Nord Stream
The new gas supply route for Europe

Environmental impact assessment report

Natural gas pipeline through the Baltic Sea

Environmental impact assessment in the exclusive economic zone of Finland

February 2009

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This Environmental Impact Assessment Report is Volume 1 of a 4 volume series. Together the four volumes comprise the documentation for the Nord Stream project submission as part of the requirements of the Finnish Act on Environmental Impact Assessment Procedure (468/1994, amendments 267/1999 and 458/2006). The Volumes are listed below.

VOLUME 1

Environmental impact assessment report
Natural gas pipeline through the Baltic Sea
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VOLUME 2

Atlas
Natural gas pipeline through the Baltic Sea
Environmental impact assessment in the exclusive economic zone of Finland

VOLUME 3

Nord Stream Environmental Impact Assessment
Documentation for Consultation under the Espoo Convention

VOLUME 4

Espoo Atlas

Nord Stream
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General information on public hearing

The EIA-report is on public display during March-May 2009 in the following municipalities:

Åland Islands	Varsinais-Suomi	Uusimaa	Itä-Uusimaa	Kymenlaakso
Föglö	Kaarina	Espoo	Loviisa	Hamina
Kökar	Kimitoön	Hanko	Pernå	Kotka
Lemland	Naantali	Helsinki	Porvoo	Pyhtää
Mariehamn	Salo	Ingå	Ruotsinpyhtää	Virolahti
	Sauvo	Kirkkonummi	Sipoo	
	Turku	Raseborg		
	Väståboland	Siuntio		

Public presentations, preliminary schedule

March 2009, week 11:

- Hanko
- Helsinki
- Turku

March 2009, week 12:

- Kotka
- Marienhamn

Nord Stream
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Glossary

GLOSSARY

µg	Microgram (10-6 g)
A&R	Abandonment and recovery
AFDW	Ash-free dry weight
AIS	Automatic identification system (used in Baltic Sea to register ship traffic)
Anoxia	Loss of oxygen
Aqueous film-forming foam, AFFF	Act as surfactant to coat and penetrate ordinary fuels to prevent them from burning at normal temperatures
As	Arsenic
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
Atlas Map	Collection of maps
Auks	Bird species of the genera Alca, Cepphus, and Uria
Automatic identification system (used in Baltic Sea to register ship traffic)	AIS is a system used by ships and Vessel Traffic Services (VTS) principally for identification and locating vessels.
Automatic ultrasonic testing (AUT)	The technique is used to determine the thickness of the test object, to monitor pipework corrosion.
BA	Buckle arrestors
Backfilling	Refilling a ditch or another excavation
Back-up control room, BUCR	Nord Stream office in Zug
Balgzand Bacton Line, BBL	The BBL Pipeline, the natural gas pipeline between the Netherlands and the United Kingdom.
Barg	Bar gauge
Bathymetry	Depth or topography of the seabed
Bcf	Billion cubic feet
Bcm	Billion cubic meters
Benthos	Aquatic organisms living at the seabed
Benthic flora and fauna	Plant and animal species living in or on the seabed
Bern Convention	International legal instrument aiming to conserve wild flora and fauna and their natural habitats, also promotes European co-operation in that field.

Biodegradation	Substances can be degraded by microorganisms utilizing it as a source of carbon or energy.
BSH	Bundesamt für Seeschifffart Hydrographie
BSPA	Baltic Sea Protected Areas
Buckle arrestors	Metallic ”belt” placed around the joint area of pipes to give mechanical protection
C	Carbon
Catchment area	Area from which water drains to certain receiving water body i.e. lake or sea
Cd	Cadmium
CFD	Computational fluid dynamics
Clay	Particles with diameter less than 1/256 mm regardless of mineral composition
Closed circuit television, CCTV	Use of video cameras to transmit a signal to a specific place, limited set of monitors
CMPP	Chemically modified polypropylene
Computational fluid dynamics	Fluid mechanics that uses numerical methods and algorithms to solve and analyze problems that involve fluid flows
Concrete weight-coating	Concrete outlining of the pipe to give pipeline weight to withstand better on the seabed
Contaminant	Impurity, waste
Contracting parties	Countries that have signed the Helsinki Convention on the protection of the marine environment of the Baltic Sea area
Copepod	Group of small crustaceans found in the sea.
Cormorants	Water bird species, in the Baltic Sea only the species Cormorant (Phalacrocorax carbo)
CPT	Cone penetration test
Cr	Chrome
CSCR	Compressor station control room
Cu	Copper
Curing agent	Hardening substance
Cyanobacteria	Algae
Dabbling ducks	Duck species not capable of diving, feeding by turning their rump upwards as e.g. mallard, wigeon, and teal Anas
dB	decibel; volume of sound

DBT	Dibutyltin
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane, a synthetic pesticide
DEGV	Double expanded gate valve
Demersal	Fish, lives on or near the seabed
DHI	Danish Hydraulic Institute
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment
Distributed control system, DCS	Control system in which the controller elements are not central in location but are distributed throughout the system with each component sub-system controlled by one or more controllers.
Dispersion	The process is also called oil-in-water emulsion.
Dissolution	The process of dissolving a solid substance into a solvent to yield a solution
Divings ducks	Duck species feeding by diving, mostly belonging to the genera Aythya as e.g. tufted duck, greater scaup, and common Pochard, and Mergus (mergansers)
Divers	Water bird species of the genus Gavia in the Baltic Sea
Dive support vessel	Ship that is used as a floating base for professional diving projects
DM	Dry matter
DNV	Det Norske Veritas
Drift ice	Floating ice, any ice that has drifted from its place of origin
DSV	Dive support vessel
DTM	Digital Terrain Modelling
Dumping	Placing something on the bottom of the sea
DW	Deep water
EAC	Ecotoxicological assessment criteria
EC	European Commission
EC Habitats Directive	International treaty protecting areas that contain certain natural environments or house certain organisms (as listed in appendices to the treaty)
Eddy	A current of water or gas running contrary to the main current, especially one mowing in a circle

EEZ	Exclusive economic zone
EIA	Environmental Impact Assessment
EIA Program	The EIA programme (scoping document) highlighted the potential environmental and socioeconomic components that may be impacted upon during a certain timeframe and over a certain distance.
Emissions	Airborne compounds emitted from traffic or combustion of fossil fuels
Epifauna	Bottom fauna living on stones, rocks, plants, etc.
Erosion	Removal of solids (sediment, soil, rock and other particles) in the natural environment due to water, wind, mechanical erosion or other factor.
Espoo Convention	Convention on Environmental Impact Assessment in a Transboundary Context
Espoo Report	Nord Stream Environmental Impact Assessment Documentation for Consultation under the Espoo Convention
EU	European Union
Eutrophication	Increase in chemical nutrients - typically compounds containing nitrogen or phosphorus
Evaporation	Slow vaporization of a liquid, which is the opposite of condensation.
Exclusive Economic Zone	Seazone in which a state has special rights over the exploration and use of marine resources
Exp	Exposure
Expected impacts	Impacts that result from a planned or known activity
Fairway	Cleared channel in navigation
Fast ice	A sea ice that has frozen along coasts along the shoals, or to the sea floor over shallow parts of the continental shelf, and extends out from land into sea.
FIMR	Finnish Marine Research Institute
FINIBA	Finnish Important Bird Area
FJC	Feld joint coating
Flow control, FC	Automatically adjusts compressor speed
Flow measurement, FT	Flow measurement is the quantification of bulk fluid movement
FNBA	Finnish National Board of Antiquities
Free span	Section where the pipeline is above the seabed

Front-end engineering design, FEED	The process for conceptual development of processing industry projects
Fusion bonded epoxy, FBE	An epoxy based powder coating that is widely used to protect steel pipe used in pipeline construction
GIS	Geographic Information System
Glacial till	Till deposited during ice age
Gravel beam	Support for the pipe made of gravel
GRT	Greifswald receiving terminal
GSF	Geological Survey of Finland
GTK	Geological Survey of Finland
GTR	Gas transportation agreement
ha	Hectares
Halocline	A strong, vertical salinity gradient
Halophilic	An organism that requires a salty environment
Haul-out	Place on shore where the seals dwell, breed, moult, etc.
HCB	Hexachlorobenzene
HCH isomers	Hexachlorocyclohexanes
HDPE	High-density polyethylene
HDPU	High density polyerythane foam
Heat-shrink sleeve, HSS	Corrosion protective coating for pipelines in the form of a wraparound or tubular sleeve that is field-applied
Hg	Mercury
High impact	Impact target has high value / sensitivity (e.g., Natura 2000 area), has caused considerable concern among stakeholders and the magnitude can be high
HELCOM	The Helsinki Commission. See ”The Helsinki Commission” for more detail
The Helsinki Commission	Convention on the Protection of the Marine Environment of the Baltic Sea Area
HLV	Heavy-lift vehicle
HSE MS	Health, safety and environment management system
HVDC cable	High voltage direct current cable
Hypoxia	Depletion of oxygen
Hz	Hertz; frequency

IBA	Important Bird Area
IBRU	International Boundaries Research Unit
Ice floes	Large pieces of drift ice
Ice ridge	Line or wall of broken ice forced up by pressure.
ICES	International Council for the Exploration of the Sea
ICPC	International Cable Protection Committee
IFAOe	Institut für Angewandte Ökologie
IMO	International Maritime Organization
IMPU	Injected-moulded polyUrethane
Indirect impact	Impacts that result from other activities that happen as a consequence of the project
Infauna	Bottom fauna burrowed in sediment
Intelligent pig	Device used to inspect the pipe from inside
Intervention Works	Seabottom moulding and changing works
IPCC	Intergovernmental Panel on Climate Change
Irreversible impact	Impacts on that are evident following termination of a project activity and which remain for an extended period of time
ISO	International Organization for Standardization
ISP	Intermediate Service Platform
IUCN	International Union for Conservation of Nature and Natural Resources
IW	Intervention Works
KP	Kilometer point (starting with KP=0 at Russian landfall)
kW	Kilowatt
kVA	Kilovolt-ampere
LFFG	Landfall facilities Germany
LFFR	Landfall facilities Russia
LNG	Liquefied natural gas
LI	Lung irritant
Local impact	Impacts that affect locally important targets in close vicinity to the pipelines
LOQ	Limit of quantitation

