 site, foreseeable as a simple consequence of the individual characteristics	Land occupation within a Natura2000 site: • the planned scope of work is not related to the occupation of land within the Natura2000 site. Resource requirements: none. Emissions within the Natura 2000 site: • at this stage, no location has been identified for the water intake for the drilling mud required for the trenchless crossing of the Struga Lędowska - the source of water for drilling is likely to be tankers or water pipelines; • At this stage, the handling of water from the dewatering of the trenches and the entry and exit chambers of the trenchless passage has not been indicated. Duration of construction: in the vicinity of the area, the works will last approximately 2 months.

Distance to Natura 2000 site	Area of Natura 2000 is located at a distance of approximately 580 m westward from the boundaries of dśu approximately620 m from pre-designated construction.

Source: own elaboration

3.1.2. Description of the Natura 2000 site (Step 3)

The Przymorskie Błota Natura 2000 site PLH220024[61] includes a fragment of the Przymorskie Błota plain and Lake Modła, located west of Ustka. The substrate is built up by boulder clays and their weathering, as well as sands and glacial gravels associated with the North-Polish glaciations. At the surface, Holocene sediments are present, developed in the form of river sands, silts and peats. Locally, lake silts and clays occur. The soil cover is formed by mosaics of black earth muds and organic soils - peaty and mucky, in the western part there are ranges of brown and flat soils. The Potynia River flows through the eastern part of the Przymorskie Błota area, including Lake Modła. The whole area is cut by a network of drainage ditches. In the western part of the area there are water reservoirs created as a result of peat exploitation, so called post-peat. The area in question is dominated by reed and sedge rushes. They overgrow the eutrophic Lake Modła. There are also very well-preserved raised and transitional bogs and thickets of European bog myrtle, as well as patches of swampy coniferous forest, birch forest, alder woods.

Nine habitats[62] listed in Annex I of the Habitats Directive are found in the Przymorskie Błota area, covering approximately 15% of the area. The Baltic-type peat bog communities, European bog myrtle thickets and site-specific swampy birches are very well preserved. Most of the area is covered by reed communities and periodically flooded wet meadows which are a bird sanctuary. The area is inhabited by numerous strictly protected species, including relict boreal plants and those of Baltic range, considered extinct. Lake Modła and the surrounding meadows and rushes are a bird sanctuary. The assessment of the conservation status of the natural habitats carried out during the work on the Plan of Conservation Tasks (PZO) showed that the conservation status of the habitats: 7150 Depressions on peat substrate with plants of the *Rhynchosporion* association and 91F0 Riparian elm-oak-ash forests- is appropriate, 3150 oxbow lakes and natural eutrophic water bodies, 7110 raised bogs with peat-forming vegetation (*Oxycocco-Sphagnetea*), 7140 transitional bogs and quaking bogs (predominantly with *Scheuchzerio-Caricetea vegetation*)- is unsatisfactory, while that of habitat 91D0 swamp forests and woodlands- is poor.

Within the area, significant areas occupied by vegetation on peat or post-peat soils were inventoried, where synsets of species characteristic of transitional peatlands of the class *Scheuchzerio-Caricetea nigrae are* present. The permanently wet or periodically flooded areas of these sites are fed by mineral-trophic waters. On the fringes of raised bogs, the process of overgrowth of peat with European bog myrtle overgrowth and an overgrowth of downy birch is ongoing. Such areas within the POP have been classified as raised bogs or boggy birch, respectively; 2 sites with a total area of approximately 53 ha of habitat 3150 Old river beds and natural eutrophic water bodies with communities with *Nympheion, Potamion* were inventoried. They are: Lake Modła and 2 small mid-forest reservoirs located within the Zaleskie Bagna reserve, which are in the last phase of the landform process. In Lake Modła the physiognomy of the community is defined by the floating pondweed *Potamogeton natans,* and the yellow water *lily Nuphar lutea*, (at the inflow and outflow). In places, in the canals near the pumping station, the Canadian pondweed *Elodea canadensis* and the Eurasian watermilfoil *Myriophyllum spicatum* were also found. The site is represented by 1 eutrophic lake (a former lagoon), which is today mostly overgrown with reed and sedge reeds. In places overgrown with reeds, the water surface contains communities belonging to the class *Lemnetea*. This allows the habitat to be classified

[61] *SDF of the Natura 2000 site Przymorskie Błota PLH220024, updated 2020-10*

[62] *According to the draft SDF update of the Przymorskie Błota Natura 2000 site (data from RDOŚ in Gdansk), 12 habitats listed in Annex I of the Habitats Directive were found to occur in the area, covering approximately 30 % of the site's area.*

[62] *According to the draft SDF update of the Przymorskie Błota Natura 2000 site (data from RDOŚ in Gdansk), 12 habitats listed in Annex I of the Habitats Directive were found to occur in the area, covering approximately 30 % of the site's area.*

as a eutrophic lake (3150.1). The catchment area of the reservoir is subject to low anthropopressure. Arable fields and built-up areas are not directly adjacent to the lake. The overall condition of the habitat is described as adequate. The lake is currently under reserve protection (for bird protection).

According to the SDF (updated March 2022), the area of the site is 1709, 61 ha.

The conservation subjects of the Natura 2000 site Przymorskie Błota PLH220024 are presented in the table below (Table 8).

Table 8. *Habitats forming the subject of protection of Natura 2000 PLH220024 Przymorskie Błota (SDF 03 202)*

Habitat type			Overall assessment of the area	Distance from the boundaries of the planned Project
Code	**Habitat type**	**Surface [ha]**		
3150	Old river beds and natural eutrophic water bodies	53,7	B	approx. 0.9 km
6410	Molinia meadows of various types	84,45	B/C*	approx. 1.3 km
6510	Extensively managed lowland fresh meadows	16,89	C	approx. 600 m
7110	Raised bogs with peat-forming vegetation	15,6	A	approx. 4.2 km
7120	High fens degraded but capable of natural and stimulated regeneration	71,08	A	n.d.
7140	Transition mires and quaking bogs	71,08	A	approx. 2.6 km
7150	Depressions on peat substrate with vegetation of the association *All.Rhynchosporion albae*	0,5	A	approx. 4.4 km
9190	Acid oaks	168,89	B	n.d.
91D0	Coniferous forests and swamp forests	101,17	B	approx. 3.0 km
91F0	Riverine oak-elm-ash forests	4,81	A	approx. 2.5 km

According to draft SDF update of Natura 2000 site Przymorskie Błota (data RDOŚ in Gdańsk, 21.09.2022)

bd- no data available

Source: Natura 2000 Standard Data Form, updated 03 2022
https://crfop.gdos.gov.pl/CRFOP/widok/viewnatura2000.jsf?fop=PL.ZIPOP.1393.N2K.PLH220024.H

In addition, the SDF mentions sub-Atlantic oak-hornbeam (9160), which is not a subject of protection of this site (assessment D). In addition, as part of the material made available by RDOŚ in Gdańsk, habitat 7230 *Mountain and lowland alkaline bogs with the nature of mires, sedges and mosses was* found in the area, which is located at a distance of approx. 820 m from the border of the planned ECI laying works, but is not currently an object of protection in the area.

The location of the planned Project in relation to the objects of conservation of the Przymorskie Błota area is presented in Figure 11 below.

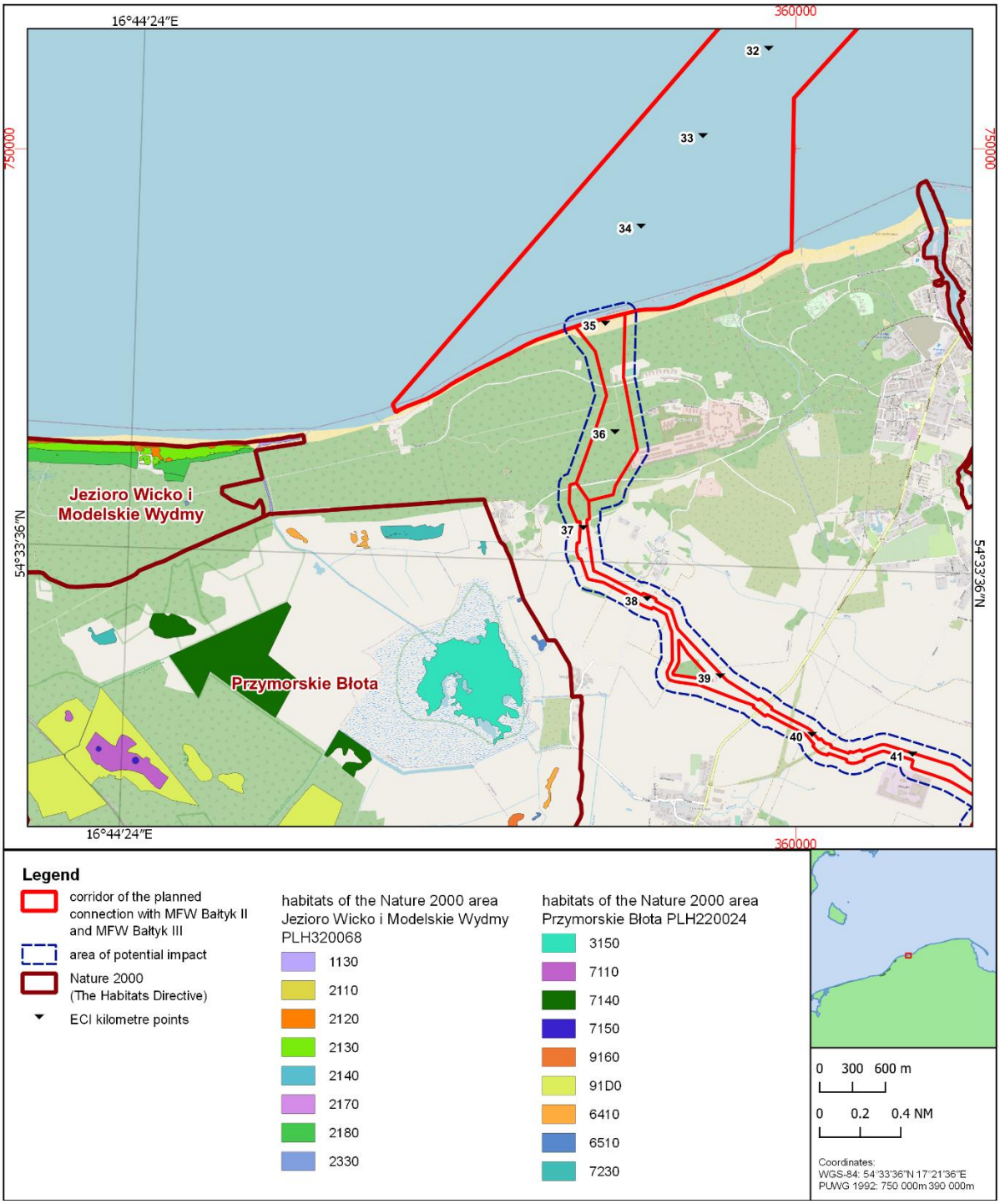

Figure 11. *Planned course of the ECI corridor against the background of natural habitats being the object of protection of the Natura 2000 Przymorskie Błota PLH220024 and Wicko Lake and Modelskie Wydmy PLH320068.*

Source: own elaboration

3.1.3. Assessment of the significance of impacts (Step 4)

The planned Project will not take place within the boundaries of the Przymorskie Błota PLH220024 Natura 2000 site, but at a distance of approx. 580 m (the boundary of the area covered by the application for an environmental decision) and approx. 620 m (the boundary of the pre-determined construction corridor, in which construction work will be carried out for the laying of cables in an open excavation and partly trenchless (wetlands in the area of Struga Lędowska and Struga Lędowska).

