8. SUMMARY

The proposed activity is the reconstruction of the access channel for ships entrance into the Port of Riga necessary to provide entrance and service of heavy-tonnage vessels (up to 130 000 dwt Aframax class oil tankers and 175 000 dwt cargo vessels) into the Port of Riga, as well as safe shipping traffic by reducing any possibility of shipping accidents.

Deepening works of the main shipping route of the Port of Riga are planned in two phases. Deepening of the shipping route section between acceptance buoy and Rīnūži (pier MKR-1) is planned down to -17 meters, because construction of deep-water piers with ground mark -17 meters is planned by Krievu sala. Deepening down to -15 meters is planned in the section between Rīnūži (pier MKR-1) and pier KS-34, because construction of container terminal with depth by the piers -15 meters is planned in Kundzinsala. Execution of deepening works is planned in two phases:

• phase one — deepening of the shipping route section between acceptance buoy and pier KS-34 down to -15 meters (Execution period: as of 2012 until 2014);
• phase two — provided sufficient demand, the shipping route between acceptance buoy and Rīnūži (pier MKR-1) will be deepened down to -17 meters. Execution period: as of 2014 until 2018.

Summary has been prepared with goal to provide information to all persons interested in regard of impact on environment and society caused by execution of the proposed activity, as well as the decisions adopted so far within the planning and discussion of the project. Summary of the environmental impact assessment summarizes the information on the most significant foreseeable impact on environment and society, as well as indicates on the activities to be performed by the executor of works in order to reduce unfavourable impact as much as possible during the period of construction and operation.

Environmental impact assessment was performed, and the summary was prepared by SIA "Estonian, Latvian & Lithuanian Environment" following the order of the Freeport of Riga Authority.

Environmental impact evaluation procedure

Law On Environmental Impact Assessment and Cabinet Regulation No. 87 adopted on 17 February 2004 "Procedures for Environmental Impact Assessment" (with amendments entered into force as of 12.06.2010) define the principles and necessity of environmental impact assessment and regulate its execution order and procedures in details.

In accordance with the defined regulation the initiator of the procedures is obliged to announce the proposed activity in the Environment State Bureau (hereinafter referred to as VPVB) before commencement of the designing works. Within 30 days the Bureau prepares program containing indications on the information to be included in the working report. According to the requirements of the program, the initiator develops working report and submits in VPVB for assessment. After reception of the

working report VPVB within 45 days prepares conclusion on the working report, indicating the amendments or additions to be made in the working report. Taking into consideration the conclusion, the initiator is obliged to prepare final report and submit it in the competent institution. Conclusion on the final report is prepared by VPVB within 30 days, in addition VPVB publishes announcement on the adopted decision.

Laws and regulations regarding the environmental impact assessment also strengthen the rights of inhabitants to participate in the decision making process. Simultaneously with the abovementioned preparation of the program initial public discussion is organized, and proposals and recommendations expressed during this discussion are included in the program. In its turn the procedure of public discussion of the working report is defined by the division V of Cabinet Regulation No. 87 adopted on 17 February 2004. The initiator of the foreseen activity is obliged to publish announcement in the newspapers at the same time with the submission of the working report in VPVB, indicating the locations, where the society can familiarize itself with the working report, submit proposals, as well as the time and place of the public discussion. The inhabitants are entitled to familiarize themselves with the offered solutions and express their opinion in regard of them within 20 days as of the announcement.

Initiator of the activity posts the prepared final report on the website, as well as publishes the announcement. Final report is available on the website for at least three months or until the day, when corresponding state institution or municipality adopts decision on the foreseen activity. Any person is entitled to submit in the bureau written comments on the final report within 20 days after the publication of the announcement in newspaper.

Justification of the project

Latvian Port Development Programme (2008-2013) has set a target — establishment of highly developed Latvian ports complying with the international standards and able to integrate in the unified transcontinental multi-modal transport corridors, offering services with high added value, thus dynamically increasing the volumes of cargoes to be processed and to provide high quality service of passengers.

Developing *the Freeport of Riga Development Programme 2009-2018* it was found that the main shipping route is too narrow in accordance with the international requirements and further development tendencies in the shipping sector. Therefore the port has set improvement of road, railway and waterway infrastructure as one of the strategic goals for this planning period, as well as promotion of their mutual tieback. Implementation of the project will provide also the achievement of another goal — promotion of safe entrance of vessels (including Panamax and vessels of larger capacity) in the port, eliminating any possibility of shipping accidents.