Low impact	Impact target has either low value / sensitivity; it has not caused much concern during the EIA process or the magnitude is minor
Lute fraction	The amount (%) of clayish substance
Macrophytes	Bigger plants living on the seabed
Macrozoobenthos	Animals retained by a 0,5 mm mesh size, inhabiting the seabed
MAR-concentration	Maximum acceptable risk-concentration
Material take-off	A list of materials with quantities and types that are required to build a designed structure or item
MCR	Main control room
MCR cable	A metallic current return cable
Mean sea level, MSL	The average (mean) height of the sea, with reference to a suitable reference surface
Medium impact	Impact target has relatively high value / sensitivity, has caused some concern among stakeholders and the magnitude is medium or high
Minor significance impact	Impact target can typically have low value/sensitivity or the impact magnitude is assessed to be low. The impact is typically local and short- termed. The impact is typically reversible
Moderate significance impact	Impact target can typically have medium value/sensitivity. The impact is typically local or regional and the duration medium or long-termed. The impact is typically reversible or partly reversible.
MBT	Monobutyltin
Multi-beam echosounder, MBES	Echograph for survey of shallow to medium water depths
Munitions	General term for ammunition, explosives and other munitions such as mines, air dropped bombs, depth charges and mine chairs/releasing systems which were found from the project area
N	Nitrogen
National impact	Impacts that affect nationally important environmental targets (~ > 10 km from pipeline route), affect an area that is nationally important / protected or have macroeconomic consequences
Natura 2000	Network of areas designated to conserve natural habitats and species of wildlife in the European Community
NaOH	Sodium hydroxide, also known as lye, caustic soda and sodium hydrate

NATO	North Atlantic Treaty Organization
Negative impact	An impact that results in an adverse change from the baseline or introduces a new, undesirable factor
NEGP	North European Gas Pipeline
NEL	Norddeutsche Erdgas-Leitung, Northern German gas link
Neric plankton	Plankton that are found near shore or in shallow areas
ng	Nanogram (10-9g)
NGO	Non-governmental organization
Ni	Nickel
nm	Nautical miles
NNM	Not normally manned
No impact	Impact can be local and temporary. The impact will not reach/change the impact target because the distance between the source and the target is larger than the extent of the impact.
Non-destructive testing, NDT	X-ray examination or automatic ultrasonic testing
Non-indigenous species, NIS	Species not living or occurring naturally in a specific area of environment
Nord Stream Pipeline	The projected natural gas pipeline with two 48-inch pipelines which will run almost in parallel through the Baltic Sea.
Nord Stream Project	Project consisting of two 1220-kilometre-long off-shore natural gas pipelines stretching through the Baltic Sea from Portovaya in the area of Vyborg/St. Petersburg in Russia to Lubmin in the Greifswald region in Germany.
NOS	The National Ocean Service
NSP	Nord Stream Project
NTG Oy	North Transgas
OPAL	Ostsee-Pipeline-Anbindungs-Leitung, Baltic Sea pipeline link
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
Oxidation	An increase in oxidation number, and reduction as a decrease in oxidation number.
Oxygen scavenger	A chemical substance added to a mixture in order to remove oxygen
P	Phosphorus
p.a.	Per annum

Pack ice	Large area of floating ice consisting of pieces of ice driven closely together
PAH	Polycyclic aromatic hydrocarbon
Partly reversible impact	Impacts on targets that depend on the quality / type of the impact target
Pb	Lead
PBCS	Portovaya Bay compressor station
PCB	Polychlorinated biphenyls
PEC	Predicted Effect Concentration
Pelagic	Species living in the water column that is not near the coast
Pelagic zone	The part of the open sea or ocean that is not near the coast
Per annum	In a year
pg	Picogram (10-12 g)
pH	A measure of the acidity or alkalinity of a solution
Photic zone	The depth of water that is exposed to sufficient sunlight for photosynthesis to occur, also called euphotic zone.
Phytoplankton	Plant organisms of plankton i.e. algae
PID	Project information document
Pigging	Inspecting the pipe from inside with the special device.
Pinger	Sub-bottom profiler used to image and map the shallow marine geology
Pinnipeds	Marine mammals
Plankton	Aquatic organisms that float passively or exhibit limited locomotive activity in the water column
Pipehaul vessel	Vessel used to transport the pipes
PNEC	Predicted No Effect Concentration
Polyethylene, PE	Thermoplastic commodity
Polypropylene, PP	thermoplastic polymer
Polyurethane, PU	Any polymer consisting of a chain of organic units joined by urethane links.
Positive impact	An impact that results in an improvement of the baseline or introduces a new, desirable factor
Post-lay	After the laying of the pipe

Pre-commissioning	Before taking the pipe in to use
Predicted No Effect Concentration	Value for chemicals, has been estimated with ecotoxicity test
Pre-lay	Before the laying of the pipe
Process of manufacture (submerged arc welding, one longitudinal weld seam)	Manufacturing that is associated with formulas or manufacturing recipes
Project information document	Summary of project information sent to affected parties in the notification procedure
psu	Practical Salinity Units
PTFE	Poly-tetra-fluoro-ethane
QA/QC	Quality assurance/quality control
Ramsar-site	Wetland preservation areas
RCO	Rossby Centre Ocean
RCR	Risk Characterisation Ratio
Regional impact	Impacts that affect targets in the EEZ of Finland but do also exceed the territorial borders of Finland
Reversible impact	An impact is reversible when the affected target can return to its pre-impact state
Rock berm	Support for the pipe, made of rock
ROV	Remotely operated vehicle
Rugged sea floor	Irregular bottom profile of the seabed
SAC	Special Areas of Conservation
Sacrificial anodes	Metallic anode used in cathodic protection where it is intended to be dissolved to protect other metallic components so that it would not be dissolved.
SAKL	Finnish fishermen's association
SAWL 485 I FD	Process of manufacture (submerged arc welding, one longitudinal weld seam)
SCADA	Supervisory control and data acquisition
SCI	Site of Community Interest
scoping	The process of identifying the content and extent of the environmental information to be submitted to the competent authority under the EIA procedure.
SD	Standard deviation
Seabed	Bottom of the sea

Sea birds	Bird species that regularly spend a substantial part of their life cycle at sea
Sea ducks	Duck species that spend most of their life cycle – except for the breeding season – at sea
Sedimentation	Motion in suspensions in response to an external force such as gravity.
Seiche	Standing wave in an enclosed or partially enclosed body of water
Semi-submersible crane vessel, SSCV	Vessel that can put much of its bulk underwater.
SEPA	Swedish Environmental Protection Agency
SES	Saipem Energy Services (formerly Snamprogetti)
SGS	Inspection, verification, testing and certification company
SGU	Geological Survey of Sweden
Shut down valve, SDV	Actuated valve installed in a pipeline.
SIA	Social Impact Assessment
Side-scan sonar	Device used to produce picture-like information from the bottom of the sea
Significant impact	Impact target has high value/sensitivity. The extent can typically be regional and duration long- termed or permanent. The impact is typically partly reversible or irreversible.
Single-beam echosounder	Echograph for survey of shallow to medium water depths.
Site of Community Interest	Area that can contribute to conservation or restore favourable status to a habitat.
Sm^3	Standard cubic meters
SMHI	Swedish Meteorological and Hydrological Institute
SPA	Special Protection Areas
spp.	Short way of saying that something applies to many species within a genus, but do not necessarily all species within that genus
Spreading	After release spreads due to current and wind.
SSS	Side-scan sonar
Stinger	Part of S-lay system, extends the ramp to reduce the length of the sag bend
Stockyard	Place for the pipes to be stored
Sub-bottom profiler	Powerful low frequency echo-sounder, provides profiles of the upper layers of the ocean bottom.

Sulphate-reducing bacteria, SRB	Important bacteria in ocean sediments which has capability to use sulphates for its energy needs
Supervisory control and data acquisition	SCADA for Supervisory Control And Data Acquisition. An industrial control system: a computer system monitoring and controlling a process.
TACS	Temporary air compressor stations
TBT	Tributyltin
TEF	Toxic equivalency factor
TEN-E	Trans-European Energy Network
TEQ	Toxic equivalent
Territorial water	Belt of coastal waters extending at most twelve nautical miles from the baseline (usually the mean low-water mark) of a coastal state.
The Helsinki Commission	Convention on the Protection of the Marine Environment of the Baltic Sea Area
Thermocline	A strong, vertical temperature gradient
Thermophilic	Heat prefering
Three-layer polyethylene, 3LPE	Anti-corrosion coating
Tie-in	Connecting the pipes together
Till	Nonsorted, nonstratified sediment carried or deposited by glacier
Top entry ball valve, TEBV	Valve that opens by turning a handle attached to a ball inside the valve.
TSS	Traffic Separation Scemes
Tug boat	Boat used for draging another boat behind
Turbidity	”Cloudy” condition of water due to suspended silt or organic matter
TW	Territorial water
TÜV	Technischer Überwachungs-Verein, (in English, Technical Monitoring Association) are German organizations that work to validate the safety of products of all kinds to protect humans and the environment against hazards.
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
Unexpected impacts	Impacts that result from an unplanned or unexpected event

Waders	Bird species of the order Charadriiformes, e.g. Dunlin (in American called “shorebirds”)
Water birds	A generic term for bird species that regularly spend a substantial part of their life cycle at water, e.g. sea birds, waders, and gulls
Wave induced	Caused by wave movements
WHO	World Health Organisation
Wide area network, WAN	Wide Area Network (WAN) is a computer network that covers a broad area (i.e., any network whose communications links cross metropolitan, regional, or national boundaries.
Wind park / farm	Area for windmills producing energy
WT	Wall thickness
VTS	Vessel Traffic Service
WWI	World War I
WWII	World War II
Zn	Zinc
Zone of sedimentation	Sedimentation surface layer
Zooplankton	Animal organisms of plankton

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Section 0

Non-technical summary

0 Non-technical summary

0.1 The Nord Stream Pipeline and the EIA

Nord Stream AG proposes the construction of an offshore natural gas pipeline from Russia to Germany with connections to onshore transmission systems in these two countries. The Nord Stream Pipeline will connect the large natural gas resources of Russia with the European natural gas pipeline network. At full capacity, it will provide 55 billion cubic metres (bcm) of natural gas per year to European consumers. This is projected to be approximately 9% of the natural gas consumption in the European Union (EU) in 2025.

