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Environmental Impact Assessment Programme

Finland

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ENVIRONMENTAL IMPACT ASSESSMENT PROGRAMME

FINLAND

NORD STREAM EXTENSION ENVIRONMENTAL IMPACT ASSESSMENT PROGRAMME - FINLAND

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CONTENT

ABBREVIATIONS AND DEFINITIONS	9
SUMMARY	12
1 BACKGROUND AND PURPOSE	15
1.1 OVERVIEW	15
1.1.1 <i>History</i>	15
1.1.2 <i>Purpose and objectives</i>	16
1.1.3 <i>Developer</i>	18
1.1.4 <i>Overall project routing</i>	19
1.2 PROJECT IN FINLAND	20
1.2.1 <i>Scope of EIA</i>	20
1.2.2 <i>Project locations</i>	22
1.2.3 <i>Offshore survey area</i>	22
1.2.4 <i>Pipeline separation</i>	24
1.2.5 <i>Relation to other projects</i>	24
1.3 TIMETABLE	25
2 TECHNICAL DESCRIPTION	26
2.1 GAS TRANSPORT CAPACITY AND PIPELINE DIMENSIONS	26
2.2 PIPELAY	26
2.3 SEABED INTERVENTION WORKS	26
2.3.1 <i>Rock placement</i>	26
2.3.2 <i>Trenching, dredging and blasting</i>	27
2.3.3 <i>Pipeline crossings</i>	27
2.3.4 <i>Cable crossings</i>	27
2.4 MUNITIONS CLEARANCE	27
2.5 PRE-COMMISSIONING	27
2.6 HYPERBARIC TIE-IN	27
2.7 COMMISSIONING	27
2.8 OPERATION	28
2.9 DECOMMISSIONING	28
2.10 LOGISTICS	28
2.11 ONSHORE ANCILLARY ACTIVITIES	28
3 EIA PROCEDURE AND PUBLIC PARTICIPATION	30
3.1 FINNISH NATIONAL EIA PROCEDURE	30
3.1.1 <i>Aim of the EIA procedure</i>	30
3.1.2 <i>EIA legislation</i>	30
3.1.3 <i>Parties in the EIA procedure</i>	30
3.1.4 <i>National EIA procedure and time schedule</i>	30
3.1.5 <i>Public participation</i>	31
3.2 TRANSBOUNDARY CONSULTATION	32
4 ALTERNATIVES	33
5 BASELINE OFFSHORE	35
5.1 STRATEGIES, POLICIES AND LAND USE IN MARINE AREA	35
5.1.1 <i>Marine Management Planning</i>	36
5.1.2 <i>Maritime Transport Strategy</i>	37
5.1.3 <i>Marine Spatial Planning</i>	37
5.2 PHYSICAL AND CHEMICAL ENVIRONMENT	38
5.2.1 <i>Bathymetry</i>	38
5.2.2 <i>Seabed morphology and sediments</i>	39

5.2.3	<i>Currents</i>	44
5.2.4	<i>Hydrology and water quality</i>	45
5.2.5	<i>Air quality</i>	46
5.2.6	<i>Noise</i>	47
5.3	BIOTIC ENVIRONMENT	48
5.3.1	<i>Benthos</i>	48
5.3.2	<i>Plankton</i>	49
5.3.2.1	<i>Phytoplankton</i>	50
5.3.2.2	<i>Zooplankton</i>	51
5.3.3	<i>Fish</i>	51
5.3.4	<i>Marine mammals</i>	52
5.3.5	<i>Birds</i>	53
5.4	PROTECTED AREAS	53
5.4.1	<i>Natura 2000 areas</i>	54
5.4.2	<i>National parks</i>	55
5.4.3	<i>Baltic Sea Protected Areas</i>	56
5.4.4	<i>UNESCO areas</i>	56
5.4.5	<i>Seal sanctuaries</i>	57
5.4.6	<i>Ramsar sites</i>	57
5.4.7	<i>Important Bird Areas</i>	58
5.5	SOCIO-ECONOMIC CONDITIONS.....	58
5.5.1	<i>Ship traffic</i>	58
5.5.2	<i>Fishery</i>	60
5.5.3	<i>Military areas</i>	60
5.5.4	<i>Munitions</i>	61
5.5.5	<i>Barrels</i>	62
5.5.6	<i>Existing and planned infrastructure</i>	62
5.5.6.1	<i>Pipelines</i>	62
5.5.6.2	<i>Cables</i>	62
5.5.6.3	<i>Extraction and spoil dump areas</i>	64
5.5.6.4	<i>Planned wind parks</i>	64
5.5.7	<i>Scientific heritage</i>	64
5.5.7.1	<i>Long term monitoring stations</i>	64
5.5.7.2	<i>Whale remains</i>	65
5.5.8	<i>Cultural heritage</i>	66
5.5.9	<i>Tourism and recreation</i>	68
5.6	BASLINE IN RUSSIA, ESTONIA AND SWEDEN	68
5.6.1	<i>Overall transboundary baseline</i>	68
5.6.2	<i>Baseline Russia</i>	69
5.6.3	<i>Baseline Estonia</i>	69
5.6.4	<i>Baseline Sweden</i>	72
6	BASLINE ONSHORE	73
6.1	LAND USE	73
6.1.1	<i>Land use planning</i>	73
6.1.2	<i>Functions located in and around the operation area</i>	76
6.1.3	<i>Mussalo port</i>	77
6.2	PHYSICAL AND CHEMICAL ENVIRONMENT	78
6.2.1	<i>Soil, bedrock and groundwater</i>	78
6.2.2	<i>Water quality</i>	78
6.2.3	<i>Air quality and climate</i>	78
6.2.4	<i>Noise</i>	78
6.3	BIOTIC ENVIRONMENT AND PROTECTED AREAS	78
6.4	SOCIO-ECONOMIC CONDITIONS.....	79
6.4.1	<i>Traffic and safety</i>	79
6.4.2	<i>People and society</i>	80

6.4.3	<i>Landscape</i>	80
7	GENERAL DESCRIPTION OF IMPACT ASSESSMENT	81
7.1	IMPACTS TO BE ASSESSED	81
7.2	PROPOSED IMPACT AREA TO BE STUDIED	82
7.2.1	<i>Proposed offshore impact area</i>	83
7.2.2	<i>Proposed onshore impact area</i>	83
7.3	METHODS FOR IMPACT ASSESSMENT AND EVALUATION CRITERIA	84
8	IMPACT ASSESSMENT OFFSHORE	86
8.1	STRATEGIES AND POLICIES FOR THE MARINE ENVIRONMENT	86
8.2	PHYSICAL AND CHEMICAL ENVIRONMENT	87
8.2.1	<i>Seabed integrity</i>	87
8.2.2	<i>Seabed morphology and sediments</i>	87
8.2.3	<i>Hydrology and water quality</i>	87
8.2.4	<i>Air quality and climate</i>	88
8.2.5	<i>Noise</i>	88
8.3	BIOTIC ENVIRONMENT	89
8.3.1	<i>Benthos</i>	89
8.3.2	<i>Plankton</i>	90
8.3.3	<i>Fish</i>	90
8.3.4	<i>Marine mammals</i>	90
8.3.5	<i>Birds</i>	91
8.4	PROTECTED AREAS	91
8.5	SOCIO-ECONOMIC CONDITIONS	92
8.5.1	<i>Ship traffic</i>	92
8.5.2	<i>Fishery</i>	93
8.5.3	<i>Military areas</i>	94
8.5.4	<i>Munitions</i>	95
8.5.5	<i>Barrels</i>	96
8.5.6	<i>Existing and planned infrastructure</i>	96
8.5.7	<i>Utilization of natural resources</i>	98
8.5.8	<i>Scientific heritage</i>	98
8.5.9	<i>Cultural heritage</i>	99
8.5.10	<i>Tourism and recreation</i>	99
8.5.11	<i>Social impacts</i>	100
8.6	DECOMMISSIONING OF THE PIPELINES IN THE FINNISH EEZ	101
8.7	CUMULATIVE IMPACTS	101
8.7.1	<i>Future use of the Finnish EEZ</i>	101
8.8	RISK ASSESSMENT	101
8.9	TRANSBOUNDARY IMPACTS	102
8.9.1	<i>Physical and chemical environment</i>	103
8.9.2	<i>Biotic environment</i>	103
8.9.3	<i>Socio-economic conditions</i>	103
8.10	COMPARISON OF ALTERNATIVES	105
9	IMPACT ASSESSMENT ONSHORE	106
9.1	LAND USE	106
9.2	PHYSICAL AND CHEMICAL ENVIRONMENT	106
9.2.1	<i>Air quality and climate</i>	106
9.2.2	<i>Noise</i>	106
9.3	SOCIO-ECONOMIC CONDITIONS	107
9.3.1	<i>Traffic and safety</i>	107
9.3.2	<i>People and society</i>	107
9.4	NON-SIGNIFICANT IMPACTS	108
10	ENVIRONMENTAL STUDIES AND SURVEYS	109

11	PREVENTION AND MITIGATION MEASURES	110
12	UNCERTAINTIES.....	111
13	PERMITS	112
13.1	SURVEY PERMIT	112
13.2	CONSTRUCTION PERMITS	112
13.2.1	<i>Council of State Consent according to the Law on the Finnish EEZ</i>	<i>113</i>
13.2.2	<i>Permit for construction according to the Water Act</i>	<i>113</i>
14	MONITORING	114
	REFERENCES	115

APPENDICES

Appendix 1: Maps

- Map 1 Natura 2000 areas
Map of Natura 2000 areas in Finnish waters in the Gulf of Finland and the Archipelago Sea
Source: HELCOM
- Map 2 National parks, BSPAs, UNESCO sites and Ramsar sites
Map of national parks, Baltic Sea Protected Areas (BSPAs), UNESCO sites and Ramsar sites in Finnish waters in the Gulf of Finland and the Archipelago Sea
Sources: HELCOM, Metsähallitus
- Map 3 Seal sanctuaries, IBAs and FINIBAs
Map of seal sanctuaries, Important Bird Areas (IBAs) and Finnish Important Bird Areas (FINIBAs) in Finnish waters in the Gulf of Finland and the Archipelago Sea
Sources: Metsähallitus, BirdLife Finland
- Map 4 TSS, anchoring areas, preliminary safety areas and navigational lanes
Map of Traffic Separation Schemes (TSS), anchoring areas, preliminary safety areas for ships and navigational lanes in Finnish waters in the Gulf of Finland and the Archipelago Sea
Sources: Finnish Transport Agency, Helsingin Sanomat
- Map 5 Military areas
Map of restricted areas and firing danger areas of Finnish Defence Forces
Source: Finnish Defence Forces
- Map 6 Existing and planned infrastructure
Map of existing and planned infrastructure in the Gulf of Finland, the Northern Baltic Proper and the Archipelago Sea
Source: Nord Stream AG
- Map 7 Scientific heritage
Map of long term monitoring stations in Finnish waters within 5 km distance from Alternative 1 and the location of whale remains
Sources: HELCOM, SYKE
- Map 8 Cultural heritage
Map of cultural heritage in the Finnish EEZ
Sources: Finnish National Board of Antiquities, Nord Stream AG
- Map 9 Surveys
Map of Nord Stream Extension survey area and most important past environmental surveys
Source: Nord Stream AG

ABBREVIATIONS AND DEFINITIONS

Abbreviation / Term	Definition
AIS	Automatic Identification System
ALT	Alternative
ALT 0	Alternative 0 in the Finnish EIA procedure (non-implementation)
ALT 1	Alternative 1 in the Finnish EIA procedure
ALT 1a	Sub-alternative in the Finnish EIA procedure at Porkkala area.
Anoxia	Total depletion of dissolved oxygen
As	Arsenic
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, Nord East Atlantic, Irish and North Seas
bcm	Billion cubic metre
BSPA	Baltic Sea Protected Area
Cd	Cadmium
Ch.	Chapter
cm	Centimetre
Co	Cobalt
CO ₂	Carbon dioxide
Cr	Chromium
Cu	Copper
dB	Decibel
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DM	Dry matter
DP	Dynamically positioned
DPFV	Dynamically positioned fall-pipe vessel
dw	Dry weight
E	East
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ELY Centre	Centre for Economic Development, Transport and the Environment
EU	European Union
FIMR	Finnish Institute of Marine Research
FINIBA	Finnish Important Bird Area
FNBA	Finnish National Board of Antiquities
GOFREP	Gulf of Finland Mandatory Ship Reporting System
ha	Hectare
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HELCOM	Helsinki Commission, Baltic Marine Environment Protection Commission
Hg	Mercury
HSE	Health, Safety and Environment
Hypoxia	Reduced (low) dissolved oxygen content
Hz	Herz
IBA	Important Bird Area
IMO	International Maritime Organization
Impact area	Conservative estimate of maximum area for impacts to occur
IUCN	International Union for the Conservation of Nature

kg	Kilogram
km	Kilometre
l	Litre
m	Metre
m ²	Square metre
m ³	Cubic metre
MARPOL	International Convention for the Prevention of Pollution from Ships
mg	Milligram
ml	Millilitre
mm	Millimetre
MMP	Marine Management Plan
MMT	Marin Mätteknik (a Swedish marine survey company)
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
MSP	Marine Spatial Planning
MTS	Maritime Transport Strategy
N	North
NECA	NO _x Emission Control Area
NEGP	North European Gas Pipeline
Ni	Nickel
ng	Nanogram
NO _x	Nitrogen oxides
PAH	Polycyclic aromatic hydrocarbon
Pb	Lead
PCB	Polychlorinated biphenyl
pg	Picogram
PM ₁₀	Measure of particles in the atmosphere with a diameter of less than or equal to a nominal 10 micrometers
POP	Persistent organic pollutant
Project	Nord Stream Extension Project
PSV	Pipe Supply Vessel
Ramsar	Convention on Wetlands, signed in Ramsar, Iran, in 1971
Route option	Corridor outside Finnish EEZ or when describing the entire Pipeline from Russia to Germany
s	Second
SAC	Special Areas of Conservation
SCI	Sites of Community Importance
SECA	Sulphur Emission Control Area
SO _x	Sulphur oxide
SO ₂	Sulphur dioxide
SPA	Special Protection Areas
Survey area	The applied survey area in the Gulf Of Finland. Width varies from 1.6 – 6 km.
SYKE	Finnish Environment Institute
TBT	Tributyltin
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
teu	Twenty foot equivalent unit
TRS	Total Reduced Sulphur
TSS	Traffic Separation Scheme
UGSS	Russia`s Unified Gas Supply System
UNESCO	United Nations Educational, Scientific and Cultural Organization
VASAB	Vision and Strategies for the Baltic Sea Region 2010

WHO-PCDD/F-TEQ	Sum of toxicity equivalents of the 17 toxicologically most important dioxins and furans
WHO(2005)-PCDD/F TEQ excl. LOQ	Sum of toxicity equivalents of the 17 toxicologically most important dioxins and furans, excluding limit of quantification
Zn	Zinc
µg	Microgram

SUMMARY

Project description

The Nord Stream Extension is a project for up to two offshore natural gas transmission pipelines from Russia to Germany through the Baltic Sea. Route options run from a landfall in Russia through Finnish, Swedish and Danish waters to a landfall in Germany. Within the Finnish Exclusive Economic Zone (EEZ) the route follows the existing Nord Stream Pipelines 1 and 2. The overall length of the route options are in the order of 1,250 km. Offshore and onshore ancillary activities are included in the scope of the Project EIA. The EIA and the permitting of the project are preliminary scheduled to be conducted to allow a construction window from 2016 to 2018.

EIA procedure

The EIA procedure is based on the Act and Decree on environmental impact assessment procedure. The EIA procedure is two-phased; EIA programme phase and EIA report (assessment) phase. The EIA programme is a plan to describe how the impacts caused by the project are planned to be assessed. In the second phase, the impacts from the alternatives will be assessed and the results presented in the EIA report.

Alternatives in the Finnish national environmental impact assessment (EIA)

The Finnish EIA includes following alternatives:

- non-implementation as Alternative 0 (ALT 0);
- the section of the Nord Stream Extension route within the Finnish EEZ as Alternative 1 (ALT 1);
- sub-alternative south of Porkkala and to the north of ALT 1 (ALT 1a).

ALT 1 is equivalent to survey area with the exception of Porkkala area, where ALT 1a is located. The length of ALT 1 in the Finnish EEZ is approximately 370 km and the width of the route corridor is 1.6-4.7 km. The length of ALT 1a is approximately 21 km and the width 2 km. The distance from the alternatives to the Finnish coastline is more than 16 kilometres.

If other sub-alternatives than ALT 1a and technical alternatives are considered during the EIA procedure, these will also be assessed in the EIA.

Status of the project area

Most of ALT 1/ALT 1a are located in the deep sea areas in the middle of the Gulf of Finland. The alternatives in the Finnish EEZ do not cross any Natura 2000 areas, however, at one location ALT 1 goes close to the protected Sandkallan Natura 2000 area. At its closest point the survey area comes within 6 m of the Sandkallan Natura 2000 area. Most of the alternatives in the Finnish EEZ are within areas that at least occasionally deficit of oxygen in the water layer nearest to the seabed and hence the biodiversity of these areas is low.

Ship traffic in the Gulf of Finland is heavy. Consequently a special concern will be paid to the safety issues during construction of the pipelines and the impact of the presence of the pipelines during operation to emergency anchoring.

The most important area for commercial fishery is at the entrance to the Gulf of Finland and in the Northern Baltic Proper.

Onshore ancillary activities will be located in the Kotka region. Nearest residential areas are located at about 1 km from the port of Mussalo. Average traffic volumes from highway 7 to the port are from 7,000 to 21,400 vehicles per day, with the proportion of heavy vehicles from 10 to 17 %.