Due to the nature of the planned Project and the significant distance to habitats that are subject to protection, potential impacts may only affect disturbance of water relations during construction, which could affect the nearest localized habitats that depend on groundwater levels i.e. : 6510 Extensively used lowland fresh meadows (at a distance of approximately 600 m) and 3150 Old river beds and natural eutrophic water bodies (at a distance of approximately 900 m).

Of the threats indicated in the Order of the RDOŚ in Gdańsk and the RDOŚ in Szczecin dated September 25, 2015 on the establishment of a plan of protective tasks for the Natura 2000 area Przymorskie Błota PLH220024 (Journal of Laws of the Western Pomeranian Voivodeship dated September 29, 2014, item 3620), the planned Project may indirectly affect:

- medium level:
  - pollution of surface waters (limnic, terrestrial, marine and brackish),
  - siltation;
- low level:
  - other man-made changes in water relations.

The following table (Table 9) presents a preliminary identification of possible impacts on the above three habitats.

Table 9 *Identification of Potential Impacts on 2 Habitats within Natura 2000 PLH220024 Przymorskie Błota*

Habitat	Risks	Description of risk	Potential impact
3150 Old river beds and natural eutrophic water bodies with *Nymphaeion* communities*, Potamion*	Existing: 1. Silting up 2. Accumulation of organic matter 3. Change in species composition (succession) 4. Pollution of surface waters (limnic, terrestrial, marine and brackish) 5. Poaching 6. Trampling, overuse 7. Waste and solid waste Potential: 8. Other man-made changes in water relations	Re 1,2,3. natural upwelling process due to accumulation of silt and organic matter, resulting in an increase in the acreage of rush vegetation Re. 4. Discharge of urban waste water into waters surface; Re 5, 6. Illegal fishing and associated penetration and destruction of vegetation in the shoreline of the lake; Re. 7. Any rubbish collected at the lake shore /dirt, tyres, white goods. etc; Re. 8. Possible disruption of pumping stations Modła I and changes to the water management system in the direct catchment.	Possible siltation of Struga Lędowska during the works
6510 Extensively used lowland fresh meadows	No threats were formulated for the habitat, as it was not found in the area during the field surveys conducted for the Conservation Task Plan. Potential: Forest clearance Removal of dead and dying trees		None - no cutting is expected within the area ora

Source: Site Protection Task Plan and data from RDOŚ

Due to the absence of threats to habitat 6510 no potential for impact of the planned Project on this habitat was identified. Accordingly a specific assessment for habitat 3150 (Lake Modła) is presented below.

3.2 STAGE II. APPROPRIATE ASSESSMENT

3.2.1. 3150. Natural eutrophic lakes and reservoirs with *Nymphaeion* communities*, Potamion*

The possibility of indirect impacts that may occur due to the planned trenchless crossing of the Struga Lędowska River (in the area of km 37.2 of the IP corridor)*, within a*pproximately 1 km from the boundaries of the proposed Project.

Brief characteristics of the habitat

Within the boundaries of the Natura 2000 site PLH220024 Przymorskie Błota, there are 2 sites with a total area of approximately 53 ha: Lake Modła and 2 small mid-forest reservoirs located within the Zaleskie Bagna reserve, which are in the last phase of the terrestrial process. In Lake Modła the physiognomy of the community is defined by the broad leaved pondweed *Potamogeton natans*, and the yellow water *lily Nuphar lutea* (at the inflow and outflow). In places, in the canals near the pumping station, the Canadian pondweed *Elodea canadensis* and the Euroasian watermilfoil *Myriophyllum spicatum* were also found. The site is represented by 1 eutrophic lake (former lagoon), which is today mostly overgrown with reed and sedge reeds. In places overgrown with reeds, the water surface contains communities belonging to the *Lemnetea* class. This allows the habitat to be classified as a eutrophic lake (3150.1). The catchment area of the reservoir is subject to low anthropopressure. Arable fields and built-up areas are not directly adjacent to the lake. The overall condition of the habitat is described as adequate. The lake is currently under reserve protection (for bird protection). The sites within the Zaleskie Błota (Zaleskie Marshes) have no open water. They are silted up and entirely overgrown with water soldiers *Stratiotes aloides*. On the banks, the process of overgrowing the lake basin has begun with large sedge rushes *Magnocaricion*, reed canary grass *Phalaridetum arundinacea* and thickets of grey willow *Salix cinerea*.

According to the Plan of Conservation Tasks for Natura 2000 Przymorskie Błota PLH220024, the aim is to maintain the habitat in an unimpaired conservation status.

Habitat impact assessment

At this stage, a trenchless crossing of the Struga Lędowska, which flows into Lake Modła, is planned. In this way, the danger of silting up the watercourse or the ingress of pollutants associated with the works in the riverbed is eliminated. Due to the planned trenchless passage through Struga Lędowska and the surrounding wetlands, and the considerable distance of the planned works from the above-mentioned habitat, the possibility of negative impacts associated with the execution of the necessary dewatering of the entry and exit chambers is not forecast.

In connection with the planned trenchless HDD crossing, the intake of water necessary for the drilling mud is required. The only potential hazard identified in this connection relates to the necessity to draw water for its preparation. In order not to disturb Lake Modła, water should not be abstracted from Struga Lędowska and other watercourses/ditches flowing into the lake (habitats). Due to the sensitivity of the lake to all pollutants, including siltation, water from excavations drainage and drilling mud should not be discharged into the watercourses flowing into the lake. At the current stage of project preparation plans to use water from tankers or waterworks. Płuczka wiertnicza będzie odebrana przez wyspecjalizowaną firmę i zagospodarowana poza miejscem powstania zgodnie z ustawą o odpadach.

The operation phase of the underground cable line is a virtually maintenance-free process, limited to service and conservation works. During the operation phase, there will be no impacts.

Measures to minimise impacts on habitat 3150

- prohibition of water abstraction for drilling mud from Lędowska Struga, Lake Modła and smaller watercourses and ditches flowing into Lake Modła along the ECI corridor from 36.9 km to 37.5 km.
- prohibition of water discharge (e.g. from dewatering of excavations or drilling mud) into Lędowska Struga, Lake Modła and smaller watercourses and ditches flowing into Lake Modła along the section of the ECI corridor from 36.9 km to 37.5 km.
- the drilling mud resulting from the drilling process will be collected by a specialised company and managed off-site in accordance with the Waste Act).

Monitoring proposal

Environmental monitoring should be carried out during the construction stage, which should include controls on method and source water abstraction associated with HDD drilling and the reception of drilling mud and the way to deal with trench drainage waters.

3.2.3. Summary of impacts on area

No direct threat to the habitat was identified during the construction and operation stages. The implementation of the proposed measures, such as the prohibition of the intake of water necessary for the drilling mud from Struga Lędowska, Lake Modła and smaller watercourses crossed by the ECI corridor from 36.9 km to 37.5 km, and the prohibition of the discharge of water into these watercourses eliminatesthe risk of any impacts on the Natura 2000 site, including on habitat 3150. The proposed measures are highly effective and allow the elimination of potential impacts on the habitats during the construction stage.

As the assessment did not identify the potential for significant adverse impacts on Natura 2000 sites, the assessment was completed at Stage 2 Appropriate Assessment.

The planned project will not have a significant negative impact on the conservation objectives of Natura 2000 PLH220024 Przymorskie Błota, in particular it will not lead to:

- deterioration of natural habitats or the habitats of plant and animal species for whose conservation a Natura 2000 site has been designated;
- negative impact on species for whose protection the Natura 2000 site has been designated;
- deterioration of the integrity of the Natura 2000 site or its connection to other sites.

In addition, the planned Project, due to its nature and location, will not affect the possibility of implementing conservation measures and achieving the objectives set out in the Plan of Conservation Tasks for Natura 2000 PLH220024 Przymorskie Błota.

4. PLH320068 WICKO LAKE AND MODEL DUNES

4.1 STAGE I. SCREENING

4.1.1. Management of the site and project description (Step 1 and 2)

Is the project directly related to or necessary for the management of the Natura 2000 site in question?

NO

Description of the project

Below is a screening matrix for the Project consisting of the construction of the planned ECI of the MFW Bałtyk II and MFW Bałtyk III in the vicinity of the Natura 2000 site Jezioro Wicko and Modelskie Wydmy PLH320068. The location of the Natura 2000 site in relation to the planned Project is shown in Figure 2.

Table 10. *Impact matrix of ECI offshore wind farms j MFW Bałtyk II and MFW Bałtyk III within Jezioro Wicko and Modelskie Wydmy PLH320068*

Brief description of the project:	The project will be implemented outside the site, at a distance of approximately 1.4 km from the border of the Natura 2000 site. The project will involve the construction of 4 cable lines (2 lines from MFW Bałtyk II and 2 lines from MFW Bałtyk III) consisting of 3 separate single-core cables each. The cables will be laid partly in an open trench and partly trenchless, including at the crossing of Struga Lędowska , which flows into Lake Modła. All of the above mentioned works will take place within the technical (construction) corridor - outside the Natura 2000 site. During the operation phase, the planned Project will be associated with a restriction of land use over the cables in a strip of about 10 -31 m wide for the 220 kV line and about 20 m for the 400 kV line. Restrictions on use,

	i.e. prohibition of residential development and tree planting, apply to the area at a considerable distance from the Natura 2000 area.
Description of the individual elements of the project that are likely to cause environmental impacts	The implementation of the cable laying works on land and the implementation of the trenchless cable entry on land will cause temporary impacts of local extent, i.e. within the boundaries of the area covered by the application for an environmental decision, and will not in any way spill over into the area under consideration.
A description of any possible direct, indirect or secondary effects of the project on the Natura 2000 site, foreseeable as a simple consequence of the individual characteristics	No
Distance to Natura 2000 site	The planned Project in the Investor's option is located at a distance of about 1.4 km from the borders of the Natura 2000 site Przymorskie Błota PLH220024)

Source: own elaboration

4.1.2. Description of the Natura 2000 site (Step 3)

The conservation subjects of the Natura 2000 site PLH320068 Jezioro Wicko i Modelskie Błota are presented in the following table (Table 11).

Table 11. *Habitats which constitute the object of protection of the Natura 2000 site PLH320068 Jezioro Wicko i Modelskie Błota (date of update 03 2022)*

Habitat type			Overall assessment of the area	Distance from the boundaries of the planned Project
Code	**Habitat type**	**Surface [ha]**		
1130	Estuaries	0,74	B	approx. 2.5 km
1150	Coastal lagoons, lagoons and coastal lakes	933,13	A	approx. 9.8 km
2110	Initial stages of coastal white dunes	15,31	B	approx. 4.3 km
2120	Coastal white dunes	20,75	C	approx. 2.9 km
2130	Coastal grey dunes	28,9	B	approx. 2.9 km
2170	Coastal dunes with creeping willow	0,05	C	approx. 3.8 km
2180	Mixed forests and coniferous forests on coastal dunes	599,69	A	approx. 2.9 km
3150	Old river beds and natural eutrophic water bodies with communities of All.Nymphaeion, All.Potamion	3,7	C	n.d.
7140	Transition mires and quaking bogs	5,68	C	n.d.
9110	Acidic beech forests	10,13	C	n.d.
9190	Acid oak trees	2,72	C	n.d.
91D0	Coniferous forests and swamp forests	34,21	C	n.d.

n.d.- no data available

Source: Natura 2000 Standard Data Form, https://crfop.gdos.gov.pl/CRFOP/widok/viewnatura2000.jsf?fop=PL.ZIPOP.1393.N2K.PLH320068.H

In addition, the SDF lists the species covered by ar. 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC *Linaria odora* (population A, conservation status A, isolation B, overall A).

According to the SDF (updated March 2022), the area of the site is 2469, 94 ha.

No Protection Task Plan or Protection Plan has been established for Natura 2000 Jezioro Wicko i Modelskie Wydmy PLH320068[63].

