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**Environmental impact assessment report on the expansion of national road no. 17 to meet the parameters of an expressway, Lubelska interchange – border of the Lubelskie Voivodeship
(km 3+200 – 74+883)**

**The stage of obtaining the decision on environmental considerations
SUMMARY**

Study approved by the Environment Department of the GDNRM

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SUMMARY

1. FORMAL AND LEGAL ASPECTS

The formal and legal basis for this study is a preliminary analysis commissioned by EUROSTRADA Sp. z o.o. in February 2007 to GEOS consulting Zakład Ochrony Środowiska, based in Warsaw, comparing the potential environmental impact of the variants of national road no. 17, as presented in the technical, economic and environmental study and in the *Environmental impact assessment report on the expansion of national road no. 17 to meet the parameters of an expressway, Lubelska interchange – border of the Lubelskie Voivodeship (km 3+200 – 74+883); The stage of obtaining the decision on environmental considerations*, pursuant to article 59 section 1 item 1 of the Act of 3 October 2008 *on providing access to information concerning the environment and environmental protection, participation of the public in environmental protection and on environmental impact assessments* (Journal of Laws No. 199, item 1227, as amended).

2. PURPOSE AND SCOPE OF THE STUDY

The purpose of the environmental impact assessment report (EIA) was to determine the environmental and spatial considerations resulting from the expansion of national road no. 17 within the border of the Masovian Voivodeship at the stage of construction works and at the operational stage. The interactions between the road and the adjacent residential areas (impact on the residents), the fauna and flora, groundwater and surface water, soil surface, objects subject to protection under the *Environmental Protection Law Act* and monuments of culture have been examined.

Given the significant distance of the planned project from the national border (approx. 110 km from the border with Belarus), no cross-border environmental impact is expected.

As of 15 November 2008, the Act of 3 October 2008 *on providing access to information concerning the environment and environmental protection, participation of the public in environmental protection and on environmental impact assessments* came into effect (Journal of Laws No. 199, item 1227, as amended), partially amending the applicable standards and procedures for environmental impact assessments provided for by the *Environmental Protection Law Act* of 27 April 2001 (J.L. of 2008, No. 25, item 150, as amended).

Pursuant to article 59 section 1 item 1 of the Act *on providing access to information concerning the environment and environmental protection, participation of the public in environmental protection and on environmental impact assessments*, an environmental impact assessment is required for the implementation of planned projects which may have a significant environmental impact, which, pursuant to the Ordinance of the Council of Ministers of 21 August 2007 amending the Ordinance *on determining the types of project that may have a considerable impact on the environment, and on detailed considerations related to qualifying projects for drawing up the environmental impact assessment report* (J.L. No. 158, item 1105), include motorways and expressways, except for the renovation of motorways and expressways as well as projects involving the construction, alteration, installation, renovation or demolition of: exit roads from a public road, road passages, parking lanes, separating lanes, road shoulders, pavements, bicycle paths, retaining structures, culverts, footbridges as well as

technical road facilities and equipment.

The environmental impact assessment is conducted as part of the procedure regarding the issuing of the decision on environmental considerations and when such an assessment is deemed as necessary by the authority competent for issuing the decision on environmental considerations (in this case, the Regional Director for Environmental Protection) – road investment permit (issued pursuant to the Act of 10 April 2003 *on the special rules of preparing and implementing national public road projects*, J.L. of 2008, No. 193, item 1194, as amended) and the building permit (issued pursuant to the Construction Law Act of 7 July 1994, J.L. of 2006, No. 156, item 1118, as amended).

The detailed scope of the environmental impact assessment report is specified by article 66 section 1 of the Act of 3 October 2008 *on providing access to information concerning the environment and environmental protection, participation of the public in environmental protection and on environmental impact assessments* (Journal of Laws, No. 199 item 1227, as amended).

3. MATERIALS USED IN THE STUDY

The presented EIA report was prepared by a team of experts from the list of the Masovian Voivode, based on the provided materials, opinions, site inspections, working discussions and the authors' own studies.

The study makes reference to the applicable acts of Polish and EU law which standardise aspects related directly or indirectly to environmental protection. The study also uses works, documentation, industry-specific and other manuals (published and unpublished), as well as numerous topographic and thematic maps (mainly geological, hydrogeological and hydrographical maps), and monitoring data, mainly related to the quality of surface and groundwater.

During several site inspections by the team of industry experts (June and October 2006, March, April, May and September 2007, March to July 2008), the natural environment and the spatial conditions in the vicinity of the discussed section of road no. 17 were surveyed in detail. The environmental survey was also intended to verify the data and materials obtained from Commune Offices, Starosta Offices and the Voivodeship Office.

In June and July 2008, a detailed wildlife inventory was taken in the valleys of the Świder and Mienia rivers (approx. 1 km section upstream and downstream of both rivers) in connection with the classification of the valley sections as potential Natura 2000 habitat protection areas. The results of the wildlife inventory and the assessment of the potential impact of the modernisation of road no. 17 on that area are presented in a separate report¹.

In 2009, a supplementary wildlife inventory was taken along the route of all of the planned road variants.

The data on the locations of wildlife refuges, the local wildlife migration routes, the places where wildlife accidents occur, as well as the condition and change in the number of wildlife in the vicinity of the discussed road, have been obtained from forest inspectorates and hunting associations.

¹ Environmental impact assessment report on the expansion of national road no. 17 to meet the parameters of an expressway in terms of the impact on the planned Natura 2000 special habitat protection area "Dolina Œwidra" (code: pltmp507). GEOS consulting, Warsaw 2008

The route of the discussed expansion variants for road no. 17 within the border of the Masovian Voivodeship was presented in December 2006 to the Voivodeship Nature Conservation Officer and the Voivodeship Monument Conservation Officer so that they could issue an opinion.

4. DESCRIPTION OF THE UNDERTAKING

The discussed project involves the expansion of national road no. 17 to meet the parameters of a dual carriageway expressway with limited accessibility on the section from the designed Lubelska Interchange to the border of the Lubelskie Voivodeship (from km 3+200 to km 74+883), excluding the constructed ring road of Garwolin.

National road no. 17 is a part of the expressway system (S17) and serves transit traffic on the route connecting the north with the south (Warsaw – Lublin – Hrebenne). Since the capacity of the existing junctions with national roads (no. 2 and 50) and Voivodeship roads (no. 721, 805 and 807) has nearly reached its limit and due to the constantly increasing intensity of transit traffic (heavy goods vehicles), the expansion of the discussed road is fully justified.

Adapting the existing road to meet the parameters of an expressway with limited accessibility involves building a second carriageway in addition to the existing carriageway or building a dual carriageway road along a new route as well as ensuring traffic entry at interchanges, connections for local traffic between the interchanges, bus traffic and grade-separated pedestrian traffic, building rest and service areas and facilities protecting the environment and human health (e.g. acoustic screens and wildlife crossings).

Meeting the above requirements will involve, among other things, demolishing some of the residential and industrial buildings, clearing greenery (mainly roadside trees and forests) as well as modifying the local social, spatial and environmental conditions.

At Stage I of the technical, economic and environmental study, a preliminary comparative analysis was conducted for the road variants 0, 1, 2 and 3 presented by EUROSTRADA Sp. z o.o. in 2006 in terms of the variants' environmental impact.

Following consultations in spring 2007 with local administration representatives, the residents concerned, the Voivodeship Nature Conservation Officer, the Board of Directors of the Masovian Landscape Park and forest inspectorates, Variants 1a and 2a (modified base variants 1 and 2) were recommended for further consideration.

Variant 3, which bypasses Wiązowna to the north-east and to the east, was rejected by the residents of Wiązowna commune in a general ballot and was not taken into consideration at the stage of preparing the report.

As a result of the findings included in the report of the Investment Opinion Team of June 2007 as well as further consultation with local government authorities and consultation with the public, the additional Variants 1b and 2b were prepared as modifications of Variants 1a and 2a on the section Wiązowna -Wólka Mładzka.

Finally, the following variants were considered in the environmental impact assessment for the expansion of national road no. 17 within the border of the Masovian Voivodeship:

Variant 0, involving abandoning the project and the road expansion, and leaving the road as it is.

Variant 1a, involving, in general, the construction of a second carriageway in addition to the

existing road with slight modifications due to visibility considerations at the curves, and the construction of the ring road of Kołbiel.

Variant 2a, mainly involving the construction of a second carriageway in addition to the existing road and guiding several sections of the road along a new route (mainly moving the road away from Wiązowna and Radiówek, and building four ring roads for the following locations: Wola Ducka-Ostrowa, Kołbiel, Gończyce and Żabianka); this variant is most widely accepted by the local community and local government authorities.

Variant 1b, identical with Variant 1a on the section to Wólka Mładzka interchange (with slight corrections of the route in the region of Wiązowna and Radiówek), with the following route being the same as Variant 2a, which is supported by the local community.