Environmental impact assessment

The results and conclusions of the Nord Stream environmental monitoring in 2009-2012 in the Finnish EEZ have been the basis for the initial evaluation of potential impact targets in this EIA programme. The impacts from the pipeline construction were minor in significance. Table below presents the impact targets in the EIA.

Impact target			Impacts to be assessed for the phases * / **	
	Category	Sub-category	Construction	Operation
Offshore	Marine policies, strategies and plans	Objectives of the policies, strategies and plans	X	X
	Physical and chemical environment	Seabed integrity	X	X
		Seabed morphology and sediments	X	X
		Hydrology and water quality	X	X
		Air quality and climate	X	
		Noise	X	X
	Biotic environment	Benthos	X	X
		Plankton		
		Fish	X	
		Marine mammals	X	
		Birds	X ***	
	Protected areas		X	X
	Socio-economic conditions	Ship traffic	X	X
		Fishery	X	X
		Military areas	X	X
		Munitions ****		
		Barrels ****		
		Existing and planned infrastructure	X	X
		Utilization of natural resources	X	X
		Scientific heritage	X	X
		Cultural heritage	X	X
		Tourism and recreation	X	
		Social impacts	X	X
		Human health		
Onshore	Land use		X	
	Physical and chemical environment	Soil, bedrock and groundwater		
		Water quality		
		Air quality and climate	X	
		Noise	X	
	Biotic environment and protected areas			
	Socio-economic conditions	Traffic and safety	X	
		People and society	X	
		Landscape		

* X = to be assessed

** Impact assessment methodology related to decommissioning presented in Chapter 8.6

*** Only impacts from munitions clearance will be assessed.

**** Munitions and barrels are not impact targets but environmental risks. Chapter 8.5.4 will present the impact assessment proposed for munitions clearance.

Transboundary impact assessment will concentrate on the physical and chemical environment and biotic environment. Also ship traffic, fishery, scientific heritage and social impacts will be considered. Potentially affected countries include mainly Russia, Estonia and Sweden.

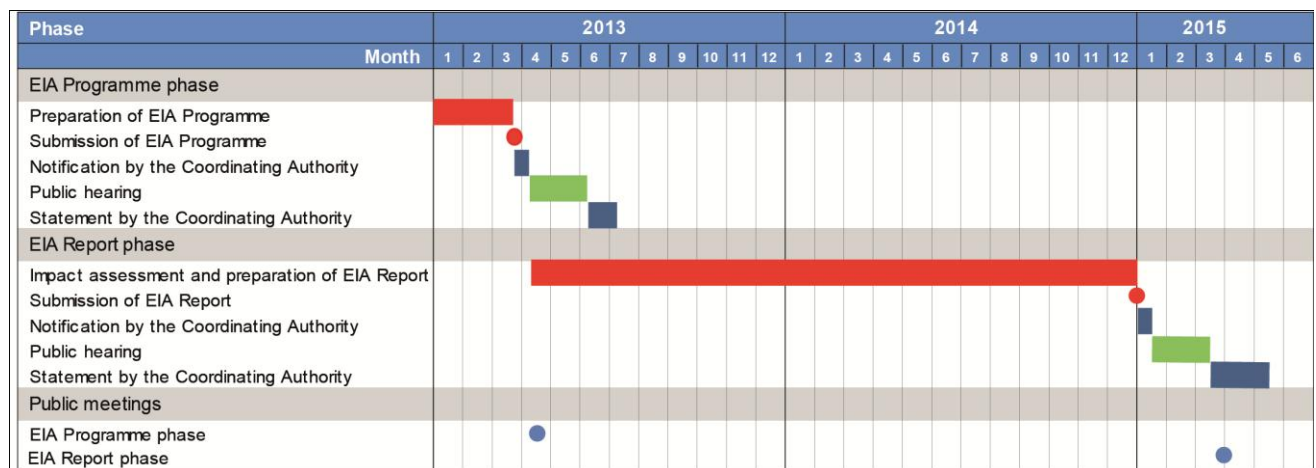
EIA time schedule

The time schedule for the EIA procedure covers the years 2013-2015.

The EIA programme is on public display from 8.4.2013 to 6.6.2013. Public meetings will be organised in Helsinki, Hanko, Turku, Kotka and Mariehamn during the hearing period of the EIA programme. Statements and opinions on the EIA programme can be sent to the Coordinating Authority by the end of the public display period. The Coordinating Authority will issue its statement on the EIA programme within 1 month of the end of the public display. The international consultation is planned to be performed within the national consultation period.

The EIA report is planned to be completed at the end of 2014, after which it will be on display for approximately two months. During this time, public hearings will be organised in similar way as those organised during the EIA programme phase. Coordinating Authority's statement will be received two months after end of public display period.

The preliminary time schedule for the national EIA procedure is presented below.



1 BACKGROUND AND PURPOSE

1.1 Overview

1.1.1 History

Nord Stream AG was founded in December 2005 and it has since constructed two pipelines (Nord Stream Pipelines 1 and 2) through the Baltic Sea from Russia to Germany. However, Nord Stream Project and pipeline route through the Baltic Sea has a long history behind (Figure 1.1).

1997-1999	Feasibility study confirms the feasibility of Nord Stream pipelines through the Baltic Sea
2005	Nord Stream AG was founded
2006	EU designated Nord Stream as 'a project of European interest'
2006-2009	National EIA procedures and international consultations according to Espoo Convention
2009-2010	Permitting for pipeline construction Parties of origin grant the permits
November 2009	Commencement of clearance of munitions from pipeline route
March 2010	Commencement of rock placement
April 2010	Commencement of Pipeline 1 installation
January 2011	Commencement of Pipeline 2 installation
November 2011	Commencement of Pipeline 1 operation
October 2012	Commencement of Pipeline 2 operation Feasibility study confirms the feasibility of Nord Stream Extension Project

Figure 1.1 History of the Nord Stream Project

Predecessor of Nord Stream AG, North Transgas Oy (NTG) carried out a feasibility study in 1997-1999, when routing through the Baltic Sea was evaluated as the most feasible of several onshore and offshore alternatives from Russia to Germany. In 2006, at the time when Nord Stream was called North European Gas Pipeline, Nord Stream was designated as an infrastructure project 'of European interest' within the framework of the EU's TEN-E guidelines. In 2007 the shareholders of Nord Stream AG made the decision on the construction of the pipelines from Russia to Germany through the Baltic Sea.

Nord Stream Pipelines 1 and 2 were constructed in 2010-2012. Pipeline 1 was taken into operation in November 2011 and Pipeline 2 in October 2012 (Figure 1.2).

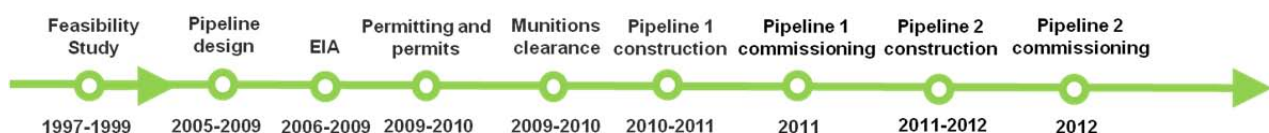


Figure 1.2 Timeline of the Nord Stream Project

In 2012 Nord Stream AG conducted a feasibility study for the potential extension to Nord Stream Project. Based on the outcomes of the feasibility study the Nord Stream Extension Project (later also: the Project) is feasible.

1.1.2 Purpose and objectives

A robust pipeline infrastructure, which connects the Russian natural gas fields to the European energy markets and safeguards reliable and secure natural gas supply, is required to fulfil contractual agreements between Russian and European natural gas companies over the coming decades. The successful construction of the first two Nord Stream pipelines clearly indicates that from an environmental, technical and economic point of view, subsea natural gas transportation through the Baltic Sea is a sustainable solution to meet European natural gas demand.

Natural gas is the only fossil fuel with expected growth in the EU's energy mix

Currently making up one quarter of the EU's primary energy consumption, natural gas accounts for a significant proportion of energy consumption within the EU member states. By 2035, the share of natural gas in the EU's primary energy mix is expected to rise from 25 % to 30 % (see Figure 1.3).

The share of natural gas will grow in lieu of other, less environmentally friendly, fossil fuels. The share of oil is predicted to go down from 33 % in 2010 to about 25 % in 2035 and the share of coal to decline from 16 % (2010) to 9 % (2035).

The percentage of nuclear energy in the EU's primary energy mix is forecasted to remain almost unchanged at 14 % (2010) and at 13% (2035). Although nuclear power generation does not emit carbon dioxide, nuclear power plants are highly disputed regarding their safety and radioactive waste management. Therefore nuclear power is not regarded as a priority option to substitute fossil fuels.

The proportion of energy supplied by renewable sources in the EU is forecasted to increase from 11 % in 2010 to approximately 23 % in 2035, still leaving a significant share of the energy mix to other sources – with natural gas, as a low-emission fuel, being the widely preferred option.

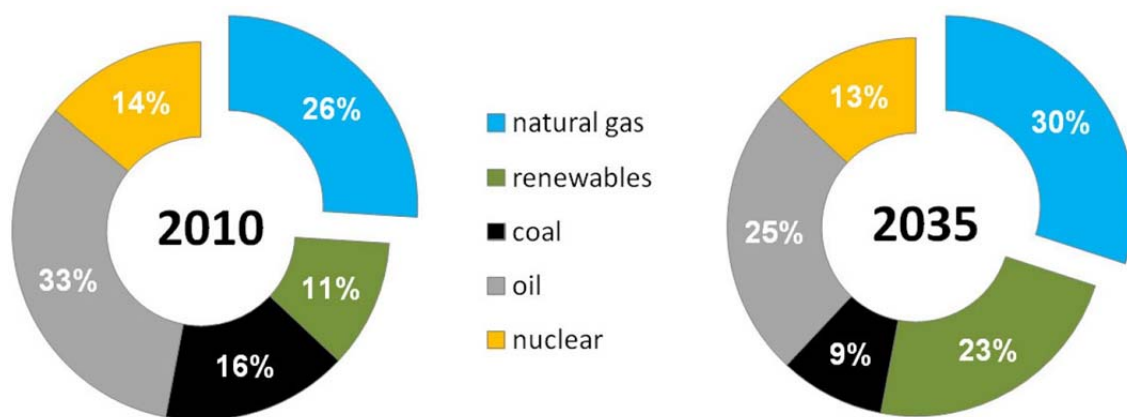


Figure 1.3 EU energy mix – the growing demand for natural gas (Nord Stream AG 2013a [Original sources: Eurostat 2012; IEA World Energy Outlook, 2012])

Natural gas and renewable energy are perfect low-carbon economy partners

One benefit offered by natural gas is becoming more vital with the increasing use of renewable energies: natural gas power plants can superiorly compensate for fluctuations in renewable energy supply.

Although hydroelectric power generation is popular in the Nordic countries, it is not an option for many EU member states that lack the requisite hydrological properties and resources. This leaves wind and solar

energy as key renewable energy sources. These, however, are characterised by highly volatile capacities due to variable winds and sunshine. Fluctuations can be observed on a seasonal basis as well as on a day-to-day or intra-day basis which means that complementary sources are needed to provide a stable, consumer oriented electricity supply. Natural gas-fired turbines can be brought online in minutes rather than the hours it takes for coal-fired plants, or even days in the case of nuclear reactors.

Natural gas-fired power plants can adapt rapidly to changing capacities that occur when energy from intermittent renewable resources is fed into the electricity grid. Thus, natural gas as a bridge technology is regarded as perfect transition partner for a low-carbon economy with renewables as the target technology.

Natural gas plays a key role in the energy transition

In 2011, the European Commission adopted the communication “Energy Roadmap 2050”, which is the basis for developing a long-term European energy framework together with all stakeholders. According to the communication, “gas will be critical for the transformation of the energy system”. It acknowledges that the “substitution of coal (and oil) with gas in the short to medium term could help to reduce emissions with existing technologies until at least 2030 or 2035. Although gas demand in the residential sector might drop by a quarter until 2030 due to several energy efficiency measures in the housing sector, it will stay high in other sectors, such as the power sector, over a longer period.”

EU’s natural gas import requirement continue to grow

Current total proven natural gas reserves in the EU are relatively low compared with the projected annual demand. At 1,100 bcm, the Netherlands has the largest remaining proven reserves within the EU. The United Kingdom, which currently contributes approximately 25 % of the annual natural gas production in the EU, has remaining proven reserves of approximately 200 bcm.

At present, natural gas production in the EU covers roughly 38 % of demand in the EU, and production from existing natural gas reserves in the EU will decline from around 201 bcm per year in 2010, to only 94 bcm per year in 2035. Even if demands remain stable, the natural gas import requirements of EU markets will significantly increase. This gap needs to be filled by additional imports and/or unconventional production.

Alternative sources and transport means prove to be insufficient or too uncertain

Norwegian gas production has grown rapidly in the last 10 years, but production from known fields in Norway is expected to begin declining from the early 2020s. The discovery and development of new fields requiring further capital investment would be necessary for Norway to maintain its production after this period and any increase in supply capacity to the EU would require additional gas transportation infrastructure.

Liquefied Natural Gas (LNG) deliveries to the EU member states are expected to almost double by 2030. However, due to global market competition, a further increase is unlikely. LNG transport, compared with offshore pipelines, tends to be less energy-efficient and involves higher carbon emissions. The LNG process is complex, and involves liquefaction of gas at the point of export, specialised shipping transport, and finally re-gasification. To replace the annual capacity planned for the Project would require some 600 to 700 round-trips by LNG tankers from an LNG facility in Russia to an LNG facility in North West Europe per year. Over and above additional carbon emissions, ship traffic causes emissions of other air pollutants, noise in the marine environment and influences maritime safety, particularly in heavily trafficked areas.

An overland pipeline project from Russia to North West Europe, for example through the eastern or northern and western Baltic Sea bordering states, would be longer and include significant environmental and social challenges when compared with an offshore pipeline on the sea floor of the Baltic Sea. Overland pipeline challenges include human settlements, roads, railways, canals, rivers, surface landforms, agricultural land, as well as potentially sensitive eco-systems and cultural heritage sites. An overland pipeline would also require additional infrastructure sites such as compressor stations approximately every 200 km to maintain pressure for gas transport flow, which would require significant land and energy usage while emitting noise and atmospheric emissions.

There is significant uncertainty surrounding the future of unconventional shale gas extraction in Europe, concerning geology as well as costs, environmental aspects, public acceptance and the lack of a drilling industry. Unconventional gas raises many environmental concerns, including groundwater pollution, methane emissions and seismicity. It could have high environmental costs which are reflected by moratoria and other restrictions on hydraulic fracturing activities (which are an essential component of unconventional gas extraction) in countries such as France, Belgium, Germany and Bulgaria. First drilling results in Poland were so far rather modest. The low political and public acceptance and the uncertain economic viability makes shale gas an uncertain option to cover future EU gas demand.

The delivery of large volumes of natural gas to the European natural gas market from the Caspian region is becoming less likely, as demand in Turkey is rising and the relevant projects have been scaled down. Furthermore, since 2009, China, which has built the related infrastructure in Turkmenistan, has been importing natural gas from Turkmenistan. Gas exports from Central Asia (Turkmenistan, Uzbekistan and Kazakhstan) to China are much more straightforward for these countries and therefore more likely than to Europe.

Russia is a sound natural gas supply source for the EU member states

With 44,600 bcm, Russia has 21.4 % of the world's currently known conventional natural gas reserves. Russia is by far the country with the largest gas reserves in the world, followed by Iran (15.9 %), Qatar (12.0 %), Turkmenistan (11.7 %), and the United States (4.1 %). Most of the natural gas reserves in Russia are located in Western Siberia, where all the largest OAO Gazprom fields, either producing (Urengoy, Yamburg, Zapolyarnoe) or under development (Yamal peninsula) are located. From there natural gas can be transported to the European markets via Russia's Unified Gas Supply System (UGSS).

EU and Russian natural gas companies have maintained a reliable long-term relationship for almost 40 years. EU companies buy some 60 % of Russian natural gas exports. Natural gas export earnings are significant to Russia's national budget. The European Union speaks of an evident interdependency on the part of the EU and Russia when it comes to energy partnership.

The Nord Stream pipelines ensure reliable natural gas supplies to the EU

The existing Nord Stream pipelines and their planned extension provide robust, reliable and secure natural gas supply to EU customers. They not only help ensure the fulfilment of existing long-term supply contracts between Russian and EU companies, but offer additional supply options to North West Europe to compensate for its declining domestic gas production.

The existing Nord Stream Pipeline system and its planned extension offer a technically sound solution for many decades of deliveries of Russian gas to the EU. Offering a direct natural gas connection they are free from non-technical risks and free of interference of a commercial or non-commercial nature by third parties. They offer a reliable delivery option for Russian natural gas exports to the EU.

The commitment of OAO Gazprom and major EU energy companies to the building of Nord Stream pipelines 1 and 2 and now to an extension of the Nord Stream Pipeline system, both involving major private investment, underlines the interest of the natural gas industry to strengthen the long-term supply relationship between Russia and the EU. This will be of considerable benefit to the EU by increasing reliability and security of supply and to its natural gas consumers by providing additional supply options.

The EU recognises the importance of the Nord Stream Pipeline. The Trans-European Energy Network via EU Decision No 1364/2006/EC of 6 September 2006 acknowledges the northern European natural gas pipeline running from Russia to Germany through the Baltic Sea as a project of "European interest".