On 30 May 2008, the Environment State Bureau on the basis of application by the Freeport of Riga Authority and the initial environmental impact assessment performed by the State Environmental Service Lielriga regional environment authority adopted decision on the necessity of environmental impact assessment for the reconstruction of the access channel for ships entrance into the Port of Riga. On 3 April 2009, the

initial public discussion of the project took place, and on 16 April of the same year Environment State Bureau issued a program for the environmental impact assessment. According to the issued program working report was prepared, and announcements on the opportunities of society in regard of familiarizing itself with the prepared working report, participation in the public discussion and submission of written proposals were published in the newspaper "Latvijas Vēstnesis" on 17 August 2010 and in the newspaper "Neatkarīga Rīta Avīze" on 19 August 2010, in addition the initiator of the activity sent individual announcements to the owners (possessors) of the real estates located in area next to the locations of the proposed activity. Public discussion of the working report of the environmental impact assessment took place on 30 August 2010. Environment State Bureau assessed the prepared working report of the environmental impact assessment involving free-lance experts, as well as taking into consideration comments and proposals of the institutions and society and on 19 October 2010 issued a conclusion on the working report.

The Final Report of the environmental impact assessment has been prepared on the basis of the conclusion on the working report, as well as taking into consideration comments and proposals of society and other institutions.

Possible alternative options of the reconstruction of the access channel for ships entrance and their description

Two options of the ships entrance position into the Port of Riga are possible within the reconstruction of the access channel for ships entrance into the Port of Riga.

Both options of reconstruction have been evaluated in detail within the environmental impact assessment, and the most significant difference is the position of channel in the area of Milestibas island and Krievu sala — option 1 of the channel reconstruction foresees that shipping channel will be located near the right bank of the River Daugava in this area. Option 2 foresees that that shipping channel will be located in different location, near the left bank of the River Daugava. Farwater in the section between Rīnūži and pier KRS-2 (Krievu sala) is moved closer to the left bank of the River Daugava in parallel with the cordon line of the perspective bank pier of Krievu sala in this option, in addition with consideration that the bottom line of the left bank of the channel was located 50 m from the abovementioned cordon line of the pier. There are no significant differences between both shipping channel reconstruction options in regard of the shipping channel areas in the Sea Gulf of Riga and by Kundzinsala. In general route of the option 2 is 63 m shorter than route of the option 1. Schematic drawing of the access channel for ships entrance into the Port of Riga is given in Figure 1.

In both cases width of the channel bottom in the outer (sea) basin is assumed 190 m, bottom mark -17.80 m BS and the gradient of dugout slopes m=5 (1:5). Width of the channel bottom in the inner (River Daugava) basin is assumed 180 m, bottom mark -17.00 m BS and the gradient of dugout slopes m=5 (1:5). Bottom mark of the final part of the channel section to be reconstructed is foreseen -15.00 m BS, width of the channel bottom 180 m and the gradient of dugout slopes m=5 (1:5). Channel section to be deepened ends by the piers KS-34, KS-33 and KS-32 (PK 123+17).

In order to provide access to piers, four ship U-turn areas are foreseen. Two of these U-turn areas fit with the locations of depth changes of the channel. Access to the perspective piers of Ziemas port and the perspective piers of the northern part of Krievu sala has been designed with bottom mark -17.00 m BS, access to the perspective piers of the northern part of Kundziņsala has been designed with bottom mark -14.50 m BS, access to piers KS-34, KS-33 and KS-32 has been designed with bottom mark -15.00 m BS, and access to the branch of Sarkandaugava has been designed with bottom mark -10.00 m BS.

Depending on the type of ground to be excavated the riverbed deepening works can be performed by using dredge pumps, multi-scoop or, in separate cases, single-scoop dredgers. Total volume of ground to be excavated is approximately 14 million m^3. Excavated material is planned to be deposited in sea or, if the material can be used for construction works, its storage is planned in temporary pile. Wherewith several disposition sites of the excavated ground have been assessed — the existing ground dump site of the Port of Riga in the Sea Gulf of Riga and the planned dump site, as well as temporary ground dump site on the coast of the Sea Gulf of Riga by the Western breakwater of the River Daugava (see Figure 8.1). Out of the total volume of excavated ground storage of 8 million m^3 is planned in the existing sea dump site, 3-4 million m^3 — in the newly established sea dump site and 2-3 million m^3 — in the temporary disposal site.

Both the existing temporary disposal site of the Port of Riga, and the planned temporary disposal site are located in the Sea Gulf of Riga, in approximate depth of 20 m. In its turn location of the temporary disposal site is planned within the limits of the Freeport of Riga, on the side of sea behind the Western breakwater. Constructive solution of the planned temporary disposal site is adopted on the basis of fact, that operation period of this structure will not exceed 10 years. The temporary disposal site will be