The length of the entire two-pipeline system ('the Nord Stream Pipeline') will be 1,220 km, of which 375 km pass through the Finnish exclusive economic zone (EEZ). The pipeline will run on the seabed in the deepest parts of the Gulf of Finland at an average depth of 88 m, in the open water area roughly 20–30 km from the coastline. The pipeline also crosses the EEZs of Russia, Sweden, Denmark and Germany.

It is planned that pipeline construction works will commence in 2010, with the second pipeline being completed in 2012. The pipeline system is designed to operate for 50 years. To ensure the long-term integrity of the pipeline, some seabed intervention work will be required. This includes adding rock material to support the pipeline in areas of irregular seabed and clearing of munitions within 25 m of each pipeline route. Individual lengths of line pipe will be welded together on a pipe-laying barge and lowered to the seabed in a continuous process. The barge will move steadily along the route, laying approximately 2.5–3 km of pipeline per day.

As the pipeline will cross the Finnish EEZ, a Finnish Environmental Impact Assessment (EIA) procedure is applied to assess the environmental impacts of the project within the Finnish EEZ. The aims of the EIA process are to evaluate the environmental impacts of a project, to ensure that consistent information on the impacts is available during planning and decision-making and to provide the public with information and the opportunity to participate in the process. The EIA report and the statement of the coordinating authority (Uusimaa Environment Centre) will be taken into account in the decision to grant permits for the project within the Finnish EEZ. The required permits are the Council of State consent according to the EEZ Act and a permit for construction according to the Water Act.

The results of the Finnish EIA procedure are compiled in this report.

The national Finnish EIA report describes the main characteristics and technical solutions of the project. These include:

- the activities during construction, operation and decommissioning of the pipeline
- the assessment methods used
- the environmental impacts of the studied alternatives
- the main information used in the assessment
- a comparison of the alternative pipeline routes within the national project area
- the viability of these alternatives
- a proposal for a monitoring programme
- a summary of the assessment work

In addition, the assessment report describes the main uncertainties related to the assessment and the measures to prevent and mitigate adverse environmental impacts. Transboundary impacts from other countries to the Finnish EEZ and from the Finnish EEZ to other countries are presented in the **Nord Stream Espoo Report - Offshore pipeline through the Baltic Sea**.

This non-technical summary focuses on the assessment results, together with expert evaluation of the expected impacts arising from the construction and operation of the Nord Stream pipeline.

0.2 Environmental impact assessment procedure

0.2.1 The Nord Stream national EIA process

The national EIA procedure is two-phased. In the first phase, Nord Stream AG developed a scoping document, or an EIA programme, which described the strategy for the assessment of environmental impacts. In the second phase, Nord Stream AG carried out the actual environmental impact assessment and compiled the results in this EIA report. The EIA procedure concludes when the Uusimaa Environment Centre (the 'Coordinating Authority') issues its statement on the report.

0.2.1.1 The first phase: EIA programme

In the first phase of the Finnish national EIA procedure, the Uusimaa Environment Centre made the Nord Stream EIA programme available to the public in November 2006. During public hearings, the Uusimaa Environment Centre requested statements from various authorities, citizens and non-governmental organisations. Based on these opinions and statements, the Uusimaa Environment Centre issued its statement on the EIA programme to Nord Stream AG in February 2007.

0.2.1.2 The second phase: environmental impact assessment

The assessment phase was carried out based on the Coordinating Authority's statement and the EIA programme.

After this EIA report is submitted to the Uusimaa Environment Centre, it will be available to the public online and in the coastal municipalities for maximum 60 days. During this period, Finnish authorities, citizens and other interest groups will have the opportunity to state their opinions on it.

The Uusimaa Environment Centre will compile the statements. Based on these, the Coordinating Authority will issue its own statement within 60 days of the public hearings. The EIA procedure will conclude with this statement. This assessment report and Uusimaa Environment Centre's statement on it will then be considered in the permitting procedures.

0.2.2 Public participation

The EIA has been carried out in an interactive manner. During the public-display period of the EIA programme, meetings were held in Helsinki, Hanko, Turku and Kotka. These meetings were attended by the public and the media.

Throughout the EIA procedure, numerous meetings with governmental authorities have also been organised in Finland, as in other Baltic Sea countries. These meetings were held to discuss the project status, technical information, assessment issues and other concerns.

The results of this EIA report will be presented at public meetings during the display period 9th of March - 5th of May 2009. Public meetings will take place in March 2009 in Helsinki (week 11), Hanko (week 11), Turku (week 11), Kotka (week 12) and Mariehamn (week 12. The meetings will be chaired by the Uusimaa Environment Centre.

Nord Stream AG has also organised media events and informal visits to survey vessels. The Nord Stream Pipeline information tour has visited events and festivals in Mariehamn, Kotka and Turku. The Nord Stream website provides updates on the project status and further information.

The schedule for the EIA, including the public participation phases, is presented in Figure 0.1.

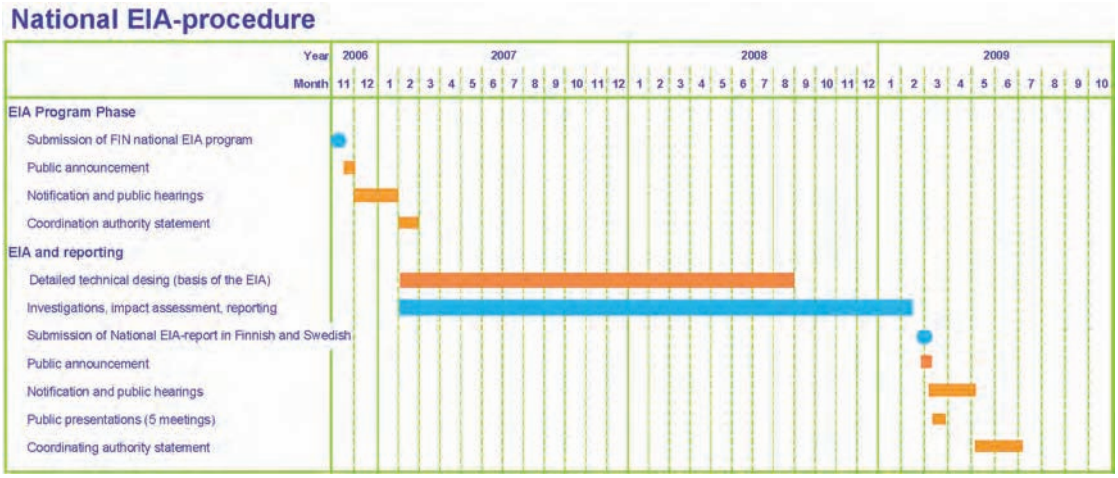

Figure 0.1. Time schedule of the national EIA procedure in Finland.

0.3 Summary of key environmental issues

Numerous surveys have been performed, allowing optimisation the pipeline route during the design phase and thereby minimising potential impacts caused by the construction and operation of the pipeline. Environmental experts estimate that the impacts caused by the pipeline will be mostly minor or non-existent within the Finnish EEZ. Most of the potential impacts will be local and temporary, occurring solely during the construction period.

The following key environmental issues relating to construction and operation of the pipeline were identified during the EIA process:

0.3.1 Public concern about environmental and military security

The most significant social impact is the negative impact on the public's sense of security. The actual changes to the physical environment due to the project are assessed to be low. However, the Finnish community is experiencing concern and uncertainty regarding the state of the Baltic Sea, national security and environmental risks arising from the project as a whole. Some of the reasons for the concerns about their sense of security are historic and would exist regardless of the project, but some are related directly to the project and to concern about its environmental impacts. The social impacts vary considerably depending on the individual's perception of the project and are not limited only to people living in coastal communities.

0.3.2 Commercial fishing

There may be a permanent impact on bottom trawling along certain sections of the pipeline route. At some locations, the pipeline will form freespans. Freespans occur where the pipeline does not rest directly on the seabed but is suspended between two local high points in the seabed. Because trawling gear can get caught under a free-spanning pipeline, bottom-trawling may be restricted in some specific areas to ensure the safety of the fishing vessels and crew. However, it should be noted that Finnish commercial fishermen generally practice mid-water trawling in these areas.

Nord Stream AG is actively consulting with the commercial fishing community to resolve these matters.

0.3.3 Sediment spreading

Seabed intervention works, anchor-handling and munitions clearance during construction of the pipeline will cause seabed sediments to be suspended in the water column and be spread by currents. This sediment spreading also includes dispersion of chemical compounds contained in the sediments. However, due to water depth and to the fact that the activities are located mostly in deep water in the middle of the Gulf of Finland, the impacts are considered to be minor.

0.3.4 Maritime safety

During the construction period, the pipe-laying barge and other vessels engaged in construction work will occupy an area with a radius of approximately 3 km, centered on the pipeline route. This includes a 500 m safety zone established and maintained by the operating area of the anchor-handling vessels. To ensure maritime safety, other vessels approaching the vicinity of the construction site shall be rerouted with minimal inconvenience. Nord Stream AG will communicate with the appropriate authorities to keep other maritime traffic informed of possible sailing restrictions.

0.3.5 Munitions and cultural heritage

The Baltic Sea, particularly the Gulf of Finland, was heavily mined during World War I and World War II. After the wars, the Gulf of Finland was swept for mines, but many remain to this day. Nord Stream AG is taking great care to locate and determine the type of munitions and cultural heritage sites within the installation corridor. Once located, construction procedures will be modified, and, where necessary, munitions will be cleared. Clearance will be performed in the safest possible manner. Munitions clearance will cause temporary sediment spreading and re-sedimentation and acoustic/pressure waves as well as some depressions and elevations on the seabed.

Underwater cultural remains, such as shipwrecks, are very well-preserved in the Baltic Sea due to its unique physical and chemical conditions. These include low salt content, low species diversity, relatively low temperatures and low oxygen content. Any shipwrecks that are encountered will be carefully surveyed. To evaluate the cultural heritage value of the wrecks, Nord Stream AG will work closely with the Finnish National Board of Antiquities (FNBA).