1.1.3 Developer

Nord Stream AG, based in Zug, Switzerland, is an international consortium of five major companies established in December 2005 for the purpose of planning, construction and subsequent operation of a natural gas pipeline system through the Baltic Sea. The shareholders of the Nord Stream consortium are the Russian natural gas company OAO Gazprom (51 %) and the four European natural gas companies

Wintershall Holding GmbH (15.5 %), E.ON Ruhrgas AG (15.5 %), N.V. Nederlandse Gasunie (9 %), and GDF SUEZ (9 %). Nord Stream AG successfully constructed the two Nord Stream pipelines, showing that subsea natural gas transportation through the Baltic Sea is a sustainable solution for meeting European natural gas demand.

1.1.4 Overall project routing

The Project comprises of up to two offshore natural gas transmission pipelines from Russia to Germany through the Baltic Sea. Nord Stream AG evaluated several main route options in the feasibility study including a routing through the Estonian and Latvian EEZ. Subsequently Nord Stream AG applied for survey permits in the corresponding countries for those route options, which were regarded as technically and environmentally feasible, in order to proceed with further investigations to optimise pipeline routing. The Estonian government decided in December 2012 not to grant Nord Stream AG a permit to perform a reconnaissance survey in the Estonian EEZ. Thus the originally identified route option through the Estonian and Latvian EEZ could not be considered further. Route options follow alignments from landfalls in Russia through Finnish, Swedish and Danish waters to landfall in Germany (Figure 1.4.).

The overall length of the route options are in the order of 1,250 km depending on the landfall locations and the detailed routing options.

A screening was performed at the Russian south coast of the Gulf of Finland for the identification of potential pipeline landfall locations based on requirements derived from connecting Russian upstream natural gas transport systems. Two locations were identified as being potentially suitable for the pipelines landfall site:

- Kolganpya at the Soikinsky peninsula and
- Kurgalsky peninsula near the Estonian border (an area where potential landfall location will be searched).

Similarly the German coastline has been screened for feasible landfall locations. The Greifswalder Bodden has been identified as a preferred region for a possible landfall location.

The landfall locations and route options are presented in Figure 1.4.

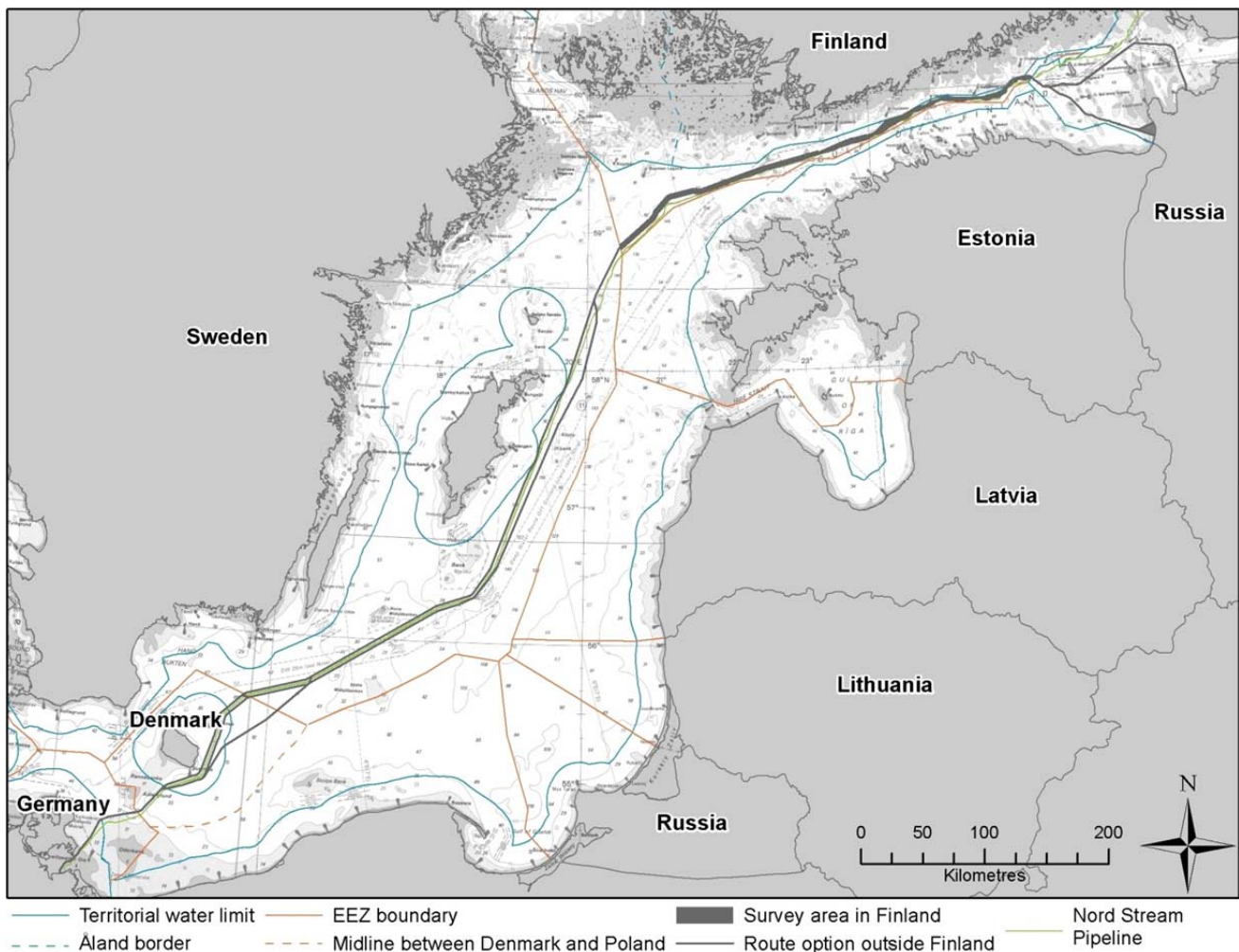


Figure 1.4 Landfall locations and route options of the Project

1.2 Project in Finland

1.2.1 Scope of EIA

The Finnish Nord Stream Extension EIA will include the following activities as summarised in Figure 1.5:

Construction

- Munitions clearance in the Finnish EEZ
- Rock placement in the Finnish EEZ
- Rock transport from a Finnish port (possibly Kotka) to rock placement site at pipeline installation corridor in the Finnish EEZ
- Crossing installations for existing cables
- Pipe supply vessel traffic from a Finnish port (possibly Hanko and Kotka) to lay barge in the Finnish EEZ
- Pipelay of two pipelines in the Finnish EEZ with dynamically positioned and anchored lay barge
- Pre-commissioning in the Finnish EEZ
- Possible hyperbaric tie-in in the Finnish EEZ
- Commissioning in the Finnish EEZ

Operation

- Operation and maintenance of pipelines in the Finnish EEZ for 50 years

Decommissioning

- Decommissioning of the pipelines in the Finnish EEZ

Ancillary activities

- Pipe shipment from concrete coating plant (possibly in Kotka) to the potential marshalling yard in Hanko
- Rock transport from potential Finnish quarry or quarries to temporary storage in a Finnish harbour. The port of Kotka is considered as a potential harbour for the receipt of rock.
- Temporary rock storage at harbour

The EIA will include national impact assessment of above mentioned activities (as presented in Chapters 8 and 9). Ancillary activities will be assessed as indirect effects of the main project. In addition, the assessment of transboundary impact from activities in Finland to affected countries (mainly Russia, Estonia and Sweden) will be in the scope of EIA.

Other activities

Other activities are proposed to be outside the scope of EIA. These activities are:

- Concrete weight coating plant (possibly in Kotka), marshalling yards and harbours (possibly in Hanko and Kotka)
- Transport of materials to concrete weight coating plant (by rail and ship)
- Transport of materials from marshalling yards to harbours (by lorry)
- Manufacture and transport of (raw) materials.

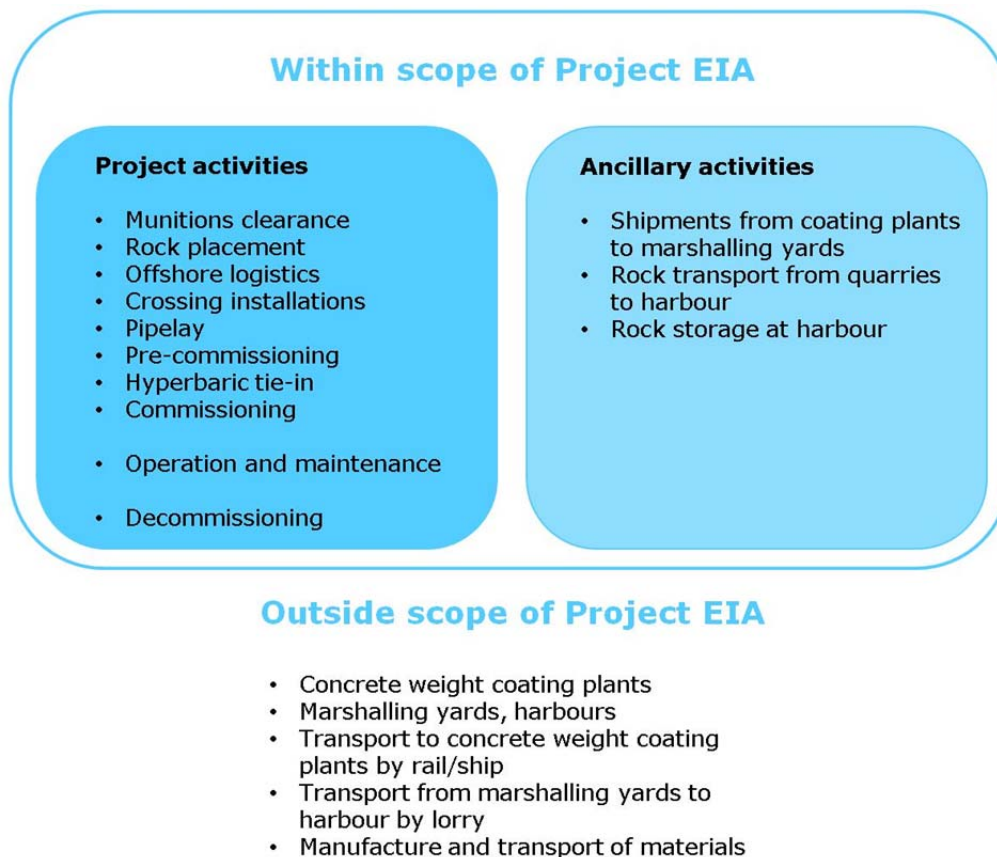


Figure 1.5 Scope of the Finnish EIA: Project activities and ancillary activities included in the project EIA, and other activities not included in the Finnish EIA

1.2.2 Project locations

The planned locations of project activities and ancillary activities in Finland are presented in Figure 1.6. The survey and main project area is between the border of the Russian territorial waters and the Swedish EEZ border. In addition, project logistics include mainly transport from Hanko and Kotka to the pipeline route. Locations for ancillary onshore activities, i.e. rock transport from quarry/quarries and temporary rock storage are anticipated to be in the Kotka area. Pipe shipment from Kotka to Hanko is ancillary offshore activity.

Regarding onshore ancillary activities, one logistic possibility is to utilize the same harbour terminal and services as for the Nord Stream project. In that case the needed rock material will be delivered from the vicinity of Kotka to a temporary storage in the harbour area and shipped via Mussalo harbour – part of Port of HaminaKotka.

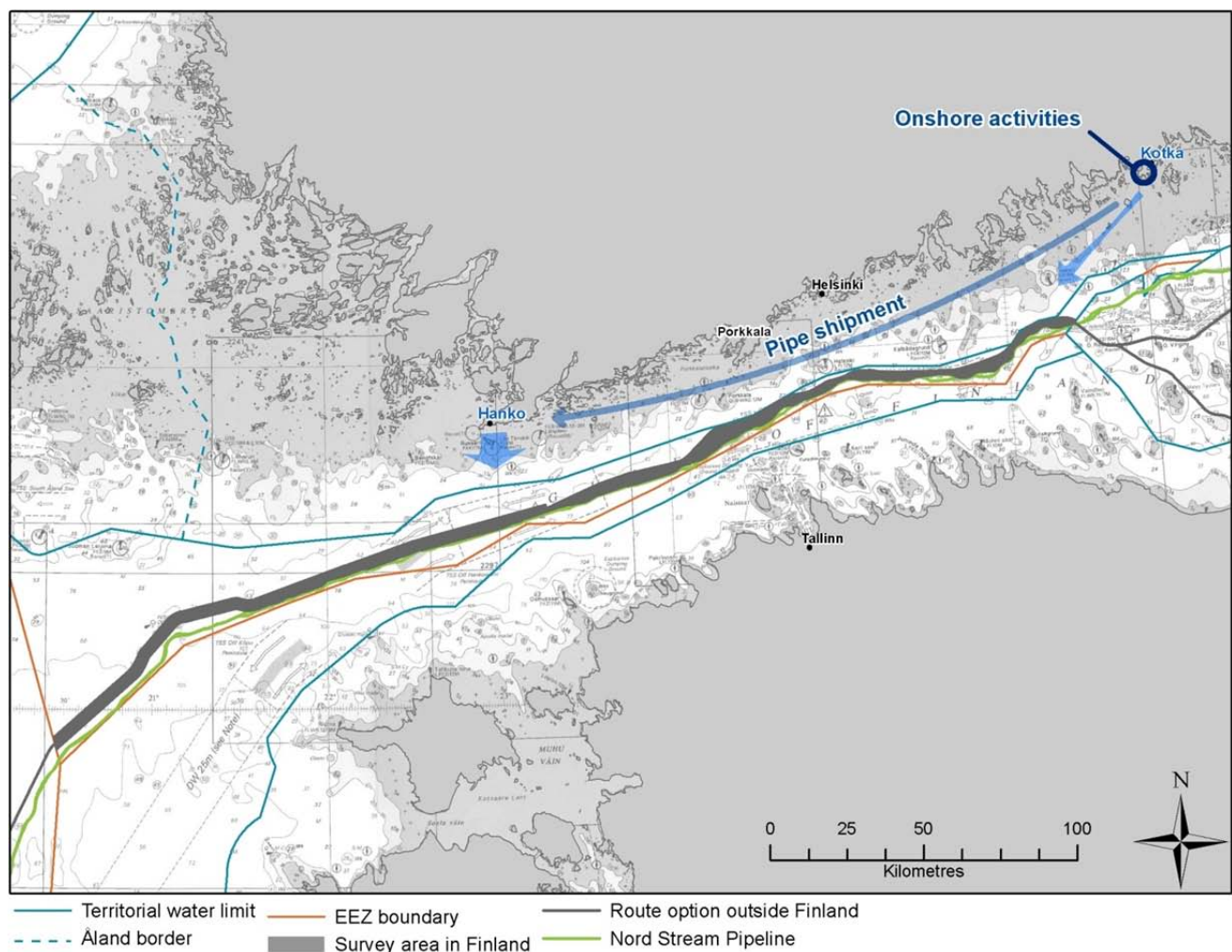


Figure 1.6 Project activities and ancillary activities in Finland

1.2.3 Offshore survey area

Nord Stream applied for the consent to conduct surveys for the Project in the Finnish EEZ. The applied and later revised survey area is limited to the Finnish EEZ (see Figure 1.7). The survey area in the Finnish EEZ has been defined by taking into account both environmental and socioeconomic constraints.

The applied survey area starts at the border of the Russian territorial waters and continues until it reaches the Swedish EEZ border. The survey area is located north of the existing Nord Stream pipelines. The length of survey area in the Finnish EEZ is approximately 370 km. The survey area width varies from 1.6 to 6 km. The survey area is widest south of Porkkala.