Variant 1c, involving an additional ring road of Wólka Mładzka. The route has been outlined to the east of that location, according to the residents' suggestions.

Variant 1d, involving the construction of a ring road of Wólka Mładzka to the west of that location.

Variant 2b is in general similar to Variant 2a but a flyover is planned on the section where the road crosses the Masovian Landscape Park (Wiązowna region).

Out of nine communes located along the route of the discussed section of national road no. 17, only three communes have valid zoning plans, according to the *Zoning and Development Act* of 27 March 2003 (J.L. No. 80, item 717, as amended). On the section running across Otwock, the variants examined in this report, except for Variant 2a, are inconsistent with the existing zoning plan. Only Górzno commune has a zoning plan that includes the required carriageway for a new expressway.

5. DESCRIPTION OF THE NATURAL ENVIRONMENT

On the discussed section, national road no. 17 runs from the north-west to the south-east and crosses the territories of nine communes in Otwocki Powiat (Wiązowna Rural Commune, Town of Otwock, Celestynów and Kołbiel Rural Communes) and Garwoliński Powiat (Pilawa Urban and Rural Commune, Garwolin, Górzno, Sobolew and Trojanów Rural Communes) in the Masovian Voivodeship.

According to J. Kondracki's physical geography of the region, the discussed area is located in the North European Plain province, the Central Poland Lowlands subprovince (Niziny Środkowopolskie) and in two macroregions: Central Masovia Lowland (Nizina Środkowomazowiecka) (mesoregions: Garwolińska Plain and Dolina Środkowej Wisły) and South Podlasie Lowland (mesoregion: Żelechów Area Upland).

The terrain was shaped by the erosive and accumulative activity of continental glaciers (strongly levelled postglacial upland) and melt waters (erosion and denudation), and later by surface watercourses (river valleys), wind activity (sand hills) and organic accumulation (peat plains).

The discussed road section is located within the limits of the geological unit Brzeźna Basin (Niecka Brzeźna), in the following sub-units: south-eastern part of the Warsaw Basin (Niecka Warszawska), the Masovia and Lublin Area Trench (Rów Mazowiecko-Lubelski) and south-western edge of the Łuków Area Plateau (Wyniesienie Łukowskie).

The Warsaw Basin is the central and deepest part of the Brzeźna Basin. It is made up of

Cretaceous formations and filled with Tertiary and Quaternary sediments. The Tertiary sediments are represented by Paleocene, Eocene, Oligocene, Miocene and Pliocene formations. The Łuków Area Plateau (Wyniesienie Łukowskie) and the Masovia and Lublin Area Trench (Rów Mazowiecko-Lubelski) are Paleozoic tectonic structures formed mainly in the Devonian and the Carboniferous, with Permian-Mesozoic sediments.

The major part of the area where the road runs is covered by Quaternary sediments: mainly strongly transformed glacial till, gravel and sand from the North Poland glacial period and the Central Poland glacial period, as well as sand, gravel and river silt in the valleys of earlier and contemporary watercourses. In several places there are major layers of eolian sand and in depressions there are aggradate mud and peat layers.

In the vicinity of road no. 17, there are four documented deposits of natural aggregate (sand-gravel and sand) with a valid mining licence (these deposits could be used at the construction stage) (Sławiny III, Gąsów, Górzno and Kobylnica) and two loam deposits (Anielinek II and III).

According to the regional classification of groundwater in Poland by B. Paczyński, the terrain discussed in the study is located in the north-eastern macroregion, Masovian region (I), central subregion (I₁) and Masovia and Podlasie Area region (I_{1A}).

The discussed area is within the border of two porous Main Ground Water Reservoirs (GZWP): GZWP 215 – Warsaw Subbasin (Subniecka Warszawska) (Tertiary reservoir) and GZWP 222 (Quaternary reservoir) – Dolina Środkowej Wisły. The first water-bearing utility layer in the area concerned is fully separated from the terrain surface and not directly threatened by road contamination.

According to information provided by starostas and communes, within a distance of 300-400 m from road no. 17, there are no municipal water intakes or other wells used by the public. There are water pipelines in most of the settlements, and the settlements are not supplied from shallow drilled and dug wells.

In the area discussed in the study, there is a well-developed river system with numerous drainage ditches. The main rivers crossing the discussed road are: the Mienia, Świder, Promnik, Korytka and Okrzejka. There are no major surface water reservoirs but there are small river beds (mainly in the valley of the Świder river), fish ponds (the largest pond is in the region of Trojanów) and excavations (peat excavation ponds and clay pits).

According to the regional climate geography of Poland by W. Okolowicz, the terrain discussed in the study is located in the Masovia and Podlasie climate region. The average annual air temperatures range from 7.4°C to 8.1°C. July is the hottest month (with an average temperature of 17.8°C) and January is the coldest (average temperature of 3°C). The annual precipitation (550-650 mm) is lower than the average value for Poland. Western winds prevail, with a significant share of southern winds.

The discussed section of national road no. 17 crosses two soil and agricultural regions: the Otwock region (Wiązowna and Celestynów communes) and the Garwolińsko-Żelechowski region (other communes). Arable land is dominated by Endoeutric Cambisols and half-bog soil, with a smaller portion of pseudopodzol. Grassland can be found mainly in river valleys on sandy alluvial soil or black earth.

Along the discussed section of road no. 17, there is protected soil, mainly of organic origin, and located primarily in depressions and swampy river valleys: on the section Puznówka-Lipówki, around Maryniszki, Mazurki, Gończyce and Fabianki villages.

The average forestation of communes located along the discussed section of national road no. 17 is 32.6%, with the national average amounting to approx. 29%. The communes with the highest forestation are Celestynów (47.2%) and the town of Otwock (40.1%). The lowest forestation is found in Kołbiel commune (19.4%). The forest in the area concerned is managed by the Celestynów Forest Inspectorate and Garwolin Forest Inspectorate. The ownership structure is dominated by private forests, with limited monitoring and supervision on the part of the forest inspectorates.

The most prominent forest communities in the area covered by the study are pine forests related to the relatively infertile fresh and humid habitats originating from river sands. They are represented by subcontinental fresh forest and suboceanic fresh forest. The least fertile pine forests, which usually grow on dunes, are represented by inland dry forest (e.g. dunes in the region of Wiązowna). Along the rivers (mainly the Świder, Mienia and Okrzejka), there are poplar and willow, elm and ash as well as ash and alder riparian forests.

The leading element in the development of the roadway are the double-sided multi-species linear tree plantings. On several sections, the plantings have a high nature value, are of an advanced age and have a considerable size, e.g. in the region of Majdan, Świerk and Puznówka.

In the area where a detailed wildlife inventory was taken, 7 habitats mentioned in Annex I to the Habitats Directive were identified, while no plants from Annexes II and IV to the said Directive were found. In the surveyed area, 16 species of vascular plants were found that are subject to national protection under the applicable law, including 8 species subject to strict protection (Marsh Labrador tea, Early Marsh Orchid, western marsh orchid, Broad-leaved Helleborine, common bladderwort, *Hepatica nobilis* Mill, mezereon and stiff clubmoss) and 8 species subject to partial protection.

Given the conducive natural conditions (high percentage of areas covered with forests and trees in the land use structure, diverse terrain shape with numerous valleys and location in an important migration corridor), there is a constant presence of a significant wildlife population in the vicinity of road no. 17. There are numerous precious species of protected mammals as well as common mammals (including game) in the area: wild boar, roe deer, European pine marten, European badger and a smaller population of elk.

In the course of the detailed wildlife inventory, 24 species of mammals were identified, including 3 species subject to strict protection (the red squirrel, Northern white-breasted hedgehog and the common shrew) and 4 species subject to partial protection (the European otter, European beaver, European water vole and the mole). Two species (the otter and the beaver) are listed in Annex II to the Habitats Directive.

Along the route of all variants for the planned expansion of national road no. 17, there are 73 species of nesting birds. The majority of the species (68) are strictly protected taxa, including 12 species that require active protection. There are also 12 bird species listed in Appendix I to the Birds Directive: the White Stork, Western Marsh-harrier, Montagu's Harrier, Corn Crake, Common Crane, Kingfisher, Black Woodpecker, Middle Spotted Woodpecker, Red-backed Shrike, Great Grey Shrike, Woodlark and the Red-breasted Flycatcher.

In the rivers crossed by road no. 17, 19 species of fish and river lamprey were identified, three of which (the Ukrainian brook lamprey, spined loach and the Amur Bitterling) are listed in Annex II to the Habitats Directive.

32 species of butterfly were identified in the course of the inventory. Butterflies are present along the whole route of the planned investment, penetrating the area in the search for food or

migrating between habitats. Therefore, they cannot be assigned to a single place. This is reflected by the results of the inventory, which did not identify any species protected under national law and species from Annex II of the Habitats Directive.