0.3.6 Long-term impacts

Most of the impacts caused by the Nord Stream project are short-termed and occur during construction. There will be a few permanent impacts, which are:

- The rock berms created by the rock placement and the pipeline will permanently occupy the seabed. The footprint of this ‘artificial reef’ is comparatively small (1.1 km^2), and therefore the impact on the seabed is assessed to be local, small and insignificant.
- The habitat of the benthos will be permanently lost on the footprint of the pipeline. The impact is local and insignificant, because the area is small compared to total area of suitable habitat for benthos.
- The flowing gas will create a permanent noise source on the seabed. The noise is assessed to be comparable to background noise and its significance low.
- The freespans of the pipeline will create a permanent impact on commercial trawling. For safety reasons, bottom trawling along certain sections of the pipeline may be restricted. The total length of the free-spanning pipeline will be approximately 33 km. The impact is considered to be of medium importance because trawling vessels can either avoid crossing the pipeline or decide to lift their trawl gear to cross the pipeline.

0.4 Project description

0.4.1 Project rationale

At present, natural gas comprises one-quarter of the primary energy consumption in the EU. It is estimated that natural gas demand will increase by 16%, from 543 bcm in 2005 to 629 bcm in 2025. At the same time, the production capacity and reserves of natural gas in the EU are expected to decline. The share of renewable energy is expected to grow from 7% to 11%, but this increase will not be enough to meet the growing demand for energy consumption, nor is it enough to replace coal in order to meet the required reduction in carbon dioxide emissions. Therefore, demand for imported natural gas will increase in the EU.

To meet the future energy demand in the EU, the Trans-European Energy Networks (TEN-E) programme has been launched. Under the TEN-E programme, the European Commission proposes expanding its natural gas supply relationship with Russia. Currently, Europe imports natural gas primarily from three sources: Russia, Norway and Algeria. The natural gas import infrastructure of the EU has an annual capacity of 281 bcm.

To meet the increased demand for natural gas in the EU, Nord Stream AG proposes an upstream offshore pipeline network from Russia to Germany. Nord Stream AG would be responsible for the development and construction of the natural gas pipeline and the operation of the upstream pipeline system.

0.4.2 Project developer - Nord Stream AG

The Nord Stream project is a joint project of four companies (see Figure 0.2).The history of the project and the companies involved are presented in this national report.

Figure 0.2. The shareholders of Nord Stream AG.

0.4.3 Pipeline route

From a supply point of view, the Russian Baltic Sea coast, with its geographical proximity to various Russian natural gas fields, is a favourable starting point for the Nord Stream pipeline. At the receiving end, Germany offers an efficient connection to the European natural gas network. To connect these two points, several onshore and offshore routes were studied and compared during the planning of the project.

Although the construction costs of an offshore pipeline may be higher than those of an onshore pipeline, the operating costs are lower, as it is a more efficient system. This is because a higher operating pressure can be used safely in an offshore environment. Therefore, the Nord Stream Pipeline requires only one compressor station to efficiently transport natural gas. An onshore pipeline of similar length would need intermediate compressor stations – approximately one every 100–200 km. Consequently, an offshore pipeline uses less fuel gas to transport the same quantity of natural gas, resulting in lower greenhouse gas emissions. Additionally, constructing an onshore pipeline requires a corridor of approximately 40 m to be cleared of vegetation and other obstructions in order to permit the welding of field joints, trenching and lowering of the pipeline. Construction and operation of an onshore pipeline is further affected by property issues, the crossing of populated areas, nature conservation areas, roads, railways, rivers, forests, lakes and the like. Therefore, an offshore route was found to be the most feasible solution.

The main route of the Nord Stream Pipeline will run from Portovaya Bay in Vyborg, Russia, through the Gulf of Finland and the Baltic Sea to Greifswald in Germany (see Figure 0.3). Within the Finnish EEZ, the pipeline route will run through the deepest parts of the Gulf of Finland and the northern Baltic Proper. In the Finnish EEZ, the pipeline is planned to be laid at a depth of 43–203 m, and in general 20–30 km from the Finnish shore.

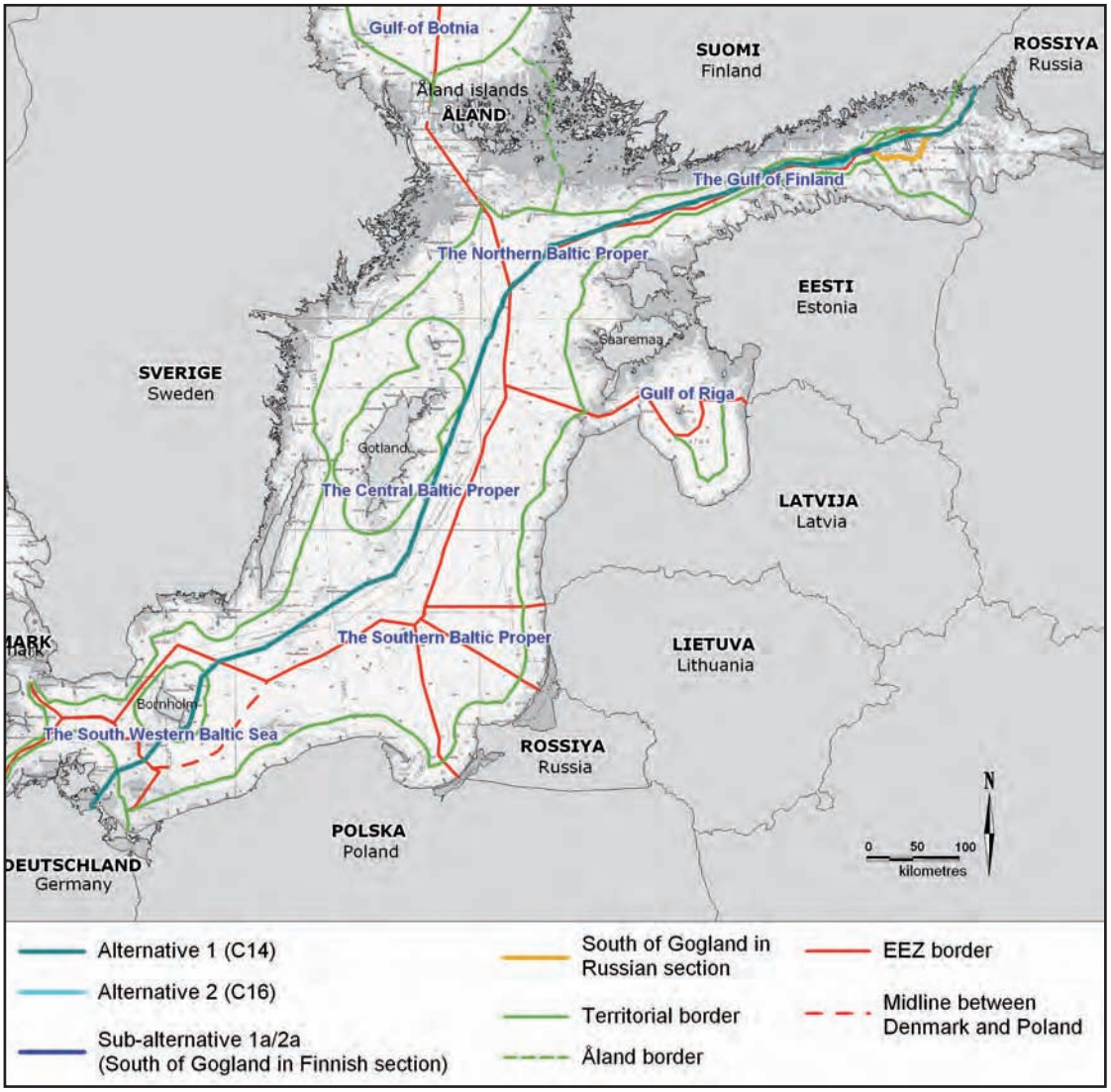

Figure 0.3. The Nord Stream Pipeline route.

An extensive survey programme was carried out to determine the optimal route for the pipeline and minimise the environmental impacts and the overall cost of the project. The key issue in the surveys was to find a route where the seabed conditions allow pipe installation with minimal seabed intervention works.

The route surveys gathered specific information on seabed conditions, such as topography and bathymetry, and also identified artefacts, such as shipwrecks, boulders and munitions along the route. Based on this information, the route optimisation has been fine-tuned.

0.4.4 Project activities

0.4.4.1 Project time schedule

Construction works in the Finnish EEZ will be conducted over several periods during the years 2010–2012. The preliminary project schedule is presented in Figure 0.4 below.

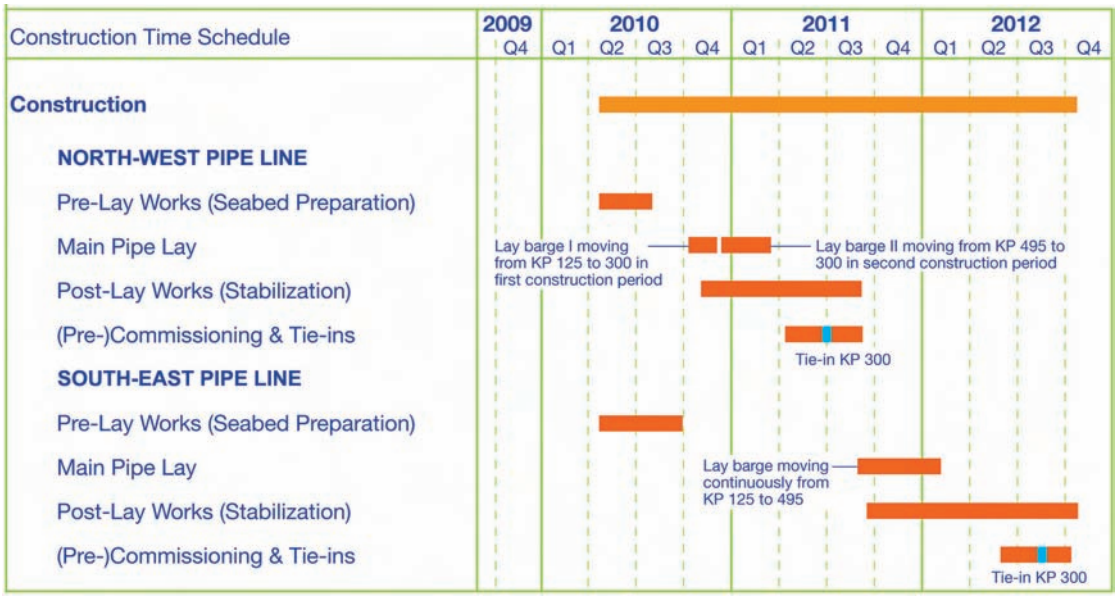

Figure 0.4. Preliminary Nord Stream Pipeline construction schedule in the Finnish sector.