The applied survey area can be described as follows:

- 1) From the Russian/Finnish EEZ border to south of Hanko:
 - The southern boundary is the Nord Stream Line 1
 - The northern boundary extends northwards 1.6 to 4.7 km north of Nord Stream Line 1. However, at the Off Porkkala Lighthouse TSS the survey area width is 6 km to allow two alternatives to be studied in the EIA.
- 2) South of Hanko to Finnish/Swedish border:
 - The southern boundary does not extend south of Nord Stream Line 1 and is at maximum 4.1 km from the Nord Stream Line 1
 - The northern boundary varies from 2.8 km to 8 km from the Nord Stream Line 1

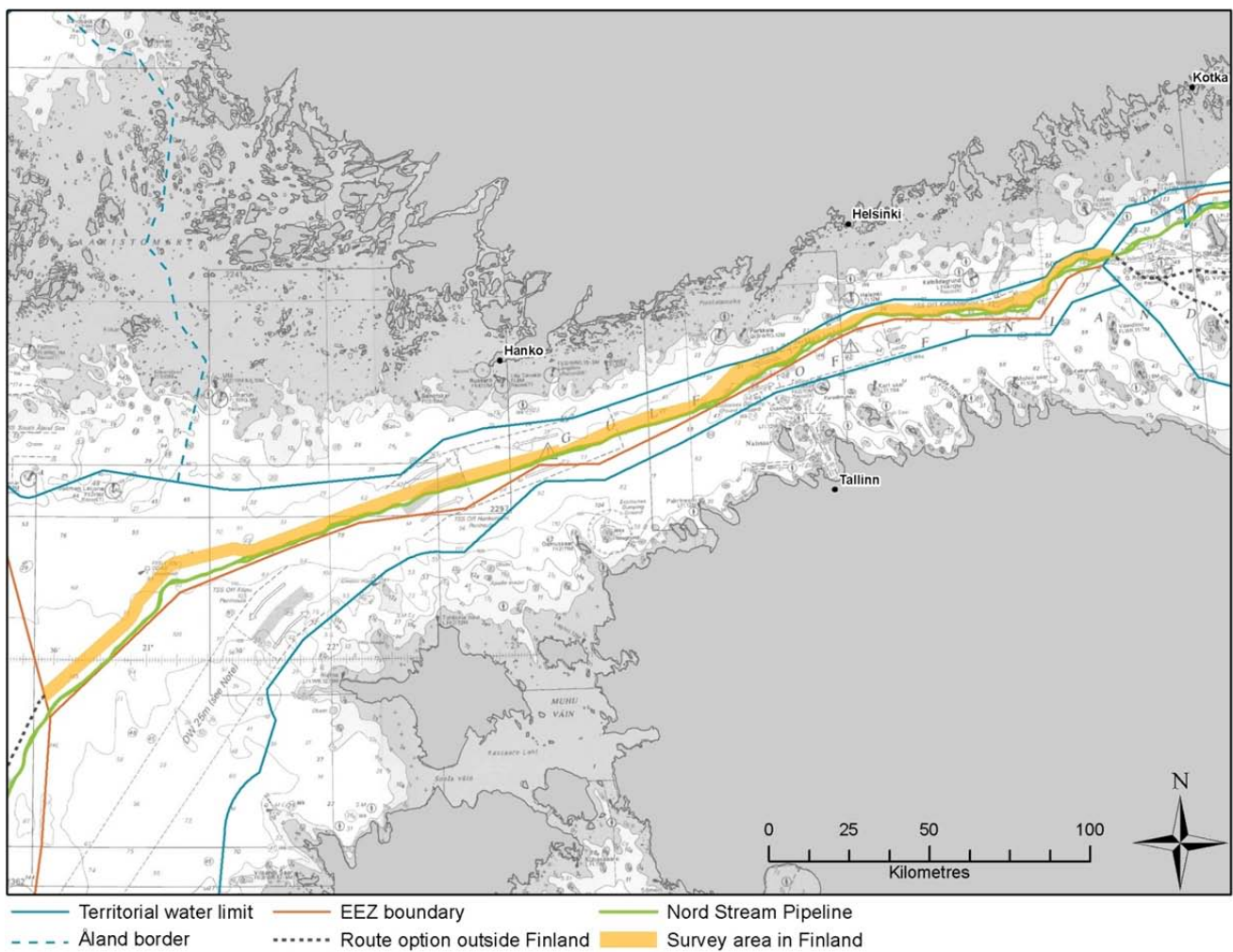


Figure 1.7 The survey area in the Finnish EEZ

1.2.4 Pipeline separation

To allow the minimisation of the cumulative footprint of the two pipeline systems the criteria that drive the minimum pipeline separation needs to be assessed. Such assessment takes into consideration the risks and constraints during the construction and operation of the pipelines.

The relevant scenarios for the construction risk are:

- Interaction between adjacent intervention works (i.e. rock berms)
- Dropped objects from construction vessels
- Pipelay vessel station keeping system: anchored or dynamically positioned
- Flexibility to temporarily laying down the pipeline anywhere along the route
- Safety distance to allow munitions clearance.

The relevant scenarios for operational risk are related to marine traffic:

- Dragged anchors
- Emergency anchoring
- Sinking ships

Detailed assessment of the risks associated with construction and operation will be performed during the engineering design phase. Such assessment will also establish the risk acceptance criteria for evaluating the risk to:

- The planned extension to Nord Stream pipeline system
- The construction risk to the Nord Stream pipeline system
- The overall risk to the integrity of two separate transmission systems (i.e. Nord Stream and the extension to Nord Stream)

The preliminary minimum pipeline separations, to be further assessed in the engineering design phase, are:

- For pipeline installation by a dynamically positioned pipelay barge the separation to Nord Stream should be at least 500 m
- For a pipeline installation by an anchored pipelay barge the separation to Nord Stream should be at least 1200 m
- The separation between the two planned pipelines for the extension to Nord Stream should be in the order of 270 m when installed by a dynamically positioned pipelay barge

The separation could be reduced on a case by case basis, in the event that other seabed constraints dictate a closer separation.

Due to the risk of interaction with and disturbance of unexploded munitions in the Gulf of Finland and to minimise the extent of the required munitions clearance it is envisaged that a dynamically positioned pipelay barge will be used from the Russian Finnish border to a location to the south of Hanko (dependent on the survey results).

To the west, within the Northern Baltic Proper the routing should allow pipeline installation by either an anchored pipelay barge or a DP pipelay barge.

The final pipeline alignments in the Finnish EEZ will be developed in close cooperation with relevant authorities.

1.2.5 Relation to other projects

The following projects in the Finnish EEZ have been implemented lately, are under construction or are in the planning phase:

- Nord Stream Pipelines 1 and 2: Pipeline 1 runs mostly along the southern edge of the survey area. No crossings of Nord Stream Pipelines are planned in the Finnish EEZ
- Balticconnector, a planned gas pipeline between Finland and Estonia which will cross the survey area
- UPT telecommunications cable constructed in 2012 will be crossed several times
- Estlink 2 power cable (installed August-December 2012) will be crossed
- Several other cables run parallel to or will be crossed (for more information, see Chapter 5.5.6.2).

- Planned offshore telecommunications cable between Finland and Germany (alignment unknown at this stage).

1.3 Timetable

An estimated time schedule for the Project is presented in Figure 1.8.

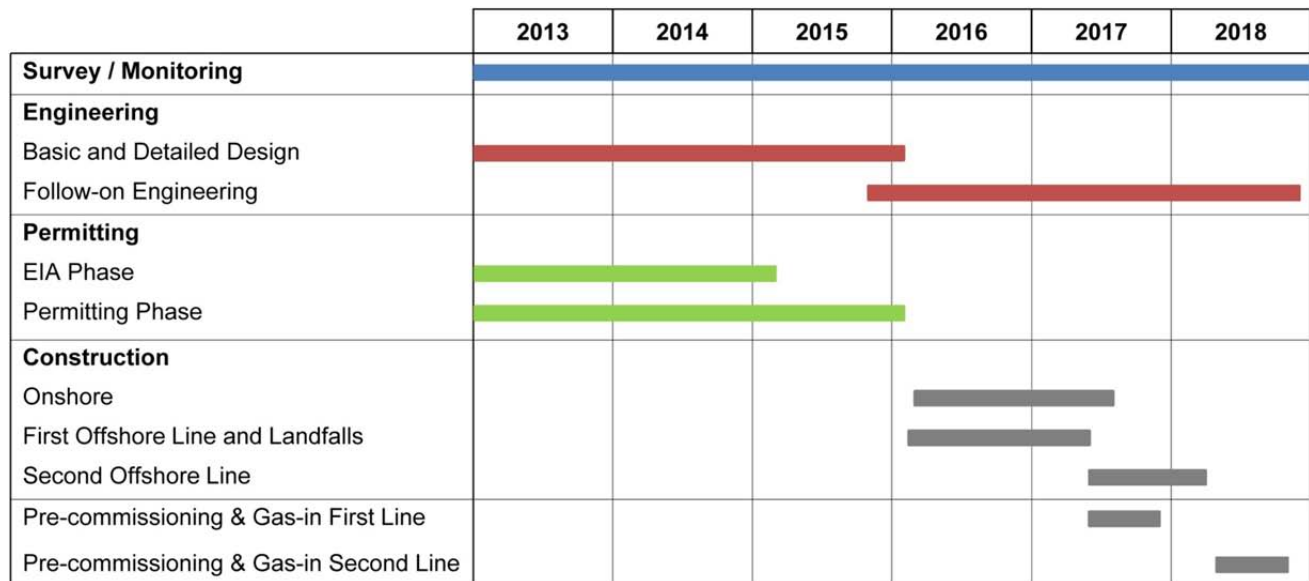


Figure 1.8 Preliminary time schedule (Nord Stream AG 2013a)

The permitting phase shown in the figure includes the permitting in all parties of origin in accordance with national legislation. In Finland, permitting will follow the EIA phase, and is scheduled for 2015-2016.

2 TECHNICAL DESCRIPTION

This chapter shortly describes the project from technical point of view, and the focus is mainly on project activities and ancillary activities to be carried out in Finland and the Finnish EEZ.

2.1 Gas transport capacity and pipeline dimensions

Each of the Nord Stream Extension pipelines is planned to be able to transport approximately 27.5 bcm (billion cubic metres) per annum of natural gas. The design pressures for the pipelines are planned to be similar as to Nord Stream i.e. in the range of 220 barg / 200 barg / 177.5 barg in three pipeline sections.

Each pipeline will be comprised of approximately 12 m individual steel pipes that are welded together. The pipelines will be protected by anticorrosion coating and concrete coating.

The provisional pipeline design is similar to Nord Stream, so it is envisaged that the inner diameter of the pipes (1,153 mm) will be consistent throughout the entire length of the pipelines. The wall thickness of the pipelines will vary according to the design pressure segments, meaning that there will be three different wall thicknesses (in the range of 34.6 mm, 30.9 mm and 26.8 mm) in offshore section. The outer diameter will vary due to variations in the wall thickness of the steel pipes and in the thickness of the concrete weight-coating (in the range of 60 mm to 120 mm depending on requirements for on-bottom stability).

2.2 Pipelay

During the pipelay process, individual pipes will be transported from the harbour by pipe supply vessels (PSVs) to the pipelay vessel. The concrete-coated pipes will be welded together on board the lay vessel into a continuous string and lowered onto the seabed. The pipelay will be performed as a conventional S-lay. This method is so-named because of the profile of the pipe as it moves across the stern of the lay vessel onto to seabed, forming an elongated 'S'.

The pipelay will be carried out using several lay and support vessels. In the Finnish EEZ, two different pipelay vessels may be used. The two different pipelay vessels that will be assessed in the EIA are:

- An anchored lay vessel which requires anchor handling vessels to manoeuvre its anchors used for positioning
- A dynamically positioned lay vessel which does not require the deployment of anchors during the pipelay process, as it uses thrusters to maintain position.

Lay rates are expected to be approximately 2-3 km/day.

2.3 Seabed intervention works

2.3.1 Rock placement

Rock placement refers to local placement of coarse gravel and cobbles (typically crushed rock) on the seabed in discrete localised berms to support the pipeline and to serve as basement structures at tie-in area. The aim is to avoid excessive freespans and overstressing of the pipeline and to ensure its dynamic stability. Rock placement will be carried out before and after pipelay.

The crushed rock would be transported by truck from the quarries to temporary storage at the nearest suitable port. The rock material will be then transported from the harbour and placed on the seabed by dynamically positioned fall-pipe vessel (DPFV).

Chapter 2.11 gives further details on onshore ancillary activities (rock transport and rock storage).

2.3.2 Trenching, dredging and blasting

No trenching, dredging or blasting is planned in the Finnish EEZ.

2.3.3 Pipeline crossings

No crossings with the existing Nord Stream pipelines are planned within the Finnish EEZ. The pipelines will cross the Nord Stream pipelines before entering into the Finnish EEZ.

2.3.4 Cable crossings

The Nord Stream Extension pipelines will cross several cables in the Finnish EEZ. For each crossing a specific crossing design will be developed, which is planned to be agreed with the cable owners. Typically crossing structures consist of concrete mattresses and/or gravel.

2.4 Munitions clearance

To ensure safe installation of pipeline, clearance of conventional munitions located on the seabed will be carried out. Depending on the munition type, alternative clearance methods will be assessed:

- Detonating a donor charge placed near munitions;
- Relocation of munitions and leaving on the seabed;
- Relocation of munitions to another location and detonating it with a donor charge in; or
- Recovery and inshore disposal.

If chemical munitions are found during surveys, any interaction with them will be avoided.

2.5 Pre-commissioning

After installation, a series of activities will be carried out to prepare the pipelines for safe operational use. Generally, these activities are flooding, cleaning and gauging, pressure testing, dewatering and drying.

During the flooding of the pipeline sea water may be taken in from the Finnish EEZ. During the cleaning and pressure testing water may be discharged in the Finnish EEZ. In the dewatering phase water taken from the Finnish EEZ may be discharged at a landfall location.

2.6 Hyperbaric tie-in

It is envisaged that each pipeline will consist of two different sections in the Finnish EEZ which will be laid partly overlapping each other at the location of tie-in. The sections will be joined underwater by means of a hyperbaric tie-in. Before laying the pipeline sections down on the sea bottom, a lay-down head will be welded to the end of the pipe head to preserve the dry, non-corrosive environment inside the pipeline. The tie-in itself will be performed in a dry welding habitat placed over the ends of the pipeline sections. At the tie-in site a rock berm will be constructed on the seabed to provide stability during the tie-in operation. The entire operation will be controlled remotely from a vessel and assisted by divers.

2.7 Commissioning

After pre-commissioning the pipelines contain dry air and are partially filled with nitrogen gas. Nitrogen acts as an inert buffer and is taken into the pipeline immediately prior to natural gas-filling. Nitrogen gas prevents natural gas to react with atmospheric air and create a potentially explosive mixture within the pipeline. Commissioning then proceeds with the filling and pressuring the pipelines with natural gas.

2.8 Operation

Pipelines will be designed for an operating life of at least 50 years. The operation of the pipelines will be monitored and controlled from the Main Control Centre, which will be manned 24 hours per day, 365 days per year. Back-Up Control Centre will be installed at a different location in case of loss of the main control centre. Landfall facilities will have local emergency shutdown systems.

External and internal inspections will be carried out regularly during operation, and maintenance operations such as additional rock placement will be conducted if needed.

2.9 Decommissioning

The pipelines will be designed to operate for 50 years, although this may be extended subject to close monitoring. The decommissioning programme will be developed when the pipelines are reaching the end of their design life or economic life. Decommissioning will take place according to industry standards and national and international legislation at that point in time, and will be agreed with the national authorities.

Current practices for decommissioning pipelines are either removing the pipeline or leaving the pipeline on the seabed after cleaning and filling with water. The prevailing current 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, and removal would disturb the possible habitats that have been generated in their vicinity.

2.10 Logistics

Project logistics, at the least, will include:

- Transport of weight-coated pipes from the marshalling yards (possibly in Hanko and Kotka) to the lay vessels
- Transport of rock placement material from a Finnish port (possibly Kotka) to seabed intervention sites.

In addition, logistics as ancillary activities, will include:

- Shipment of weight-coated pipes from the envisaged coating plant in Kotka to the envisaged marshalling yard in Hanko
- Rock transport from quarry or quarries to a Finnish port (possibly Kotka)
- Rock storage potentially in Kotka harbour.

Note: the logistics concept for the Project, including e.g. the locations of the ports and marshaling yards, is not yet defined. At present it is envisaged that the Mussalo port in Kotka and the existing concrete weight coating plant at Mussalo port and a marshalling yard in Hanko would be used. In addition it is assumed that part of the needed rock material would be extracted from the Kotka area, transported onshore to the Mussalo port and stored there temporarily. There is no assumption for a specific marshalling yard to be used in Hanko at this stage.

Chapter 2.11 gives further details on onshore ancillary activities (rock transport and rock storage).

2.11 Onshore ancillary activities

Should rock material for seabed intervention works be sourced from Finland, then based on the Nord Stream Project, approximately 0.4 - 1.8 million m³ of rock would required depending on whether Finnish rock would be used only in the Finnish EEZ or also in Russia.

At this stage it is not yet decided where and how the rock material will be supplied. Rock reserves in the Kotka area are suitable for the Project both regarding quality and quantity.

The assumption for this EIA programme is that all rock to be installed in Finnish and Russian waters would be sourced from Finnish quarry/quarries and that a similar quantity would be required as for the Nord Stream Project:

- Rock installed to Finnish waters: 682,000 tonnes (equal to 0.4 million m³)
- Rock installed to Russian waters: 2,123,000 tonnes (1.4 million m³)
- Total rock installed: 2,805,000 tonnes (1.8 million m³)

It would take about 70,000 deliveries by truck (load 40 tonnes) to transfer the total rock material from quarries to the harbour terminal. Upon arrival at the port, the rock would be temporarily stored in the harbour area. In the Nord Stream Project the storage area was about 1 ha, corresponding to approximately 50,000 tonnes, or three shiploads. Vessel loading was performed directly from the temporary storage on the quay side by means of a conveyor belt.

3 EIA PROCEDURE AND PUBLIC PARTICIPATION

3.1 Finnish national EIA procedure

3.1.1 Aim of the EIA procedure

The aim of the environmental impact assessment procedure (EIA procedure) is to ensure the assessment of environmental impacts of a project and that the consideration of these impacts is part of the decision-making process. In addition, the EIA procedure aims to assess and compare different realistic project alternatives.

At the same time, the aim of this procedure is to increase public participation and the availability of information to citizens.

3.1.2 EIA legislation

The EIA procedure is described in the Act on Environmental Impact Assessment Procedure (468/1994) and the Decree on Environmental Impact Assessment Procedure (792/1994). The legislation entered into force on 1 September 1994. Amendments to the legislation were made in 1995, 1999, 2004, 2005, 2006, 2009 and 2011. (Act on Environmental Impact Assessment Procedure, Decree on Environmental Impact Assessment Procedure)

The EIA Decree includes a list of projects to which the assessment procedure shall be applied. Regarding transmission and storage of energy and materials, it is stated that “gas pipelines with diameter of more than DN 800 millimetres and a length of more than 40 kilometres” are included in the list of so-called “obligatory EIA projects” (EIA Decree, Chapter 2, Section 6). The EIA Act also applies in the Finnish EEZ referred to in section 1 of the Act on the Finnish Exclusive Economic Zone (EIA Act, Chapter 2, Section 4a).

As both the pipeline diameter and the length of the route exceed the mentioned minimum levels, the Project is subject to a national EIA procedure in Finland.

3.1.3 Parties in the EIA procedure

The parties in the Project’s EIA procedure are:

- The Developer; currently represented by Nord Stream AG, the party responsible for the preparation and implementation of the project;
- Uusimaa Centre for Economic Development, Transport and the Environment (ELY Centre) as the Coordinating Authority, the authority ensuring that the EIA procedure fulfils the EIA legislative requirements;
- Other authorities and those parties whose circumstances or interests the project may affect including the general public.