4.1.3. Assessment of the significance of impacts (Step 4)

The planned Project will not be implemented within the boundaries of the Natura 2000 site Jezioro Wicko i Modelskie Wydmy PLH320068, and at a distance of approx. 2.4 km from the boundaries of this site, including approx. 2.5 km from the boundaries of the technical (construction) corridor, which is directly related to the construction works, includes places where the topsoil, undergrowth will be destroyed, or trees and shrubs will be removed.

The Jezioro Wicko i Modelskie Wydmy PLH320068 Natura 2000 site consists mainly of the best developed and preserved coastal white dunes and their initial forms in the West Pomeranian Voivodeship. Wicko Lake, located about 9.8 km from the borders of the planned Project, is a very well preserved coastal lake (habitat 1150), whose shores are mostly preserved in their natural state and are not urbanised.

As the assessment the planned Project will be implemented at a considerable distance from protected habitats and species and the nature of impacts that will arise during implementation will be local and short-term, did not identify the potential for significant adverse impacts on any of the objects of protection of this, the assessment was completed at Stage 1 of the Screening.

5. DOLINA SŁUPI PLH220052 (SŁUPIA VALLEY)

5.1 STAGE I. SCREENING

5.1.1. Management of the site and project description (Steps 1 and 2)

Is the project directly related to or necessary for the management of the Natura 2000 site in question?

NO

Description of the project

Below is the screening matrix for the Project consisting in the construction of the planned ECI of the MFW Bałtyk II and MFW Bałtyk III in the vicinity of the Natura 2000 site Dolina Słupi PLH220052. The location of the Natura 2000 site in relation to the planned Project is shown in Figures 1 and 2.

Table 12. *Matrix of ECI impacts of offshore wind farms j MFW Bałtyk II and MFW Bałtyk III within PLH220052 Przybrzeżne wody Bałtyku*

Brief description of the project:	The project will be located outside the site, approximately 1.5 km from the Natura 2000 site boundary. • The impact is analyzed mainly in the context of the planned works in the coastal zone where spawning migration to the Słupia River takes place and includes:laying of four high-voltage AC three-core subsea export cables: two cables from offshore Bałtyk II and two cables from offshore Bałtyk III, • trenchless passage through the coastal zone along the entire section of the shoreline to the exit behind the last reef in HDD (Horizontal Direct Drilling) technology over a length of up to about 1.2 km) - the method preferred by the Investor; • optionally, in the event that the trenchless passage is shorter and exits before the last revetment, a deeper subsea excavation of up to 800 m to the exit beyond the last revetment (as specified in the POM Plan - a minimum of 3 m below the inter-revetment depression) will be carried

[63] *According to information on the website of the RDOŚ in Szczecin, the conservation task plan for this area is under implementation - Project No. POIS.02.04.00-00-0193/16 entitled "Development of conservation task plans for Natura 2000 sites" dated 18 March 2017.*

	out on the subsea section, including the placement of spoils from the bottom dredging. The distance between the cables from one wind farm will be approximately 25 m and the distance between the connection from MFW BII and MFW BIII will be approximately 50 m. During the construction stage, there will be no direct impact on the Natura 2000 site, however, works will be carried out in the coastal strip, which is the habitat for the migration of bi-environmental species, including the Atlantic salmon, recorded in the River Słupia; the estuary of the river to the sea is located at a distance of approx. 1.5 km from the planned Project. It is assumed that interference with the area associated with the construction stage, will mainly involve: clearing of the bottom, movement of equipment laying the cable and excavation of the trench. The bottom interference will not exceed a strip of approximately 5 m for each cable, with the assumption that it will be 5 - 10 m.
Description of the individual elements of the project that are likely to cause environmental impacts	The implementation of the offshore cables has the potential to cause impacts (water turbidity and barrier effect) on bi-environmental species that enter the Słupia River for spawning and which can move in the coastal zone up to 4 Mm from the shore, i.e. Atlantic salmon and river lamprey. The implementation of the cable laying works on land and the implementation of the trenchless cable entry on land will cause temporary impacts of local extent, i.e. within the boundaries of the area covered by the application for an environmental decision, and will not in any way spill over into the area under this study.
A description of any possible direct, indirect or secondary effects of the project on the Natura 2000 site, foreseeable as a simple consequence of the individual characteristics	A temporary increase in water turbidity,noise and increased movement of units causing a barrier effect in the area of subsea cable burial/laying works, if it occurs during the migration and ascent of Atlantic salmon and river lamprey to spawn in the Słupia River.
Distance to Natura 2000 site	The planned Project in the Investor's option is located at a distance of about 1.5 km from the borders of the Natura 2000 PLH220025 Dolina Słupi area.

Source: own elaboration

4.1.2. Description of the Natura 2000 site (Step 3)

The area includes the valley of the River Słupia and its tributaries, from Sulęczyno to its mouth. In this area there are numerous water reservoirs of various types, peatbogs and other non-forest communities with valuable vegetation; a significant part of the area is covered by forests, with beeches and oak-hornbeam, and over the watercourses - a belt of oak-hornbeam; no protection plan is in force in this area.

In the narrow area of the Słupia Valley and the valleys of its tributaries, there are valuable natural habitats and sites of rare, endangered species from various systematic groups.

According to the SDF (update date 03 2022), the subject of protection in the area are:

- 20 habitat types associated with riverine and riparian habitats,
- 17 plant and animal species, including with regard to ichthyofauna, the potential impact of the planned Project may concern bi-environmental species: the Atlantic salmon *Salmo salar* with a status rating of B - breeding population and the river lamprey *Lampetra fluviatilis* with a status rating of C - breeding population.

No Protection Task Plan or Protection Plan has been established for the Natura 2000 Dolina Słupi PLH220052 site[64], while in March 2022, a draft Ordinance on establishing a plan of protective tasks for the area was posted on the pages of the RDOŚ in Gdansk.

4.1.3. Assessment of the impacts significance (Step 4)

In terms of ichthyofauna, there is a spawning migration route for Atlantic salmon and sea trout and river lamprey in the coastal zone, approximately 4 miles offshore. These species use the River Słupia as a breeding ground, especially in autumn.

Negative effects of the works (especially in the coastal zone, in autumn and spring causing water turbidity and noise), especially with regard to the population using the River Słupia as a spawning site. This could represent a potential significant negative impact on these species. [65]

The Draft Area Protection Task Plan identifies as a threat to salmon: J02.01 - reduction of migration and barriers to migration.

While habitat enhancement, particularly by improving hydromorphological conditions, is cited as a conservation goal, there is no reference throughout the document to the potential disruption of bi-environmental species migration associated with offshore work in the migration zone.

Accordingly with the potential impact of the planned works, a specific assessment was carried out for Atlantic salmon *Salmo salar* and river lamprey.

5.2 STAGE II. APPROPRIATE ASSESSMENT

1106. Atlantic salmon *Salmo salar*

Atlantic *salmon Salmo salar* was not recorded in the inventories conducted for the planned Project. However, the species was recorded in the inventories for the Bałtyk II MFW (in the deep-water zone) as well as for the connection infrastructure from FEW Baltic II (in the coastal zone). The occurrence of salmon has therefore been confirmed in the area of the planned Project at different locations in both the deep water and the coastal zone. The results obtained indicate that the ECI area is used as a migration corridor for spawning to the Słupia River Atlantic salmon. Increased migration was observed in autumn, despite the unfavourable pattern of wind directions and sea currents.

The possible impacts of laying subsea cables up to 4 Mm offshore on Atlantic salmon (construction stage) and the impacts of the operational stage associated with the constant, small-scale magnetic field emissions generated by subsea cables are assessed below.

Impact of water turbidity

The amounts of suspended solids that may be generated during subsea cable laying, as predicted from the modelling[66] , will be greatest near the bottom, while they will be considerably less in the water depths and near the surface, thus limiting the negative impact on pelagic bi-environmental fish species. The threshold value for suspended solids impact on fish adopted in the model (5 mg/l) is significantly lower than that found in rivers that are migration routes for this group of species (typically up to 20 mg/l and above) and will not affect adults of these species in the sea. Another accepted threshold value (> 30 mg/l) that may have some impact on bi-environmental species will be spatially limited and, at the maximum unfavourable hydro-meteorological conditions adopted for modelling, will occur in the water depths over a total area of approximately 5.6 km^2 , and in the surface layer of less than 1.5 km^2. Therefore, the possibility of a significant impact of this factor on bi-environmental species has been demonstrated. However, with the application of minimizing measures, which consist in

[64] According to information on the website of the RDOŚ in Szczecin, the conservation task plan for this area is under implementation - Project No. POIS.02.04.00-00-0193/16 entitled "Development of conservation task plans for Natura 2000 areas" dated 18 March 2017.

[65] Bernaś et al, 2009

[66] Modelling of the spread of suspended solids during the laying of subsea cables is provided in Volume IV in Appendix 2.

excluding works in the zone up to 4 Mm from the shore during the period of migration of Atlantic salmon from the sea to the Słupia River, this impact can be effectively reduced.

Impact of a mechanical barrier on migration routes

During the construction stage, increased vessel traffic is expected due to works involving the laying of ECI cables. Conducting these works may periodically present an underwater physical barrier to fish migration. In addition, suspended matter lifted from the seabed will act as an additional physical barrier to fish movement during the works as they avoid areas of increased suspended matter concentration. The duration of suspended matter in the water, the rate at which it settles and the extent of its spread will depend on the type of substrate at the site, the pattern of sea currents and the works technology. However, the barriers will be point-like (at the current works location), so migrating fish will be able to avoid the barrier. Nonetheless, it is possible that the works will have a negative impact (especially in the coastal zone, in autumn) on the spawning migration of Atlantic salmon and sea trout, especially for the population using the River Słupia as a breeding site[67]. This could represent a potential negative impact on these species, and given the conservation status of Atlantic salmon in the Natura 2000 site Dolina Słupi PLH220052 (population rating B) - the impact has been assessed as significant for salmon and sea trout mainly in terms of the undersea noise generated causing a scaring effect. However, this impact can be eliminated by appropriate timing of works in the coastal zone (up to 4 Mm), outside the spawning period of salmon (as well as the co-occurring sea trout).

Operation stage - magnetic field emissions

Potential impacts include interference with the natural magnetic field caused by electromagnetic field emissions around transmission cables. These impacts may result in disruption of orientation and consequent rerouting of spawning fish. This is more commonly observed for sensitive species (so-called electrosensory species), which include cod, plaice, eel, salmonids and sea and river lamprey [68,69,70,71,72]. This therefore includes both marine and bi-environmental species that migrate between rivers and lakes and the sea.

For the planned IP, it was envisaged to use three-phase AC cables for energy transmission. Due to the phase shifts of the currents in the individual conductors of the cable, this allows an almost complete reduction in magnetic field emissions outside the cable. [73]

An increase in distance from the cable location causes a rapid decrease in the magnitude of the magnetic field, At a distance of about 1 meter, the field value is about 1 μT, with an alternating current of 100 A and a voltage of 145 kV. In contrast, at a distance of about 10-13 meters from the cable, the magnitude of the magnetic field drops below 0.01 μT. The variant proposed for implementation according to the technical parameters, assumes a voltage of 220 kV. With such parameters, for a cable buried at a depth of 1 m, the generated maximum value of the electromagnetic field will be up to 7.85 μT (which is more than 6 times smaller than the Earth's magnetic field, which is about 50 μT). At a distance of 10 meters horizontally from the cable, the value will drop at the bottom to 0.22 μT, and in the water depth (10 meters above the bottom) it will be 0.08 μT. When the cable is buried at a greater depth, the electromagnetic field values above the bottom will be even lower.