The main project activities include further surveys, placing of gravel supports prior to the installation of the pipeline, laying the pipes on the seabed and across the supports, logistics, post-lay activities, pre-commissioning and commissioning, operation and decommissioning.

0.4.4.2 Surveys prior to and during construction

To complement the route optimisation and munitions screening surveys, several additional surveys will be made prior to and during the installation of the pipeline to ensure safe and efficient operations.

- An anchor-corridor survey prior to installation will document environmental constraints, geological features, cultural heritage sites and munitions in order to plan anchoring areas for the pipe-laying barge
- A pre-lay survey will confirm that the installation corridor is clear for the safe installation of the pipeline, i.e., no new obstacles are found on the seabed
- During pipeline construction, full survey capacity will be available to perform any ad hoc surveys, e.g., monitoring the pipeline touchdown point.

Due to the intention to use a dynamically positioned laybarge without anchors for both pipelines between KP 0-300 detailed phases of anchor corridor survey and munitions clearance will be done only in the parts of the route where an anchored laybarge will be used.

0.4.4.3 Pipe-laying

Nord Stream AG will construct the natural gas pipeline using individual steel line pipes that have been pre-treated against corrosion at an onshore facility. The line pipes are also weight-coated with concrete to ensure on-bottom stability and to protect against external impacts.

The line pipes will be welded together at sea on a pipe-laying barge, from which the pipeline will be laid down on the sea bottom in a continuous process. This process is shown in Figure 0.5.

Figure 0.5. Various aspects of pipe-laying activities on pipe-laying barge Castoro Sei.
Clockwise from top left: Line pipe on the deck of the Castoro Sei; welding the individual line pipes; preparing the field joint coating over the welded joint; and pipeline entering the water at the back of the lay barge.

Two pipelay barges will be used to install the pipelines in the Finnsh EEZ. It is planned that a dynamically positioned lay-barge (no anchoring) will start from the Russian boarder and proceed in a westerly direction. The second lay barge (with anchors) will start in Swedish waters and proceed eastwards. These two pipe sections will be welded together under water during pre-commissioning at approximately kilometre point (KP) 300. Figure 0.6 shows the anchored lay barge Castoro Sei and the dynamically positioned lay barge Solitaire. A dynamically posi-

tioned lay vessel is kept in position by thrusters that constantly counteract the external forces acting on the vessel; these include the pipeline tension/reaction, waves, current and wind.

Figure 0.6. Pipe-laying barges Castoro Sei (left) and Solitaire (right).

Multiple vessels will be involved in the construction works. The anchor-positioned pipe-laying barge will be maintained on station by 12 anchors positioned by anchor-handling tugs at surveyed locations. To allow the barge to move ahead, the anchors will be progressively lifted and repositioned. Where required, guard vessels will secure a safety zone around the pipe-laying barge.

0.4.4.4 Seabed intervention works

Nord Stream AG will conduct seabed intervention works both before and after pipe installation. These works include placing rock material on the seabed to support the pipeline (rock placement) where it has not been possible to avoid freespans during the extensive route optimisation process. Crushed rock will be transported by dedicated rock placement vessels to the specific locations where the support is required. Referring to Figure 0.7, the rock will be loaded into a fall pipe through which the material will be placed at the exact location in accordance with the engineering design. The controlled placement of the rock through the fall pipe allows the material to be precisely installed without coming into direct contact with the water column. The structure of each rock support has been carefully designed to minimise the amount of rock material to be used. Rock placement vessels shall maintain a safety zone when engaged in construction activities.

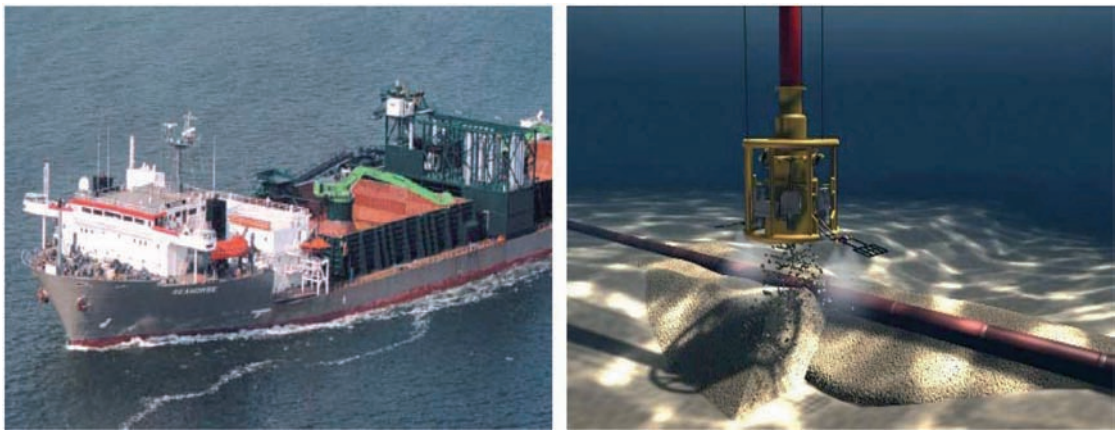

Figure 0.7. Flexible fall pipe vessel (left) and controlled placement of crushed rock (right).

0.4.4.5 Logistics

The following onshore and offshore support logistics are also necessary during construction:

- Steel line pipes from pipe manufacturers (Russia and Germany), as well as cement, sand, iron ore and steel reinforcement used for weight coating, will be transported to the weight-coating facilities (in Kotka, Finland, and in Sassnitz-Mukran, Germany). The line pipes will be stored in stockyards close to the weight-coating plants.
- Interim stockyards will be established in Kotka and in Hanko for the supply of the pre-coated line pipe to the lay barge. Coaster vessels will be used for the supply of the interim stockyards from the weight coating plants.
- Supply vessels will transport the pre-coated line pipes from the harbour to the pipe-laying barges.
- The crushed rock for rock placement will be transported from the source to the harbour stockpile by truck. The dedicated rock placement vessels will be loaded directly from stockpiles.

0.4.4.6 Post-lay activities

After the pipes have been laid, Nord Stream AG will conduct as-laid surveys to determine the pipeline / seabed configuration. Based on the survey results, post-lay rock placement works will be performed to provide further support to the pipeline.

An as-built survey will be performed in sections where post-lay activities will be carried out to determine the final configuration of the installed pipeline.

Pre-commissioning activities will be carried out before the pipeline is filled with natural gas. During pre-commissioning, the pipeline will be flooded with seawater, cleaned and gauged internally and pressure tested. Tie-in of the pressure-tested sections of the pipeline will be performed, and then the pipeline will be dewatered and dried.

After pre-commissioning is completed, the pipeline will be commissioned, which is the process of the safe introduction of natural gas into the pipeline.

0.4.5 Operation

The operation of the Nord Stream Pipeline will be monitored and controlled from the main control room at the Nord Stream AG head office in Zug, Switzerland. The main control room will be manned 24 hours per day, 365 days per year. There will also be a back-up control room in Zug.

Each of the Nord Stream landfall facilities will have a local operations room, but these rooms will normally be unmanned and in monitoring mode only. Some maintenance operations can be controlled from local facilities.

The Nord Stream Pipeline control system consists of pressure regulation, pressure safeguarding, leak detection, parameter monitoring (including temperature, gas composition and inlet/outlet flow and pressure), telemetry and telecommunications, fire and gas detection and protection, and emergency shutdown systems.

0.4.6 Decommissioning

The Nord Stream Pipeline is designed to operate for 50 years, although it may be extended subject to close monitoring. The decommissioning programme will be developed during the operations phase. It is likely that the technological options and preferred methods for decommissioning of offshore installations and pipeline will be different in 50 years' time. The status of the pipeline at the time of decommissioning will also impact the chosen decommissioning methods. Under all circumstances, decommissioning activities will be carried out according to prevailing international and national legislation and regulations and best practices regarding environmental and other potential impacts.

The current practices for decommissioning pipeline are either removal of the pipeline or leaving the pipeline on the seabed after cleaning and filling it with water. The prevailing opinion is that leaving the pipeline in place results in the least environmental impact. As over time the pipelines will become integrated within the seabed environment, then the removal would disturb the habitats that have generated in the vicinity of the pipelines.

0.5 Alternatives in the national EIA

This EIA includes two main route alternatives and one sub-alternative (a slight variation at the Russian end of the Finnish pipeline section). In addition, a so-called 'non-implementation alternative' is assessed.