3.1.4 National EIA procedure and time schedule

The EIA procedure begins officially when the Developer submits the assessment programme (EIA programme) to the Coordinating Authority. The first phase ends when the Coordinating Authority has provided its statement on the EIA programme to the Developer.

The second phase is the assessment phase. When the impacts have been assessed, the results will be compiled into an assessment report (EIA report). The EIA procedure ends when the Coordinating Authority has provided its statement on the EIA report.

The EIA procedure is not a decision-making process. Permits for a project are granted according to specific legislation. If a project requires an EIA procedure, the permitting authority may not grant permit before it has received an assessment report and the Coordinating Authority’s statement on it. (For required permits, see Chapter 13.)

The Coordinating Authority will notify other authorities and coastal municipalities in the Gulf of Finland about the display of the EIA programme. A public announcement will be published electronically and in newspapers in the project's proposed impact area. Schedule for the Finnish EIA procedure is presented in Figure 3.1.

The EIA programme will be on public display in Finnish and Swedish from 8.4.2013 to 6.6.2013. Public meetings will be organised in Helsinki, Hanko, Kotka, Turku and Mariehamn during the hearing period of the EIA programme. The authorities and other interested parties have until the end of the public display period to provide their statements and opinions on the EIA programme to the Coordinating Authority.

The Coordinating Authority will review all statements and opinions and issue its statement on the EIA programme within 1 month of the end of the public display.

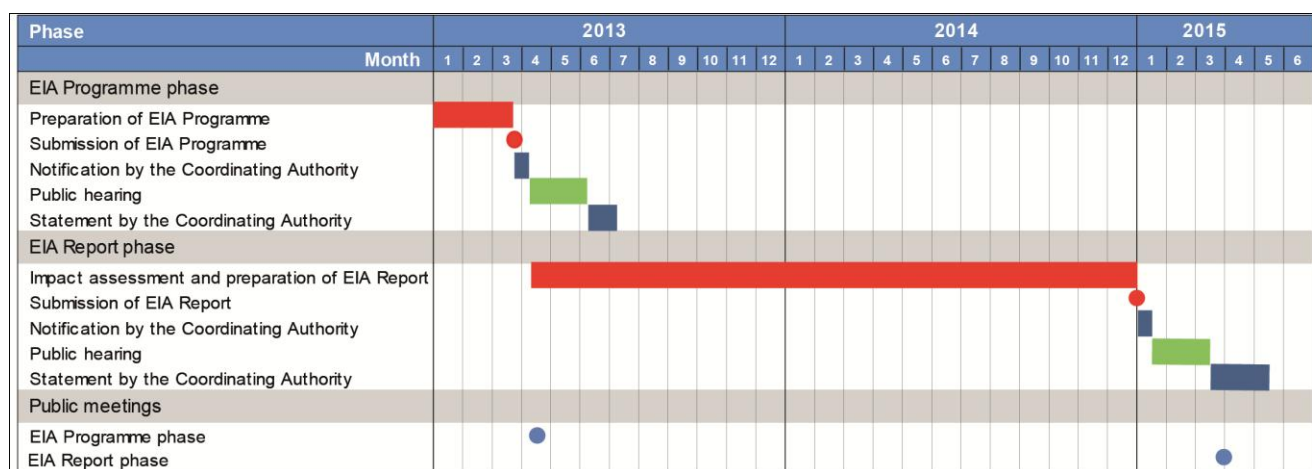


Figure 3.1 Time-schedule for the Finnish EIA procedure

The EIA report is planned to be completed by the end of 2014, after which it will be on display for approximately two months. During this time, public hearings will be organised in similar way as those organised during the EIA programme phase.

3.1.5 Public participation

The EIA procedure will be performed in an interactive manner with authorities, other stakeholders and the public.

Meetings

In preparation of the EIA programme, an authority workshop was held on 3 December 2012 to discuss the draft EIA programme. Additional authority meetings has been held to discuss specific topics.

During the preparation of the EIA report, similar meetings will be organised to support the assessments and for information purposes. These meetings will be organised by the Developer. Meetings with research institute's, non-governmental Organisations and other stakeholders will also be organised.

During the public display of both the EIA programme and the EIA report, five public meetings will be held to present the documents on public display. These meetings will be chaired by the Coordinating Authority.

Questionnaire

A citizen survey will be executed as a part of the impact assessment. Questionnaires will be sent out to random recipients in the southern coastal municipalities. In addition to the general citizen survey a specific survey targeting on the fishermen will be performed. The target group includes all fishermen trawling in the Gulf of Finland. This feedback will be used as input for the social impact assessment.

A citizen survey with regard to transboundary social impacts to Estonia, is planned to be executed in a similar way as for Finland.

Website

The Project plans to provide project and EIA information on its website. The website will include a link to a map portal and a feedback channel for citizen use. However, the official feedback for the EIA shall be directed to the Coordinating Authority.

Language

Even though the EIA programme has been prepared in English, the main official documents have been translated into Finnish and Swedish.

3.2 Transboundary consultation

The Espoo Convention on Environmental Impact Assessment in a Transboundary Context (SopS 67/1997) stipulates the obligations of parties to notify and consult one another on all major projects under consideration that are likely to have a significant adverse environmental impact across state boundaries. Finland is one of the signatory and ratified parties of the Espoo Convention.

The Espoo Convention stipulates as parties of origin the countries in the beginning and end of the pipeline as well as all countries through which the pipeline runs. The parties of origin for the Project are Finland, Sweden, Denmark and Germany. The affected parties for the project are Germany, Denmark, Sweden, Finland, Estonia, Latvia, Lithuania and Poland. Russia has signed, but not ratified the Convention.

Finland and Estonia have signed a bilateral agreement on transboundary EIA (Agreement between the Government of the Republic of Estonia and the Government of the Republic of Finland on Environmental Impact Assessment in a Transboundary Context, SopS 51/2002), where the principles of the Espoo Convention have been defined.

The bilateral agreement is applied to large-diameter oil and gas pipelines and underwater pipelines in the Baltic Sea. The agreement is applied to any other proposed activity under the national EIA procedure of the party of origin, if the activity is likely to cause significant adverse transboundary impacts. The decision is made by the parties on a case-by-case basis.

There is a joint commission on EIA in a transboundary context for the implementation of the provisions of this bilateral agreement. The commission convenes at least once a year and also as necessary.

The procedure for international consultation and how it will be linked to national procedures will be discussed between the authorities in the countries (party of origin, affected party) and the Developer.

At present, the understanding is that the national Coordinating Authority will send the EIA programme to the Ministry of the Environment, to be forwarded to the affected parties with an invitation to participate in the national EIA procedure. If an affected party decides to participate, it will put the EIA programme on public display, collect opinions and return them to the party of origin (Ministry of the Environment in Finland). Ministry of the Environment will forward the feedback to the national Coordinating Authority, to be taken into account in its statement on the EIA programme. The same procedure will be carried out for the EIA report.

A public meeting to present the EIA programme is planned to be held in Estonia, Tallinn, during the public display period.

4 ALTERNATIVES

The Nord Stream Extension route goes across the Baltic Sea from Russia to Germany. The Project consists of up to two pipelines and is similar to the Nord Stream Pipeline Project.

The Finnish national environmental impact assessment procedure includes the following alternatives:

- Non-implementation as Alternative 0 (ALT 0)
- The section of the Nord Stream Extension route within the Finnish EEZ as Alternative 1 (ALT 1)
- Sub-alternative south of Porkkala and to the north of ALT 1 (ALT 1a)

ALT 0: Non-implementation

The natural gas pipeline from Russia to Germany will not be implemented through the Baltic Sea.

The environmental baseline description as drafted in Chapters 5 and 6, further to be developed during the assessment phase and to be presented in the upcoming EIA report represent the 0-alternative.

All of the activities connected with project implementation, including amongst others, munitions clearance, seabed intervention works, pipeline installation and operation would not take place and there would therefore be no environmental impacts from the Project.

The environmental impact assessment will focus on the impacts of the project alternatives (ALT 1 and ALT 1a). Impacts from project alternatives will be compared with ALT 0.

ALT 1: Project alternative in the Finnish EEZ

Alternative 1 is located entirely in the Finnish EEZ on the section from the Russian border to the Swedish EEZ border. Length of the section in the Finnish EEZ is approximately 370 km and the width varies from 1.6 to 4.7 km.

Southern and northern borders of ALT 1 can be described in two different sections;

- Russian/Finnish border to south of Hanko:
 - The southern boundary is the Nord Stream Line 1
 - The northern boundary extends northwards 1.6 to 4.7 km north of Nord Stream Line 1
- South of Hanko to Finnish/Swedish border:
 - The southern boundary does not extend south of Nord Stream Line 1 and is at maximum 4.1 km from the Nord Stream Line 1
 - The northern boundary varies from 2.8 km to 8 km from the Nord Stream Line 1

ALT 1 in the Finnish EEZ is shown in Figure 4.1.

ALT 1a: Sub-alternative south of Porkkala

ALT 1a is located south of Porkkala along the northern margin of the westbound Porkkala Lighthouse TSS. The length of ALT 1a is approximately 21 km and the width 2 km. The alternative in the Finnish EEZ is shown in Figure 4.1.

The basis to propose ALT 1a to be assessed in the EIA procedure results from the feasibility study conducted in 2012. The results concluded that a sub-alternative, ALT 1a south of Porkkala, was preferred over the ALT 1 as:

- There is less interference with existing infrastructure and better crossing angles of existing telephone cables;
- There is less interference with ship traffic during installation as the ALT 1a is aligned with the northern limit of the TSS which would allow west bound traffic to pass to the south, remaining within the westbound TSS and thereby reducing the impact to shipping during pipeline installation;
- The Porkkala area was heavily mined and a high density of mines remain on the seabed. Some of these mines may need to be cleared to ensure the safe installation and operation of the pipelines. Munitions clearance within the northern margin of the TSS is likely to cause less impact to shipping and the risk to the existing infrastructure.

However, in the case of the future use of the EEZ, for example when considering emergency anchoring, ALT 1a would further restrict potential areas that could be used for emergency anchoring. If the future pipelines were to be located within the ALT 1 to the north of Nord Stream, this would reduce such impact.

The EIA report will include impact assessment of both ALT 1 and ALT 1a and compare the impacts of both these alternatives.

Other alternatives

At specific sections for technical reasons or due to nearby environmental constraints, other sub-alternatives than ALT 1a may be developed later during the basic design. These possible sub-alternatives may require additional survey permits and will be assessed.

In addition, technical alternatives such as the type of lay vessel (dynamically positioned or anchored lay vessel) or other alternative technical solutions, for example the methods for handling and clearance of underwater munitions, will be assessed.

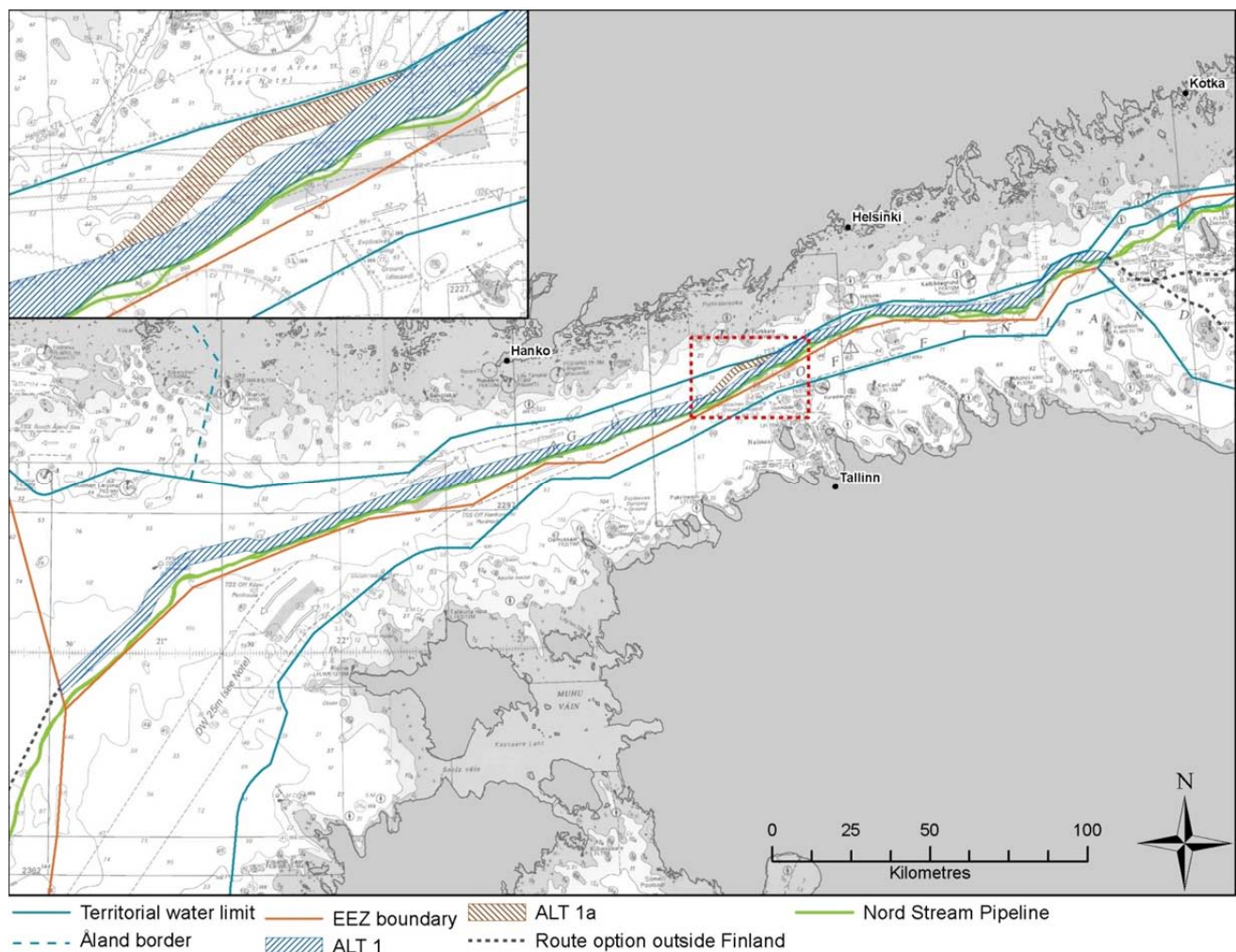


Figure 4.1 Alternatives in the Finnish EIA

5 BASELINE OFFSHORE

An outline of the present state and sensitive areas within the offshore project area and its vicinity is provided below. Main references used in this context are the EIA documents of the Nord Stream Project (2006-2009) and the results of monitoring carried out during construction of the Nord Stream Pipelines (2010-2012). A detailed description will be presented in the EIA report, when the survey results are available.

In this EIA the offshore study area is limited to the Finnish EEZ where living conditions for biota on the seabed are dependent on dissolved oxygen content. Oxygen content levels in the Gulf of Finland decrease with increased water depth and therefore conditions worsen towards the Northern Baltic Proper where the water depth increases compared to the Gulf of Finland. Due to the relatively low oxygen content levels the ecological diversity in the offshore areas in the Gulf of Finland does not change considerably in the east-west axis. For this reason the EIA will be based on a single ecological region rather than applying an ecological sub-region approach to the EIA.

5.1 Strategies, policies and land use in marine area

A Regional Land Use Plan defines the use of areas needed for specific purposes and the principles of urban structure from the point of view of regional development. Regional Land Use Plans cover marine areas in internal territorial waters and are not applicable to the Finnish EEZ. Municipality-level Land Use Plans are restricted to onshore and coastal areas. Water Management Plans developed in accordance with the Water Framework Directive and corresponding national legislation are applicable to inland and territorial waters.

Since Land Use Plans and Water Management Plans are not applicable to the Finnish EEZ, different strategies and plans under preparation for the Finnish marine area, territorial waters and the EEZ are described in this chapter. Figure 5.1 shows those considered relevant for the Project.

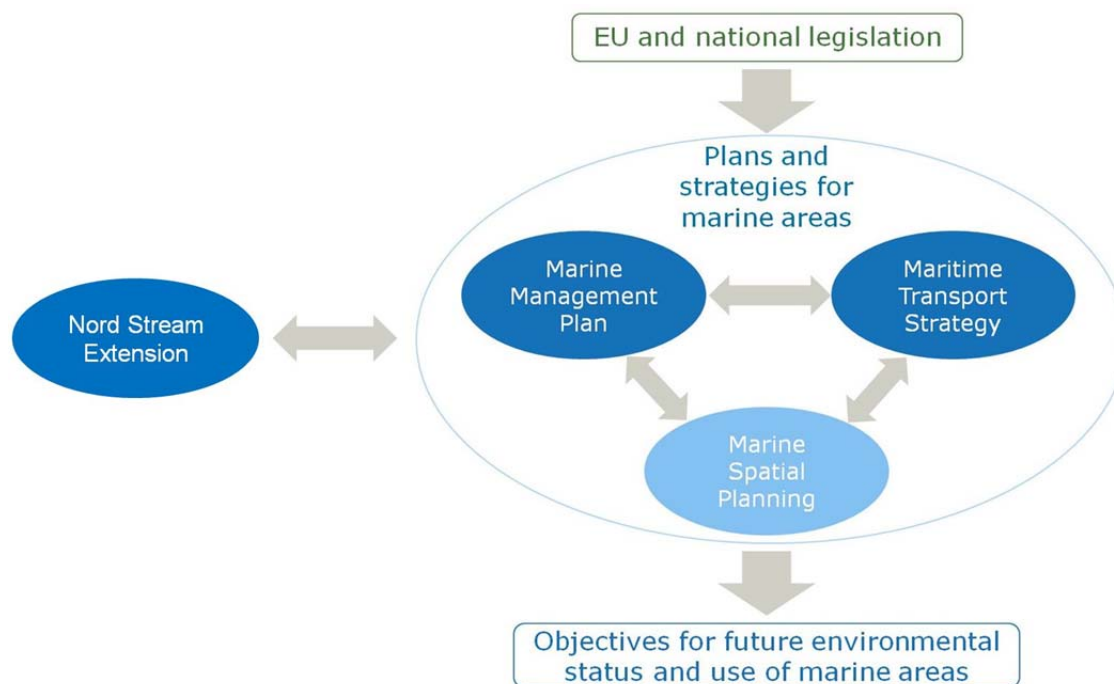


Figure 5.1 The link between the strategies and the project in the Finnish EEZ

5.1.1 Marine Management Planning

The Marine Strategy Framework Directive (MSFD) of EU (2008/56/EY) obliges an ecosystem-based approach to the management of human activities on marine areas. The goal of the directive is to achieve a good and sustainable environmental status of seas by 2020. Accordingly the Member States have to plan and implement their strategies to reach this goal.

