Nord Stream
The new gas supply route for Europe

Section 13

Prevention and mitigation measures

13 Prevention and mitigation measures

The EIA process identifies negative impacts and provides proposals for mitigation measures for the detailed technical planning of the project. The primary goal of the process is to prevent identified negative impacts by for example finding another technical alternative. If it is impractical to prevent a specific impact (i.e., no technical or economically feasible alternative is available), mitigation has been planned. In cases where it is not practical to identify prevention or mitigation measures to reduce significant unwanted environmental impacts, compensation shall be considered.

Mitigation measures implemented prior to the submission of this EIA report (during the planning phase) are presented in Chapter 13.1. If any remaining, or 'residual' impact has been foreseen and identified as significantly negative, further measures have been proposed for consideration by the project developer during the implementation phase of the project. Prevention and mitigation measures have been planned for the implementation phases of the project after the EIA phase has ended (see Chapter 13.2).

Mitigation and prevention measures for the decommissioning phase of the project will be planned in accordance with prevailing regulations at the time of decommissioning.

To some extent, the impact assessment is subject to uncertainty (see Chapter 12). Therefore, measures for mitigating unplanned and unexpected impacts (Chapter 13.3) have been included separately.

METHODS TO MITIGATE ENVIRONMENTAL IMPACTS

Prevention
Measures to prevent impacts by changing or replacing the planned activities during planning phase. For example, it has been possible to prevent negative environmental impacts by locating the pipelines as far as possible from sensitive or valuable areas, such as Natura 2000 areas.

Mitigation
If no technical alternative is available, the next step is to mitigate prior and during construction and operation. The most efficient method is to mitigate as close to the impact source as possible. For example, contact with cultural heritage by anchor wires can be mitigated by carefully planning the anchor patterns and using buoyancy to raise the anchor wires.

Compensation
Measures to compensate for impacts that cannot be mitigated. 'Compensation' can be economic (e.g., paying fishermen for reduced fishing areas) or physical (e.g., generating ecosystems in another area than the one affected by the project).

13.1 Prevention and mitigation measures prior to EIA submission

This section describes prevention and mitigation measures in the Finnish EEZ that have been implemented during the planning (feasibility and design) phase, which means prior to submission of this EIA report.

13.1.1 Route surveys and route optimisation

The established route alternatives for the pipeline are of great importance from environmental, technical and economic points of view. The development of pipeline route is an iterative process evolving from the NTG studies conducted between 1998 and 2000 (see Chapters 2 and 6). The strategic selection objective is to identify an installation corridor that provides an efficient, reliable and secure pipeline route corridor whilst keeping environmental impact to a minimum. This process is based on extensive surveying and engineering evaluation from the initial concept through to the selection of the installation corridor.

Survey results provide the basis to realise the environmental benefits during the engineering design phase (route selection and optimisation). During the survey, areas that may influence the long term integrity of the pipeline such as unsuitable seabed soil conditions and irregular seabed morphology are identified. Detailed knowledge of the complex seabed morphology allows the engineer to design the route with minimal seabed intervention works. Also the length of the route and avoiding critical seabed conditions, such munitions and shipwrecks are an integral part of the optimisation process.

Location and precise positioning of third party facilities such as electrical and telecommunications cables ensures that there is minimal interference to existing infrastructure within the Finnish EEZ.

High resolution surveys of the selected alignment (so called “munitions screening surveys”) provide detailed assessment of:

- cultural heritage value of wrecks and the development of procedures to ensure there is no impact during the pipeline installation;
- munitions that may influence the long term integrity of the pipeline and develop procedures to allow the safe installation and operation of the pipeline;
- anthropogenic debris, such as barrels, that may have a potential impact on the environment if disturbed during the pipeline installation.

There are two main route alternatives and one sub-alternative studied in the Finnish EEZ (see Chapter 3.2 and Chapter 6). Route alternatives within the Finnish EEZ are largely dicta-

ted by the geology of the Gulf of Finland. It should be noted that the rough topography of the sea bottom within the Finnish EEZ limits the option of re-routing around, e.g., cultural heritage sites and requires additional mitigation measures.