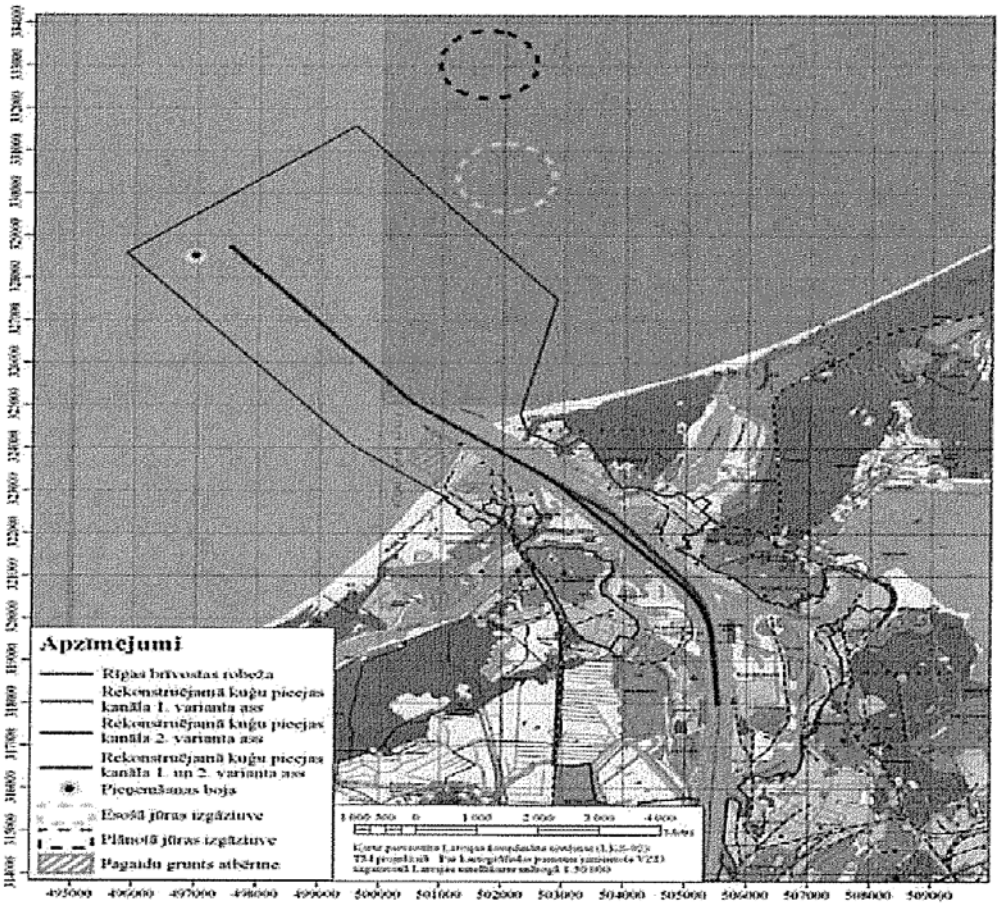


Figure 8.1. Route options of the access channel to be reconstructed

Legends
Border of the Freeport of Riga
Option 1 of the ship access channel to be reconstructed
Option 2 of the ship access channel to be reconstructed
Options 1 and 2 of the ship access channel to be reconstructed
Acceptance buoy
Existing sea dump site
Planned sea dump site
Temporary disposal site

separated from the rest of the basin with the separating breakwater structured until its height reaches +3.0 m, in case of necessity — even up to +5.0 m, correspondingly fortifying the slope from the side of the sea.

Possible impact on environment and the planned activities for reduction of the impact

Characterization of the depth marks

In general deepening of Daugava riverbed in different parts of the river will be carried out at depth between 1.5 m and 10 m. The least deepening will be in places, where the farwater of the reconstructed channel fits with the farwater of the current shipping channel. In its turn the largest deepening is expected in places, where the route of channel to be reconstructed will be directed (extended) along the so far practically untouched part of Daugava riverbed, i.e., closer to the river banks. Reconstruction will result in the increase of square of the cross-section of Daugava riverbed by 5 to 37%, approximately by 20% average. The least increase of square of the cross-section is expected in the river section, where the channel depth is foreseen 15.0 m, but the largest one — in places, where the channel depth is foreseen 17.0 or 17.8 m; in addition accesses to the piers are foreseen. In the ship U-turn areas increase of square of the river cross-section can even exceed the abovementioned 37%.

Changes of the nature of streams

In order to evaluate the impact of the reconstruction on the river streams in numbers — flow rate and speed, hydrodynamic modelling of the section of the River Daugava to be reconstructed has been performed within the assessment. Result of the modelling led to findings that the water levels in the River Daugava will practically remain unchanged, but the speed of stream will slightly decrease in the cross-section of river due to the increase of the square of the active cross-section of the riverbed. In general regarding numbers the speed of stream will remain in the same diapason after the construction, however the periods or duration when the speed corresponds with any of the values will change.

Changes in the nature of waves

Undulation processes directly depend on the speed and direction of wind, as well as on the main parameters of the water object (depth, length, width, bank shape etc.). Taking into consideration that changes of depth and shape of Daugava riverbed are foreseen within the reconstruction, there is an opportunity that undulation processes can also change. In order to evaluate the potential changes, modelling of the undulation processes in case of significant storm (model storm) was performed within the hydrodynamic modelling.