According to MSFD the 'good environmental status' means the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.

Qualitative descriptors for determining good environmental status, presented in MSFD, are:

- Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.
- Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.
- All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.
- Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.
- Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.
- Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
- Concentrations of contaminants are at levels not giving rise to pollution effects.
- Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.
- Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
- Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

In Finland (mainland) the MSFD has been enacted as the Act on Water Resources and Marine Management (1299/2004, revised 272/2011) and the Decree on Marine Management (980/2011). The strategy is called the Marine Management Plan (MMP). The strategy includes a preliminary assessment of the status of the Finnish sea areas, specification of what is meant by good environmental status and how to measure it //. The first part of the MMP was finalized in December 2012 by Finnish Government decision. The monitoring programme has to be launched by 2014 and the programme of measures latest by 2016. Objectives to achieve the good status of the environment determined based on the above listed descriptors are presented in detail in the following document "Meriympäristön nykytilan arvio, hyvän tilan määrittäminen sekä ympäristö-tavoitteiden ja indikaattoreiden asettaminen, 19.10.2012" (Ministry of the Environment 2012). In brief, the general and functional objectives are:

- Eutrophication do not harm the environment of the Baltic Sea;
- Harmful substances do not harm the marine ecosystem functions or prevent using fish and game as food;
- Conservation status of all natural species of the Baltic Sea is favourable and their long-term survival is secured;
- Shipping is safe and it causes the minimum of adverse environmental impacts;
- Use of offshore natural resources is sustainable;
- Marine Spatial Planning prevents the conflicts related to use of marine areas.

The Government of Åland has prepared the Åland Marine Strategy, which has been on public display in April – May 2012. The strategy has been prepared in close cooperation with Finnish authorities. The strategy describes the status of Åland marine waters and the objectives to reach the good status of the environment. A specified action programme for marine waters will be drawn up by 2015. (Ålands landskapsregering 2012)

The MMPs will be updated every sixth year. The plans will have influence on the commitments of authorities but not on the commitments of operators and private persons. Single projects may be analyzed as single pressure factors possibly having effect on achieving good environmental status.

5.1.2 Maritime Transport Strategy

Ministry of Transport and Communications has started to prepare a Maritime Transport Strategy for Finland in June 2012 in cooperation with other authorities and 3rd party stakeholders.

The strategy aims to ensure efficient transport links for Finnish foreign trade and help guarantee the international competitiveness of Finnish maritime transport. The objective is to achieve the good state of the marine transport sector by 2030. The strategy will contain short-term (2012-2015) and long-term (2016-2022) measures. All measures will have named responsibilities.

The strategy includes eight focus areas of which following has a possible link to the Project;

- Environmental issues in the transport sector
- Vessel traffic services, maritime safety and rescue services
- Fairways, transport chains and winter navigation

The strategy work is expected to be completed and a final report to be published by the end of 2013.

5.1.3 Marine Spatial Planning

In 2008, the EU Commission adopted the communication - Roadmap for Maritime Spatial Planning: Achieving common principles in the EU - which proposed a set of key principles for MSP. EC initiated studies 2008–2010 on various aspects of MSP, e.g. the legal aspects and the economic effects. A research project was started in 2009 aiming at producing integrated management tools for monitoring, evaluation and implementation of spatially managed areas.

A proposal for EU directive is under preparation and the goal is to have a similar system in marines areas, as exists for land use plan system onshore. The information available is that the directive will enter into force 1.1.2014.

MSP is a tool for coordinating spatial use and balancing competing interests for the the sea use. Such interests are human activities (e.g. ship traffic, fishing, infrastructure, offshore wind energy, submarine pipelines and cables), and on the other hand protection of marine ecosystems and cultural heritage.

MSP will have a legal binding role only through ratified bilateral or multilateral international agreements and subsequent national legislation.

The responsible authority for marine spatial planning in Finland is the Ministry of the Environment, Department for Built Environment.

Two organisations, HELCOM and VASAB, have in 2010 established a MSP working group for the cooperation in the Baltic Sea area.

5.2 Physical and chemical environment

5.2.1 Bathymetry

The Baltic Sea with its brackish water is in many ways unique. The relatively young (from a geological perspective) sea is small and shallow and connected to the oceans through the very narrow Danish Straits. The Baltic Sea consists of numerous basins that have their own typical physical and topographical features. The Gulf of Finland forms the easternmost and one of the shallowest basins. Only the average depth of the Archipelago Sea, in the south-western part of the Finnish coast, is shallower (19 m). The seabed is formed by a relief of soft bottom with hard outcrops which is influencing the local current conditions. Hydrographically the Gulf of Finland is an extension of the Gotland basin, because there is no sill between those basins.

The average water depth in the Baltic Sea (not including the Danish Straits) is 56 m, and the maximum depth is 459 m. The corresponding figures in the Gulf of Finland are 37 m and 123 m. As a comparison, water volumes of these basins are 20,918 km³ and 1,098 km³, respectively (Myrberg et al. 2006). The Gulf of Finland becomes shallower towards the east. The deepest areas (80-100 m) are located in the western and southern parts of the basin (Figure 5.2). Topography of the northern Gotland basin, that includes the westernmost Finnish EEZ (the Northern Baltic Proper), varies with vast areas where water depth is over 150 m (Myrberg et al. 2006).

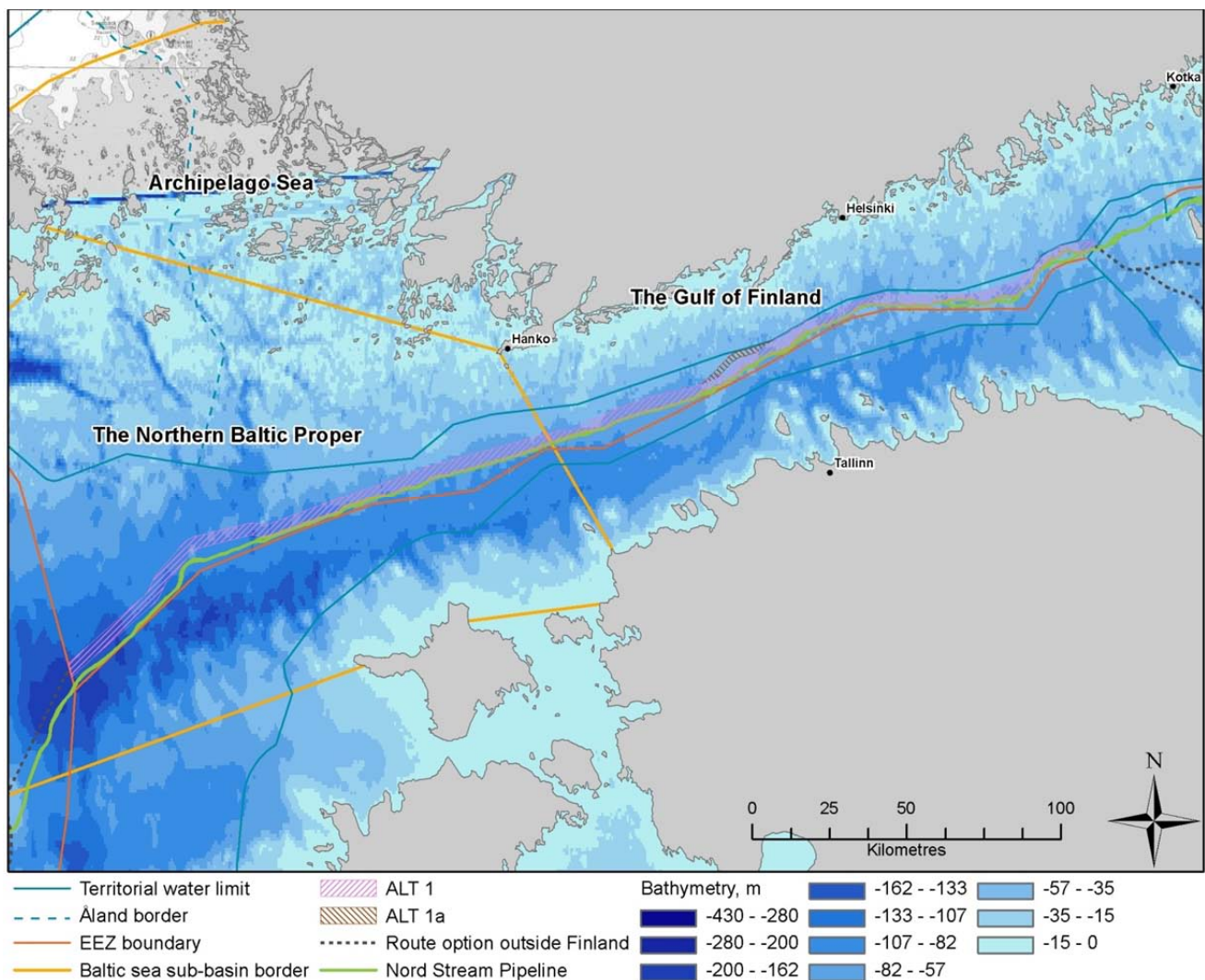


Figure 5.2 Bathymetry of the Gulf of Finland and the Northern Baltic Proper

The project area of the Nord Stream Extension in the Finnish EEZ covers sea areas in the Gulf of Finland and north-eastern parts of the Northern Baltic Proper. Water depth along the ALT 1 and ALT 1a varies between 24 m and 165 m with an average depth of 76 m.

5.2.2 Seabed morphology and sediments

The last ice age created unique seabed morphology in Finnish waters and left behind a variety of sediments. Depositions on the seabed are mosaic-like, with rocky outcrops, clay or mud in depression areas and sand, till and gravel bottoms along the slopes and in shallower areas. (Myrberg et al. 2006)

Sedimentation of particles occurs in deep basins, local depressions and sheltered areas. Seabed exposed to wave- or current-induced water motion can be classified either as a non-sedimentation area or a mixed zone where sedimentation is possible depending on prevailing currents or winds.

The project area of the Nord Stream Extension is located in the middle of the Gulf of Finland. As indicated in Figure 5.3, the eastern part of the project area is located mainly on hard seabed, while the middle and western parts consist of soft clay/mud sediments.

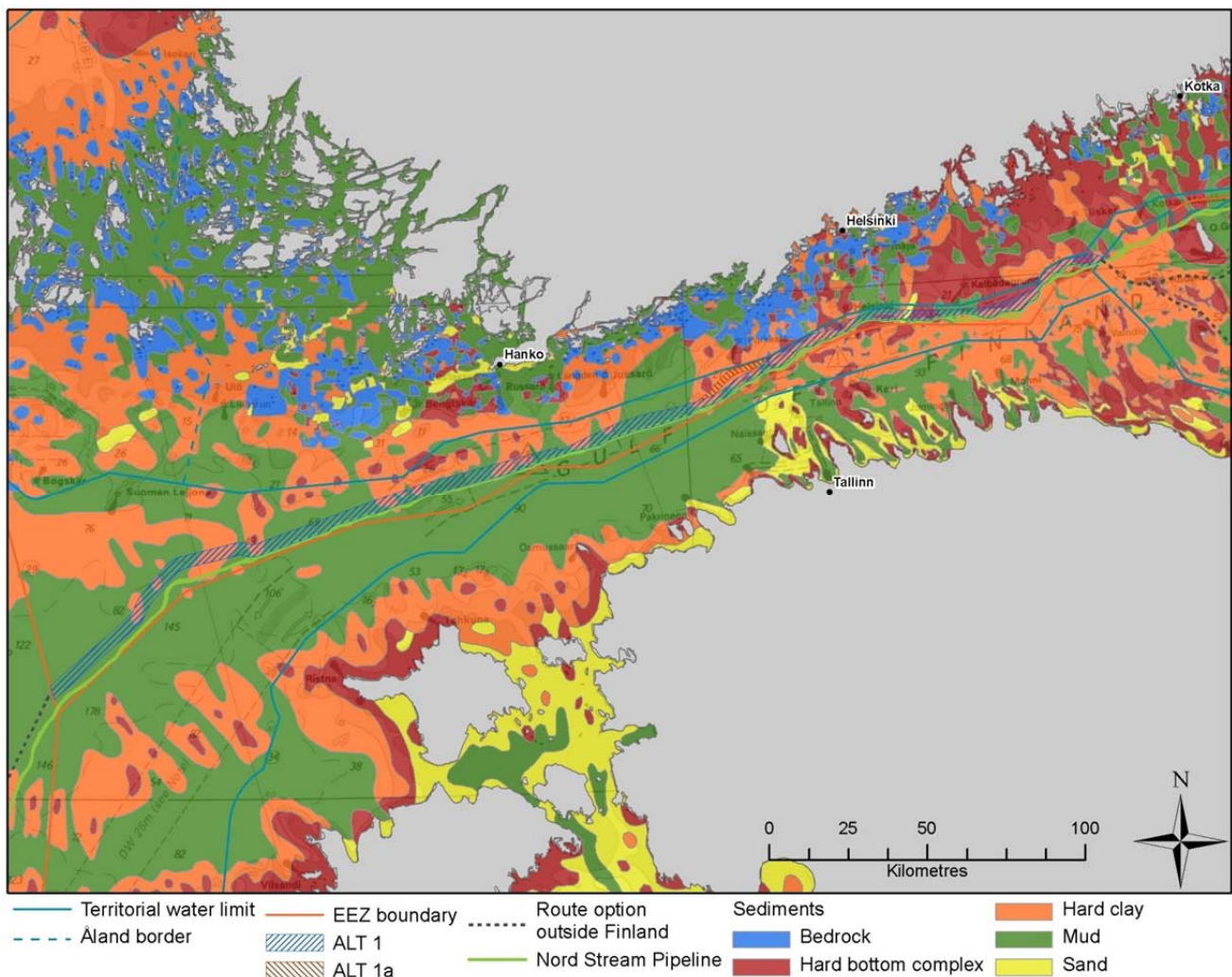


Figure 5.3 Seabed structure of the Gulf of Finland and the Northern Baltic Proper (Source: Geological Survey of Finland (GTK))

Heavy metals, dioxins and other organic compounds

Sediment samples for analysing different hazardous substances in the seabed along the planned pipeline route for the Nord Stream project were taken in 2009, before the pipeline construction activities had commenced (Figure 5.4). There were altogether 33 sampling locations areas along the pipeline route and the core depth was up to 0.5 m, depending on the seabed type (Ramboll 2009). In Tables 5.1 – 5.3 the main results of the concentrations of the analysed substances are presented.

Table 5.1 Results of the analysed metal concentrations in the baseline samples in 2009 (Ramboll 2009).

	As mg/kg DM	Hg mg/kg DM	Cd mg/kg DM	Co mg/kg DM	Cr mg/kg DM	Cu mg/kg DM	Pb mg/kg DM	Ni mg/kg DM	Zn mg/kg DM
Surface analyses									
Interval	4.5-21	<0.1-0.15	0.29-3.5	7.2-29	34-130	19-79	18-67	19-77	76-340
Median	12.0	<0.1	1.3	14.0	50.0	41.0	30.0	35.0	150
All analyses									
Interval	4.5-29	<0.1-0.24	<0.2-3.5	7.2-39	29-150	19-79	10-71	19-92	69-340
Median	12	<0.1	0.87	16.0	60.0	36.5	29.5	38	140

Table 5.2 Results of the concentrations of dioxins in the sediment (analysed and normalised) in the baseline samples in 2009 (Ramboll 2009). Concentrations are determined according to WHO based scheme for surrogate toxicity of dioxins (WHO(2005)-PCDD/F TEQ excl. LOQ (limit of quantification))

	WHO(2005)-PCDD/F TEQ excl. LOQ ng/kg DM (analysed)	WHO(2005)-PCDD/F TEQ excl. LOQ ng/kg DM (normalised)
Surface analyses		
Interval	3.3 - 21.9	3.3 - 13.6
Median	8.66	5.3
All analyses		
Interval	0.023 - 64.4	0.033 - 42.9
Median	6.49	4.73

Table 5.3 Results of the analysed concentrations of organic contaminants in the baseline samples in 2009 (Ramboll 2009).