13.1.2 Technical solutions for pipeline support: intervention works

Seabed intervention works comprise various methods for achieving a more level foundation for the pipelines on the seabed. The outcrops in the Finnish section consist of relatively hard material, such as hard till or crystalline bedrock. One alternative to achieve a level seabed could have been 'peak removal', by blasting significant outcrops from the seabed and/or dredging of the sediments. The advantage of this alternative is that freespans are avoided or minimised, leading to a lower risk to fishing activities. However, the environmental impacts of removing these outcrops (e.g., on marine mammals, on fish and on water quality) could be significant and have been considered unacceptable. In order to prevent these impacts, it was decided during the planning phase that peak removal or dredging shall not take place in the Finnish EEZ and that seabed intervention works will include only rock placement (please refer to Chapter 3.5.3 for a description of rock placement).

The amount of rock material needed for the intervention works has been minimised during the detailed technical design by, e.g., re-routing the pipeline in difficult areas. Thereby, the sediment spreading related to the placement of large amounts of rock has also been minimised.

13.1.3 Logistics

In the optimisation of the logistics, including pipe supply, it has been ensured that the transportation distances are minimised as much as possible, and thereby the use of fuel minimised. This mitigates environmental impacts such as air pollution. At the same time, it reduces costs.

13.1.4 Public dialogue

An important measure to mitigate negative impacts in relation to public opinion and concern has been an ongoing dialogue with relevant stakeholders. From the start of the EIA process, Nord Stream AG has been in contact with various groups with direct or indirect interests in the project and its impacts, to ensure that all possible environmental and socioeconomic effects are discussed and that possible solutions are properly assessed. The purpose of this consultation procedure, which will continue throughout the entire construction phase and initial operation of the pipeline system, is to ensure that appropriate solutions are chosen and that a common understanding is achieved.

13.2 Mitigation of impacts from planned activities after the EIA submission

As Chapter 8 “Environmental impact assessment” indicates some of the planned activities during construction and operation will result in impacts on the environment. To mitigate and prevent the impacts as much as possible, a number of mitigation measures will be applied after the submission of this EIA report, as described in the following sections.

13.2.1 Pre-installation surveys

There are two phases of pre-installation surveys; the anchor corridor survey and the pre-lay survey.

In order to prevent damage to sites of cultural heritage and minimise the risk of unplanned contact with munitions during the anchoring of the lay barge, a detailed anchor corridor survey is required. Nord Stream AG commenced this survey in the Finnish sector in mid-November 2008. The survey covering the entire length of the pipelines should be completed in the third quarter of 2009. The survey will mainly be conducted in a 1 km wide corridor to each side of the pipeline routes. In shallower waters (below 100 m) the survey corridor will be 800 m either side of the route. As with the munitions screening surveys (see Chapter 13.1.1), the anchor corridor survey has a series of phases which commence with the geophysical phase followed by visual inspection and concluding with expert evaluation of acquired results. The Finnish National Board of Antiquities will assess the cultural heritage value of wrecks and munitions will be evaluated by a marine warfare expert.

In critical sections defined based on the survey results, anchor patterns will be developed and submitted to the appropriate authorities.

Prior to the commencement of any construction works, whether it is the placement of rock material for supports or the installation of the pipeline, the area of directly effected seabed will be surveyed to verify the seabed conditions i.e. that there are no new obstructions. These pre-lay surveys will be carried out using an instrumented remotely operated vehicle (ROV).

13.2.2 Munitions clearance

To ensure safe installation and operation of the pipeline all munitions with +/- 25 m of the pipeline will be cleared. Also clearance of additional mines within the anchor corridor may be required to allow the safe anchoring of the lay-barge The question of physically removing the ordnance affecting the pipeline route has been addressed by the appointed munitions experts, with the conclusion that this option would incur greater risk. Safe and proven clearance methods will be used and it is envisaged that these methods will be similar to those

previously used to dispose of munitions in the Baltic Sea i.e. as implemented by the navies of Sweden, Finland and Estonia.

Clearance of munitions will be conducted in accordance with a clearance plan that will be developed in conjunction with relevant Finnish authorities. The clearance plan will include a permit requirements, clear risk assessed procedure for the technical performance of the work together with the monitoring plan to minimise impact to marine mammals, fish and birds.

Permits may be required for the clearance of munitions within the Finnish EEZ. Nord Stream is in consultation with the Ministry of Employment and Economy and the West of Finland Environmental Permit Authority to establish the legal basis for the permitting procedure.