Depth and width of the channel will be larger after the reconstruction, and in case of storm the waves will reach deeper into the territory of the Freeport of Riga. Height of waves in the River Daugava opposite to the branch of Vecdaugava can exceed 0.9 m (approximately 0.3 m higher than under current conditions), and after reflection to Žurku sala the waves will spread above along the River Daugava. Comparing both

reconstruction options, slightly larger undulation is expected in option 2 due to more significant deepening volume above Krievu sala.

According to the modelling results undulation by the piers will also slightly increase, however, comparing the calculated wave height values with the passport data on the allowable calculated values of maximum wave height of the corresponding piers, a conclusion comes that the maximum height of waves will not exceed the allowable values after reconstruction in any of the options.

Movement of silts and bank erosion

Reconstruction of the channel significantly increases and unifies the depths in lower River Daugava, thereby reducing the carrying capacity of stream sediments and possibilities of the sedimentation caused by the stream and erosion. Assessing the annual potential changes of depths it was found that clogging of the riverbed exceeding 25 cm a year is expected in the upper part of navigation channel of the Freeport of Riga — between Vanšu Bridge and entrance into Andrejosta. Clogging of the piers MK-3, 4 can exceed 0.75 — 1 m per year, but the clogging of Riga Passenger Terminal piers JPS-1, 2 can exceed 25-50 cm per year.

Deepening of the riverbed can result also in acceleration of erosion of the unfortified banks due to the undulation, as well as additional threat to the banks due to possible land slide in the underwater slopes of the channel bed. Such land slides can be instant and they are included in the design of deepening works. However, during the operation of channel operation decrease of gradient of the channel side slopes under influence of different factors (streams, wind waves, movement of watercrafts, internal waves) cannot be ruled out. Such land slides can endanger:

- unfortified sections of the banks — reaching the bank;
- stability of piers — reaching the pier line.

The most endanger sections of the banks in both options are Mangaļu pussala, opposite to the U-turn area by the entrance into Ziemas port, Krievu sala and Kurpnieku sala near the borders of U-turn area of Kundziņsala. Risk zones include also the coastal zone of Mīlestības sala, where a significant undulation impact is expected. Danger below and above the river branch of Vecdaugava, on both sides of Southern entry of the basin of Riga universal terminal and the coast zone of piers MKR-1…5 of PAS "Terminālis Vecmīlgrāvis" is potentially possible in the reconstruction option 1. In its turn bank erosion risk throughout the length of Žurku sala in the reconstruction option 2, and bank erosion throughout the length of Mīlestības sala is also possible.

Taking into consideration these conditions, performance of bank monitoring and, in case of necessity, fortification is recommended. In order to avoid emergency situations caused by sudden deformation or collapse of hydrotechnical structures, technical condition of the operating piers and bank constructions must be followed carefully throughout the section of deepening, paying attention to new splits and deformations in the building constructions. In case any changes are observed in the

existing buildings, inspection, evaluation of the technical condition and, in case of necessity, reinforcement must be carried out.

Water quality

Since both the deepening works, and disposition of the material obtained during these works in the sea temporary disposal site or dump site will promote temporary water suspension in the Sea Gulf of Riga, for the purposes of reduction of this impact following activities are recommended during reconstruction:

• use of equipment with as minimal suspension emission as possible for the deepening works (both in the River Daugava and the Sea Gulf of Riga). The least suspension and water pollution is usually caused by dredge pumps loosening the ground to be excavated with the help of milling cutter, however larger suspension is caused by dredgers (especially multi-scoop dredgers) and the dredge pumps loosening the ground to be excavated with the help of water jet,

• in case of necessity assembly of geotextile "curtains" must be performed thus significantly delaying the spread of suspended water in the adjacent basin;

• equipment of water-flow pipes of the temporary disposal site dams with filters;

• transportation of the ground to the spoil site within the limits of possibility should be performed by foreseeing the ground pumping to the disposition site through pipelines.

Air quality

Air quality in the territory of the Freeport of Riga is mainly influenced by the industrial activities in this particular area, but pollution caused by motor transport plays the dominating role in the adjacent territory of the Freeport. Reconstruction of the access channel will promote development of the port, and increase of the ship movement intensity is foreseeable. Therefore impact on air quality caused by deepening work equipment and ship engine emissions has been assessed within the work. The most significant polluting substances typical for the engine emissions are nitrogen dioxide, carbon dioxide, sulphur dioxide, particles PM_{10} and particles $PM_{2,5}$.

Maximum concentrations of the polluting substances will develop within direct reach of the access channel (in basin of the River Daugava), however these concentrations will be insignificant outside the territory of the Freeport of Riga. Summarizing the pollution caused by ship emissions and concentrations caused by other sources (including manufacturing objects, motor transport emissions) it was found that air quality standards will not be exceeded, except for one local territory by Eksporta Street between Muitas Street and Valdemāra Street.