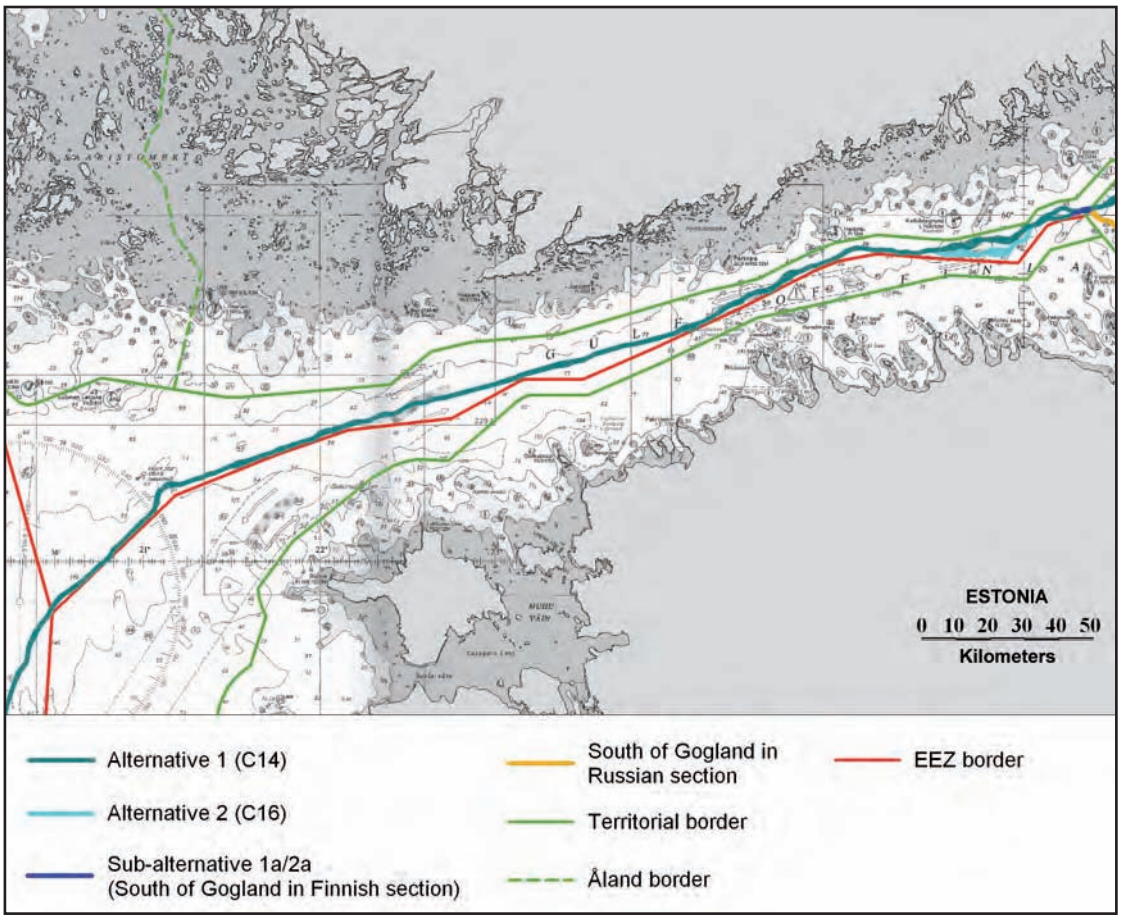

Figure 0.8. Route alternatives of the Nord Stream Pipeline in the Finnish EEZ.

The alternatives are:

Alternative 0: non-implementation of the Nord Stream Pipeline, i.e., not constructing the offshore natural gas pipeline from Russia to Germany.

Alternative 1: (Route revision C14). This alignment runs exclusively within the Finnish EEZ from the Russian border to the Swedish border and is close to the Finnish and Estonian EEZ border. The route does not enter Finnish territorial waters.

Alternative 2: (Route revision C16). This alignment is for the most part (90%) identical to Alternative 1, but it deviates for a length of 40 km to pass to the south of the area known as Kalbådagrund. Alternative 2 was investigated because the geological conditions were expected to be more favourable south of Kalbådagrund. Based on the results of the engineering design, Alternative 2 requires seabed interventions in fewer locations than Alternative 1.

Near the Russian EEZ, the Alternative 1 and Alternative 2 routes are identical. There are however two route options depending on the selected alignment within the Russian sector, i.e., whether the pipeline passes to the north or south of the island of Gogland. The short section of route linking to the alignment passing south of Gogland is called Sub-alternative 1a/2a, as there is only a minor deviation from the main routes. These sub-alternatives are assessed in this report.

0.6 Environmental impacts in the project area

Potential impacts from pipeline construction and operation were identified and assessed. To determine their significance, they were compared with the present environmental conditions.

The impacts are categorised as follows and are discussed within the sub-sections below:

- The physical and chemical environment, including the seabed, water quality, air quality, noise and visual aspects
- The biotic environment, including the benthic and planktonic environments, fish and fish stocks, marine mammals and seabirds
- Protected areas
- The socioeconomic environment, including ship traffic, commercial fishery, military areas, infrastructure, utilisation of natural resources, cultural heritage, human health, tourism and recreation and social (human wellbeing) impacts.

The impacts related to decommissioning (ending the operation of the pipeline) and to unplanned events (incidents and accidents) are discussed at the end of the chapter.

For this EIA report, the significance of impacts is classified into four levels:

- **No impact:** the impact target is not affected or changed by the project.
- **Minor:** impact with low importance, magnitude, and/or short duration. The impact is typically reversible.
- **Moderate:** impact with medium importance. The impact is local/regional and/or the duration is medium- or long-term. The impact is typically partly reversible or irreversible.
- **Significant:** Impact with high importance and significance for the impact target. The extent is typically regional/national and/or the duration is long-term or permanent. The impact is irreversible.

At the end of this chapter, the impacts are summarised in Table 0.1 and followed by a comparison of the route alternatives' impacts to assist with the route selection process.

Transboundary impacts from other countries to the Finnish EEZ and from the Finnish EEZ to other countries are presented in the Nord Stream Espoo Report - Offshore pipeline through the Baltic Sea.

In the final phase of this EIA Nord Stream advised that a dynamically positioned pipelay barge will install both pipelines (south-eastern and north-western) from the Russian boarder to KP 300 km. The impact assessment is however made according to the worst-case-scenario, which means that assessment is based on the assumption that all pipelay would be performed with an anchored pipelay barge.

0.6.1 Summary of impacts on the phy sical and chemical environment

0.6.1.1 Present conditions

The physical and chemical environment of the Baltic Sea is unique due to its special geographical, climatological and oceanographic conditions. The water depth along the surveyed corridor of the pipeline in Finland varies from 43–203 m. The seabed features troughs and valleys bordered by escarpments, together with high banks. Most of the bottom is covered by sediments that have accumulated since the last ice age. Some of the most recent sediments may contain harmful substances and nutrients, due to human activities or natural causes.

The water quality is mainly affected by salinity, oxygen levels, suspended solids, nutrients, heavy metals and organic pollutants. Oxygen concentrations in the Baltic Sea vary significantly according to season and water depth. The halocline lies at a depth of 60–70 m, below which there is very little oxygen and conditions are inhospitable to sustaining life.

The air quality in the Gulf of Finland is influenced by emissions from maritime traffic.

The existing background noise in the Finnish project area, both in air and underwater, is also caused primarily by maritime traffic.

0.6.1.2 Project activities

The pipeline, together with the rock placed to support it, occupy a relatively small permanent footprint (1.1 km^2, or 0.003 % of the surface area of the Finnish EEZ) on the seabed.

The construction of the pipeline requires some seabed intervention works in selected areas to protect and support the pipeline. In the Finnish EEZ, this means:

- placing limited amounts of rock material on the sea bottom (rock placement)
- clearing munitions in the installation corridor
- possibly clearing debris found in the vicinity of the pipeline

0.6.1.3 Possible impacts

The intervention works and munitions clearance will cause a temporary, localised mobilisation of seabed sediments (turbidity), usually for less than a day. This may have a temporary effect on water quality that typically will be limited to the construction area only.

Some of the chemical compounds and nutrients deposited in the sediment will stay in the water after the particles have settled back to seabed. It may have a short-termed impact on the water quality. However, the amounts are small with respect to measured background levels and will rapidly be diluted. The impacts are assessed to be minor. During the operation phase, the use of anodes will release metals in the ambient water.

The impacts from munitions clearance refer to above-mentioned sediment spreading and dispersion of chemical compounds. However, due to water depth and distance to the coastline, the impacts are considered to be minor. Mine clearance will cause pressure waves, and precautionary measures will be taken to avoid harm to marine mammals and fish. Also some depressions and elevations on the seabed may occur. However, it is assessed that the impacts are short-term and close to negligible.

The construction works will also cause some greenhouse gas emissions (CO2); however, they are not disproportionate or unacceptable in comparison with the prevailing maritime traffic.

Noise emissions to the air will not reach inhabited areas due to the distance from the Finnish coast. The noise levels are comparable to those caused by the prevailing ship traffic in the Finnish project area except for munitions clearance. Disturbance caused by noise and physical activities is not expected to reach any important seal haul-out or bird areas.

0.6.2 Summary of impacts on the biotic environment

0.6.2.1 Present conditions

The Baltic Sea, as a large, brackish water ecosystem, is unique and hosts many species and habitats, although long-term eutrophication has led to some ecological deterioration.

The valuable habitat created by aquatic plants (benthic macrophytes) can be found only in shallow waters. The shortest distance from the pipeline route to most of the shore areas of this kind is approximately 10 km.

Due to the varying salinity and oxygen concentrations in the sea, aquatic bottom fauna (benthic fauna) in the Finnish project area die out from time to time and re-establish themselves later. At present, in the northern Baltic Proper about one-third of the total sea area is without macrofauna due to oxygen deficiency.

The Baltic Sea is host to approximately 70 saltwater fish species and another 30-40 brackish or freshwater species. The composition of fish communities varies in different regions along

the natural gas pipeline route in relation to the habitat characteristics of these regions. The low oxygen content in deeper areas limits the suitable habitats for fish.

Four mammal species are native to the Baltic Sea, but only grey seals and ringed seals are observed in the Finnish project area. During periods of ice cover, the species breed in the open sea, where there are suitable ice formations. About half the Baltic grey seals are located in the south-western Finnish archipelago, more than 50 km away from the pipeline route.

The Baltic Sea is an important migration route, breeding and resting area for birds. The shortest distance from the pipeline route to known breeding areas is approximately 10 km. Important bird areas (Birdlife International) have been taken into account in this assessment and are a minimum distance of 18 km from the pipeline.

0.6.2.2 Project activities

Pipe-laying, together with the associated activities like anchor-handling and rock-placement, will lead to some impacts due to disturbance of the seabed and sediment re-suspension. The construction activities will also cause some visual and noise disturbance.

0.6.2.3 Possible impacts

Sediment spreading (turbidity) and subsequent sedimentation will lead to some impacts on benthic fauna in the vicinity of the pipeline. Depending on the nature of the benthic communities and their regeneration potential, the impact will be mostly reversible. Rapid re-colonisation is likely to take place over a period of months to a few years.

Most construction activities will be carried out in deep waters (more than 60 m), where the oxygen conditions are often poor and benthic fauna is limited. Impacts on marine fauna are therefore assessed to be very limited. The impact on the planktonic environment due to re-suspension of sediments and elevation of contaminant and nutrient levels are assessed to be minor.

The main impact on fish during construction will be the avoidance reaction of areas where sediment is re-suspended. The impact is reversible, local and short-term. The impacts will not reach herring spawning sites and are not likely to have a significant effect on pelagic sprat eggs.

Marine mammals theoretically might be affected by munitions clearance. However, the impact is considered to be of minor significance, as care will be taken to ensure that there are no mammals inside the safety zone. Construction of the pipeline is a significant distance from all known seal haul-outs, so only minor impacts are expected.

Birds are likely to avoid the construction area due to noise and visual disturbance. However, the effect is very local and temporary. In the construction area (radius of roughly 2 km), the small increase of turbidity due to sediment re-suspension might also reduce the feeding success of diving birds. However, the construction area is mainly located in areas too deep for

feeding birds. Thus, the significance of the impact on birds due to construction activities is assessed as minor.