[67] *Bernaś et al, 2009*

[68] *Gill and Taylor, 2001*

[69] *Westerberg, 2000*

[70] *Gill et al. 2005*

[71] *Rodmell and Johnson, 2005*

[72] *Yano et al. 1997*

[73] *OSPAR 2012*

There is limited literature data on the effects of magnetic fields on fish. [74,75,76] Available information indicates that the magnitude of the electromagnetic field is lower for the alternating current (AC) cables that will be used in the planned ECI than for the direct current (DC) cables used in the existing SwePol Link transmission cable. Observations using cameras in the SwePol Link cable area have shown the presence of fish (including cod) and invertebrates in its immediate vicinity and above the cable. This indicates that the magnetic field does not have a strong deterrent effect on aquatic organisms. However, literature studies have observed the effects of magnetic and electric fields on fish species showing greater sensitivity, which include salmonids [77,78,79]. The detection threshold for magnetosensory organisms ranges from 0.01 μT to 0.05 μT for different species.

Considering the detection thresholds for magnetosensory organisms, the electromagnetic field generated by the 220 kV cables of the planned ECI will be detected by these organisms from greater distances (up to several tens of metres near the bottom). With regard to bi-environmental fish species such as Atlantic salmon or sea trout, the impact of the magnetic field on migration routes will be marginal, as these fish move through the water, usually at a considerable distance from the bottom.

Taking these conditions into account, the significance of the impact of electromagnetic fields on ichthyofauna during the operational phase has been assessed as insignificant.

Measures to minimise impacts on Atlantic salmon

- to carry out cable laying works in a zone up to 4 Mm from the shore outside the spawning migration period for sea trout and salmon falling between 15 September and 15 November.

Monitoring programme

During the construction phase, works should be carried out under the supervision of an ichthyologist in order to:

- ensure that subsea cable laying works are carried out outside the spawning migration period for sea trout and salmon which falls between 15 September and 15 November;
- formal confirmation of the time of commencement and completion of works from shore to 4 Mm.

No monitoring is proposed during the operational stage due to the lack of impact of the Project during the operational phase.

Summary of impact on Atlantic salmon

Impacts associated with the implementation of the proposed project on Atlantic salmon have been assessed to be significant which is primarily related to:

- the possible effect of a barrier to species entering the Słupia River for spawning (as a result of water turbidity and subsea noise);
- carrying out the aforementioned works during the spawning migration period, i.e. from 15 September to 15 November.

These impacts can easily be eliminated (carrying out works outside the spawning migration period). No significant impacts are expected on the Atlantic salmon during the operational phase of the connection.

Summary of impacts on Atlantic salmon *Salmo salar*

Impact	Possibility of minimising
Construction stage	

[74] *Gill 2005*

[75] *Öhman et al, 2007*

[76] *Horns Rev Offshore..., 2005*

[77] *Rodmell and Johnson, 2005*

[78] *Gill and Taylor, 2001*

[79] *Westerberg, 2000*

Impact	Possibility of minimising
• Barrier effect of cable laying during spawning migrations (water turbidity, undersea noise)	• carrying out works outside the spawning migration period from 15 September to 15 November • ichthyological monitoring of the timing of the works.
Operation stage	
No impact on the species is expected during the operational phase	No minimising action proposed - no impacts

5.2.2. 1099. Lamprey *Lametra fluviatilis*

The river lamprey *Lampetra fluviatilis* was not listed in the inventories conducted for the planned Project. However, the species is listed in the SDF of the area in question with a population status of C and, according to the literature, ascends the Słupia River to spawn. This indicates the potential use of the IP area as a migration corridor for the ascending spawning population of this species into the Słupia River. Increased migration of river lamprey occurs in autumn (October-November) and early spring (March-April).

The possible impact of laying submarine cables in the zone up to 4 Mm from the shore on the river lamprey (construction phase) and the impacts of the operation phase associated with the constant, small-scale emission of the magnetic field generated by the submarine cables are assessed below.

Effect of water turbidity

The impact of increased concentrations of suspended solids on river lamprey will be similar to that described above for Atlantic salmon, For river lamprey, the possibility of a significant impact from this factor has also been demonstrated. However, with the use of minimization measures, consisting of exclusion of works in the zone up to 4 Mm from the shore during the autumn and spring migration of river lamprey from the sea to the Słupia River, this impact can be effectively reduced.

Impact of mechanical barrier on migration routes

The combined impact of increased noise and suspended solids concentration (as a mechanical barrier) on river lamprey will be similar to that described above for Atlantic salmon. For river lamprey, the possibility of a significant impact from this factor has also been demonstrated. However, with the application of minimization measures, consisting of excluding works in the zone up to 4 Mm from the shore during the autumn and spring migration of river lamprey from the sea to the Słupia River, this impact can be effectively reduced.

Functional phase - magnetic field emissions

A detailed description of the impact of this factor in connection with the operation of the planned IP is presented above for Atlantic salmon. Taking into account the conditions presented, the significance of the impact of the electromagnetic field on ichthyofauna, including river lamprey at the stage of operation was assessed as insignificant.

Measures to minimize the impact on river lamprey

- Conducting cable laying works in the zone up to 4 Mm from the shore outside the period of autumn spawning migration of river lamprey, falling, as for Atlantic salmon, from September 15 to November 15, and during the spring spawning run (March 1 to April 15).

Monitoring program

During the construction phase, works should be carried out under the supervision of an ichthyologist to:

- ensure that submarine cable laying works are carried out outside the spawning migration period (September 15-November 15 and March 1-April 15);
- formally confirm the start and completion time of works in the shoreline section up to 4 Mm.

No monitoring was proposed during the operation phase due to the lack of impact of the Project during the operation phase.

Summary of impact on river lamprey

Impacts associated with the implementation of the planned investment on the river lamprey were assessed as potentially significant, which is primarily related to:

- a possible barrier effect on species entering the Słupia River for spawning (as a result of water turbidity and submarine noise);
- the conduct of the aforementioned works during the spawning migration period, i.e. from September 15 to November 15 and from March 1 to April 15.

These impacts can easily be eliminated (conducting the works outside the spawning migration period). No significant impacts on river lamprey are expected during the operation phase of the connection.

Summary of impacts on river lamprey *Lampetra fluviatilis*

Impact	Ability to minimize
Construction phase	
• Barrier effect during cable laying during spawning migrations (water turbidity, undersea noise)	• Conducting works in the coastal zone up to 4 Mm outside the spawning migration period in the months from September 15 to November 15 and from March 1 to April 15 • ichthyological supervision of the timing of the works
Functioning phase	
No impact on the species is expected during the operational phase	No minimization measures proposed - no impacts

5.2.3. Summary

The planned project does not generate threats to the integrity of the Natura 2000 Dolina Słupi PLH220052 site or to the coherence of the network. The works will be carried out at a considerable distance from the site, and the only potential short-term and reversible impacts are related to the timing of cable laying in the coastal zone, i.e. up to 4 Mm from the shore and the associated possibility of disrupting spawning migrations of Atlantic salmon and river lamprey.

The proposed minimisation measures completely eliminate the possibility of disturbance to spawning migrations of Atlantic salmon entering the Słupia River.

Pomorski Wojewódzki Konserwator Zabytków

ZA.5183.770.2022.SS Gdańsk, dnia 18.08.2022 r.

O P I N I A K O N S E R W A T O R S K A

dla lokalizacji inwestycji w zakresie terminalu gazowego

Działając na podstawie przepisów następujących aktów prawnych:

(1) ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (tekst jednolity: Dz.U. z 2022 r., poz. 840) [**Ustawa o Ochronie Zabytków**]: art. 89 pkt 2, art. 91 ust. 4 pkt 4 Ustawy o Ochronie Zabytków;

(2) ustawy z dnia 24 lipca 2015 r. o przygotowaniu i realizacji strategicznych inwestycji w zakresie sieci przesyłowych (tekst jednolity: Dz.U. z 2022 r. poz. 1265) [**Specustawa**]: art. 4 ust. 2 pkt 2 Specustawy;

Pomorski Wojewódzki Konserwator Zabytków [PWKZ]

po rozpatrzeniu wniosku Spółki MFW BAŁTYK II Sp. z o.o., w imieniu której występuje pełnomocnik: Pan Mateusz Samulak, PROJMORS Biuro Projektów Budownictwa Morskiego Sp. z o.o., sygn. 12275_PM_JC_035_PWKZ_BII z dnia 27.07.2022 r. (wpłynął 27.07.2022 r.), o wydanie opinii na potrzeby wniosku o wydanie decyzji o ustaleniu lokalizacji inwestycji pn. „Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk II – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego";

O P I N I U J E

P O Z Y T Y W N I E

Inwestycję pn. „Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk II – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego";

Na trasie inwestycji nie występują znane tut. organowi elementy podwodnego dziedzictwa kulturowego.

W przypadku natrafienia w trakcie realizacji inwestycji na relikty podwodnego dziedzictwa kulturowego, należy wstrzymać prace oraz powiadomić o tym fakcie Pomorskiego Wojewódzkiego Konserwatora Zabytków, Dyrektora Urzędu Morskiego w Gdyni oraz Dyrektora Narodowego Muzeum Morskiego w Gdańsku.

Z up. Pomorskiego Wojewódzkiego
Konserwatora Zabytków

Piotr Klimaszewski

Kierownik Wydziału ds. Zabytków Archeologicznych

Otrzymują:
1. MFW BAŁTYK II Sp. z o.o., pełnomocnik: Mateusz Samulak
2. a/a SS

Klauzula informacyjna

Zgodnie z art. 13 ust. 1 i 2 rozporządzenia Parlamentu Europejskiego i Rady (UE) 2016/679 z dnia 27 kwietnia 2016 r. w sprawie ochrony osób fizycznych w związku z przetwarzaniem danych osobowych i w sprawie swobodnego przepływu takich danych oraz uchylenia dyrektywy 95/46/WE (Dz.U.L 119 z 4.05.2016r.) zwanych dalej „RODO", informuję, że:

1) Administratorem przetwarzającym Pani/Pana dane osobowe jest Pomorski Wojewódzki Konserwator Zabytków z siedzibą w Gdańsku, ul. Dyrekcyjna 2-4,

2) W Wojewódzkim Urzędzie Ochrony Zabytków wyznaczony został Inspektor Ochrony Danych, z którym można skontaktować się:

   — przez email: iod@zabytki.mail.pl lub

   — listownie na adres: Dyrekcyjna 2-4, 80-852 Gdańsk

3) przetwarzanie danych osobowych następuje w celu prowadzenia postępowań administracyjnych na podstawie przepisów prawa- ustawy z dnia z ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami oraz przepisów wykonawczych do ustawy, ustawy z dnia 7 lipca 1994 r. Prawo budowlane, ustawy z dnia 16 kwietnia 2004 r. o ochronie przyrody , ustawy z dnia 14 czerwca 1960 r. Kodeks postepowania administracyjnego. Zgodnie z art. 6 ust. 1 lit. c RODO, przetwarzanie jest niezbędne do wypełnienia obowiązku prawnego ciążącego na administratorze

4) W związku z przetwarzaniem danych w celu wskazanym powyżej, Pani/Pana dane osobowe mogą być udostępniane innym odbiorcom lub kategoriom odbiorców danych osobowych, którymi mogą być:

   — podmioty, które przetwarzają Pani/Pana dane osobowe w imieniu Administratora na podstawie zawartej umowy powierzenia przetwarzania danych osobowych (tzw. podmioty przetwarzające),

   — inne upoważnione organy lub instytucje publiczne.

5) Pani/Pana dane osobowe nie będą przekazywane do państwa trzeciego lub organizacji międzynarodowej.

6) Pani/Pana dane osobowe będą przetwarzane przez okres niezbędny do realizacji wskazanego powyżej celu przetwarzania, w tym również obowiązku archiwizacyjnego wynikającego z przepisów prawa.