	PAH (sum 16) mg/kg DM	PCB (sum 7) mg/kg DM	Chlordanes (sum) mg/kg DM	DDT/DDE/ DDD (sum) mg/kg DM	HCH (sum) mg/kg DM	HCB mg/kg DM
Surface analyses						
Interval	0.31-2.4	<0.001-0.003	<0.001	<0.001-0.02	<0.001	<0.001
Median	0.63	<0.001	<0.001	0.003	<0.001	<0.001
All analyses						
Interval	<0.05-2.4	<0.001-0.007	<0.001	<0.001-0.032	<0.001	<0.001
Median	0.59	<0.001	<0.001	0.002	<0.001	<0.001

In the samples taken in 2009 the dioxin concentrations were generally low. The most dangerous dioxin congener, TCDD, represented less than 2% of the average toxicity equivalent (Ramboll 2009). In the eastern Gulf of Finland the assessed impact area of dioxins originating from the polluted sediments of the River Kymijoki extends to a distance greater than 50 km from the estuary (Figure 5.4). However, there the dioxin concentrations (data from Isosaari et al. 2002 and Ramboll 2009) have declined to about one-seventh of the initial levels (Ramboll 2012a). Dioxins that are in general strictly bound to particles can be found only in soft seabed sediments where circumstances for sedimentation of drifting particles are appropriate.

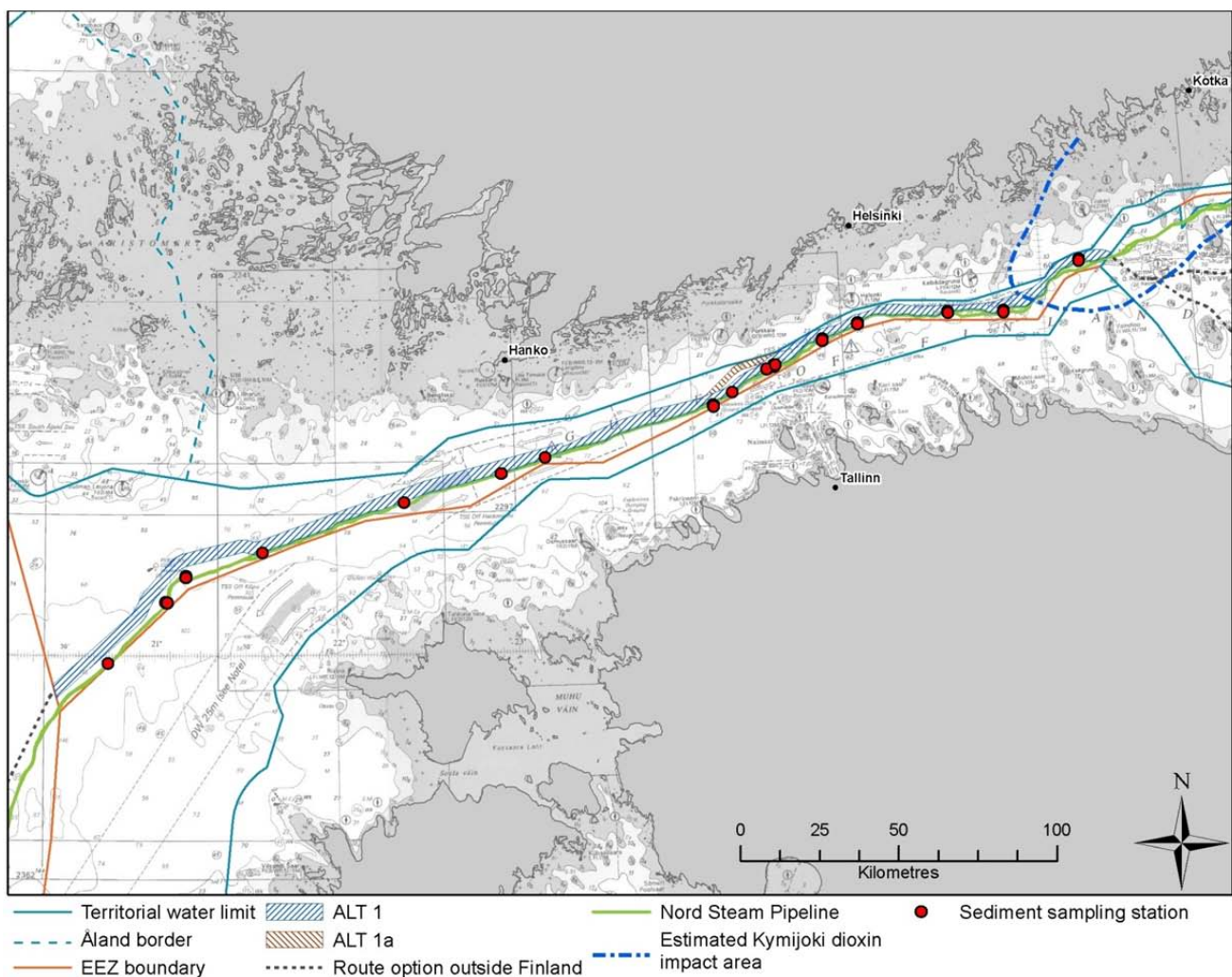


Figure 5.4 Sampling stations during the sediment sampling campaign in 2009 along the planned route of the Nord Stream pipelines and estimated impact area of the polluted sediments from the River Kymijoki (Ramboll 2009, Ramboll 2012a).

Monitoring of surface sediment quality during construction of the pipelines in 2009-2011 was carried out at five stations in the Finnish EEZ. In Figure 5.5 an example of the behaviour of the concentrations of metals and organotin compounds along a transect near the hyperbaric tie-in site is given. At this site largest amount of rock material was placed on the seabed to construct a berm upon which pipeline sections of both pipelines were connected. Concentrations were mostly low but in some locations, due to the heterogenic nature of the seabed, clearly elevated (Figure 5.5).

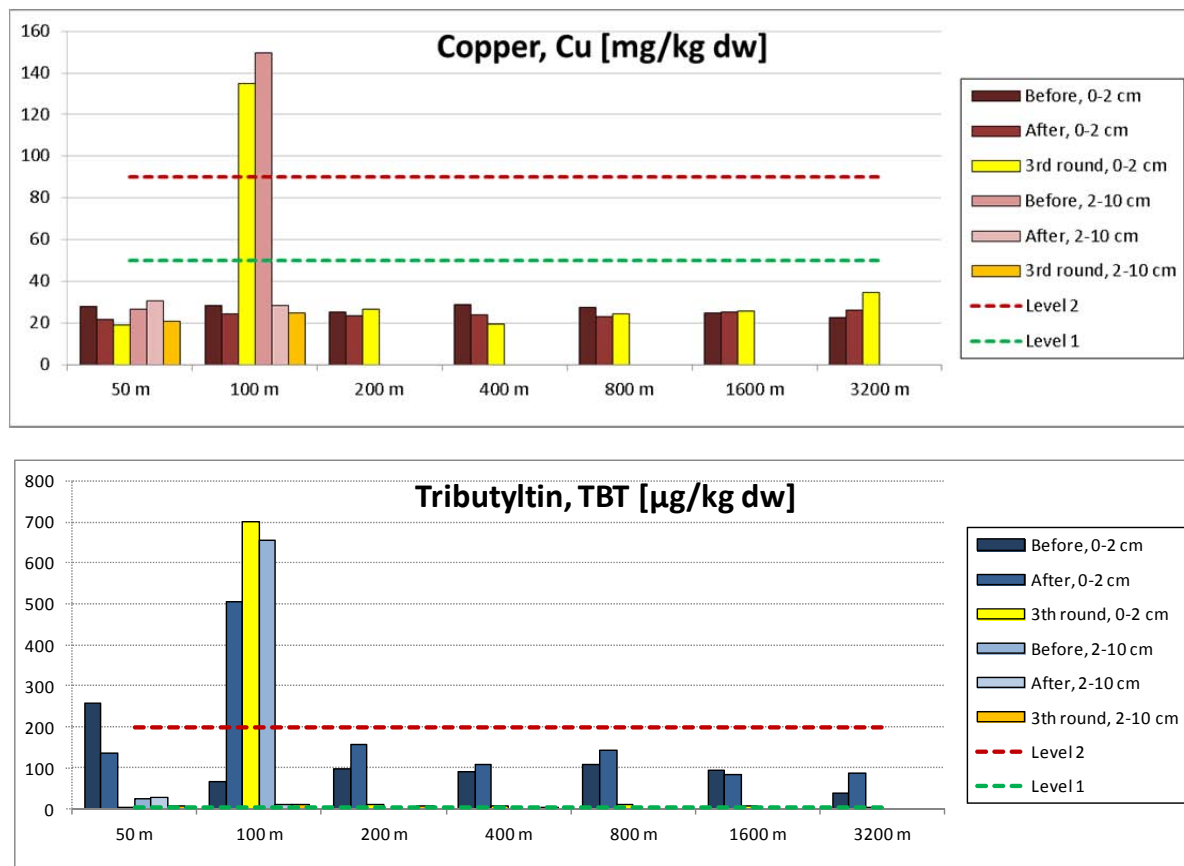


Figure 5.5 Normalised concentrations of copper and tributyltin (as an example) in surface sediment along the transect in 2010 near the tie-in site, before and after rock placement and in 2011, upon completion of Pipeline 1 construction (Luode Consulting Oy 2012, Ramboll 2012b). *Level 1 (threshold for slightly contaminated sediments) and Level 2 (threshold for contaminated sediments) refer to recommendations of the Finnish quality criteria developed for the instructions for dredging and depositing dredged materials.*

Natural variation of the seabed's physical composition is the main factor influencing the level of the concentrations of contaminants in the open sea areas of the Gulf of Finland. At all sampling stations the analysed concentrations of metals and dioxins were generally low. However, tributyltin (TBT) concentrations were randomly high. TBT values are expected to be randomly high near shipping lanes. TBT was previously used as an antifouling paint on the hulls of the vessels. All normalised concentrations of dioxins in the monitoring results were below or very close to the lower threshold value (Level1 – 20 ng/kg dw) set for dredged materials, meaning that the surface sediment is considered not to be contaminated with dioxins (Ramboll 2012b).

Radioactive substances

The most significant source of artificial radioactivity in the Baltic Sea sediments is the fallout from the Chernobyl accident in 1986. The distribution pattern of Cs-137, the radionuclide of main radiological significance in the Chernobyl deposition, is patchy due to the uneven deposition and sediment accumulation to the bottoms. In the Gulf of Finland the highest amounts occur in the sediments of the eastern part of the sea. However, most of the radioactivity in the sediments of the Baltic Sea originates from naturally occurring radionuclides. At present the radioactivity in the sediments is not expected to cause harmful effects to the Baltic Sea wildlife. (HELCOM 2013)

HELCOM MORS Expert Group monitors radioactive substances in the Baltic Sea. Data collected from MORS (Monitoring of Radioactive Substances) station network will form a baseline for radioactive substances in the project area (Figure 5.6).

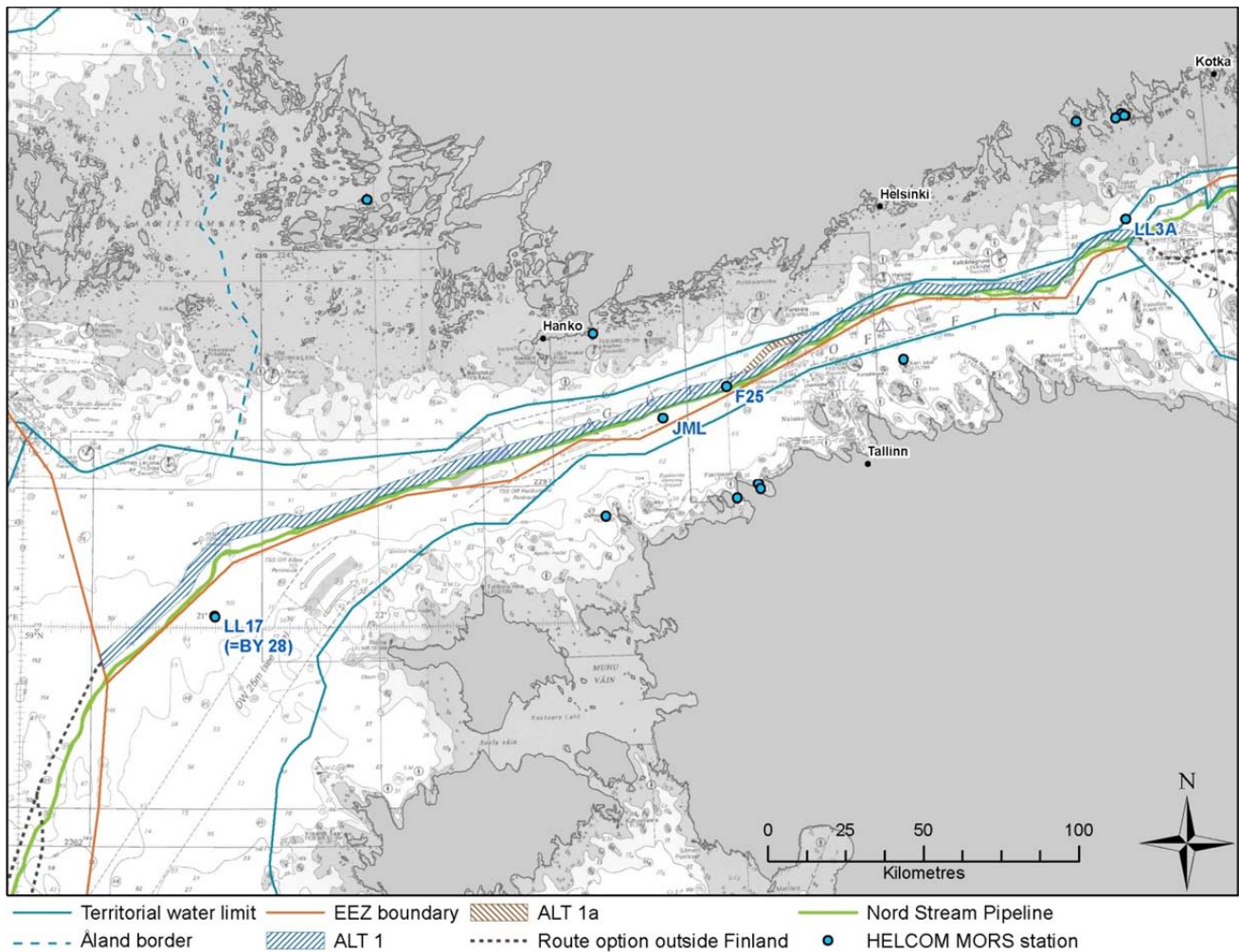


Figure 5.6 HELCOM MORS stations in the Gulf of Finland and the Northern Baltic Proper (HELCOM 2013)

5.2.3 Currents

Traditionally the current pattern in the Gulf of Finland has been seen as a cyclonic (counter clockwise) circulation. Water is flowing westward out of the Gulf of Finland near the Finnish coast and a counter current flows eastward along the coast of Estonia (Myrberg et al. 2006). The average flow velocity is in the order a few cm per second (Soomere et al. 2008). A schematic representation of the current pattern is shown in Figure 5.7.

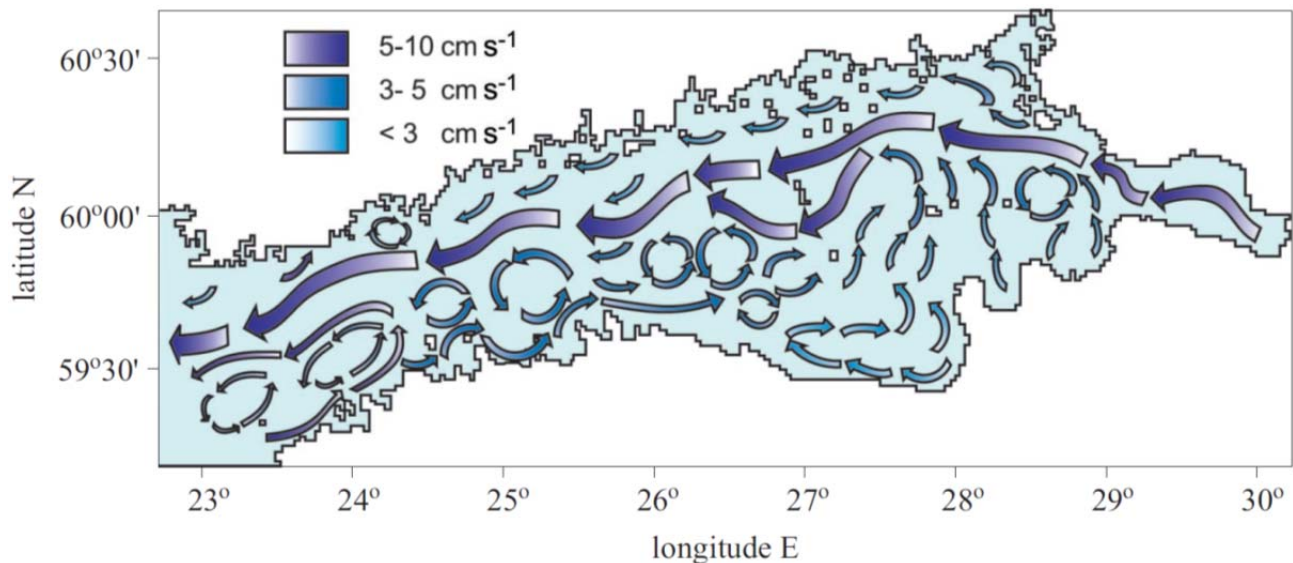


Figure 5.7 Schematic illustration of the mean circulation in the Gulf of Finland (after Andrejev et al. 2004).

As illustrated in Figure 5.7 the circulation patterns in the Gulf of Finland contain numerous meso-scale eddies. This circulation pattern can be found in both the mean and instantaneous flow field (Soomere et al. 2008).

During the Nord Stream Project current profiles were measured at 6 positions for periods of 41 to 737 days. Based on the long term monitoring results (late 2009 - late 2011) local current speeds in the water column were observed to vary in both space and time. Average current magnitude was observed to 0.04-0.06 m/s (at the long-term stations). This is in line with the above mentioned magnitude of the cyclonic flow velocities. The highest recorded current magnitude in the layer near the seabed varied from 0.37 m/s (western area) to 0.51 m/s (eastern area) illustrating the temporal variations.