In addition, 8 species of strictly protected beetle and 6 species of dragonfly were identified.

In the vicinity of the discussed variants of national road no. 17, there are also 2 species of amphibians from Annex II to the Habitats Directive (the northern crested newt and the European fire-bellied toad).

Along the discussed road section, there are several areas with a variety of species, some of which are protected. These include: the valley of the Mienia and Świder, the forest complex of the Masovian Landscape Park and the Warsaw Landscape Conservation Area, *Miętne* region forests, the valley of the Spod Górzna watercourse, forests in the region of Aleksandrów and Trzcianka, as well as the broad valley of the Okrzejka river covered with forests and meadows, including fish ponds in Trojanów.

The following protected areas were identified along road no. 17: the Świder nature reserve (including the valleys of the Świder and Mienia rivers), the Masovian Landscape Park with buffer zone (crossed by the road in the region of Wiązowna, and between Ostrowik and Anielinek), landscape conservation areas: the Warsaw landscape conservation area (between Wiązowna and Wólka Mładzka, and Ostrów and Ostrowik) and the Vistula landscape conservation area (between Kołbiel and Puznówka), the planned Natura 2000 special habitat conservation area "Dolina Świdra", as well as ecological land and park facilities protected by the monument conservation officer.

At a distance of approx. 9 kilometres from road no. 17, there are four Natura 2000 areas: special bird protection area – PLB140001 Bagno Całowanie and PLB140004 Dolina Środkowej Wisły, site of Community importance PLH140001 Bagno Całowanie and a proposed site of Community importance Wisła Środkowa. Given the distance and nature of the planned activity, the listed Natura 2000 areas are outside the impact range of the planned project.

Several trees growing in the vicinity of road no. 17 are protected nature monuments. These are two pedunculate oaks in Emowo, Wiązowna commune, and two Norway maples in Potaszynki, Górzno commune.

There are rural parks entered into the register of historic monuments in the discussed area, outside the impact range of the planned project: Nojman park and palace in Wiązowna, the Karolin-Marianów park and villa (Chrzanowscy) in Wiązowna, a park in Gródek and a number of other architectural and sacral objects.

6. IMPACT OF THE PLANNED PROJECT ON GROUNDWATER

The impact on the groundwater during the implementation phase will involve interference with the soil environment in connection with the replacement and compacting of soil, terrain levelling, excavations for rainwater ducts, storage reservoirs and settling tanks. The threats will be related mainly to the use of mechanical equipment and potential leakage of fuel or oil into the soil as well as the penetration of these substances into the groundwater or directly into the surface water. Soil contaminated as a result of leaked fuel or oil must be removed immediately and replaced with fresh soil. Other potential hazards include waste water from the personnel facilities.

In order to reduce the potential contamination of the soil and water environment with waste water and waste produced at the implementation stage, the construction site facilities must be arranged in such a way as to prevent the contamination of the soil and water environment, including the following measures: compacting parking places for machinery and vehicles to protect the soil from being contaminated with oil-derived substances, providing personnel facilities for the employees (e.g. containers), providing storage for construction materials, a car park for employees, and installing portable toilets.

At the stage of the building permit design, it may become apparent that certain sections of the modernised route require water drainage facilities that will lead to short-term changes in the regime of groundwater located just below the earth surface. It will be possible to determine the amount of water that must be drained from the excavation and the extent of water drainage only after adopting detailed structural solutions and a water drainage method that is best suited to the specific situation.

Depending on the adopted method, any water drainage works must be preceded by a water law study, based on which a water law permit for reducing the water level in the water-bearing layer will be issued, as well as hydrogeological documentation defining the hydrogeological conditions in connection with the planned water drainage facilities. The system draining water from the road upstream of the surface water receiving body must be terminated with a safety feature (e.g. a settling tank), and the bottom of the ditch must be sealed on a length of a few metres upstream of the feature.

At the design stage, the structure of the grass ditches must be taken into consideration (use of geotextile fabrics), in particular on sandy soil, in valleys and in areas with a shallow groundwater layer (information from geotechnical tests), making the structure dependent on the form of the geological surface layer.

The hazard to groundwater at the operational stage of altered national road no. 17 will not increase significantly compared to the present status. Ordinary road use is only a small hazard for the quality of groundwater. The hazard increases in the case of incidents that involve the release of a substance that easily infiltrates water-bearing layers (oil-derived substances, other chemicals, etc.).

The areas adjacent to road no. 17 are fully isolated from the terrain surface. There are no wells used for local water pipelines. It can be assumed that the risk of contamination of the water-bearing layer in the vicinity of road no. 17 is low.

The hazard will be higher on road sections running through the valleys of small watercourses and in wide river valleys, where the first usable water-bearing layer is not isolated at all or is poorly isolated: the valley of the Spod Górzna watercourse (approx. km 51), the valley of the Promnik (approx. km 60) and the valley of the Okrzejka (approx. km 73). In these areas, particular attention must be paid to the designed safety solutions (settling tanks, gates, structure and volume of storage reservoirs).

If the works related to the planned project are conducted according to the applicable laws and standards, using equipment that is in good working order and in consideration of the above-mentioned safety measures, they will not have a significant negative impact on the soil and water environment, and will not lead to significant changes in that environment.

7. IMPACT OF THE PLANNED PROJECT ON SURFACE WATER

The negative impact on the quality of surface water during the expansion of road no.17 may be

caused by the following: silting as a result of soil erosion (erosive contamination is predominant on the slopes of embankments, excavations, in ditches and in the surrounding area), failure to treat household and process wastewater from the construction site facilities, the washing out of hazardous substances from the building materials (e.g. slag, bituminous substances), introduction of significant quantities of suspension from the construction site into the surface water (cement, limestone dust, etc.) and the penetration of petroleum products from machines and vehicles into the water.

The water regime may change as a result of excavations under the road, piling works during the construction of engineering structures, such as bridges, and channelising works in the region of the road (redirecting watercourses, building culverts, etc.). All decisions regarding the possible modification of watercourse beds, and the construction of culverts and bridge crossings must be analysed on a case-by-case basis, and such decisions must be consulted (the respective decisions will be made at the design stage).

The construction of bridges and culverts, the alteration of watercourse beds in the vicinity of the planned bridge objects and the rerouting of ditches to change the angle of the crossing with the road crown may be considered only at the building permit design stage and shall require water law permits. Where water is drained from excavations, the water discharge place and the drainage method will require independent approvals.

In the case of traffic disasters or vehicle malfunctions, hazardous substances may leak or pour out, leading to the contamination of water. Suitable protective measures must be planned, in particular at the discharge points into the water environment of the Mienia and Świder rivers, which form the nature reserve Świder, at the discharge into the Okrzejka river supplying water to the fish ponds in Trojanów and in landscape conservation areas.

The negative impact on the surface water during the construction phase must be reduced by, among other things, ensuring proper work organisation, i.e. keeping order at the construction site, taking care of the condition of access roads, fuel tanks, etc., good quality of the performed work, suitable selection as well as correct operation and maintenance of machinery and vehicles, depositing excavated soil away from watercourses, ensuring a correct slope and excavation angle and compacting them by turfing or topsoiling, exercising caution during works in the region of drainage systems and not introducing household wastewater produced in the construction site facilities directly into the receiving bodies.

Precipitation water from the roadway of road no. 17 will be drained using grass ditches, closed canals (rainwater drain pipes) and sealed ditches. The drainage method depends on technical considerations and environmental requirements. For environmental reasons, a tight water drainage system will be required, among other things, on the crossings with river valleys and waterlogged areas. Water drainage using drain pipes and tight ditches will also result from technical considerations.

According to the forecast contamination of precipitation water drained from road no. 17 and the required quality standards for water at the discharge into surface water or into the soil, the suspension content and the outflow of oil-derived substances must be reduced. To this end, water treatment equipment must be planned upstream of the receiving bodies. For example: sand traps (open settling tanks), optionally with a shut-off inflow or outflow gate, settling tanks (underground equipment also known as catch basin with sump) with a trapped outflow, or infiltration grass ditches.

Road no. 17 will satisfy the environmental water protection requirements if the water drainage system is built according to the applicable laws, in accordance with the local considerations

and the recommendations of this report. The proposed measures minimising the environmental impact of precipitation water drained from the road will ensure that the required standard is achieved at the discharge points into the surface water or into the soil. The basic condition for observing the standards is the correct design and operation of storage and pre-treatment equipment.

The greatest impact at the construction stage will occur if the road is built according to the new variants (2a, 1b, 1c, 1d and 2b), which have the greatest environmental impact on the surface water in the undeveloped areas. For the operational stage, Variant 1a is the most favourable variant for the water environment, while Variant 0 is the least favourable.