7) Posiada Pani/Pan prawo żądania dostępu do treści swoich danych, prawo ich sprostowania, usunięcia ograniczenia przetwarzania, wniesienia sprzeciwu wobec przetwarzania, prawo do przenoszenia danych, prawo do cofnięcia zgody na przetwarzanie w dowolnym momencie bez wpływu na zgodność z prawem przetwarzania, którego dokonano na podstawie zgody przed jej cofnięciem.

8) Ma Pani/Pan prawo wniesienia skargi do organu nadzorczego, tj. Prezesa Urzędu Ochrony Danych Osobowych.

9) Podanie przez Panią/Pana danych osobowych jest warunkiem rozpatrzenia sprawy (przeprowadzenia postępowania administracyjnego) przez Pomorskiego Wojewódzkiego Konserwatora Zabytków w Gdańsku i wynika z przepisów prawa; co do zasady jest dobrowolne, jednak niezbędne do załatwienia sprawy w Wojewódzkim Urzędzie Ochrony Zabytków w Gdańsku, o ile z przepisów ustawy nie wynika prawny obowiązek udostępnienia Pomorskiemu Wojewódzkiemu Konserwatorowi Zabytków danych osobowych (w szczególności w związku z obwiązkami dysponenta zabytku o których mowa w art. 28 ust. 1 ustawy o ochronie zabytków i opiece nad zabytkami.)

10) Przetwarzanie podanych przez Panią/Pana danych osobowych nie będzie podlegało zautomatyzowanemu podejmowaniu decyzji, w tym profilowaniu, o którym mowa w art. 22 ust. 1 i 4 ogólnego rozporządzenia o ochronie danych osobowych z dnia 27 kwietnia 2016 r.

NARODOWE
MUZEUM
MORSKIE
w Gdańsku

NMM/N-OD/2418/2022

Gdańsk, 19 sierpnia 2022 r.

Pan
Mateusz Samulak
PROJMORS
Biuro Projektów Budownictwa Morskiego Sp. z o.o.
ul. Narwicka 2D
80-557 Gdańsk

Szanowny Panie,

Działając na podstawie art. 89 pkt 1 ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (Dz. U. 2003 Nr 162 poz. 1568 z późn. zm.), art. 23 ust. 2 ustawy z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej (Dz. U. z 2020 r. poz. 2135, z późn. zm.), art. 106 §1 i 5 Kodeksu postępowania administracyjnego oraz w związku z powierzeniem przez Wiceprezesa Rady Ministrów Minister Kultury, Dziedzictwa Narodowego i Sportu prof. dr hab. Piotra Glińskiego pismem z dnia 11 czerwca 2021 roku (DOZ.0101.1.2021.ŁC) bezterminowo Dyrektorowi Narodowego Muzeum Morskiego w Gdańsku prowadzenia spraw należących do właściwości ministra właściwego do spraw kultury i ochrony dziedzictwa narodowego, w tym opiniowania na podstawie art. 26 i 27, ust. 1 ustawy przesyłam postanowienie w sprawie dotyczącej realizacji sieci przesyłowych dla inwestycji pn. *Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk II – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego.*

Z poważaniem

Narodowe Muzeum Morskie
w Gdańsku
T: 58 301 86 11
F: 58 301 84 53
E: sekretariat@nmm.pl
Ołowianka 9-13
80-751 Gdańsk
www.nmm.pl

NARODOWE
MUZEUM
MORSKIE
w Gdańsku

Gdańsk, 19 sierpnia 2022 r.

NMM/N-OD/ARL/2418/2022

POSTANOWIENIE

Działając na podstawie art. 89 pkt 1 ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (Dz. U. 2003 Nr 162 poz. 1568 z późn. zm.), art. 26 i 27 ust. 1 ustawy z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej (Dz. U. z 2020 r. poz. 2135, z późn. zm.), art. 106 §1 i 5 Kodeksu postępowania administracyjnego oraz w związku z powierzeniem przez Wiceprezesa Rady Ministrów Ministra Kultury, Dziedzictwa Narodowego i Sportu prof. dr hab. Piotra Glińskiego pismem z dnia 11 czerwca 2021 roku (DOZ.0101.1.2021.ŁC) bezterminowo Dyrektorowi Narodowego Muzeum Morskiego w Gdańsku prowadzenia spraw należących do właściwości ministra właściwego do spraw kultury i ochrony dziedzictwa narodowego, w tym opiniowania na podstawie art. 26 ust. 1 i 27 ust. 1 ww. ustawy z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej, decyzji w sprawie uzgodnienia lokalizacji kabli i rurociągów na obszarach morskich wód wewnętrznych, morza terytorialnego i wyłącznej strefy ekonomicznej,

postanawiam:

zaopiniować pozytywnie wniosek w sprawie dotyczącej realizacji inwestycji pn. *Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk II – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego, ze* wskazaniem, że decyzję o wydaniu pozwolenia należy uzupełnić o warunek wynikający z art. 32 ust. 1 pkt. 1-3 ustawy o ochronie zabytków i opiece nad zabytkami (Dz.U. z 2003 Nr 162 poz. 1568 z późn. zm.) w związku z możliwością natrafienia podczas prac na zabytki archeologiczne.

UZASADNIENIE

Wnioskiem z dnia 27 lipca 2022 r. przedstawiciel MFW Bałtyk II sp. z o.o. za pośrednictwem Pana Mateusza Samulaka (PROJMORS Biuro Projektów Budownictwa Morskiego Sp. z o.o.) zgodnie z art. 4 ust. 2 pkt 2a), 2b) ustawy o przygotowaniu i realizacji strategicznych inwestycji w zakresie sieci przesyłowych zwrócił się do Ministra Kultury i Dziedzictwa Narodowego z wnioskiem o wydanie opinii dla inwestycji pn. „Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk II – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego" (12275_PM_JC_027_MKiDN_BII).

W dniu 01 sierpnia 2022 r. Minister Kultury i Dziedzictwa Narodowego przekazał przedmiotowy wniosek (DOZ-OAiK.056.94.2022.AR) do Dyrektora Narodowego Muzeum Morskiego w Gdańsku z prośbą o wydanie opinii w sprawie.

Minister Kultury, Dziedzictwa Narodowego i Sportu pismem z dnia 11 czerwca 2021 roku (DOZ.0101.1.2021.ŁC) powierzył bezterminowo Dyrektorowi Narodowego Muzeum Morskiego w Gdańsku prowadzenie spraw należących do właściwości ministra właściwego do spraw kultury i ochrony dziedzictwa narodowego określonych w ustawie z dnia 21 marca 1991 r. o obszarach morskich Rzeczpospolitej Polskiej między innymi w przedmiocie opiniowania na podstawie art. 26 ust. 1 i 27 ust. 1 ustawy, wniosków o wydanie decyzji w sprawie uzgodnienia lokalizacji kabli i

rurociągów na obszarach morskich wód wewnętrznych, morza terytorialnego oraz wyłącznej strefy ekonomicznej. Zatem właściwym do zaopiniowania wniosku jest Dyrektor Narodowego Muzeum Morskiego w Gdańsku.

Mając na uwadze powyższe Dyrektor Narodowego Muzeum Morskiego opiniuje wniosek pozytywnie ponieważ po zapoznaniu się z treścią wniosku i załączonej dokumentacji stwierdza się, że opisane w nim działania nie powinny mieć wpływu na ochronę dziedzictwa kulturowego w obrębie planowanej inwestycji.

Ponieważ podczas prowadzonych prac istnieje możliwość natrafienia na zabytki archeologiczne położone w głębszych strukturach dennych decyzję o wydaniu pozwolenia należy uzupełnić o warunek wynikający z przepisu art. 32 ust. 1 pkt 1-3 oraz ust. 10 ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami. Przepis ten stanowi, że kto w trakcie prowadzenia robót budowlanych lub ziemnych odkrył przedmiot, co do którego istnieje przypuszczenie, iż jest on zabytkiem, jest zobowiązany przerwać wszystkie roboty mogące uszkodzić lub zniszczyć odkryty przedmiot; zabezpieczyć, przy użyciu dostępnych środków, ten przedmiot i miejsce jego odkrycia; niezwłocznie zawiadomić o tym właściwego wojewódzkiego konserwatora zabytków. W przypadku odkrycia przedmiotu, co do którego istnieje przypuszczenie, iż jest on zabytkiem, na polskich obszarach morskich należy niezwłocznie zawiadomić o tym fakcie właściwego dyrektora urzędu morskiego z jednoczesnym zachowaniem zasad określonych w przepisie art. 32 ust. 1 pkt. 1-3 i ust. 10 tej ustawy.

POUCZENIE

Postanowienie niniejsze jest ostateczne w administracyjnym toku postępowania. Od niniejszego postanowienia nie przysługuje zażalenie, jednakże strona niezadowolona z postanowienia stosownie do art. 127 § 3 Kpa, może zwrócić się z wnioskiem o ponowne rozpatrzenie sprawy w terminie 7 dni od dnia jego doręczenia na adres Narodowego Muzeum Morskiego w Gdańsku.

Jeżeli strona nie chce skorzystać z prawa do zwrócenia się z wnioskiem o ponowne rozpatrzenie sprawy, może wnieść na niniejszą decyzję skargę do Wojewódzkiego Sądu Administracyjnego w Gdańsku, w terminie 30 dni od dnia doręczenia decyzji stronie. Skargę wnosi się za pośrednictwem Dyrektora Narodowego Muzeum Morskiego w Gdańsku. Wpis sądowy od skargi wynosi 100 zł. Stronie, na jej wniosek złożony przed wszczęciem postępowania lub w toku postępowania, może być przyznane prawo pomocy. Prawo pomocy obejmuje zwolnienie od kosztów sądowych w całości lub w części oraz ustanowienie adwokata albo radcy prawnego, doradcy podatkowego lub rzecznika patentowego. Wniosek o przyznanie prawa pomocy wolny jest od opłat sądowych.

Z up. Ministra Kultury i Dziedzictwa Narodowego

Z-CA DYREKTORA
ds. merytorycznych
Narodowego Muzeum Morskiego
w Gdańsku
dr Marcin Westphal

Otrzymują:

1. MFW Bałtyk II sp. z o.o., za pośrednictwem : Mateusz Samulak, PROJMORS Biuro Projektów Budownictwa Morskiego Sp. z o.o., ul. Narwicka 2D, 80-557 Gdańsk.
2. a/a.

Do wiadomości:

1. Ministerstwo Kultury i Dziedzictwa Narodowego – esp.
2. Pomorski Wojewódzki Konserwator Zabytków – esp.

KLAUZULA INFORMACYJNA O PRZETWARZANIU DANYCH OSOBOWYCH

Informacja przekazywana zgodnie z art. 13 Rozporządzenia Parlamentu Europejskiego i Rady (UE) 2016/679 z dnia 27 kwietnia 2016 r. w sprawie ochrony osób fizycznych w związku z przetwarzaniem danych osobowych i w sprawie swobodnego przepływu takich danych oraz uchylenia dyrektywy 95/46/WE (ogólne rozporządzenie o ochronie danych) (Dz. Urz. UE L 119 z 04.05.2016, str. 1, z późn. zm.), zwanym dalej „rozporządzeniem"

1. Administratorem Pana/Pani danych osobowych przetwarzanych w Narodowym Muzeum Morskim w Gdańsku jest: Narodowe Muzeum Morskie w Gdańsku, Ołowianka 9-13, 80-751 Gdańsk.

2. Kontakt do inspektora ochrony danych osobowych pod adresem poczty elektronicznej ochrona.danych@nmm.pl.

3. Przetwarzanie danych osobowych jest dokonywane w celu wypełnienia obowiązków prawnych prowadzenia postępowań administracyjnych oraz postępowań przed sądami administracyjnymi, na podstawie przepisów ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (t.j. Dz. U. z 2018 r. poz. 2067 z późn. zm.), podanie danych identyfikujących uczestnika postępowania, umożliwiających jego wszczęcie i prowadzenie, wynika z przepisów ustawy - Kodeks postępowania administracyjnego (t.j. Dz.U. z 2018 r. poz. 2096 z późn. zm.)