Sulphur dioxide concentration already exceeds the allowed level in this territory and the proportion of pollution caused by shipping traffic is insignificant in the summary concentration (background concentration of sulphur dioxide is 40.2 $\mu g/m^3$, but the pollution caused by the shipping traffic — 0.08 $\mu g/m^3$. In addition, in comparison with the situation in 2008, the sulphur dioxide pollution caused by the ship emissions

will slightly decrease even at the forecasted increase of the total number of ships, since the movement will grow in the northern part of the port, but decrease in the southern part near city centre).

Noise level changes

No significant noise level increase is foreseen as a result of construction and operation of the deepened access channel. Calculating the difference between the planned situation after reconstruction and the real situation it was found that the noise level would decrease or remain unchanged in the section between Passenger port and Mīlgrāvis channel, and this can be explained with the reduction of shipping intensity in this section. In its turn increase of noise level to 2 dB(A) is expected in the section between Mīlgrāvis channel and the estuary into the Sea Gulf of Riga in within direct reach of shipping routes. Such an increase of noise level is to be considered insignificant. It is expected, that the noise thresholds will not be exceeded in any of the adjacent territories of the River Daugava due to operation of the deepened channel.

Possible impact on flood territories

The expected impact has been assessed as possible changes of the flood territories after the reconstruction of the channel. In general, calculation of the flood territory showed that neither deepening of the shipping channel, nor choice between the deepening options has significant impact on the configuration of the flood territory. Assessment confirmed that sea levels are dominating in this territory, since the territory is located in an estuary of a river.

Quality of the ground to be excavated

Cabinet Regulation No. 475 adopted on 13 June 2006 "Procedures regarding the Cleaning and Deepening of Surface Water Bodies and Port Basins" specify criteria and define quality requirements of the ground to be deposited in the disposal sites in the sea after deepening of the basins. Information regarding bed pollution researches in Daugava riverbed available in the archives of the Freeport of Riga Authority is used for the characterization of the bed pollution. The information available characterizes both the current pollution of Daugava riverbed and pollution level of the already moved ground before its excavation. This information provides opportunity of assessment of the general pollution level in Daugava riverbed. Results of the chemical analyses of ground shows that solely the nickel and oil product concentration in previously analyzes samples exceed the first threshold value of ground quality specified in the Appendix to Cabinet Regulation No. 475 adopted on 13 June 2006; however, it is lower than the second threshold value. No clear tendency in regard of the changes of pollution level in parallel of the longitudinal profile axle of river is observed on the basis of the information available, and the previously observed changes of pollution level are likely occasional, and this is not related with distance to the river's fall into the gulf, but with the dominating operation of piers located in the corresponding river sections.

In order to commence the river deepening works, technical design must be developed, and according to the option of route position specified in this design work program of performance of ground analyses has to be received from the State Environmental Service in accordance with the requirements of Cabinet Regulation No. 475 adopted on 13 June 2006. Part of the ground — with quality indices confirming this ground has no harmful impact on living organisms and storage in the disposal site in the sea is allowable according to the additionally performed analyses — will be stored in the existing ground dump site. As soon as the capacity of the existing ground dump site will be fully used, the rest of the ground will be deposited in the ground dump site to be established following the aforementioned quality indices. Separate kinds of ground with engineering geological indices sufficient for construction works will be stored in the temporary disposal site by the Western breakwater.

If the results of analyses performed in accordance with the work program of performance of ground analyses issued by the State Environmental Service will confirm pollution of the ground, this part of ground will be delivered to a special location for purification purposes or yard with A or B category permit for storage of this kind of waste.

Impact assessment on water ecosystem

Any transformation works of large scale water course bed in natural water courses are related with significant impact on the biological resources of the water courses affected by the activity. The significant kinds of unfavourable impact are — transformation of life-world by executing deepening works in the River Daugava and covering of life-world with ground while depositing ground in the Sea Gulf of Riga. Transformation or covering of fish life-world can have significant impact lasting for several years in the direct reach of the location of execution of the works until the previous productivity and biota of the life-world renew.

At the same time it can be forecasted that the reconstruction of the shipping route of the Port of Riga will have minimum impact on fish fauna and its structure in lower River Daugava and the Sea Gulf of Riga in general. That is mainly determined by the small proportion of the life-world affected in the total life-world acreage in the Sea Gulf of Riga and the lower River Daugava. Although the bed deepening works will be executed in the fish migration "corridors", they will directly affect comparatively narrow band, thereby fish migration opportunities in the lower River Daugava in general will retain. Impact of the reconstruction works of the shipping route on the natural populations of fish species included in the laws and regulations regarding nature protection should be assessed as insignificant. Majority of the protected fish found in lower River Daugava and in the waters of the southern coast of the Sea Gulf of Riga are travelling fish or fish species, whose populations' existence does not directly depend on the basins affected by the deepening and ground disposition.