8. IMPACT OF THE PROJECT ON SOIL SURFACE, VEGETATION, WILDLIFE, LANDSCAPE AND PROTECTED AREAS

The expansion of national road no. 17 to meet the parameters of an expressway involves the occupancy of a large area of land for the road infrastructure: two roadways, service roads, interchanges, modified local road system and engineering structures (bridges, overpasses, culverts, footbridges and wildlife crossings), rerouted utility supply, water drainage facilities, etc.

In terms of the project's impact on the soil surface, Variant 1a is the most favourable, as it will involve the additional purchase of approx. 5.67 km² of land, including biologically active areas. In other variants, due to the construction of several ring roads and the rerouting of the road in the region of Warsaw, the area of investment land planned for purchase is greater (from approx. 6.05 km² in Variant 2b to approx. 6.10 km² in Variant 1c).

For roads which run along historic traffic routes, a major problem is the clearance of the roadside tree rows, which have high value as greenery as well as significant cultural value. This is the case along the discussed road, where a high percentage of the tree rows on both sides are lime, ash and maple that are several dozen years old or older (e.g. in the region of Puznówka and Góraszka). According to calculations and forecasts, approx. 6.8-7 thousand trees would have to be cleared.

Irrespective of which variant is chosen, the planned project's impact on the soil surface will involve the following: using humus removed along with sod from existing arable land along the construction site strip (this particularly applies to meadow soil with thicker humus) and limiting the clearance strip in forest complexes. According to the applicable law, before commencing construction works, the contractor must remove the humus layer and deposit it for reuse, e.g. for forming the slopes of embankments.

The Masovian section of national road no. 17 crosses or runs in the vicinity of several complementary wildlife corridors connecting two main corridors of national importance (southern and central corridor, and northern and central corridor), which are important national migration routes for large animals. Given the significance of these areas for wildlife migration and the Investor's suggestions regarding the safety of traffic participants as well as numerous points of interference with wildlife, the authors have proposed using two-sided enclosures along the whole road, preventing animals from entering the roadway.

In order to mitigate the negative consequences of the division of open areas and the wildlife barrier in the form of the enclosed road, 6 new full-size crossings for large and medium-sized animals have been proposed: in the region of Anielinek (approx. km 20-21), Puznówka (approx. km 34), Miętne (approx. km 40), Potaszniki (approx. km 54), Trzcianka (approx. km

63) and Ruda (approx. km 75). In addition, after considering the recommendations included in the report (minimum dimensions, and suitable formation of land and greenery), 8 bridge objects will be able to fulfil this function. The design must also provide for the adaptation of the culverts to function as crossings for small animals (after being fitted with a dry shelf). In two places, special crossings for amphibians have been planned (with 2-3 openings).

During the construction of the Bocian interchange in the region of Anielinek and the ring road of Gończyce, the degradation of bodies of water must be prevented if possible. If this is not possible, mitigation steps must be taken by creating new bodies of water for amphibians. These bodies of water must be located at a distance of 100-200 m from the existing bodies of water.

Considering the potential impact of the expansion of road no. 17 on protected areas, Variant 1a is the most favourable variant for such areas. This is due to the fact that it causes the least interference. Variant 0, i.e. abandoning the investment, would be a bad solution because the migration corridor would not be protected and traffic pollution affecting protected areas would continue to increase.

National road no. 17 crosses Dolina Świdra, a Natura 2000 special habitat protection area, in two places: in the valley of the Mienia (approx. km 7) and in the valley of the Świder (approx. km 11-13, depending on the variant). The impact of the expansion of the discussed road on this area is presented in a separate report, as already mentioned before. In general, the planned project will have a small impact on the protected habitats and species in the area of Dolina Świdra.

The Natura 2000 areas located approx. 9 km and further away from the discussed road, i.e. Bagno Całowanie PLH140001, Bagno Całowanie PLB140001, Dolina Środkowej Wisły PLB140004 and Wisła Środkowa (code: pltmp255), are outside the impact range of the planned project.

9. WASTE MANAGEMENT

During the construction of the Masovian section of national road no. 17, the main source of waste will be works related to preparing the construction site (demolition of buildings, clearance of trees and shrubs, and earthworks) as well as, to a lesser extent, the construction works proper. During the construction works, the construction site technical facilities and the personnel will produce municipal waste as well as waste related to the operation, servicing and maintenance of machinery and equipment, warehousing and the storage of building materials, etc.

Given the fact that, in Variant 1a, the road crosses settlements, this variant would require the purchase and demolition of a higher number of buildings (162). In the other variants, the number of the buildings for demolition is lower but still comparable (90 to 97). During the expansion of the discussed road, the excavated soil and the soil from terrain levelling will be used for forming embankments, overpass abutments or for levelling other terrain. Since the balance of soil is negative, irrespective of the variant, large quantities of soil will have to be supplied to the construction site (the largest soil quantity will have to be supplied in Variant 2b).

At the road operation stage, waste will be produced mainly as a result of road maintenance (mud and sediments from the cleaning of precipitation water pre-treatment equipment, waste from road cleaning, waste from repair works, waste plant matter from the maintenance of

organised greenery and waste produced as a result of accidents, etc.), as well as a result of the use of auxiliary infrastructure (e.g. municipal waste from car parking areas).

If waste management is organised according to the guidelines included in the environmental protection provisions and if proper working conditions are observed, the environmental impact of waste produced during the implementation of the investment will not be significant and will be of short duration on the individual construction site sections. The environmental impact will mainly involve the occupancy of land where waste is temporarily deposited and stored, and will not extend beyond the area of the construction works.

In general, given the limited number of waste sources and the type of waste, the impact of the waste produced at the investment operation stage will be insignificant. Ensuring suitable equipment and infrastructure for depositing the waste, and punctual waste collection and transport by authorised parties will help minimise the negative environmental impact.

10. IMPACT OF THE PLANNED PROJECT ON THE ACOUSTIC CLIMATE

The present condition of the acoustic climate in the settlements located in the vicinity of national road no. 17 is good but it may deteriorate after the road expansion is completed, unless acoustic protection measures are put in place. This is due to the forecast increase in traffic intensity on the road, which is particularly noticeable in the forecast for 2030. Given the fact that the permitted noise levels near residential buildings are expected to be exceeded, protective measures in the form of acoustic screens on some of the road sections are required.

Once the acoustic screens are built, the acoustic climate in the vicinity of the road is expected to improve significantly. For 2013 intensities, it is not expected that the permitted noise levels during day time will be exceeded, and during night time the levels will not be exceeded by more than 5 dB. Due to the significant increase in traffic intensity in 2030, the acoustic climate in residential areas will deteriorate but it will be significantly better than in the present situation, let alone in Variant 0, which means abandoning the modernisation of the road.

During the modernisation of the road, there will be temporary acoustic disturbance in the analysed region caused by heavy construction machinery and vehicles transporting components and raw materials. The acoustic power of machinery ranges from 90 to 110 dB. The acoustic nuisance depends on the distance from the construction site and the operating time of machinery. At present, since there is no detailed work schedule for the road modernisation and no list of machinery, it is not possible to analyse in detail the impact of the construction works on the acoustic climate in the surrounding areas.

Based on estimates, the noise impact range is approx. 250 metres from the construction site, with typical heavy machinery and vehicles with high levels of acoustic power. Therefore, where the section runs in the vicinity of residential buildings, it is recommended that works be conducted during the day.

In terms of environmental acoustics, the best variants are 1c and 1b, which run the farthest from the settlements. Since Variant 1a runs mainly along the existing road and crosses settlements such as Ostrów, Wola Ducka, Gończyce and Żabianka (while the other variants bypass these settlements), it is the worst variant in terms of acoustics.

11. IMPACT OF THE PLANNED PROJECT ON AIR QUALITY

The main sources of air pollution during the project's implementation are construction machinery and diesel engine vehicles. At the construction stage, there will be a temporary increase in dust concentration caused by the transport of materials and the operation of construction machinery. These emissions are not organised and they cannot be quantified. The impact will be local and last for a short time only in places where construction works are conducted, and will discontinue once the works are completed. However, the works will cause a nuisance, which must be mitigated by maintaining a high working culture.

At the implementation stage, the forecast emission of air pollution is higher than during the operation of the road in its present condition. This is due to the fact that, on most road sections (the whole Variant 1a), the alteration will be performed without stopping traffic, which will involve bottlenecks, leading to reduced vehicle speeds and higher emissions. In addition, construction site machinery and vehicles will also increase the emissions.

When analysing the results of calculations for the implementation stage, it must be noted that the maximum average annual concentrations in cross-sections for Variants 2a, 1b, 1c, 1d and 2b are lower than in Variant 1a because Variant 1a involves the modernisation of the existing road, which means a combined impact of road traffic, construction site machinery and vehicles.

The results of calculations for the present situation and the 2013 forecast (commencement of use) for national road no. 17 indicate that the impact of vehicle emissions on air quality will be small. The forecast impact of the analysed road sections in 2030 is greater than in the case of the 2013 forecast because the forecast traffic intensity is much higher, leading to a higher emission of pollutants.