The Finnish Boarder Guard and Ministry of Defence may be involved with the coordination of the clearance operation. GOFREP will be consulted with regard to the identification and implementation of demarcation zones and assurance of safe shipping movements for all vessels in the surrounding area.

The technical procedure of the munitions clearance will address:

- Pre-detonation inspections: ROV based verification survey using high resolution cameras to record the seabed conditions and the surrounding environment including presence of existing infrastructure, cultural heritage, anthropogenic debris (e.g. barrels) and other munitions;

- Munitions classification: where all munitions will be identified and confirmed (type, model and amount of explosive material based on historical data);

- Disposal: method involves placing a small charge next to the identified live or suspected live ordnance on the seabed using a small specially developed Remotely Operated Vehicle (ROV). These charges are then detonated acoustically from a surface support ship located at a safe distance from the target;

- Post detonation survey: to verify successful detonation and if necessary remove any remaining large residual items of metal that are still present in the area and which could create further pipeline installation difficulties. ROV utilising manipulators and special baskets will also carry out this operation.

Although the impact of munitions clearance on marine mammals is assessed to be low, there remains a risk that marine mammals are affected by munitions clearance activities. To mitigate the risk to marine mammals, fish and birds there are two phases where measures can be implemented to minimise the impact: the planning and execution phase.

In the planning phase, where possible the schedule for munitions clearance should consider the seasonal variations in the environment. All work should be carried out during the ice-free period in the Gulf of Finland and away from important timings for fish spawning and marine mammal migration.

In the execution phase expert observations are preferred as the primary mitigation method. The use of unproven and complex technology such as bubble curtains is not recommended as this not the standard method used by the navies in the Baltic and increases risk during the performance of the work. Observational monitoring should be made to assess whether:

- Marine mammals are within the risk area; if present the mammals should be frightened away acoustically. This could include the use of acoustic harassment devices ('pingers'), both for seals and harbour porpoises, since they have proven to be effective in driving the animals away from the source /409/. However, the mean avoidance zone around a pinger might be small (500 m or less are reported for porpoises) /480, 481/. Thus, it might be necessary to deploy several pingers at different distances from the mine site.

- Fish shoals are in the area; if shoals are identified through acoustic survey then the munition disposal should be delayed.

- Diving seabirds (seaducks and auks) are in the area; if diving birds are identified then the munitions disposal should be delayed.

The radius of the exclusion will be adjusted according to type of munitions, sound propagation conditions and subject of protection.

As discussed above the mitigation measures focus mainly on visual and acoustic observations and monitoring. Other measures should be considered relate to the effectiveness of the observations due to light and sea conditions, such as:

- Limiting the blasting to calm to slight sea conditions and daylight hours (between one hour after sunrise and one hour before sunset).

- Ensuring observations commencing at least 30 minutes before each detonation.

- Ensuring observations for marine mammals and birds commence no earlier than 20 minutes after sunrise.

13.2.3 Seabed intervention works

The seabed intervention works will be carried out with a dedicated fall-pipe vessel. The fall pipe is lowered close the seabed where the head is positioned by means of thrusters on the attached Remotely Operated Vehicle (ROV). Rock placement is then controlled by the ROV which can be manoeuvred along a pre-defined track to place rock at the required position, quantity and to the dimensions provided through the detailed engineering design. The ROV is fully instrumented to allow visual and bathymetric survey of the placed rock.

The use of an instrumented fall pipe ensures that the rock is placed with great accuracy and minimises sediment spreading. This is an optimal solution both from an environmental and an economic point of view.

13.2.4 Pipe-laying and anchoring

During the construction process the anchors or anchor wires could affect the wrecks of high cultural heritage value, munitions or debris such as barrels. Consequently the anchor handling tugs pipe-lay barges and survey vessels will be provided with information on these sites, as well as the protection zones around these sites.

Dedicated anchoring plans will be prepared prior the construction period to prevent impacts on these sites. Such plans may include:

- adjusting the anchoring pattern (placing the anchors in a different configuration than that used normally);
- laying the anchors with the anchor wire under tension so the anchor handling tug is not directly over the drop location and the length of the length of wire on the seabed is kept to a minimum;
- using mid-wire buoys (Yokohama fenders) to lift anchoring wires over the wreck/munitions sites;
- use of 'live anchors' i.e. replacing anchor(s) placed on the seabed with tugs providing the reaction as required by the lay-barge.