As opposed to the small foreseeable impact on the fish of protected species it is expected that the planned reconstruction works of the shipping routes of the Port of Riga will cause significant losses for the fisheries industry, mainly as temporarily lost fisheries production. According to the equipment to be used for the deepening works,

work execution season and other factors exact calculation will be performed for the compensations of fisheries losses.

In order to reduce the unfavourable impact on biological resources, it is recommended to reduce the acreage of the affected life-world, reducing the basin acreage covered with sand as much as possible. Operation of the disposal site by the Western breakwater of the River Daugava for as short period as possible is also desirable, as well as soon renewal of the current hydromorphological condition of the affected basin. Other activities described in the report in detail include both restrictions of activity time, and conditions for the execution of works.

Impact on the biological diversity of the territory and vicinity

Deepening of Daugava riverbed performed within the project of reconstruction of the access channel for ships entrance into the Port of Riga will not cause significant negative impact on land biotopes and the related species.

Impact of the possible temporary disposal site in the sea by the Western breakwater on nature reserve zone of nature park "Piejūra" called "Daugavgrīva" has been assessed in detail. This territory has been included in the list of especially protected nature territories of European significance "NATURA 2000" of Latvia. Nature reserve zone is a significant protection territory of open inland dunes with hair-grass and seaside meadows. This territory is adjacent to the Sea Gulf of Riga and has formed under direct influence of sea, estuaries of large rivers and human activity. Dominating relief shapes are related to different development stages of the Baltic Sea and the Gulf of Riga, and they serve as original testimonies of the coast development process. Taking into consideration these conditions, the assessment included the assessment of the possible temporary disposal site according to the guidelines developed in the European Union.

Taking into consideration the information regarding the constructive solution of disposal site and its occasional status, as well as possible impact of the disposal site on hydrological, hydrogeological and silts condition, no significant changes of negative factors important for the existence and distribution of natural values of the nature reserve zone of nature park "Piejūra" called "Daugavgrīva" (raise of groundwater level, flood of the territory, washout of the sea coast). Since the establishment of disposal site in planned not in the territory of the reserve zone, but next to it, its establishment foresees neither decrease of the acreage, nor fragmentation of this territory. Direct negative impact of the establishment of disposal site on the key species of the reserve or their density (this concerns species of birds, invertebrates and plants) is unforeseeable (direct spoilage or destruction of the life-world of the reserve zone will take place).

Possible impact on the cultural history environment and recreational resources

Deepening of the shipping channel will not have significant impact on the territory and its vicinity, as well as the heritage. At the same time archaeological findings are possible during execution of construction works. In such case the executor of construction works is obliged to interrupt the construction works and report the State Inspection for Heritage Protection.

The most significant impact on landscape is expected in regard of the planned temporary disposal site by the Western breakwater. Establishment of the temporary disposal site will result in appearance of new territories of sands by the Western breakwater formed instead of natural basin of the Sea Gulf of Riga. Establishment of the temporary disposal site will have the most significant impact on the landscapes of local importance, it will be well detectable from the north-eastern part of Daugavgrīva beach and while riding on water transport means between the breakwaters. The temporary disposal site will have dominating meaning in the view directions towards Western breakwater, thereby significantly changing the landscape in comparison with the current situation. The sand spoil site will be visible from other nearest visitors' locations (Eastern breakwater, Vakarbuļļi beach), however it will not have dominating meaning in the landscape views.

The landscape should be considered a technogenic landscape in the phase of the construction of temporary disposal site. Volume of the impact on landscape will change in the course of time, in addition, by forming the temporary disposal site gradually it will cause certain habit thereby reducing the meaning of influence from the observer's point of view. Together with the development of the nearby territories (potential construction of oil terminal by Ziemas port) and changes of the current mainly natural landscape to industrial port building landscape, the impact caused by the temporary disposal site of sand will also decrease. In accordance with the applicable laws and regulations at state and municipal level restrictions related to landscape protection or conditions in regard of the development of landscapes are not defined in the location of the proposed activity, therefore limiting factors for the implementation of the planned activity from landscape aspect are not found.

There are several cultural monuments in the estuary of the River Daugava. Complex of construction buildings for the River Daugava estuary banks and Komētforta dam are the nearest to the location of the proposed activity. Any construction works and other works with possible transforming effect on the cultural monuments or landscape in the protection zones of cultural monuments should be carried out in accordance with the restrictions defined in the Protection Zone Law, as well as implementing activities for preservation of the cultural monuments.