The comparison of the route variants (1a, 2a, 1b, 1c, 1d and 2b) for national road no. 17 does not indicate significant differences in terms of the impact of emissions because the same traffic intensity is forecast on the variant routes.

According to the analysis, the impact of the emission of traffic pollution on the discussed section of national road no. 17 on air quality will not exceed the permitted levels during the implementation and operational stage within 2013 and 2030 forecast timelines.

12. IMPACT ON RESIDENTS' HEALTH AND LIVING CONDITIONS

From the perspective of human health, the main factors affecting the living standards of residents in the areas adjacent to traffic routes include: noise, vibrations, locally increased air pollution and the pollution of soil and crop plants.

Noise is one of the key measurable factors affecting the quality of life in the environment. The acoustic climate in the environment (place of residence, rest and work) can be measured subjectively, based on individual perception, or objectively, based on the measurement of the sound level.

The negative impact of the planned expansion of national road no. 17 will depend on the daily intensity and structure of vehicle traffic as well as on the route running through developed areas and technical measures to mitigate the negative impact, such as acoustic screens.

Considering these facts, from among the examined variants for road no. 17 running through settlements, in terms of the impact on residents' health, the comparable and most favourable variants are 2a, 1b, 1c, 1d and 2b, while the worst variant is 1a.

In addition, with constantly increasing traffic intensity on road no. 17, the number of road

accidents on the discussed section remains at a comparable high level (approx. 50-60 annually). Considering the overall trend, if the road is not expanded, safety will not improve.

13. RISK OF INCIDENTS

Extraordinary environmental hazards are related to the life and health of living organisms (as a result of fires, explosions, dust concentration, and chemical, biological and radiological contamination) and to the contamination of the main components of the environment (chemical, biological, radiological and thermal contamination), such as air, soil and water. In contamination caused by road transport incidents, the highest percentage involves the contamination of the soil environment.

In particular, the possibility of extraordinary environmental hazards must be expected when the road is in use. At the modernisation stage, the potential sources of major incidents may be the incorrect use or malfunction of machinery. At the operational stage, major incidents may involve malfunctions or collisions of vehicles transporting hazardous materials.

The contamination of soil with toxic substances has negative consequences, such as the contamination and impoverishment of the biologically active soil layer. Oil-derived substances are some of the most hazardous materials which may contaminate the soil as a result of traffic accidents. The penetration of fuel into the soil poses a major hazard to groundwater. The rehabilitation of land contaminated with such substances is extremely difficult and expensive because the contamination may not only affect the top layers but also deeper layers.

The planned alteration of national road no. 17, due to the possible transport of hazardous materials, can be classified as an investment with the potential of extraordinary environmental hazards. At present, the risk of a major incident is low. Therefore, no technical measures are planned to prevent such risk, except for typical traffic safety solutions, such as absorbing barriers, correct road profile, horizontal and vertical road signs, etc.

In the case of a major incident, suitable measures should be taken by specialised rescue services. The service responsible for the rescue operation during major incidents leading to the contamination of the environment is the Chemical Rescue Division of the National Fire Service. The Environmental Protection Inspectorate supervises the incident recovery process.

The planned investment is an element of a road solution intended to improve transport conditions and traffic safety. Using solutions to ensure safety reduces the risk of incidents that involve the release of hazardous substances into the environment and the risk of hazards to health, life and the environment.

Variants 2a, 1b, 1c, 1d and 2b of national road no. 17, i.e. variants bypassing settlements, will reduce the impact of potential incidents involving hazardous materials on the residents.

14. ENVIRONMENTAL MONITORING

The Investor is obliged to measure the levels of substances or energy introduced into the environment in connection with the operation of the altered objects (roads). This obligation is specified in article 175 section 3 of the *Environmental Protection Law Act*. Article 175 section 4a stipulates that the obligation referred to in section 3 must be fulfilled within a year from the commencement of use of the altered object.

According to the Ordinance of the Minister of the Environment of 24 July 2006 *on the*

conditions to be fulfilled when draining wastewater into bodies of water or into soil, and on the substances which are particularly harmful to the water environment, the road user is obliged to conduct, at least twice a year, inspections of water treatment equipment, and to record maintenance work in a maintenance log book.

15. SOCIAL CONFLICTS

With constantly increasing traffic intensity on the section between Warsaw, Lublin and the national border, the capacity of national road no. 17 has decreased significantly. While the single carriageway on non-urban sections could handle the traffic for several more years, sections running through large settlements and towns would lead to bottlenecks, in particular in settlements such as Kołbiel, Ryki and Kurów.

Along the discussed section of road no. 17, there is also a rapid development of residential, service and industrial civil engineering structures. There are suburban structures in the region of Majdan, Góraszka and Wiązowna, while Wola Ducka, Ostrów and Puznówka are developing rapidly. In the light of these spatial considerations, every new proposal on modernising road no. 17 causes significant emotional response and controversy.

In spring 2007, a meeting was held in Wiązowna to discuss the variants of road no. 17. Following the meeting, Variant 2 was recommended (currently modified into Variant 2a), while Variant 3 (bypassing Wiązowna to the east) was strongly opposed.

The residents of Otwock (Wólka Mładzka) also expressed their opinion on the road running through their settlement. An emotional response was also given to the proposition of the road running in the vicinity of Radiówek and the densely developed area of Wola Ducka and Ostrów.

The report's authors have consulted the variants of road no. 17 with the Board of Directors of the Masovian, Chojnowski and Brudzeński Landscape Parks, the Voivodeship Nature Conservation Officer, Celestynów and Garwolin Forest Inspectorates and the Voivodeship Monument Conservation Officer (in Warsaw, and the branch in Siedlce). In addition, discussions were held in Otwock and Garwolin communes and Starostas.

As a result of the consultation with the public and the work of the design team, four variants for national road no. 17 were proposed, i.e. 1a, 2a, 1b and 2b. Based on the obtained materials and the expressed opinions, it appears that the best and the least controversial variants from the perspective of the local community are Variants 2b and 2a.

Variant 1a is the worst variant as it runs across settlements (it does not bypass Ostrów, Wola Ducka, Gończyce and Żabianka) and causes nuisance (noise, vehicle traffic, safety concerns, etc.).

16. LEGALLY PROTECTED MONUMENTS

In the vicinity of national road no. 17, in the conventionally adopted strip with a width of up to 300 m on both sides, there are two monuments: the brick-built motor mill dating back to approx. 1918 in Gończyce (Sobolew commune), approx. 60+050 km, at the western edge of the road, and the remains of World War II shelters in the region of Wiązowna (Wiązowna commune), approx. 5+450 km, approx. 200 m to the west of the road.

If Variant 1a is chosen (road running across Gończyce), it is expected that the historic mill will

remain intact, which is consistent with the letter of the Siedlce branch of the Voivodeship Monument Conservation Office in Warsaw. In other variants, the ring road of Gończyce is planned.

Attention must also be directed to the remains of World War II shelters in the region of Wiązowna, forming a part of the so-called Warsaw Bridgehead, i.e. a complex of several dozen shelters reaching from the east of the Vistula river, Zalew Zegrzyński, over Zielonka, Wesola and Wiązowna, to Karczew.

Along national road no. 17, there are also roadside crosses, shrines, memorial sites, etc., which are an important part of the cultural landscape and of the identity of the residents. More than twenty such objects have been identified. Where the road interferes with such an object, the object must be relocated to a new site specified by the local parish priest, in consultation with the local community.

In close vicinity of national road no. 17, within the border of the Masovian Voivodeship (in a strip of up to 300 m on both sides of the road), there are also numerous archaeological sites, such as the remnants of settlements from the Stone Age to the early Middle Ages, which are covered by the contemporary top soil layer.

Most of the overall 26 registered archaeological sites are located between Wiązowna and Wólka Mładzka, and between Żelazna and Lipówki (Pilawa commune) as well as in the region of Józefów (Górzno commune), and are beyond the impact range of the planned project. The planned expansion of the road interferes with the archaeological sites only in a few areas (mainly in the region of Radiówek, if Variant 2a is chosen). In this case, before any investment works are commenced, archaeological excavation works must be conducted.

In addition, the whole strip of the planned project must be under archaeological supervision because historic objects of archaeological interest may be found (not registered in existing studies).

17. RESTRICTED USE AREAS

The legal basis for establishing restricted use areas is the *Environmental Protection Law Act of 27 April 2001* (J.L. of 2008, No. 25, item 150, as amended).

For linear objects generating higher-than-permitted noise levels (motorways, expressways, national roads, voivodeship roads and city streets) in spite of the proposed and implemented environmental protection measures (construction of acoustic screens, planting of separation greenery and modification of land or building functions), there may be a number of areas where the measured environmental impact will exceed the permitted levels.