In the operating phase, only minor impacts will occur due to periodic inspection works and additional rock placement – if it is required. Impacts on further compartments of the ecosystem, such as fish or birds, as a result of an impairment of the benthos are not foreseeable in the Finnish EEZ.

0.6.3 Summary of impacts on protected areas

0.6.3.1 Present conditions

The Baltic Sea features several important ecological sites that are protected by means of nature reserves of varying degrees of protection. Ecological conservation in the Baltic Sea is aimed at both marine and coastal biotopes (habitats and species). Most protected areas are located in coastal waters and usually are an extension of a land site.

There are currently no offshore protected sites in the Finnish EEZ, i.e., in the vicinity of the planned Nord Stream Pipeline. The closest nature reserve (a Natura 2000 site) is situated approximately 10 km from the planned pipeline route. Three national parks are located within a distance of approximately 20–30 km of the Nord Stream Pipeline route. Eight Baltic Sea protected areas (BSPA), five Ramsar wetland sites and four seal protection areas are located at a distance of 10–50 km from the pipeline.

0.6.3.2 Project activities

Impacts on protected areas have been assessed primarily with respect to construction works that may have an impact on water quality and create some noise disturbance.

0.6.3.3 Possible impacts

The distance between the route alignment in the Finnish EEZ and the protected areas (more than 9 km) is significant; therefore no physical impacts, e.g., sedimentation or noise, are expected to occur in protected areas. As a conclusion, it is not expected that protected areas will be compromised.

For birds migrating outside of protected areas, the construction area is in general too deep for feeding. Noise and visual disturbance will in general keep the birds away. No impacts on mammals are expected either, assuming no mammals will be present insider the exclusion zone during munitions clearance as the result of effective mitigation measures.

0.6.4 Summary of impacts on economic life and human conditions

0.6.4.1 Present conditions

The Baltic Sea is one of the busiest seas in the world, with 14 primary shipping routes. The greatest annual shipping intensity in the Baltic Sea is on the route between Tallinn and Helsinki.

Fishery is of some importance in Finnish waters. At the end of 2007, there were 2,059 officially registered professional Finnish fishermen operating on the sea area. The commercial fishing fleet operating in the Finnish EEZ consists of eight trawlers. These mid-water trawlers are used to capture mainly herring and sprat.

Tourism in the Baltic Sea is closely linked to nature and the sea itself. Leisure boating and fishing are popular. There are thousands of summer cottages in the costal areas of the Gulf of Finland. A few houses are 5-10 km from the pipeline route, but the majority of them are further away.

After 1945, the Baltic Sea became an important strategic **military** area. Although the balance has shifted from military interests to logistical and commercial interests, the area remains a strategic one. The Baltic countries carry out various types of military practice exercises in the sea. The planned pipeline route passes through a section of the Örö D52 firing danger area of the Finnish Defence Forces and passes close to three others.

During World War I and World War II, sea mines and other **munitions** were deployed or dropped into the Gulf of Finland (see Figure 0.9 below). Following the wars, munitions were disposed of in the sea. Nord Stream AG performed a munitions screening survey during 2007 and 2008. Within 25 m of route Alternative 1, 29 objects were identified as munitions, and two additional objects were identified within 25 m of Alternative 2.

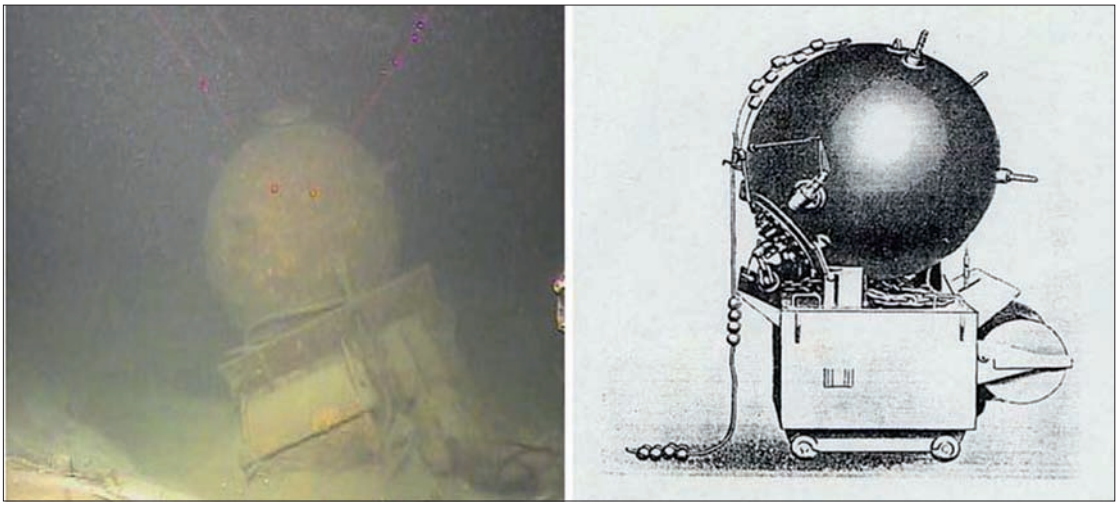

Figure 0.9. Correlation of munitions survey findings with historical records. The image on the left shows a mine with an anchoring mechanism that is located in a deep, scoured hollow surrounded by a flat seabed of soft gyttja clay. Based on the drawing on the right, the object has been identified as an EMC I + II German WW II moored contact mine, with either a 250 kg or 320 kg hexanite charge.

Both active and inactive **electrical and telecommunications cables** traverse the Finnish EEZ. There is also a plan to construct a natural gas pipeline, Baltic Connector, between Estonia and Finland. Areas for wind parks are also under investigation in the Gulf of Finland, but the areas of interest are located 20 km from the pipeline routes.

The maritime **cultural heritage** sites of the Finnish EEZ are primarily related to shipwrecks. Due to the physical conditions in the Baltic Sea, the shipwrecks are well-preserved. Nord Stream AG has worked closely with the Finnish National Board of Antiquities (FNBA) to assess the archaeological significance of the discovered wrecks. The types of wrecks range widely and include a World War II destroyer, an aircraft and several wooden sailing vessels of varying age.

A total of four wrecks or possible wrecks are situated less than 50 m from the pipeline route. On the pipeline route, a small wooden sailing dinghy was identified, which the FNBA has assessed as dispensable because there are already many similar examples in Finnish museums. Seven wrecks or possible wrecks have been identified within 50-250 m of the pipeline. An example of a wreck site discovered during the survey in the Finnish EEZ is presented in Figure 0.10. The skull-like features are part of the ship's rigging.

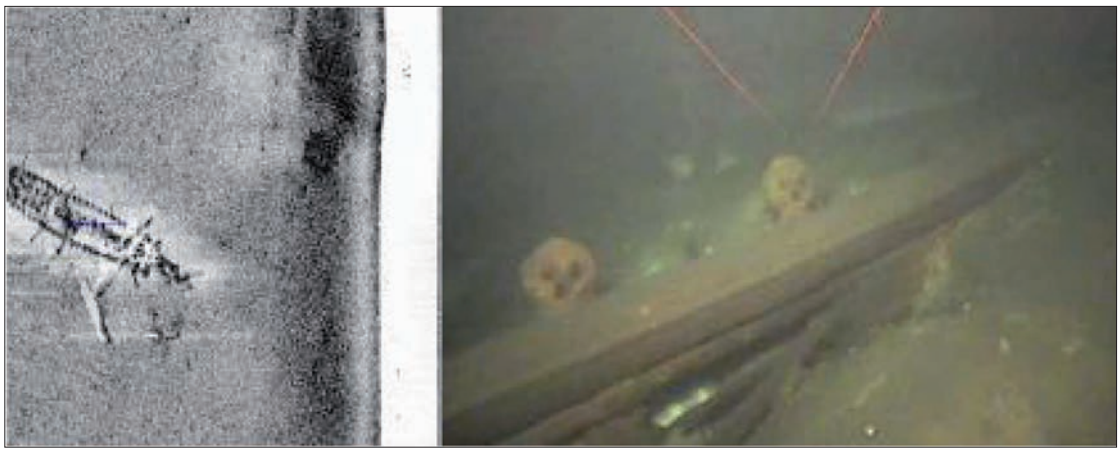

Figure 0.10. Example of a wreck in the Finnish EEZ; sidescan sonar image (left) and image from video survey by remotely operated vehicle (right).

0.6.4.2 Project activities

The construction activities may cause some impacts on the above-mentioned aspects. In addition, the presence of the pipeline during the operations phase will have some impacts on fishery.

0.6.4.3 Possible impacts

A safety zone will be created around the construction fleet as it moves along the pipeline route. The greatest shipping intensity is on the route between Tallinn and Helsinki. Because the construction area is located in the open sea and away from narrow fairways, the gen-

eral maritime traffic will not be compromised. Ship traffic will be monitored through a joint (Estonia, Finland, and Russia) maritime traffic control system known as the Gulf of Finland Reporting (GOFREP) system. Therefore, minor impacts are expected on **ship traffic** in the project area.

Fishery is assessed to be somewhat affected at the construction site due to the spreading of sediment. This is likely to result in short-term avoidance reactions by fish species. The pipeline may also have a permanent impact on trawling along certain sections of the pipeline route. At some locations along the route, the pipeline will form freespans (i.e., the pipeline will not rest directly on the seabed but will be suspended between two localised 'highs' in the seabed). Because trawling gear may become caught under the pipeline, it may be recommended that bottom-trawling may be restricted in these areas. However, Finnish fishermen generally practice mid-water trawling. Nord Stream AG is in active consultation with fishermen's associations.

No impacts on **tourism** or **recreation** are expected, as the interference of pipe-laying activities with the surrounding traffic is assessed to be minor and the pipe-laying barge itself will not be visible from any of the cottage areas in the Finnish archipelago. Noise emissions to the air will not reach inhabited areas due to the distance from the Finnish coast. The noise levels are comparable to those caused by prevailing ship traffic in the area. No impacts on human health due to sediment spreading or other factors are expected, as the amounts of harmful substances mobilized by project are so small that they will not be bioaccumulated in food chain and transferred to humans.

Because the public may have questions and concerns regarding the project, Nord Stream AG seeks to mitigate this impact by means of open and transparent communications.