4. W celu określonym w pkt 3 Administrator przetwarza Pana/Pani imię i nazwisko, adres zamieszkania lub adres do korespondencji oraz inne dane (np. nr telefonu lub adres poczty elektronicznej), jeśli zostały przez Pana/Panią podane.

5. W związku z przetwarzaniem danych w celach, o których mowa w pkt 3 Pana/Pani imię i nazwisko może być udostępniane innym uczestnikom tych postępowań. Dane osobowe mogą być udostępniane organom władzy publicznej oraz podmiotom wykonującym zadania publiczne lub działającym na zlecenie organów władzy publicznej, w zakresie i w celach, które wynikają z przepisów powszechnie obowiązującego prawa.

6. Dane osobowe będą przechowywane przez okres niezbędny do realizacji celów określonych w pkt 3, a więc prawomocnego zakończenia postępowań administracyjnych, a po tym czasie zgodnie z przepisami dotyczącymi przechowywania i archiwizacji dokumentów Administratora.

7. Osoba, której dane są przetwarzane ma prawo do:

- dostępu do swoich danych osobowych, zgodnie z art. 15 rozporządzenia, prawo to podlega ograniczeniu w przypadku żądania kopii danych, której udostępnienie może niekorzystnie wpływać na prawa i wolności innych podmiotów danych,
- żądania ich sprostowania, zgodnie z art. 16 rozporządzenia, które jest ograniczane przez cele przetwarzania danych, nie można żądać uzupełnienia o dane, które wychodziłyby, poza cel przetwarzania danych przez administratora,
- żądania ograniczenia przetwarzania, zgodnie z art. 18 rozporządzenia, o ile żądanie nie wpływa na tok i wynik postępowania,

W związku przetwarzaniem danych osobowych stanowiącym realizację obowiązku prawnego administratora, na podstawie art. 6 ust. 1 lit. c rozporządzenia, osobie której dane dotyczą nie przysługuje prawo:

- żądania usunięcia danych zgodnie z art. 17 rozporządzenia,
- żądania przeniesienia danych do innego administratora, zgodnie z art. 20 rozporządzenia,
- wniesienia sprzeciwu wobec przetwarzania, zgodnie z art. 21 rozporządzenia.

8. W przypadku zbierania danych w inny sposób niż od osoby, której dane dotyczą, dane mogą być pozyskiwane z publicznych rejestrów lub ewidencji, takich jak ewidencja gruntów i budynków, księgi wieczyste, rejestr zabytków albo od innych organów władzy publicznej lub podmiotów wykonujących zadania publiczne lub działających na zlecenie organów władzy publicznej albo od innych uczestników postępowania.

9. Pana/Pani dane osobowe nie będą przetwarzane w sposób zautomatyzowany i nie będą profilowane.

10. W przypadku powzięcia informacji o niezgodnym z prawem przetwarzaniu Pana/Pani danych osobowych, przysługuje Panu/Pani prawo wniesienia skargi do organu nadzorczego właściwego w sprawach ochrony danych osobowych - Prezesa Urzędu Ochrony Danych Osobowych, ul. Stawki 2, 00-193 Warszawa.

MINISTERSTWO
KULTURY I DZIEDZICTWA NARODOWEGO
DEPARTAMENT OCHRONY ZABYTKÓW

dr Katarzyna Pałubska
Dyrektor

Warszawa, 01 sierpnia 2022 r.

DOZ-OAiK.056.94.2022.AR

Pan
Robert Domżał
Dyrektor Narodowego
Muzeum Morskiego

Szanowny Panie Dyrektorze,

W związku z § 1 pkt 2 lit. a), b) i c) pisma Ministra Kultury, Dziedzictwa Narodowego i Sportu z dnia 11.06.2021 r., znak: DOZ.0101.1.2021.ŁC, przekazuję Panu w załączeniu wniosek MFW Bałtyk II sp. z o.o., reprezentowanej przez Pana Mateusza Samulaka, z dnia 27.07.2022 r. dotyczący „Budowy zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk II – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego", celem jego rozpatrzenia.

Pragnę przy tym wskazać, że zgodnie z art. 4 ust. 3 ustawy o przygotowaniu i realizacji strategicznych inwestycji w zakresie sieci przesyłowych, właściwy organ wydaje opinię o ustaleniu lokalizacji strategicznej inwestycji w terminie nie dłuższym niż 21 dni od dnia otrzymania wniosku o wydanie opinii. Niewydanie opinii w tym terminie traktuje się jako brak zastrzeżeń do wniosku o wydanie decyzji o ustaleniu lokalizacji strategicznej inwestycji w zakresie sieci przesyłowej.

Z wyrazami szacunku

Katarzyna Pałubska

[Pismo podpisano elektronicznie]

Otrzymują:
1. Dyrektor Narodowego Muzeum Morskiego + wniosek z załącznikami.
2. a/a

Do wiadomości:
3. MFW BAŁTYK II sp. z o.o. za pośrednictwem:
Mateusz Samulak, PROJMORS Biuro Projektów Budownictwa Morskiego sp. z o.o.
ul. Narwicka 2D, 80-557 Gdańsk

Informacja dotycząca zasad przetwarzania danych osobowych przez Administratora oraz praw osób, których dane są przetwarzane została zamieszczona na stronie http://bip.mkidn.gov.pl w zakładce ochrona danych osobowych.

Potwierdzam zgodność kopii wydruku z dokumentem elektronicznym:

Identyfikator dokumentu	1278785.4836893.4839236
Nazwa dokumentu	Na podpis Dyrektora DOZ - przekazanie do NMM Projmors MFW Bałytk II - kable morskie.pdf
Tytuł dokumentu	Na podpis Dyrektora DOZ - przekazanie do NMM Projmors MFW Bałytk II - kable morskie
Sygnatura dokumentu	DOZ-OAiK.056.94.2022
Data dokumentu	2022-08-01
Skrót dokumentu	0D032A5C04DD4BB24FB101C5AF00C1F20F2BFB7E
Wersja dokumentu	1.5
Data podpisu	2022-08-01 10:52:03
Podpisane przez	Katarzyna Mirosława Pałubska Dyrektor
Rodzaj certyfikatu	Certyfikat kwalifikowany podpisu elektronicznego

EZD 3.108.75.75.

Data wydruku: 2022-08-16

Autor wydruku: Rojek Artur (Główny Specjalista ds. prowadzenia postępowań administracyjnych i skargowych)

ZA.5183.985.2022.SS Gdańsk, dnia 27.09.2022 r.

O P I N I A K O N S E R W A T O R S K A

dla lokalizacji strategicznej inwestycji w zakresie sieci przesyłowych

Działając na podstawie przepisów następujących aktów prawnych:

(1) ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (tekst jednolity: Dz.U. z 2022 r., poz. 840) [**Ustawa o Ochronie Zabytków**]: art. 89 pkt 2, art. 91 ust. 4 pkt 4 Ustawy o Ochronie Zabytków;

(2) ustawy z dnia 24 lipca 2015 r. o przygotowaniu i realizacji strategicznych inwestycji w zakresie sieci przesyłowych (tekst jednolity: Dz.U. z 2022 r. poz. 273) [**Specustawa**]: art. 4 ust. 2 pkt 7 Specustawy;

Pomorski Wojewódzki Konserwator Zabytków [PWKZ]

po rozpatrzeniu wniosku Spółki MFW BAŁTYK III Sp. z o.o., w imieniu której występuje pełnomocnik: Pani Joanna Cygert, PROJMORS Biuro Projektów Budownictwa Morskiego Sp. z o.o., sygn. 12275_PM_JC_068_PWKZ_BIII z dnia 06.09.2022 r. (wpłynął 06.09.2022 r.), o wydanie opinii dla inwestycji pn. „Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk III – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego”;

O P I N I U J E

P O Z Y T Y W N I E

Inwestycję pn. „Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk III – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego”;

Na trasie inwestycji nie występują znane tut. organowi elementy podwodnego dziedzictwa kulturowego.

W przypadku natrafienia w trakcie realizacji inwestycji na relikty podwodnego dziedzictwa kulturowego, należy wstrzymać prace oraz powiadomić o tym fakcie Pomorskiego Wojewódzkiego Konserwatora Zabytków, Dyrektora Urzędu Morskiego w Gdyni oraz Dyrektora Narodowego Muzeum Morskiego w Gdańsku.

Z up. Pomorskiego Wojewódzkiego
Konserwatora Zabytków

Piotr Klimaszewski

Kierownik Wydziału ds. Zabytków Archeologicznych

Otrzymują:
1. MFW BAŁTYK III Sp. z o.o., pełnomocnik: Joanna Cygert
2. a/a SS

Klauzula informacyjna

Zgodnie z art. 13 ust. 1 i 2 rozporządzenia Parlamentu Europejskiego i Rady (UE) 2016/679 z dnia 27 kwietnia 2016 r. w sprawie ochrony osób fizycznych w związku z przetwarzaniem danych osobowych i w sprawie swobodnego przepływu takich danych oraz uchylenia dyrektywy 95/46/WE (Dz.U.L 119 z 4.05.2016r.) zwanych dalej „RODO", informuję, że:

1) Administratorem przetwarzającym Pani/Pana dane osobowe jest Pomorski Wojewódzki Konserwator Zabytków z siedzibą w Gdańsku, ul. Dyrekcyjna 2-4,

2) W Wojewódzkim Urzędzie Ochrony Zabytków wyznaczony został Inspektor Ochrony Danych, z którym można skontaktować się:

   — przez email: iod@zabytki.mail.pl lub

   — listownie na adres: Dyrekcyjna 2-4, 80-852 Gdańsk

3) przetwarzanie danych osobowych następuje w celu prowadzenia postępowań administracyjnych na podstawie przepisów prawa- ustawy z dnia z ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami oraz przepisów wykonawczych do ustawy, ustawy z dnia 7 lipca 1994 r. Prawo budowlane, ustawy z dnia 16 kwietnia 2004 r. o ochronie przyrody , ustawy z dnia 14 czerwca 1960 r. Kodeks postepowania administracyjnego. Zgodnie z art. 6 ust. 1 lit. c RODO, przetwarzanie jest niezbędne do wypełnienia obowiązku prawnego ciążącego na administratorze

4) W związku z przetwarzaniem danych w celu wskazanym powyżej, Pani/Pana dane osobowe mogą być udostępniane innym odbiorcom lub kategoriom odbiorców danych osobowych, którymi mogą być:

   — podmioty, które przetwarzają Pani/Pana dane osobowe w imieniu Administratora na podstawie zawartej umowy powierzenia przetwarzania danych osobowych (tzw. podmioty przetwarzające),

   — inne upoważnione organy lub instytucje publiczne.

5) Pani/Pana dane osobowe nie będą przekazywane do państwa trzeciego lub organizacji międzynarodowej.

6) Pani/Pana dane osobowe będą przetwarzane przez okres niezbędny do realizacji wskazanego powyżej celu przetwarzania, w tym również obowiązku archiwizacyjnego wynikającego z przepisów prawa.

7) Posiada Pani/Pan prawo żądania dostępu do treści swoich danych, prawo ich sprostowania, usunięcia ograniczenia przetwarzania, wniesienia sprzeciwu wobec przetwarzania, prawo do przenoszenia danych, prawo do cofnięcia zgody na przetwarzanie w dowolnym momencie bez wpływu na zgodność z prawem przetwarzania, którego dokonano na podstawie zgody przed jej cofnięciem.