In the case of non-urban roads, the main factors which justify the establishment of a restricted use area are exceeded noise levels and, to a lesser extent, air pollution measured at the limits of the roadway (e.g. in health resorts). Restricted use areas should only be established in the areas where it is not possible to use technical measures to protect existing or planned (plots of land for development) residential buildings. Restricted use areas are not established in other areas which, considering the land use and the legal provisions, do not require protection.

Article 135 section 5 of the *Environmental Protection Law Act of 27 April 2001* (J.L. of 2008, No. 25, item 150, as amended) stipulates that: *If the obligation to establish a restricted use area results from the environmental impact assessment procedure for a project involving the construction of a national road, as stipulated by the Act of 21 March 1985 on public roads*

(...), the restricted use area shall be established based on a post-implementation review (...). The road investment permit shall include the obligation to prepare a post-implementation review 1 year from the date when the object was commissioned to use, and to present the review 18 months from the date when the object was commissioned to use.

If, in spite of the use of acoustic protection measures, the standard acoustic climate cannot be restored in certain areas ($L_{Aeq}D = 60$ dB, $L_{Aeq}N = 50$ dB), the establishment of a restricted use area is recommended based on a post-implementation review.

According to the analysis of the impact of the discussed section of road no. 17 on air quality in the vicinity of residential buildings, at the implementation and operational stage, there will be no reasons to establish a restricted use area due to air pollution.

18. COMPARISON OF THE VARIANTS

A table comparing the main hazards has been used to examine the six investment variants for national road no. 17 (1a, 2a, 1b, 1c, 1d and 2b) proposed by EUROSTRADA Sp. z o.o. and Variant 0.

The authors have used a quality classification method, which, as with all tools of this type (check lists, matrices, etc.), carries a load of objectivism and is characterised by a simplified approach to the task at hand. However, it can be assumed that the detailed analyses conducted for the purpose of the report in the main part of the study (chapters 6-11) limit the risk of assessment errors.

The three-grade scale (xxx – large impact, xx – medium impact, x – small impact) is sufficient for correctly performing the task. The variant with a high “x” score has a major impact on the natural environment and living conditions of residents in the adjacent areas, and should be rejected.

For Variant 0 (which involves abandoning the project), some of the elements cannot be estimated because, when the road is not expanded, assigning specific weights to such elements is inconsistent with the adopted method, and the result would be inaccurate and incomparable with the investment variants.

When discussing the impact of the individual variants on the soil and water environment, two general indicators discussed in detail in the report have been used: the influence on the quality of groundwater and the influence on the quality of surface water as a resultant of the discussed conditions (e.g. exposure of water-bearing layers to pollution, the nature of the watercourses and their valleys, etc.).

Secondly, the influence of the variants on the soil surface has been examined as a result of the loss of protected soil, the loss and transformation of soil resulting from the construction of engineering objects (bridges and overpasses in valleys), road routing through areas with diverse terrain shape (complexes of dunes and hills) and the movement of significant amounts of soil required for the construction of embankments and bridge abutments.

When discussing the impact of the variants on vegetation and wildlife, the negative impact on the ecosystems as well as the fragmentation of forest and meadow habitats related to the occupancy of new biologically active areas have been taken into consideration. The valuation also includes the negative impact on valuable natural habitats, vegetation and animal species (including those protected), which were identified in the course of the detailed wildlife inventory.

At present, national road no. 17 is a major barrier to animal migration locally, as well as for seasonal migration (e.g. of elk), leading to interference with wildlife (several elk fatalities are recorded each year). The expressway should be more animal-friendly thanks to the construction of new and adaptation of existing objects to allow safe wildlife migration.

Another compared element of the expansion variants for road no. 17 has been the impact on protected areas, and in particular on Dolina Świdra, a Natura 2000 area, which is discussed in a separate study. The assessment of the variants considers the length of the sections running through protected areas and the surface of the occupied sensitive areas, including habitats and legally protected species.

In addition to the natural environment, the impact assessment also considers the impact on residents and residential areas. The main influence on the living environment of residents is the fact that the road runs through human settlements, leading to, among other things, higher risk of higher-than-permitted noise emission, air pollution, etc.

When outlining the route of the road, it will be necessary to purchase land, and to purchase and demolish entire households (residential and utility buildings) and technical infrastructure (e.g. petrol stations). At the same time, the existing route and the variants differ in terms of the hazard they pose to monuments or other objects of material culture. These issues involve social aspects which are difficult to assess, such as attachment to the place of residence (as a family settlement, attachment to the home), the workplace, neighbours, etc.

According to the summary in table 1, Variants 1b and 1a have the lowest unfavourable score (x), 29 and 31 respectively.

Variant 1a is better than the other variants in terms of its impact on the natural environmental because almost its entire route (except for the region of Wiązowna and Kołbiel) runs along the existing road and causes the least interference with new and relatively slightly transformed areas. On the other hand, in the absence of a bypass of Wólka Mładzka, Wola Ducka, Ostrów, Gończyce and Żabianka, this road variant deepens the division of the settlements and has a negative impact on residential areas, which is particularly evidenced by the number of buildings which must be purchased and demolished, the highest number of residents exposed to noise and higher levels of air pollution.

Variant 1b, which bypasses Wiązowna, Wola Ducka, Ostrów, Kołbiel, Gończyce and Żabianka, is better than Variant 1a from the perspective of some of the local communities. The route bypassing these settlements considers the natural conditions and minimises the occupancy of valuable forest and meadow ecosystems (preserving wildlife migration corridors), protected soil and exposed areas where groundwater is found shallow beneath the surface.

Variant 1d has been considered to be worse than Variant 1b mainly because the acoustic impact extends to new residential areas located along the planned bypass of Wólka Mładzka to the west (the variants are identical with regard to other aspects).

The poorer scores of Variants 2a (34) and 2b (36) are due to the fact that these route variants run across protected forest complexes of the Masovian Landscape Park, while Variant 1c (38) runs across forests in the region of Wólka Mładzka and causes the greatest interference with Dolina Świdra, a Natura 2000 area.

When assessing the variants' impact on the Natura 2000 area Dolina Świdra, considering the representative nature and the area of the habitats that are endangered and exposed to pollution, the population of the affected Community species, the width of the riverbed in the area of the

designed bridge objects, and the number of wildlife crossings and culverts, it was found that Variant 1a or 1b is the best variant for this area, followed by Variant 1c, while Variant 1d was found to be the worst variant.

When discussing the environmental impact of national road no. 17 on the section from the Lubelska interchange to the border of the Lubelskie Voivodeship (altered to meet the parameters of an expressway), particular attention has been paid to the region of Kołbiel, where national road no. 17 crosses national road no. 50 (the southern ring road of Warsaw for heavy goods vehicles).

The analysis of the project's impact on the individual components and the natural environment as a whole, as well as the living conditions and the health of the residents in the region of Kołbiel considers the combined impact of both national roads. When analysing the accumulated impact, noise emission, air pollution, and the influence on protected areas and wildlife migration routes have been taken into account.

From the perspective of the impact on the acoustic climate, the best solution is to adopt a road no. 17 route according to Variants 1a, 1b, 1c, 1d and 2a, with road no. 50 running according to Variant 4. In this case, the accumulated noise at the Bocian interchange will cause the least nuisance for the local residents and will not exceed permitted levels once the planned mitigation measures are put in place (acoustic screens). If national road no. 50 were to run according to Variant 1, the hazard of accumulated noise would affect a much higher number of residents, in particular the residents in Stara Wieś II, Stara Wieś I and Kołbiel.

In terms of the impact of both roads on protected areas and on main wildlife migration routes, the worst road variants are 2b for road no. 17 and Variant 4 for road no. 50. With these variants, road no. 17 would cross the main wildlife migration corridor in a new place, within the limits of the Masovian Landscape Park, and road no. 50 would also cross an important migration corridor in the valley of the Świder in a new place, and it would cross the planned Natura 2000 area Dolina Świdra. '

Based on the comparison of six investment variants for road no. 17 (1a, 2a, 1b, 1c, 1d and 2b), the best variant in terms of functionality, the least negative impact on the residents and the natural environment is Variant 1b, followed by Variant 1a.