Deepening of the shipping channel in the estuary of the River Daugava will increase the meaning of the River Daugava as an object of tourism and recreation by providing access to larger cruise ships. Deepening will not affect tourism and recreation activities in the adjacent territories of the River Daugava, because the accessibility of the waters of the River Daugava and embankments will remain the same. Impact of the temporary disposal site on the recreation resources will show by confining the sea coast by the Western breakwater. This section of the beach is used for recreation purposes less intensively than the nearest beaches in Daugavgrīva (by the central exit to the sea) and Vakarbullļļ. It is expected that the area confined by the disposal site will be less interesting to the vacationers as a place for recreation purposes, however the beach will be available to public for walks. In addition the planned lifetime of the temporary disposal site of ground should be taken into consideration, therefore impact on recreational resources will be reflexive.

Characterization of the possible environmental impact of the excavated ground disposition sites

Impact on the water ecosystems and biological diversity of the territory has been characterized in the according chapters of this report. Additionally to these impacts the impact of ground storage on other environmental factors has also been assessed. It was found during the assessment that ground disposition in the temporary disposal site or in the see would not cause significant impact on hydrological, hydrogeological and silts condition.

While executing the deepening works and moving the excavated ground impact of additional undulation in the coastal zone and intensified erosion of the unfortified banks are possible. Thereby prevention of such impacts by choosing technological solutions causing as little undulation as possible is recommended, as well as transportation of the ground to the spoil site by foreseeing pumping of the ground to the deposition site by pipelines.

Social and economic assessment of the proposed activity

Transit cargoes have important role in the development of all ports of the Baltic Sea region and transport sector. International practice shows that diversion of the transit cargoes to the ports affects two groups of factors:

• condition of infrastructure and development plans (ports, surface and coastal infrastructure, service infrastructure, access),
• external factors, for example, economic growth, financial markets, changes in population, labour market (availability, education etc.), transport costs, environmental considerations and political relationships.

Development of regional and cross-border infrastructure is also very important for the Port of Riga as a transit port and promotion of its development. Improvement of the transport chain promotes increase of the cargo volumes and attraction opportunities of new cargos, as well as services related to cargos shipment. Reconstruction of the access channel for ships entrance into the Port of Riga will promote development of infrastructure and safe shipping, thereby promoting economical development of the port itself as well as increase of the volume of services related to the port operation. Benefits for the sea transport sector will be provided by two key factors — increase of the proportion of heavy-tonnage vessels and shipping safety.

Direct and indirect losses caused for the fisheries should also be mentioned together with the benefits for the Freeport of Riga. More and more significant restrictions on fisheries are expected together with the development of port and shipping safety. No fishing is possible in the shipping route, as well as no U-turn of ships is possible in the basins, by the piers and in other territories.

Loss of lower River Daugava (below Vanšu Bridge) as a fishing area is expected as development of the Freeport of Riga continues in the long term. One of the possible solutions is change of the fishing area by moving the activity to the section of river

above Vanšu Bridge to Riga HES. At the same time this solution will definitely cause additional fishing costs to the fishermen living below the lower River Daugava.

Monitoring

Recommendations for monitoring in the phase of construction and operation of the proposed activity have been prepared on the basis of possible assessment of impacts.

Hydrological conditions

The Freeport of Riga already performs regular measurements of the speed of stream for the provision of navigation of the River Daugava. This work should be carried on after the reconstruction. Improvement of the data base of measurements by collection and saving of the historical measurement data would be recommended. Measurements of flow rates and water levels are performed by SIA "Latvijas Vides, ģeoloģijas un meteoroloģijas centrs" (Limited Liability Company "Latvian Environment, Geology and Meteorology Centre") in the hydrometrical stations in the lower pool of Riga HES, Andrejosta and Daugavgrīva, and this is in general sufficient to perform analysis of the hydrological conditions in the territory of the Freeport of Riga.

Bank erosion

In order to assess the bank erosion processes in the unfortified sections of the banks of the River Daugava, bank monitoring is recommended determining arrangement of the banks on regular basis by using repeated geodesic measurements in the stationary observation posts. In case decision in favour of bank fortification is adopted by building protecting constructions, no further monitoring is necessary. If the banks are fortified applying simple methods (special plantations, unplanned and unfortified piles of stones or wooden piles etc.) and executing them without development of its technical design, the monitoring observations should be carried out also after the implementation of these activities.

Ground excavated during the deepening works

Performance of the chemical and ecotoxicological analyses of the ground in accordance with the farwaters reviewed by Helsinki commission for the disposition of ground excavated during the deepening works must be provided before the commencement of works. In order to receive the work program of performance of the chemical and ecotoxicological analyses, information concerning location and borders of the object to be deepened, planned depth of the object after deepening, volume and characterization of the ground to be excavated must be submitted in the State Environmental Service.