8) Ma Pani/Pan prawo wniesienia skargi do organu nadzorczego, tj. Prezesa Urzędu Ochrony Danych Osobowych.

9) Podanie przez Panią/Pana danych osobowych jest warunkiem rozpatrzenia sprawy (przeprowadzenia postępowania administracyjnego) przez Pomorskiego Wojewódzkiego Konserwatora Zabytków w Gdańsku i wynika z przepisów prawa; co do zasady jest dobrowolne, jednak niezbędne do załatwienia sprawy w Wojewódzkim Urzędzie Ochrony Zabytków w Gdańsku, o ile z przepisów ustawy nie wynika prawny obowiązek udostępnienia Pomorskiemu Wojewódzkiemu Konserwatorowi Zabytków danych osobowych (w szczególności w związku z obwiązkami dysponenta zabytku o których mowa w art. 28 ust. 1 ustawy o ochronie zabytków i opiece nad zabytkami.)

10) Przetwarzanie podanych przez Panią/Pana danych osobowych nie będzie podlegało zautomatyzowanemu podejmowaniu decyzji, w tym profilowaniu, o którym mowa w art. 22 ust. 1 i 4 ogólnego rozporządzenia o ochronie danych osobowych z dnia 27 kwietnia 2016 r.

NARODOWE
MUZEUM
MORSKIE
w Gdańsku

Gdańsk, 28 września 2022 r

NMM/N-OD/ARL/2667/2022

Pani
Joanna Cygert
Biuro Projektów Budownictwa Morskiego
PROJMORS, ul. Narwicka 2D
80-557 Gdańsk

Szanowna Pani,

Działając na podstawie art. 89 pkt. 1 ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (Dz. U. 2003 Nr 162 poz. 1568 z późn. zm.), art. 27 ust. 1 ustawy z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej (Dz. U. z 2020 r. poz. 2135, z późn. zm.), art. 106 §1 i 5 Kodeksu postępowania administracyjnego oraz w związku z powierzeniem przez Wiceprezesa Rady Ministrów Minister Kultury, Dziedzictwa Narodowego i Sportu prof. dr hab. Piotra Glińskiego pismem z dnia 11 czerwca 2021 roku (DOZ.0101.1.2021.ŁC) bezterminowo Dyrektorowi Narodowego Muzeum Morskiego w Gdańsku prowadzenia spraw należących do właściwości ministra właściwego do spraw kultury i ochrony dziedzictwa narodowego, w tym opiniowania na podstawie art. 27 ust. 1 ww. ustawy, decyzji w sprawie pozwolenia na układanie i utrzymywanie kabli w wyłącznej strefie ekonomicznej, a także w związku z wystąpieniem Ministra Kultury i Dziedzictwa Narodowego z dnia 08 września 2022 r. (znak sprawy DOZ-OAiK.056.109.2022.AR) o wydanie opinii w sprawie dotyczącej realizacji inwestycji pod nazwą **„Budowa zespołu urządzeń służących do wyprowadzania mocy z MFW Bałtyk III – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego”,** przesyłam stosowną opinię**.**

Z wyrazami szacunku,

DYREKTOR
Narodowego Muzeum Morskiego
w Gdańsku
dr Robert Domżał

NARODOWE
MUZEUM
MORSKIE
w Gdańsku

Gdańsk, 28 września 2022 r.

NMM/N-OD/ARL/2667/2022

POSTANOWIENIE

Działając na podstawie art. 89 pkt 1 ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (Dz. U. 2003 Nr 162 poz. 1568 z późn. zm.), art. 27 ust. 1 ustawy z dnia 21 marca 1991 r. o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej (Dz. U. z 2020 r. poz. 2135, z późn. zm.), art. 106 §1 Kodeksu postępowania administracyjnego oraz w związku z powierzeniem przez Wiceprezesa Rady Ministrów Minister Kultury, Dziedzictwa Narodowego i Sportu prof. dr hab. Piotra Glińskiego pismem z dnia 11 czerwca 2021 roku (DOZ.0101.1.2021.ŁC) bezterminowo Dyrektorowi Narodowego Muzeum Morskiego w Gdańsku prowadzenia spraw należących do właściwości ministra właściwego do spraw kultury i ochrony dziedzictwa narodowego, w tym opiniowania na podstawie art. 27 ust. 1 ustawy o obszarach morskich Rzeczypospolitej Polskiej i administracji morskiej, decyzji w sprawie o wydanie pozwolenia na układanie i utrzymywanie kabli w wyłącznej strefie ekonomicznej,

postanawiam:

zaopiniować pozytywnie wniosek MFW Bałtyk III sp. z o.o. dotyczący inwestycji pn. „Budowa zespołu urządzeń służących do wyprowadzania mocy z MFW Bałtyk III – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego", ze wskazaniem, że decyzję o wydaniu pozwolenia należy uzupełnić o następujący warunek:

- wynikający z art. 32 ust.1 pkt1-3 ustawy o ochronie zabytków i opiece nad zabytkami (Dz.U. z 2003 Nr 162 poz. 1568 z późn. zm.) w związku z możliwością natrafienia podczas prac na zabytki archeologiczne.

U Z A S A D N I E N I E

Wnioskiem z dnia 08 września 2022 r. (znak sprawy DOZ-OAiK.056.109.2022.AR) Minister Kultury i Dziedzictwa Narodowego przekazał do Dyrektora Narodowego Muzeum Morskiego w Gdańsku. wniosek spółki **MFW Bałtyk III dotyczący inwestycji pn. „Budowa zespołu urządzeń służących do wyprowadzania mocy z MFW Bałtyk III – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego".**

Minister Kultury, Dziedzictwa Narodowego i Sportu pismem z dnia 11 czerwca 2021 roku powierzył bezterminowo Dyrektorowi Narodowego Muzeum Morskiego w Gdańsku prowadzenie spraw należących do właściwości ministra właściwego do spraw kultury i ochrony dziedzictwa narodowego określonych w ustawie z dnia 21 marca 1991 r. o obszarach morskich Rzeczpospolitej Polskiej między innymi w przedmiocie opiniowania na podstawie art. 27 ustawy, wniosków o wydanie decyzji w sprawie układania i utrzymywania kabli w wyłącznej

strefie ekonomicznej. Zatem właściwym do zaopiniowania wniosku jest Dyrektor Narodowego Muzeum Morskiego w Gdańsku.

Mając na uwadze powyższe Dyrektor Narodowego Muzeum Morskiego opiniuje wniosek pozytywnie.

Ponieważ podczas prowadzonych prac istnieje możliwość natrafienia na zabytki archeologiczne położone w głębszych strukturach dennych, decyzję o wydaniu pozwolenia należy uzupełnić o warunek wynikający z przepisu art. 32 ust. 1 pkt 1-3 oraz ust. 10 ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami. Przepis ten stanowi, że kto w trakcie prowadzenia robót budowlanych lub ziemnych odkrył przedmiot, co do którego istnieje przypuszczenie, iż jest on zabytkiem, jest zobowiązany przerwać wszystkie roboty mogące uszkodzić lub zniszczyć odkryty przedmiot; zabezpieczyć, przy użyciu dostępnych środków, ten przedmiot i miejsce jego odkrycia; niezwłocznie zawiadomić o tym właściwego wojewódzkiego konserwatora zabytków. W przypadku odkrycia przedmiotu, co do którego istnieje przypuszczenie, iż jest on zabytkiem, na polskich obszarach morskich należy niezwłocznie zawiadomić o tym fakcie właściwego dyrektora urzędu morskiego z jednoczesnym zachowaniem zasad określonych w przepisie art. 32 ust. 1 pkt. 1-3 i ust. 10 tej ustawy.

Z up. Ministra Kultury i Dziedzictwa Narodowego
Dyrektor
Narodowego Muzeum Morskiego w Gdańsku

dr Robert Domżał

Otrzymują:
1. MFW Bałtyk III sp. z o.o., za pośrednictwem Pani Joanny Cygert, Biuro Projektów Budownictwa Morskiego PROJMORS, ul. Narwicka 2D, 80-557 Gdańsk.
2. a/a.

Do wiadomości:
1. Ministerstwo Kultury i Dziedzictwa Narodowego – esp.
2. Ministerstwo Infrastruktury – esp.

POUCZENIE

Postanowienie niniejsze jest ostateczne w administracyjnym toku postępowania. Od niniejszego postanowienia nie przysługuje zażalenie, jednakże strona niezadowolona z postanowienia stosownie do art. 127 § 3 Kpa, może zwrócić się z wnioskiem o ponowne rozpatrzenie sprawy w terminie 7 dni od dnia jego doręczenia na adres Narodowego Muzeum Morskiego w Gdańsku.

Jeżeli strona nie chce skorzystać z prawa do zwrócenia się z wnioskiem o ponowne rozpatrzenie sprawy, może wnieść na niniejszą decyzję skargę do Wojewódzkiego Sądu Administracyjnego w Gdańsku, w terminie 30 dni od dnia doręczenia decyzji stronie. Skargę wnosi się za pośrednictwem Dyrektora Narodowego Muzeum Morskiego w Gdańsku. Wpis sądowy od skargi wynosi 100 zł. Stronie, na jej wniosek złożony przed wszczęciem postępowania lub w toku postępowania, może być przyznane prawo pomocy. Prawo pomocy obejmuje zwolnienie od kosztów sądowych w całości lub w części oraz ustanowienie adwokata albo radcy prawnego, doradcy podatkowego lub rzecznika patentowego. Wniosek o przyznanie prawa pomocy wolny jest od opłat sądowych.

KLAUZULA INFORMACYJNA O PRZETWARZANIU DANYCH OSOBOWYCH

Informacja przekazywana zgodnie z art. 13 Rozporządzenia Parlamentu Europejskiego i Rady (UE) 2016/679 z dnia 27 kwietnia 2016 r. w sprawie ochrony osób fizycznych w związku z przetwarzaniem danych osobowych i w sprawie swobodnego przepływu takich danych oraz uchylenia dyrektywy 95/46/WE (ogólne rozporządzenie o ochronie danych) (Dz. Urz. UE L 119 z 04.05.2016, str. 1, z późn. zm.), zwanym dalej „rozporządzeniem"

1. Administratorem Pana/Pani danych osobowych przetwarzanych w Narodowym Muzeum Morskim w Gdańsku jest: Narodowe Muzeum Morskie w Gdańsku, Ołowianka 9-13, 80-751 Gdańsk.

2. Kontakt do inspektora ochrony danych osobowych pod adresem poczty elektronicznej ochrona.danych@nmm.pl.

3. Przetwarzanie danych osobowych jest dokonywane w celu wypełnienia obowiązków prawnych prowadzenia postępowań administracyjnych oraz postępowań przed sądami administracyjnymi, na podstawie przepisów ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (t.j. Dz. U. z 2018 r. poz. 2067 z późn. zm.), podanie danych identyfikujących uczestnika postępowania, umożliwiających jego wszczęcie i prowadzenie, wynika z przepisów ustawy - Kodeks postępowania administracyjnego (t.j. Dz.U. z 2018 r. poz. 2096 z późn. zm.)

4. W celu określonym w pkt 3 Administrator przetwarza Pana/Pani imię i nazwisko, adres zamieszkania lub adres do korespondencji oraz inne dane (np. nr telefonu lub adres poczty elektronicznej), jeśli zostały przez Pana/Panią podane.

5. W związku z przetwarzaniem danych w celach, o których mowa w pkt 3 Pana/Pani imię i nazwisko może być udostępniane innym uczestnikom tych postępowań. Dane osobowe mogą być udostępniane organom władzy publicznej oraz podmiotom wykonującym zadania publiczne lub działającym na zlecenie organów władzy publicznej, w zakresie i w celach, które wynikają z przepisów powszechnie obowiązującego prawa.