The standard installation tolerance for the pipeline is +/- 7.5 m i.e. the pipeline will be placed within a 15 m wide corridor on the seabed. In critical areas, such as in close vicinity to a shipwreck of high cultural value, the installation precision can be improved. By implementing different controlling measures, such as ROV touchdown monitoring and/or acoustic beacons, the position of the pipeline can be controlled with +/- 2 to 4 m accuracy. It is therefore possible to ensure that established safety zones, e.g., around wreck sites or barrels, are respected.

A controlled installation procedure will be discussed with the Finnish National Board of Antiquities regarding areas where archaeologically significant wreck sites are closer than 50 m to the pipeline route. Each controlled installation procedure will include descriptions of the specific site, the integrity of the wreck site, assessments of the site's significance, illustrations of the site, detailed drawings of the pipeline routing around the site and descriptions of the controlling measures that will be employed to ensure safe passing of the site.

The cultural heritage protocol, which will be established in consultation with the Finnish National Board of Antiquities, will include guidelines for actions to be taken in case of accidental finds or observations of cultural-heritage artefacts or sites. The protocol will include instructions for documenting observations and dealing with artefacts that may be encountered during construction and inspection work.

13.2.5 Traffic control

Maritime traffic in general may be affected by pipe-laying operations, although it will be for only a short period. To minimise safety and environmental impacts and to avoid critical situations, e.g., collisions and oil spills, good communications are essential.

Within the Finnish EEZ the interface between maritime traffic and the pipe-lay spread will be monitored and controlled through the Gulf of Finland Reporting System (GOFREP). The GOFREP system is approved by the International Maritime Organization (IMO) and is a joint operation between Finland, Estonia and Russia.

The route within the Finnish EEZ falls within two monitoring zones. The south western section is monitored by Tallinn Traffic in Estonia and the remainder of the Finnish EEZ is monitored Helsinki Traffic in Finland. St. Petersburg Traffic in Russia monitors the Russian sector including the sea area north of Gogland. Vessel movements are tracked through the use of radar, camera systems, and AIS (Automatic Identification Systems).

A safety zone will be installed around the slow-moving construction spread. Based on consultation with the Finnish Maritime Administration it is suggested that marine traffic flow around this area will be coordinated GOFREP.

Each vessel involved in the construction has a marine captain. Clear communication procedures and lines of command are established prior to the commencement of the work. Vessel movements are planned in order to avoid collision within the construction fleet. Clear communication between the general ship traffic and construction vessels will reduce unexpected situations and miscalculations. Because many construction vessels will operate simultaneously, it is preferable to centralise radio communications so that one construction vessel manages the movements of the construction fleet.

Traffic control and alerts will be carried out in accordance with the requirements of GOFREP and International Maritime regulations. Regularly updating GOFREP and Helsinki VTS (Vessel Traffic Service) regarding the daily and weekly work plans of the construction fleet will ensure safe and efficient navigation of the general maritime traffic. Information concerning ongoing activities (those occurring in a three-to-four-hour period) would ease navigation, especially on the route between Helsinki and Tallinn, where high-speed crafts will pass the construction spread many times each day (see Chapter 8.4.1).

A system of ‘notice to mariners’ will also serve to notify recreational maritime traffic of the location and extent of the construction area.

13.2.6 Public dialogue

At the beginning of the construction phase, it is furthermore suggested to maintain close contact with fishing organisations to ensure a rapid response in the event of unforeseeable impacts. Nord Stream AG will implement a dedicated means of communication with the

fishing community that provides information about the planned construction activities (what, where and when) on a weekly basis in the form of a leaflet. The details of this approach are presently being developed based on successful experience with such communication tools in the North Sea.

13.2.7 Monitoring

In general the monitoring programme proposed in Chapter 15 will ensure on-going investigation of the impact of the pipeline project during the construction phase. This will provide the opportunity to consider additional mitigation measures, if necessary. A further option to be considered is the stationing of experts onboard a vessel in the construction spread (e.g. survey vessel) or establishing a connection with experts online, to ensure continuous monitoring of critical aspects, such as cultural heritage and fishery.