Table 1

Comparison of the discussed variants for the expansion of national road no. 17

Natural and spatial elements considered when comparing the variants	Variant 1a	Variant 2a	Variant 1b	Variant 1c	Variant 1d	Variant 2b	Variant 0
Impact on the natural environment							
<i>Impact on water and soil environment</i>							
Impact on groundwater (water quality)	XX	XX	XX	XX	XX	XX	xxx
Impact on surface water (water quality)	X	XX	XX	XX	XX	XX	xxx
<i>Impact on soil surface</i>							
Loss of protected soil types, mainly organic	X	XX	XX	XX	XX	XX	(-)
Transformation of terrain	X	XX	XX	XX	XX	XX	(-)
Balance of earth quantity	X	XX	XX	XX	XX	XX	(-)
<i>Impact on vegetation and wildlife</i>							
Occupancy of forest ecosystems	X	XXX	XX	XXX	XX	XXX	(-)
Occupancy of meadow ecosystems	X	XX	XX	XX	XX	XX	(-)
Fragmentation of forest and meadow habitats	X	XXX	XX	XXX	XX	XXX	(-)
Hazard to protected habitats and plant species	XX	X	X	XXX	X	XX	(-)
Hazard to protected animal species	X	X	X	XXX	X	X	X
Barriers to wildlife migration	XX	X	X	X	X	X	xxx
<i>Impact on protected areas</i>							
Impact on Natura 2000 area Dolina Świdra	X	XX	X	XXX	XXX	XX	X
Length of section running through protected areas	X	XX	X	X	X	XX	X
Occupancy of new exposed fragments of protected areas	X	XX	X	XX	X	XXX	X
Impact on developed areas							
Settlement crossings limiting settlement development	XXX	XX	XX	XX	XX	XX	xxx
Residential areas exposed to higher-than-permitted	XXX	X	X	X	XX	X	xxx

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noise levels							
Number of buildings to be purchased and demolished	XXX	XX	XX	XX	XX	XX	-
Residential areas exposed to air pollution	xxx	X	X	X	X	X	xxx
Impact on monuments	XX	X	X	X	X	X	XX
Total	31	34	29	38	32	36	(-)

xxx – large impact, xx – medium impact, x – small impact, (-) – It is not possible to determine the impact in the absence of the road's expansion

19. DIFFICULTIES IN PREPARING THE REPORT

The main difficulty encountered during the preparation of this report is the uncertainty of traffic forecasts for the discussed road which were used to estimate, among other things, the exposure to higher-than-permitted noise, the forecast quality of water drained from the planned road and air pollution caused by vehicle traffic.

A major obstacle in assessing the project's impact on the planned Natura 2000 area Dolina Świdra is the absence of the final limits of that area, and of credible data on protected habitats, as well as animal and plant species in the area.

20. CONCLUSIONS AND RECOMMENDATIONS

- * The discussed project involves the expansion of national road no. 17 to meet the parameters of an expressway on the section from the designed *Lubelska* interchange to the border of the Lubelskie Voivodeship (from km 3+200 to km 74+883), excluding the constructed ring road of Garwolin. The presented *Report* examines six investment variants (1a, 2a, 1b, 1c, 1d and 2b) and the comparative Variant 0.
- * According to the obtained information, along road no. 17, within a distance of 300-400 m from the road, there are no municipal water intakes or other wells used by the public. There are water pipelines in most of the settlements, and the settlements are not supplied from shallow drilled and dug wells.
- * The discussed area is within the border of two Main Ground Water Reservoirs (GZWP): GZWP 215 – Warsaw Subbasin (Subniecka Warszawska) (Tertiary reservoir) and GZWP 222 (Quaternary reservoir) – Dolina Środkowej Wisły.
- * Road no. 17 crosses a well developed river system (Mienia, Świder, Promnik and Okrzejka) with numerous water drainage ditches. There are no major natural surface water reservoirs but there are small river beds, fish ponds and excavations filled with water (peat excavation ponds and clay pits).
- * Road no. 17 will satisfy the environmental water protection requirements if the water drainage system is built according to the applicable laws, in accordance with local considerations and the recommendations of this report.
- * Precipitation water drained from the designed road no. 17 will be drained mainly by means of roadside grass and infiltration ditches, given favourable soil and water conditions. To a lesser extent, sealed ditches and rainwater drain pipes will be used due to ecological or technical considerations (such as river valley crossings and interchanges).
- * At the outlet points from the water drainage system to the receiving bodies, pre-treatment equipment with sedimentation and flotation function must be used and protected against hydraulic overload. At the inlets to the Mienia, Świder, Promnik, Korytka and Okrzejka rivers and in legally protected areas, inflow shut-off devices must be installed, protecting the receiving body against contamination by hazardous substances.
- * Water law permits must be obtained for discharging precipitation water into surface water or into the soil, for building bridges and culverts, for rerouting the beds of watercourses

(drainage ditches) and, where necessary, for altering drainage facilities.

- * The forests along the road are administrated by Celestynów Forest Inspectorate and Garwolin Forest Inspectorate. The ownership structure is dominated by private forests without full land development surveys, with limited monitoring and supervision on the part of the forest inspectorates.
- * Pine forests are the most numerous of the forest complexes adjacent to and crossed by the road. In the region of Garwolin (Miętne precinct), due to more fertile habitats, there are more oak, hornbeam, lime and maple forest complexes (fresh and mixed forests). Along the rivers (Świder, Mienia and Okrzejka), there are poplar and willow, elm and ash as well as ash and alder riparian forests. Along Variant 2b, in the area of Anielinek and Bocian, the ring road runs in the vicinity of the Masovian Landscape Park forest complex (150-200 m).
- * Two-sided linear tree plantings are the leading element in the development of the roadway, along almost the full length of the discussed section of national road no. 17 (except for the road fragments running through forest complexes). The predominant species are common ash, Norway maple, Small-leaved Lime, black poplar (and mixed species), with a smaller population of birch, oak, horse-chestnut, silver maple and others. On several sections, the plantings have high natural value, are of an advanced age and have a considerable size, e.g. in the region of Majdan, Świerk (IBJ) and Puznówka. The Report proposes places where trees should be re-planted.
- * In terms of the protection of the soil surface, the planned project does not change the present use of land. Based on the analysis of the new route of road no. 17, from the perspective of the transformation of soil surface and the occupancy of protected soil (i.e. arable and forest soil), the best variant is 1a, followed by Variants 1b and 1d, with the remaining variants (2a, 1c and 2b) being equivalent.
- * Based on the results of the detailed wildlife inventory, the main hazards to natural habitats, as well as to plant and animal species listed in the annexes to the Habitats Directive and the Birds Directive, and to the plant and animal species legally protected in Poland have been identified for all of the planned expansion variants for national road no. 17. From this standpoint, Variant 1c is the least favourable variant, mainly because it occupies protected natural habitats, interferes with breeding territories and involves the loss of habitats of some of the protected animal species in the region of Wólka Mładzka.
- * Given the conducive natural conditions (high percentage of areas covered with forests and trees, diverse terrain shape with numerous valleys and location in an important east-west migration corridor), there is a constant presence of a significant wildlife population in the vicinity of road no. 17. Vast areas of forests, swamps and meadows separated by strips of arable land are ideal wildlife habitats. Every year, there are numerous accidents involving large animals (elk, roe deer and wild boar), and a higher traffic intensity could be a threat to the region's population.
- * On the section from the *Lubelska* interchange to the border of the Lubelskie Voivodeship, road no. 17 can become a major barrier to wildlife migration on the east-west route by separating the forest complexes of *Lasy Otwocko-Celestynowskie* and *Lasy Garwolińskie* from eastern Masovia. In the absence of mitigation measures, higher traffic intensity and the planned expansion of the road to meet expressway parameters will disrupt the adjacent

migration corridor connecting Natura 2000 areas *Dolina Środkowej Wisły and Bagno Całowanie*, and the said forests with areas to the east of the road, including the region of Mińska Mazowiecki and Natura 2000 areas *Dolina Liwca* and *Lasy Łukowskie*.

- * The following nature conservation areas are located along road no. 17: Świder nature reserve, Masovian Landscape Park (including buffer zone), Warsaw and Vistula Landscape Conservation Areas, and the planned Natura 2000 special habitat protection area Dolina Świdra. In addition to the mentioned conservation areas, there are also protected nature monuments, environmental use areas and parks protected by the monument conservation officer.
- * As of January 2009, the areas included in the list of Natura 2000 network located approx. 9 km from the planned project but not affected by the project are: special bird protection areas – PLB140001 Bagno Całowanie and PLB 140004 Dolina Środkowej Wisły, site of Community importance – PLH140001 Bagno Całowanie and a proposed site of Community importance – Wisła Środkowa.
- * In April 2008, a portion of the valleys of the Świder and Mienia rivers was included in the list of potential Natura 2000 special habitat protection areas on the website of the Minister of the Environment under the name “Dolina Świdra”. A detailed description of the area is included in a separate study.
- * The impact of the expansion of national road no. 17 on the planned Natura 2000 special habitat conservation area can be described as follows:
 - The key factors affecting the Natura 2000 area Dolina Świdra are mainly the existing and planned bridge objects in Wiązowna, Wólka Mładzka, and in the vicinity of Adamówka and Rudka. On the other sections, due to the significant distance of the road variants from the analysed area, no significant negative impact related to land occupancy, clearance of greenery, noise emission, pollution, etc. is expected.
 - It is estimated that the total area of natural habitats (mainly riparian forests and Carpinion betuli with a low naturalness level, which occupy approx. 700 hectares in the described Natura 2000 area) lost as a result of the construction or modernisation of the bridge crossings ranges from 0.45 ha (Variants 1b and 1d) to 0.91 ha (Variant 2a). The estimated area of natural habitats exposed to the emission of traffic pollution, including heavy metals, ranges from 1.1 ha (Variant 1b) to 1.74 ha (Variant 2a).
 - It must be stressed that most of the habitats which will be eliminated or which are exposed to an increased emission of pollutants are characterised by a low representativeness, which is expressed in a simplified structure, a high share of foreign species and a marked influence of human activity, meaning that the project will have a small impact on these habitats.
 - It is only with Variant 1c that the construction of the bridge crossing will lead to the loss of protected habitats of subcontinental Carpinion betuli, ash and alder riparian forests, and eutrophic old river beds with a total area of approx. 0.3 ha.
 - The other negative impact on natural habitats and species should be considered as small, without any particularly significant consequences for the environment. The most noticeable impact involves noise and vibrations, which are also currently present in the vicinity of the road. The animals potentially affected by this impact are mainly