6. Dane osobowe będą przechowywane przez okres niezbędny do realizacji celów określonych w pkt 3, a więc prawomocnego zakończenia postępowań administracyjnych, a po tym czasie zgodnie z przepisami dotyczącymi przechowywania i archiwizacji dokumentów Administratora.

7. Osoba, której dane są przetwarzane ma prawo do:

- dostępu do swoich danych osobowych, zgodnie z art. 15 rozporządzenia, prawo to podlega ograniczeniu w przypadku żądania kopii danych, której udostępnienie może niekorzystnie wpływać na prawa i wolności innych podmiotów danych,
- żądania ich sprostowania, zgodnie z art. 16 rozporządzenia, które jest ograniczane przez cele przetwarzania danych, nie można żądać uzupełnienia o dane, które wychodziłyby, poza cel przetwarzania danych przez administratora,
- żądania ograniczenia przetwarzania, zgodnie z art. 18 rozporządzenia, o ile żądanie nie wpływa na tok i wynik postępowania,

W związku przetwarzaniem danych osobowych stanowiącym realizację obowiązku prawnego administratora, na podstawie art. 6 ust. 1 lit. c rozporządzenia, osobie której dane dotyczą nie przysługuje prawo:

- żądania usunięcia danych zgodnie z art. 17 rozporządzenia,
- żądania przeniesienia danych do innego administratora, zgodnie z art. 20 rozporządzenia,
- wniesienia sprzeciwu wobec przetwarzania, zgodnie z art. 21 rozporządzenia.

8. W przypadku zbierania danych w inny sposób niż od osoby, której dane dotyczą, dane mogą być pozyskiwane z publicznych rejestrów lub ewidencji, takich jak ewidencja gruntów i budynków, księgi wieczyste, rejestr zabytków albo od innych organów władzy publicznej lub podmiotów wykonujących zadania publiczne lub działających na zlecenie organów władzy publicznej albo od innych uczestników postępowania.

9. Pana/Pani dane osobowe nie będą przetwarzane w sposób zautomatyzowany i nie będą profilowane.

10. W przypadku powzięcia informacji o niezgodnym z prawem przetwarzaniu Pana/Pani danych osobowych, przysługuje Panu/Pani prawo wniesienia skargi do organu nadzorczego właściwego w sprawach ochrony danych osobowych - Prezesa Urzędu Ochrony Danych Osobowych, ul. Stawki 2, 00-193 Warszawa.

MINISTERSTWO
KULTURY I DZIEDZICTWA NARODOWEGO

DEPARTAMENT OCHRONY ZABYTKÓW

Jakub Wiśniewski
Zastępca Dyrektora

Warszawa, 08 września 2022 r.

DOZ-OAiK.056.109.2022.AR

Pan
Robert Domżał
Dyrektor Narodowego
Muzeum Morskiego

Szanowny Panie Dyrektorze,

W związku z § 1 pkt 2 lit. b) i c) pisma Ministra Kultury, Dziedzictwa Narodowego i Sportu z dnia 11.06.2021 r., znak: DOZ.0101.1.2021.ŁC, przekazuję Panu w załączeniu wniosek MFW Bałtyk III sp. z o.o., reprezentowanej przez Panią Joannę Cygert z Biura Projektów Budownictwa Morskiego PROJMORS, z dnia 6.09.2022 r. a dotyczący inwestycji pod nazwą: *Budowa zespołu urządzeń służących do wyprowadzenia mocy z MFW Bałtyk III – odcinek od morskiej stacji elektroenergetycznej do miejsca, w którym planowane jest wykonanie przewiertu podmorskiego,* celem jego rozpatrzenia.

Pragnę przy tym wskazać, że zgodnie z art. 4 ust. 3 ustawy o przygotowaniu i realizacji strategicznych inwestycji w zakresie sieci przesyłowych, właściwy organ wydaje opinię o ustaleniu lokalizacji strategicznej inwestycji w terminie nie dłuższym niż 21 dni od dnia otrzymania wniosku o wydanie opinii. Niewydanie opinii w tym terminie traktuje się jako brak zastrzeżeń do wniosku o wydanie decyzji o ustaleniu lokalizacji strategicznej inwestycji w zakresie sieci przesyłowej.

Z wyrazami szacunku

Jakub Wiśniewski
[Pismo podpisano elektronicznie]

Otrzymują:
1. Dyrektor Narodowego Muzeum Morskiego + wniosek z załącznikami – esp.
2. a/a

Do wiadomości:
3. Minister Infrastruktury– esp.
4. MFW BAŁTYK III sp. z o.o. za pośrednictwem:
   Joanna Cygert, PROJMORS Biuro Projektów Budownictwa Morskiego sp. z o.o.,
   ul. Narwicka 2D, 80-557 Gdańsk

Informacja dotycząca zasad przetwarzania danych osobowych przez Administratora oraz praw osób, których dane są przetwarzane została zamieszczona na stronie http://bip.mkidn.gov.pl w zakładce ochrona danych osobowych.

KLAUZULA INFORMACYJNA O PRZETWARZANIU DANYCH OSOBOWYCH

Informacja przekazywana zgodnie z art. 13 Rozporządzenia Parlamentu Europejskiego i Rady (UE) 2016/679 z dnia 27 kwietnia 2016 r. w sprawie ochrony osób fizycznych w związku z przetwarzaniem danych osobowych i w sprawie swobodnego przepływu takich danych oraz uchylenia dyrektywy 95/46/WE (ogólne rozporządzenie o ochronie danych) (Dz. Urz. UE L 119 z 04.05.2016, str. 1, z późn. zm.), zwanym dalej „rozporządzeniem"

1. Administratorem Pana/Pani danych osobowych przetwarzanych w Ministerstwie Kultury i Dziedzictwa Narodowego, dalej zwanym „Ministerstwem" jest: Minister Kultury i Dziedzictwa Narodowego, ul. Krakowskie Przedmieście 15/17, 00-071 Warszawa.
2. Kontakt do inspektora ochrony danych osobowych administratora pod adresem wskazanym w pkt 1 oraz adresem poczty elektronicznej abi@mkidn.gov.pl
3. Przetwarzanie danych osobowych jest dokonywane w celu wypełnienia obowiązków prawnych ciążących na Ministrze - prowadzenia postępowań administracyjnych oraz postępowań przed sądami administracyjnymi, na podstawie przepisów ustawy z dnia 23 lipca 2003 r. o ochronie zabytków i opiece nad zabytkami (t.j. Dz. U z 2018 r. poz. 2067 z późn. zm.), podanie danych identyfikujących uczestnika postępowania, umożliwiających jego wszczęcie i prowadzenie, wynika z przepisów ustawy - Kodeks postępowania administracyjnego (t.j. Dz.U. z 2018 r. poz. 2096 z późn. zm.)
4. W celu określonym w pkt 3 Administrator przetwarza Pana/Pani imię i nazwisko, adres zamieszkania lub adres do korespondencji oraz inne dane (np. nr telefonu lub adres poczty elektronicznej), jeśli zostały przez Pana/Panią podane.
5. W związku z przetwarzaniem danych w celach, o których mowa w pkt 3 Pana/Pani imię i nazwisko może być udostępniane innym uczestnikom tych postępowań. Dane osobowe mogą być udostępniane organom władzy publicznej oraz podmiotom wykonującym zadania publiczne lub działającym na zlecenie organów władzy publicznej, w zakresie i w celach, które wynikają z przepisów powszechnie obowiązującego prawa.
6. Dane osobowe będą przechowywane przez okres niezbędny do realizacji celów określonych w pkt 3, a więc prawomocnego zakończenia postępowań administracyjnych, a po tym czasie zgodnie z przepisami dotyczącymi przechowywania i archiwizacji dokumentów Administratora.
7. Osoba, której dane są przetwarzane ma prawo do:
   - dostępu do swoich danych osobowych, zgodnie z art. 15 rozporządzenia, prawo to podlega ograniczeniu w przypadku żądania kopii danych, której udostępnienie może niekorzystnie wpływać na prawa i wolności innych podmiotów danych,
   - żądania ich sprostowania, zgodnie z art. 16 rozporządzenia, które jest ograniczane przez cele przetwarzania danych, nie można żądać uzupełnienia o dane, które wychodziłyby, poza cel przetwarzania danych przez administratora,
   - żądania ograniczenia przetwarzania, zgodnie z art. 18 rozporządzenia, o ile żądanie nie wpływa na tok i wynik postępowania,

   W związku przetwarzaniem danych osobowych stanowiącym realizację obowiązku prawnego administratora, na podstawie art. 6 ust. 1 lit. c rozporządzenia, osobie której dane dotyczą nie przysługuje prawo:
   - żądania usunięcia danych zgodnie z art. 17 rozporządzenia,
   - żądania przeniesienia danych do innego administratora, zgodnie z art. 20 rozporządzenia,
   - wniesienia sprzeciwu wobec przetwarzania, zgodnie z art. 21 rozporządzenia.
8. W przypadku zbierania danych w inny sposób niż od osoby, której dane dotyczą, dane mogą być pozyskiwane z publicznych rejestrów lub ewidencji, takich jak ewidencja gruntów i budynków, księgi wieczyste, rejestr zabytków albo od innych organów władzy publicznej lub podmiotów wykonujących zadania publiczne lub działających na zlecenie organów władzy publicznej albo od innych uczestników postępowania.
9. Pana/Pani dane osobowe nie będą przetwarzane w sposób zautomatyzowany i nie będą profilowane.
10. W przypadku powzięcia informacji o niezgodnym z prawem przetwarzaniu Pana/Pani danych osobowych, przysługuje Panu/Pani prawo wniesienia skargi do organu nadzorczego właściwego w sprawach ochrony danych osobowych - Prezesa Urzędu Ochrony Danych Osobowych, ul. Stawki 2, 00-193 Warszawa.

Pomorski Wojewódzki Konserwator Zabytków

ZND.5183.438.2022.KM

Słupsk, dnia 28 października 2022 r.

PROJMORS
Biuro Projektów Budownictwa Morskiego Sp. z o.o.
Ul. Narwicka 2D
80-557 Gdańsk

dotyczy: wstępnej opinii na terenie zabytkowego kompleksu fortyfikacyjnego BAS 9 w Lędowie, gm. Ustka

Wojewódzki Urząd Ochrony Zabytków w Gdańsku Delegatura w Słupsku po zapoznaniu się z przedłożonym w dniu 05.10.2022 r. wnioskiem wskazującym planowaną lokalizację przebiegu infrastruktury służącej budowie morskich farm wiatrowych na obszarze zabytkowego kompleksu zespołu zabudowań 9 Baterii Artylerii Stałej w Lędowie, wpisanej do wojewódzkiej ewidencji zabytków informuje, że:

1. szkolne stanowisko ogniowe wskazane w Państwa piśmie nie jest objęte ochroną konserwatorską,
2. istnieje możliwość lokalizacji planowanej przez Państwa infrastruktury od działobitni nr 4 objętej ochroną konserwatorską w odległości minimum 10 metrów od jej fundamentów

Z up. Pomorskiego Wojewódzkiego
Konserwatora Zabytków w Gdańsku
mgr inż. arch. Krystyna Jaruszewicz-Palacz
KIEROWNIK DELEGATURY w SŁUPSKU

Otrzymują:

1. adresat
2. a/a

Realizując obowiązek informacyjny wynikający z Rozporządzenia (UE) 2016/679 Parlamentu Europejskiego i Rady z dnia 27 kwietnia 2016 r. w sprawie ochrony osób fizycznych w związku z przetwarzaniem danych osobowych i w sprawie swobodnego przepływu takich danych oraz uchylenia dyrektywy 95/46/WE szczegółowe informacje na temat przetwarzania Pani/Pana danych osobowych zamieszczone zostały na stronie http://www.ochronazabytkoww.gda.pl/rodo/. Prosimy o zapoznanie się z tymi informacjami.