Disposal site in the sea

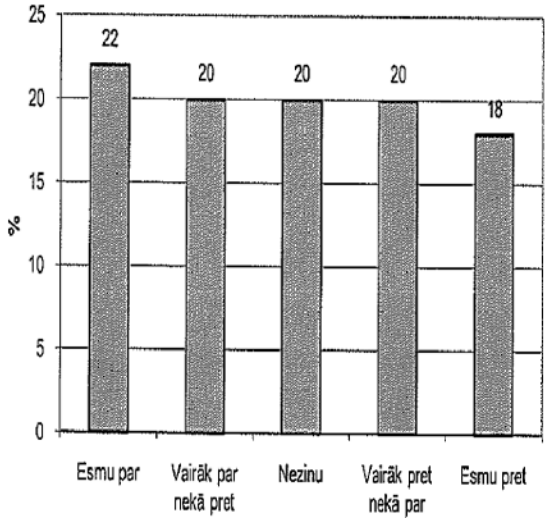
The Freeport of Riga is obliged to perform monitoring of the disposal sites in the sea, where the ground to be excavated during deepening works will be deposited. Monitoring must be performed in accordance with the program previously coordinated with the State Environmental Service.

Opinion of society regarding the proposed activity

Questionnaire of the inhabitants of Riga residing in the ambit of the location of project implementation (Vecmīlgrāvis, Mangaļsala, Bolderāja, Voleri, Daugavgrīva) was performed within the environmental impact assessment of the reconstruction of the access channel for ships entrance into the Port of Riga. Goal of the questionnaire was to study attitude and personal interest of the inhabitants in the reconstruction of the access channel and to inform inhabitants about this project.

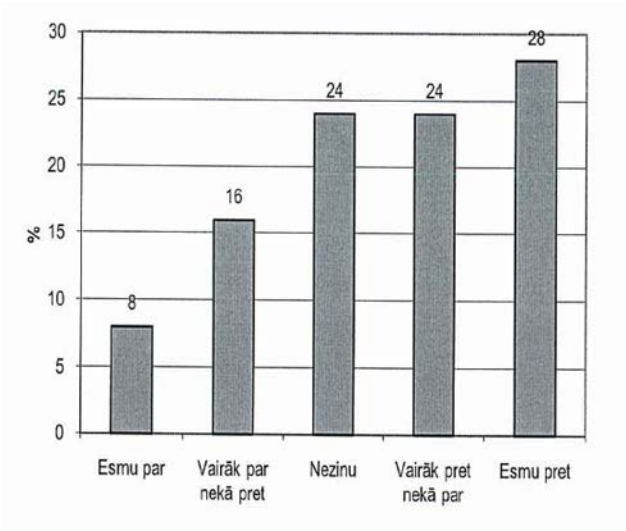
Inhabitants were asked to answer, if they would be in favour of or object to the reconstruction of channel, if the environmental impact assessment would result in permit to commence the reconstruction issued by state institutions of environmental protection. In general attitude to the implementation of the project is quite ambiguous (see Figure 2), 22% of the respondents support this project, 20% of the respondents rather support the project than not, 20% of the respondents do not have any opinion about the necessity of the project, 20% of the respondents rather do not support the project, and 18% of the respondents are against the implementation of the project.

Further use of the excavated ground is an important aspect of the project, therefore question about inhabitants' attitude (support or disagreement) to the establishment of the temporary disposal site in the sea by the Western breakwater (see Figure 3) was included in the questionnaire. Most of the respondents supporting such a temporary option of disposal site reside in the residential area on the other side of the River Daugava — in Mangaļsala, Vecmīlgrāvis, therefore they do not take this disposal site as obstruction, as well as stress that this is a temporary option.



In favour
Rather in favour than against
I don't know
Rather against than in favour
Against

Figure 2. Opinion of the inhabitants regarding the implementation of project



In favour
Rather in favour than against
I don't know
Rather against than in favour
Against

Figure 3. Opinion of the inhabitants regarding option of the position of the temporary disposal site

Comparison and assessment of alternatives

Environmental impact assessment includes review of two options of reconstruction of the access channel with the most significant difference in position of the channel in the region of Mīlestības sala and Krievu sala. Hydrodynamic calculations with assessment on the stream condition, water level and configuration of the flood territories, as well as assessment of the movement of silts and sedimentation/erosion processes have been performed for both of these options. Undulation model has also been prepared and impact on undulation condition in lower River Daugava has been assessed. Taking into consideration the changes of these processes impacts have been assessed both before and after the implementation of activities for the prevention or reduction of environmental impact (see Chapter 5). In total 57 different criteria regarding both on the phase of construction and the phase of operation have been assessed within the report of the environmental impact assessment. 39 of these criteria are related to the impacts caused by the deepening of the access channel, but 18 — with the disposition possibilities of ground excavated during the deepening works.

The performed assessment confirmed that environmental impacts caused by alternative reconstruction options of the access channel should be assessed equally, and significant differences in volume of impact or character are not found. In the opinion of experts from the environmental protection point of view the option 1 of the reconstruction has been proposed for further designing as more favourable solution, because of following reasons:

• it is located in the area of the route of port access channel,

• reconstruction option 2 contains bank erosion risk in throughout the bank zone of the territory of nature park "Piejūra" called "Mīlestības sala".