- nesting birds, such as the Kingfisher, the Black Woodpecker and the Red-breasted Flycatcher.
- In addition, in the area of bridge crossings, there is a potential hazard of contamination of watercourse waters and banks with chemicals. In particular, this risk affects animal species inhabiting the water environment, such as the European Weatherfish, the Amur Bitterling, the European otter and the Kingfisher.
 - In order to mitigate the impact of the planned road on the planned Natura 2000 area Dolina Świdra, which is also a wildlife migration corridor, the construction of bridge objects with parameters suitable for crossings for large animals is planned, along with enclosures and a tight water drainage system for the bridge object.
 - The significant reduction of the negative impact on the habitats (including protected habitats) during the construction of bridge crossings in the Natura 2000 area Dolina Świdra is related to the very nature of this valley, with its very narrow river beds and flood plains (35 to 50 metres wide); therefore, the bridge abutments will be located on the slopes, and it will not be necessary to build supports in the river bed.
- * Following the assessment of the variants' impact, considering the representative nature and the area of the habitats that are endangered and exposed to pollution, the population of the affected Community species, the width of the riverbed in the area of the designed bridge objects, and the number of wildlife crossings and culverts, it was found that Variant 1a or 1b is the best variant for the Natura 2000 area Dolina Świdra, followed by Variant 1c, while Variant 1d was found to be the worst variant.
 - * The Masovian section of national road no. 17 crosses or runs in the vicinity of several complementary wildlife corridors connecting two main corridors of national importance (southern and central corridor, and northern and central corridor), which are important national migration routes for large animals.
 - * Given the significance of these areas for wildlife migration and the Investor's suggestions regarding the safety of traffic participants, as well as numerous points of interference with wildlife, the authors have proposed using two-sided enclosures along the whole road, preventing animals from entering the roadway.
 - * In order to mitigate the negative consequences of the division of open areas and the wildlife barrier in the form of the enclosed road, 6 new full-size crossings for large and medium-sized animals have been proposed: in the region of Anielinek (approx. km 20-21), Puznówka (approx. km 34), Miętne (approx. km 40), Potaszniki (approx. km 54), Trzcianka (approx. km 63) and Ruda (approx. km 75).
 - * In addition, after considering the recommendations included in the report (minimum dimensions, and suitable formation of land and greenery), 8 bridge objects will be able to fulfil this function. The design must also provide for the adaptation of culverts to function as crossings for small animals (after being fitted with a dry shelf). In two places, special crossings for amphibians have been planned (with 2-3 openings).
 - * During the construction of the Bocian interchange in the region of Anielinek and the ring road of Gończyce, the degradation of bodies of water must be prevented if possible. If this is not possible, mitigation steps must be taken by creating new bodies of water for amphibians. These bodies of water must be located in a distance of 100-200 m from the

existing bodies of water. It is important to minimise the loss in the amphibian population (in particular, the northern crested newt) during road construction works.

- * A 40 to 60 m wide strip of land with an area of 5.66 to 6.1 km² (depending on the variant) will be occupied for the purpose of altering national road no. 17, leading to an irreparable loss of biologically active developed areas, including substantial forest areas and roadside trees. According to preliminary calculations and forecasts, approx. 6.8-7 thousand trees would have to be cleared. In addition, as part of preparation works, a substantial number of buildings will have to be purchased and demolished: for Variant 1a – 162 buildings, Variant 2a – 92 buildings, Variant 1b – 96 buildings, Variant 1c – 90 buildings, Variant 1d – 97 buildings and Variant 2b – 94 buildings.
- * According to the survey, the information obtained from the Masovian Voivodeship Office and from commune offices, there are two nature monuments (Norway maples) (approx. km 54-55) interfering with all of the analysed variants.
- * According to the calculations and analyses, the impact of the alteration of road no. 17 on air quality will be small. No higher-than-permitted impact on human life and protected plants is expected; therefore, it is not necessary to change the use of arable land and to introduce insulating greenery to protect the crops.
- * According to the calculation analysis, the impact of the emission of traffic pollution on the discussed section of national road no. 17 on air quality will not exceed permitted levels during the implementation and operational stage within the 2013 and 2030 forecast timelines.
- * Given the significant forecast increase in traffic on the modernised road, the acoustic climate around the road will deteriorate considerably over a dozen or so years. Therefore, it is necessary to build acoustic screens with a total length of 33.55 km (Variant 1c) to 39.93 km (Variant 1a).
- * One year after the investment is commissioned to use (post-implementation review) and, after that, every 5 years, the noise level must be measured to verify whether the acoustic climate in residential areas has deteriorated. If the permitted noise levels are significantly exceeded in residential areas, it will be necessary to install, for instance, a diffractor on the top edge of the screen, or the existing screens will have to be extended.
- * At present, there is no need to classify national road no. 17 as a high-risk undertaking or as an undertaking with a high risk of a serious industrial incident, based on the type and quantity of hazardous substances.
- * The Investor is obliged to measure the levels of substances or energy introduced into the environment in connection with the operation of the altered objects (roads). This obligation is specified in article 175 section 3 of the *Environmental Protection Law Act*. Article 175 section 4a stipulates that the obligation referred to in section 3 must be fulfilled within a year from the commencement of use of the altered object. The scope and the requirements for such measurements are specified in the Ordinance of the Minister of the Environment of 2 October 2007 *concerning the requirements for measuring the environmental levels of substances or energy by the administrators of roads, railways, tram lines, airports and ports* (J.L., No. 192, item 1392).
- * In the vicinity of national road no. 17, on the section from the *Lubelska* interchange to the

border of the Masovian Voivodeship, there are a dozen or so objects entered into the register of the Voivodeship Monument Conservation Officer (summary included in the text). There are also roadside crosses, shrines, memorial sites, etc., which are an important part of the cultural landscape and of the identity of the residents. More than twenty such objects have been identified.

- * Most of the overall 26 registered archaeological sites are located between Wiązowna and Wólka Mładzka, and between Żelazna and Lipówki (Pilawa commune) as well as in the region of Józefów (Górzno commune).
- * Irrespective of the chosen variant, the planned expansion of national road no. 17 within the border of the Masovian Voivodeship does not pose any major hazards to historic and nature monuments because such objects are located at a significant distance from the discussed road.
- * Given the fact that, in spite of the use of acoustic protection measures, the standard acoustic climate cannot be restored in some areas ($L_{AeqD} = 60$ dB, $L_{AeqN} = 50$ dB), the establishment of a restricted use area is recommended based on a post-implementation review.
- * When discussing the environmental impact of national road no. 17 on the section from the Lubelska interchange to the border of the Lubelskie Voivodeship, particular attention has been paid to the region of Kołbiel, where national road no. 17 crosses national road no. 50 (the southern ring road of Warsaw for heavy goods vehicles). When analysing the combined impact from both national roads, noise emission, air pollution, and the influence on protected areas and wildlife migration routes have been taken into account.
- * From the perspective of the impact on the acoustic climate, the best solution is to adopt a road no. 17 route according to Variants 1a, 1b, 1c, 1d and 2a, with road no. 50 running according to Variant 4 (according to the study of the Warsaw Development Planning Office). In this case, the accumulated noise at the Bocian interchange will cause the least nuisance to the local residents and will not exceed the permitted levels once the planned mitigation measures are put in place.
- * In terms of the impact of both roads on protected areas and on main wildlife migration routes, the worst road variants are 2b for road no. 17 and Variant 4 for road no. 50. With these variants, road no. 17 would cross the main wildlife migration corridor in a new place, within the limits of the Masovian Landscape Park, and road no. 50 would also cross an important migration corridor in the valley of the Świder in a new place, and it would cross the planned Natura 2000 habitat area.
- * Based on the comparison of six investment variants (1a, 2a, 1b, 1c, 1d and 2b), the best variant in terms of functionality, the least negative impact on residents and the natural environment is Variant 1b, followed by Variant 1a.