The most significant social impact of the Nord Stream Pipeline is subjectively experienced concern and uncertainty. This concern is related to the state of the Baltic Sea, national security and/or environmental risks. Social impacts of the Nord Stream Pipeline vary significantly depending on an individual's perception of the project. The number of people expressing concern or uncertainty is high. Social surveys conducted by Nord Stream show that there is a moderate social impact due to project.

The impacts on **military areas** are assessed to be local because the pipeline route will run through only one firing danger area. The military authorities will be informed of construction activities before they move close to military exercise areas. The pipeline will not interfere with military exercises during the operations phase. The impacts, therefore, will be minor.

All **munitions** will be handled appropriately to ensure that they will not pose any risks during construction and operation of the pipeline. Clearance of munitions will be conducted in consultation with relevant national authorities. The seabed below 40 m in the Finnish EEZ does not contain any sensitive habitat structure, such as, e.g., biogenic reefs. Therefore, the effect on seabed morphology is of low importance.

The pipeline will not hinder the possibility to use or maintain existing **cables**. The pipeline is also a safe distance from planned wind park areas and raw material extraction areas. Currently, there is no known exploitation of **natural resources** on the continental shelf within the alignment of the planned pipeline route. No impact on cables or other infrastructure is expected.

Cultural heritage sites within the anchoring corridor will be avoided, and protection zones will be established during anchor-handling operations. The FNBA has assessed all identified wrecks to evaluate their cultural heritage value. One small wreck was identified on the pipeline route and has been assessed to have no cultural value. Agreements about controlled pipeline installation procedures will be established in consultation with the FNBA. Overall, the impact on cultural heritage sites will be limited and is assessed to be minor.

0.6.5 Summary of impacts of decommissioning

A separate study of options for decommissioning (ending the operational period of the Nord Stream Pipeline) will be carried out in due time before decommissioning commences. The study will include a review of the technical and economic feasibility of various decommissioning options, together with an analysis of the environmental impact. It is more appropriate to decide on the decommissioning strategy at that point, as experience from other decommissioning projects will have increased, and industry practices and legal requirements will have developed. Regardless of the procedure chosen, great care will be taken to ensure the least environmental impact.

The limited experience available at present suggests that leaving the pipeline on the seabed is the most likely scenario and that this will have no significant impact on the environment. Removal of the pipeline at the end of their operational lifetime will most likely cause minor environmental impacts comparable to but slightly higher than the impacts from construction of the pipeline.

0.6.6 Summary of impacts from unplanned events

Unplanned events are incidents and accidents. Comprehensive assessments of the risks to people and the environment during the construction and operation of the Nord Stream Pipeline were undertaken. According to the results of these assessments, no risks are considered unacceptable when compared to the risk tolerability criteria for the project. This is not surprising, given that natural gas pipelines are used worldwide and considered a safe means of transporting large volumes of gas. For example, there are more than 122,000 km of natural gas pipelines in Europe, more than 548,000 km in the US and many more in Australia, Russia and Canada.

During pipeline construction, the risk to third parties will be limited to the crews and passengers of passing vessels that could potentially collide with construction vessels. These risks are very small. The most significant risks to the environment during construction arise

from the potential for oil spills as a result of tanker collisions with construction vessels. The exclusion zones around the construction vessels will minimise the chance of this happening. Based on the results of the anchor corridor survey a risk assessment will be performed to assess the anchor and anchor wire interaction with unexploded munitions during pipeline installation.

During pipeline operation, the risk to third parties will arise from possible pipeline failure as well as natural gas release and ignition, impacting people on vessels in the immediate area. This risk has been shown to be very low. There is potential for fishing nets to become entangled with the pipeline, and this will be subject to risk assessment in 2009. The pipeline will be indicated on the relevant nautical charts to ensure ships in the vicinity of the pipeline are aware of their location, and the pipeline will be protected by rock placement in certain areas to prevent dragging anchors from damaging the pipeline.

0.6.7 Summarised comparison of environmental impacts of route alternatives

The environmental impacts of the route alternatives are summarised in Table 0.1 below. No major differences in environmental impacts between the route alternatives were identified. Values in the table represent the highest score assessed for the impact target in question and, therefore, should be considered a conservative comparison. The evaluation of Sub-alternative 1a/2a also includes the impacts of Alternative 1 and Alternative 2.

Table 0.1. Comparison of impacts of different route alternatives in the national EIA report.

Key to symbols used in the table: +++ = Significant positive impact, ++ = Moderate positive impact, + = Minor positive impact, 0 = No impacts, – = Minor negative impact, – – = Moderate negative impact, – – – = Significant negative impact, (X) = Mitigation implemented, (*) = Additional mitigation required

SCALE	– – –	– –	–	0	+	+ +	+ + +

		0-Alternative: non-implementation	Alternative 1 (C14)	Alternative 2 (C16)	Sub-alternative 1a/2a
Physical environment	Seabed	0	– (X)	– (X)	– (X)
	Water quality	0	– (X)	– (X)	– (X)
	Air quality	0	0	0	0
	Noise	0	0	0	0
	Visual aspects	0	0	0	0
Biotic environment	Benthic environment	0	– (X)	– (X)	– (X)
	Planktonic environment	0	0	0	0
	Fish and fish stocks	0	– (X)	– (X)	– (X)
	Marine mammals	0	– (X)(*)	– (X)(*)	– (X)(*)
	Seabirds	0	– (X)	– (X)	– (X)
Protected areas	Protected areas	0	0	0	0
Socio-economic environment	Ship traffic	0	0	0	0
	Fishery	0	– – (*)	– – (*)	– – (*)
	Military areas	0	0	0	0
	Infrastructure	0	0	0	0
	Natural resources	0	0	0	0
	Cultural heritage	0	0 (X)	0 (X)	0 (X)
	Human health	0	0	0	0
	Tourism and recreation	0	0	0	0
	Social impacts	0	– – (*)	– –(*)	– –(*)

Although all alternatives have been assessed to have minor environmental impacts, there is a slight difference between the route alternatives. In this EIA, slight differences between the route alternatives have been identified with respect to impacts on:

- seabed
- benthic fauna
- marine mammals
- seabirds
- protected areas
- ship traffic
- fishery
- infrastructure

The differences are summarised in Table 0.2 below. Alternative 2 appears to have a slightly lower overall environmental impact than Alternative 1.

Table 0.2 Conclusions of differences between Alternative 1 and 2.
Legend: + = Slightly better, - Slightly worse, 0 = No difference

Impact target	Alt 1	Alt 2	Reasoning
Physical and chemical environment			
Seabed	+	-	Alternative 2 has a larger footprint
Water quality	0	0	
Air quality	0	0	
Impacts on noise	0	0	
Biotic Environment			
Benthic fauna	-	+	Alternative 1 impacts more benthic fauna communities
Planktonic environment	0	0	
Fish and fish stocks	0	0	
Marine mammals	-	+	Alternative 2 is further away from haul-outs
Seabirds	-	+	Alternative 2 is in deeper areas
Protected areas	-	+	Alternative 2 is further away and in deeper areas
Economic and human conditions			
Ship traffic	-	+	Alternative 2 has less traffic
Fishery	+	-	Alternative 1 is less within known trawling areas
Military areas	0	0	
Infrastructure and utilisation of natural resources	+	-	One cable crosses route Alternative 2 three times, whereas it crosses Alternative 1 only once
Cultural heritage	0	0	
Human health	0	0	
Tourism and recreation	0	0	
Citizens' wellbeing	0	0	
Total number of + for each Alt.	**3**	**5**	

Based on technical project, baseline information and the performed environmental impact assessment it is predicted that all project alternatives (Alternatives 1 and 2, Sub-alternative 1a/2a) are acceptable from the environmental perspective and feasible to construct and operate. Through the comparative assessment of the route alternatives, Alternative 2 (C16) is selected as the preferred route.

0.7 Prevention and mitigation measures

The EIA process endeavoured to prevent possible negative impacts. If it has been impossible to prevent a specific impact completely (i.e., no other technical or economically feasible alternative is available), Nord Stream AG has planned mitigation measures.

0.7.1 Measures during the planning phase

The careful and detailed route selection and optimisation process has been a major mitigation measure against negative impacts. Both the number and magnitude of seabed intervention works have been minimised. The material transportation distances have also been minimised to reduce ship traffic and unnecessary greenhouse gas emissions.

0.7.2 Measures during the construction and operations phases

Pre-installation surveys will locate and allow the establishment of avoidance zones around cultural heritage and munitions areas to prevent contact with and damage to these sites.

A safety zone will be established around the slow-moving pipe-laying barge. When the construction vessels work within the Finnish EEZ, ship traffic will be monitored through the GOFREP system. As required, the captain of the service vessel fleet and pipe-laying barge will communicate with passing ships to avoid collisions.

Safety zones around the construction vessels will also minimise the risk of an oil spill as a consequence of a vessel collision.

The pipeline will be indicated on the relevant nautical charts to ensure that vessels in the vicinity of the pipeline are aware of their location, so as to avoid any damage to the pipeline.

Depending on the outcome of the update of the risk assessment for incidents due to fishing gear - pipeline interaction, restriction zones might be introduced.

0.8 Proposal for a monitoring programme

Nord Stream AG is designing a monitoring programme to verify the results of the impact assessment and to reveal any uncertainties. In addition, monitoring will ensure that the planned mitigation measures function appropriately. Monitoring is not only important for the Nord Stream project in particular; it will also provide valuable information for the assessment of similar projects in future.

The following aspects will be given highest priority in the environmental monitoring programme:

- Monitoring of marine mammals and other fauna before and during construction phase
- Monitoring of maritime traffic during construction phase
- Monitoring of cultural heritage during and after construction phase
- Monitoring of bottom sediment before and after construction phase
- Monitoring of water quality during construction phase
- Monitoring of benthic and fish fauna before and after construction phase

Table 0.3. Proposed environmental monitoring programme.

Items to be monitored	Prior to construction phase	During construction phase	After construction phase / during operation
Marine mammals and birds			
Ship traffic			
Cultural heritage			
Bottom sediment			
Water quality			
Benthic fish and fauna			

Table 0.3 summarises the proposed monitoring activities to take place after submission of the EIA report. The details of the monitoring programme (i.e., the frequency and time of monitoring) will be developed further after the EIA procedure in cooperation with the appropriate authorities.