13.2.8 Compensation

If the ongoing studies identify significant long term impacts on fishing activities Nord Stream will establish a compensation scheme for the loss of catch.

13.3 Mitigation of impacts from unplanned events

Although considerable efforts have been made to reduce risk and mitigate possible impacts, there is a possibility that unplanned events, such as incidents or accidents could occur and result in environmental impacts (see Chapter 9). The risk assessments that have been undertaken for the construction and operation of the Nord Stream pipeline have identified a number of specific risk mitigation measures to ensure that the risk remains at an acceptable level. The assessments have also highlighted specific areas of best practice the project should adopt. These mitigation measures and areas of best practice are summarized below.

One of the major concerns during construction is the risk related to ship traffic. Risk mitigation measures will be applied during the installation of the pipelines in order to reduce the risk of ship collision to a level as low as reasonably practical (ALARP). In the estimation of the ship-to-ship collision risk, the following mitigation measures have been included:

- The pipe-laying contractor will have procedures and equipment in place to monitor ship traffic and identify possible collision candidates;.
- If required a guard vessel will enforce the exclusion zone around the pipe-laying vessel;
- The lay barge, survey vessels and anchor-handling vessels will be in continuous radio contact;

- A safety zone surrounding the lay barge will be proposed to the navigational authorities;
- The Gulf of Finland reporting system (GOFREP) will be used;
- Notice to Mariners and other maritime and fishery bulletins will be used to increase awareness of the activities of the pipe carriers, the lay barge, the survey vessel(s) and intervention work vessels during the construction period;
- Personnel onboard pipe carriers / lay barges will have sufficient experience. If required, native speakers of local language on the lay vessel will facilitate communication with local vessels;
- Proper training will be carried out to ensure that the crew onboard the pipe carriers and the lay barge are alert when crossing high-risk areas;
- Contact with the maritime authorities will be maintained;
- Pipe-laying in bad weather conditions, during which there is an increased collision risk, will be avoided.

Other methods to prevent or mitigate potential impacts from unplanned events during construction include:

- Compliance with MARPOL (International Convention for the Prevention of Pollution From Ships) requirements related to discharge of oil and waste products;
- Oil spill cleanup kits on construction sites to address any local spills;
- Preparation of procedures, hazard identification exercises and toolbox talks before start of construction works;
- Working and safety procedures for anchor-handling to mitigate any risk of contact with munitions or the remains of barrels etc;
- Monitoring of anchor wire tension to avoid dragging of anchors.
- Planned anchor patterns developed on the basis of high-resolution anchor corridor survey in areas of cultural heritage, munitions and existing infrastructure. Exclusion zones established close to cultural heritage and munitions, barrels and other environmentally sensitive objects to avoid interference by anchor or anchor wire.
- Weather forecasting to identify potential onset of unstable/poor weather conditions, and established criteria for suspension of construction activities;
- Mandatory use of refuelling (bunkering) procedures for the pipe-laying barge and anchor-handling tugs (ensuring that hoses are checked, spill trays are in place, oil spill kit is in

place, scuppers are blocked, communications are in place and that operations are closely monitored to ensure oil transfer spills are minimised).

During operation, the risks due to unplanned events are minimised by:

- Indicating the pipeline on the relevant nautical charts;
- Implementing restriction zones for bottom trawling in areas with free spans due to rough seabed conditions. These restriction zones have minimal effect on commercial fishing activities because pelagic trawlers, which are operating in the areas will be able to avoid the freespans by allowing sufficient distance between freespan sections of the pipelines and the towed net.
- Pressure-testing prior to gas filling the pipeline before initial use to prevent leakage;
- Establishing pipeline pressure regulation and automatic pressure safeguarding system and leak detection (supervisory control and data acquisition system, automatic alarms and signals) so that in case of pipeline leak or rupture the leak can be detected and repaired (if necessary, gas flow shut down);
- Emergency oil spill procedures and equipment onboard all construction vessels;
- Use of intelligent pigs for periodic inspection/monitoring;
- Performing annual surveys (initially) to monitor integrity of pipeline exterior. The survey frequency will only be reduced (1) if the survey results prove to be acceptable and (2) after agreements with the appropriate authorities have been reached.