The dominant current direction differs between different stations confirming the presence of meso-scale eddies and/or local topographic influence for e.g. seabed outcrops. In the open sea waters of the Gulf of Finland the average current speed near the seabed was 0.05 m/s at the monitored sites (depth range 60 – 80 m) during the construction activities of the Nord Stream pipelines in 2010-2011. The highest single value recorded was 0.21 m/s. Easterly and south-westerly current directions were most common (Ramboll, Witteveen+Bos and Luode Consulting Oy 2012).

The current monitoring data compiled under Nord Stream have been analysed in detail and comprise a good basis for the dedicated numerical current model improvement study for the Gulf of Finland (Ramboll, Witteveen+Bos and Luode Consulting Oy 2012).

5.2.4 Hydrology and water quality

The prevailing water depth in the Finnish EEZ is greater than 70 m. In these areas the chemical properties in the water column vary vertically remarkably depending on the season. A situation where a clear density gradient forms to a depth zone between 20-50 metres is common during the summer time. In this zone the oxygen concentration decreases steeply and further down, near the seabed, oxygen deficit is clear (suboxic situation).

Oxygen levels near the seabed are highly dependent on the mixing of different water columns that differ by their salinity characteristics. A distinct halocline is normally present between 60-80 m in the central and western Gulf of Finland (Myrberg et al. 2006). In the early 1990s there was a temporary improvement in oxygen conditions for many years, when salinity decreased to a level where strong halocline weakened and at the same time improvement in oxygen situation was remarkable. As indicated in Figure 5.8, the situation in this respect has worsened during the past decade.

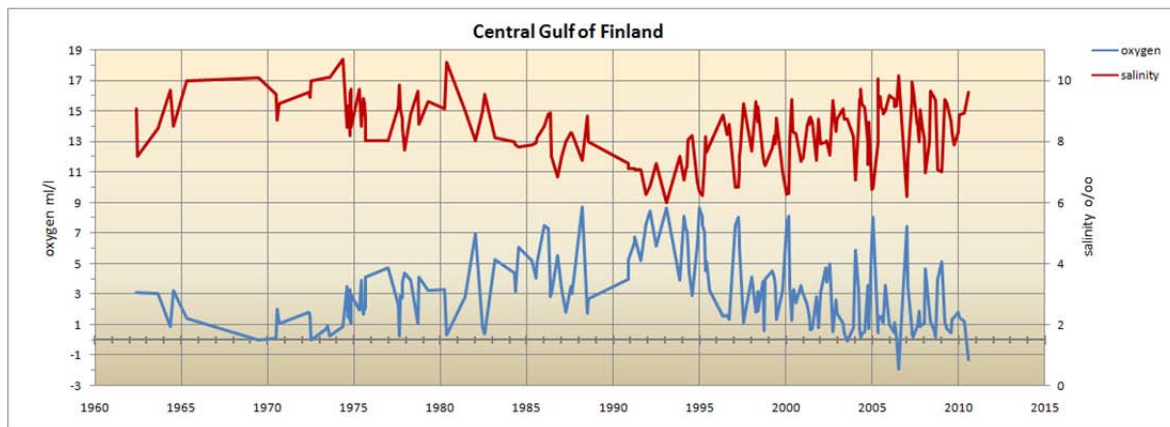


Figure 5.8 Long-term variations in oxygen concentration and salinity at one metre above the seabed in the vicinity of HELCOM station LL7. Negative oxygen levels are based on hydrogen sulphide measurements (Finnish Environment Institute 2011).

External loads of nutrients (phosphorus and nitrogen) from the catchment area of the Baltic Sea and also from atmospheric deposition burden heavily the sea environment. Nutrient enrichment leads to increased phytoplankton primary production (organic matter). This in turn causes decrease in water transparency (visibility), especially in coastal regions. Nowadays internal loading of phosphorus from sediments and the fixation of atmospheric nitrogen by cyanobacteria can also be substantial.

Eutrophication increases the amount of suspended organic particulate matter in sea-water. Compared with the more oligotrophic oceanic waters, the particle amount in the Baltic Sea is much higher. The satellite image in Figure 5.9 shows the concentration of chlorophyll in the European seas. In the figure the entire Gulf of Finland is dark red indicating high chlorophyll concentrations and hence high eutrophication status.

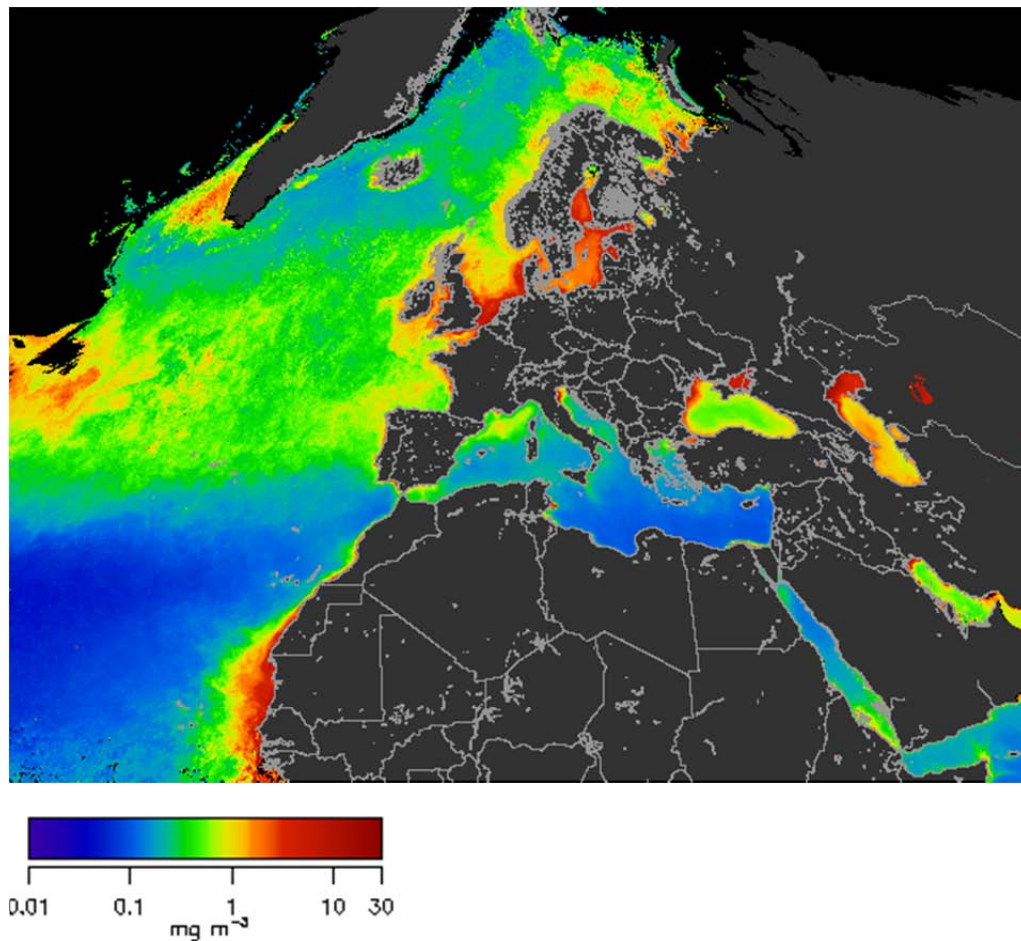


Figure 5.9 Chlorophyll concentrations in the European seas (Bruun et al. 2010)

5.2.5 Air quality

The emission of air pollutants in the Baltic Sea is highly affected by the volume of ship traffic. In the Gulf of Finland (between Helsinki and Tallinn), there are substantially higher amounts of passenger ferries and passenger ships than in the rest of Baltic Sea. At the same time, most of the Baltic Sea cargo traffic is shipped to or from the eastern side of the Gulf of Finland.

In the Nord Stream EIA report, the magnitude of emission loads from maritime traffic in the Baltic Sea was analysed based on AIS (Automatic Identification System) data on ship traffic intensity. Emissions were estimated for carbon dioxide (CO₂), nitrogen oxides (NO_x) and sulphur dioxide (SO₂). CO₂ and SO₂ are emitted due to the carbon and sulphur content in the fuel, while NO_x is emitted due to the nitrogen content in atmospheric air. The remaining compounds are a result of incomplete combustion. The majority of the emission loads from ship traffic is CO₂. Results for the existing ship traffic in the Finnish EEZ are presented in Table 5.4.

Table 5.4 Total estimated emission loads from existing ship traffic in the Finnish EEZ (2006 level)

	Tonnes/year		
	CO ₂	NO _x	SO ₂
Total	3,091,748	61,021	14,493

IMO (International Maritime Organization) has designated the Baltic Sea as a Sulphur Emission Control Area (SECA) requiring a progressive reduction in sulphur oxide (SO_x) emissions from ships by 2015.

Air pollution from ships is regulated by Annex VI of IMO's MARPOL 73/78 on "Regulations for the Prevention of Air Pollution from Ships". The aim of the legislation is to reduce SO_x emissions from ships to reduce the acidification of the atmosphere and the resulting acid rain. This is to be achieved by limiting the sulphur content in marine fuels.

Annex VI of MARPOL 73/78 makes the Baltic a "SO_x emission control area", demanding as of 19 May 2006 all ships either to use fuel oil with sulphur content not exceeding 1.5% or emission-cleaning systems reaching equivalent standards. According to the recently revised Annex VI, the sulphur content of any fuel oil used by ships within the Baltic SECA must be further decreased, to 1.0 % m/m during 2010 and to as low as 0.1 % m/m in 2015.

HELCOM Contracting States have established a Correspondence Group to collect the necessary information to propose IMO designation of the Baltic Sea as a NO_x Emission Control Area (NECA), whereby ships constructed on or after 1 January 2016 and operating within a NECA would be required to reduce their NO_x emissions by 80% in comparison to current levels.

5.2.6 Noise

Due to heavy ship traffic, the existing background noise in the Finnish project area, both airborne and underwater, is dominated by sounds generated by ships most of the time.

Underwater background noise consists of combined natural and man-made sounds that vary according to location, season and time of day. In the Finnish project area, especially for sound sources within a frequency bandwidth of approximately 10-500 Hz, sounds from ships are usually the main contributor to background noise. Other sounds that contribute to the sound field, and occasionally may have the ability to mask some of the vessel sounds, are waves and wind during stormy weather conditions or breaking of ice. However, no specific acoustic measurements of background noise exist for the project area.

There are no known published measurements of airborne noise in the open sea in the Finnish project area. Natural background noise in the open sea consists of sounds from sea waves, birds, wind and rain. Sound levels can vary largely depending on conditions, probably between 20-70 dB. Anthropogenic sound sources, such as ships or aeroplanes, can have a local effect on sound levels.

5.3 Biotic environment

Eutrophication is common environmental problem in the Baltic Sea, and of the sea waters along the Finnish coastline especially in the Gulf of Finland. As a consequence of overloading of nutrients to the sea environment different changes and malfunction of the marine ecosystem have become more common. Typical consequences of eutrophication are inter alia algal blooms, turbid waters, loss of submerged aquatic vegetation and increasing areas of dead zones on the seabed. Figure 5.10 shows the oxygen level of the water layer just above the seabed in late summer 2010 - 2012 in the Baltic Sea.

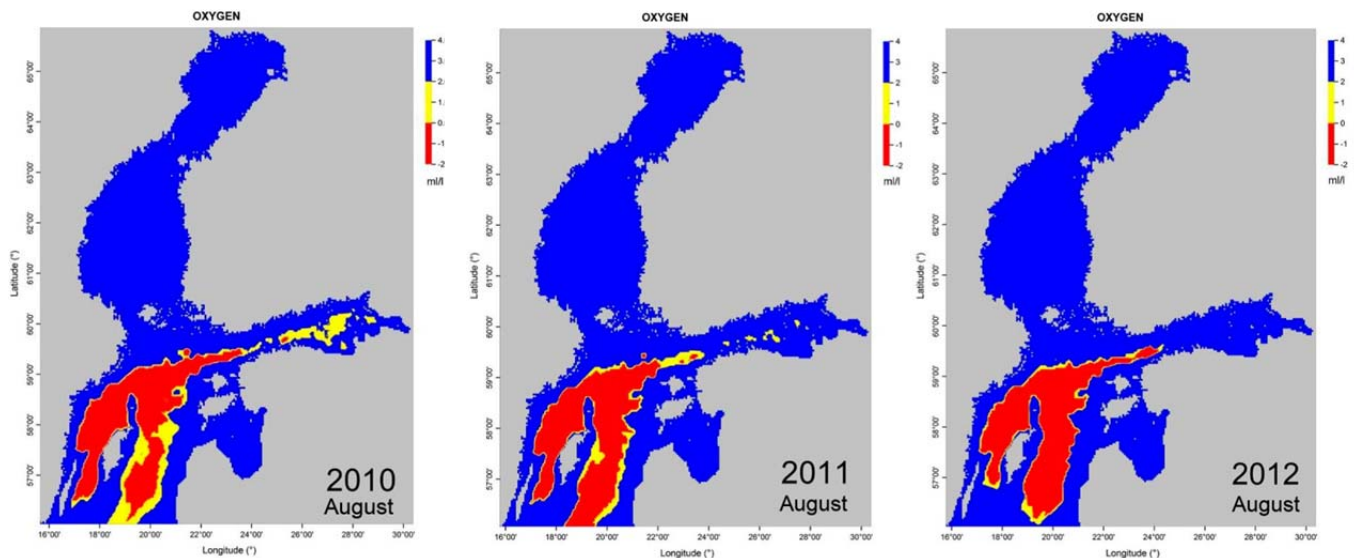


Figure 5.10 Oxygen conditions near the seabed in August 2010-2012 in the Baltic Sea according to SYKE. Red areas indicate anoxic conditions.

As a result of all this the biodiversity¹ of different biotopes have impoverished a lot. A good example of this is the state of the macrozoobenthos communities in the open sea areas, where nowadays only a few taxa can survive in changing oxygen conditions.

Eutrophication together with the accumulating scientific evidence of warmer temperatures in the future due to climate change can alter the Baltic Sea ecosystem quite dramatically. In this context, changes in other conditions associated with atmospheric circulation and precipitation, including a decrease in the average salinity of the Baltic, would also have a major influence on the conditions for biota in the Baltic Sea basin. This will affect species composition, distribution, and interaction in ways that are only roughly understood at the present time (Helsinki Commission 2007).

5.3.1 Benthos

The soft seabed in the deep sea areas (≥ 70 m) in the middle of the Gulf of Finland is a hostile living environment for benthos. The reason for this is a clear oxygen deficit, in places even anoxia, in the sediment-water interface (Figure 5.11). Formation of hydrogen sulphide, hazardous for any life, is typical under these circumstances. As such, macrobenthic communities are severely degraded throughout the open sea areas of the Baltic Proper and the Gulf of Finland at present (Andersen et al. 2011).

¹ The existence of a wide range of genotypes, species, or biotopes, in a given area or during a specific period of time.

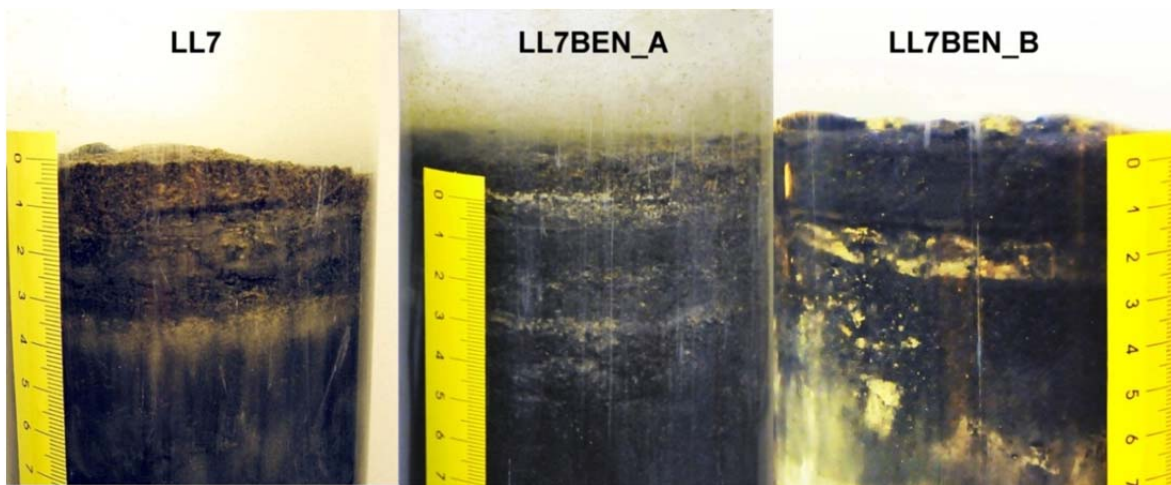


Figure 5.11 Quality of surface sediment at the HELCOM station LL7 – area in 2010. Gas formation is seen in the sediment profile LL7BEN_A (centre; Bruun et al. 2011).

In an unstable environment, where living conditions may change rapidly and without any concise pattern, macrozoobenthos species have a big challenge to colonise the seabed. In such circumstances, it is difficult for consistent communities to develop, and therefore the number of species and individuals present is low. Only those taxa² that might have a competitive advantage in the generally unfavourable environment may thrive.

In the 1990s, when living conditions at the HELCOM stations that have been monitored annually for decades were favourable for benthos, the dominant species were the amphipods *Pontoporeia femorata* and *Monoporeia affinis*. Other typical species were the isopod *Saduria entomon* and the polychaete *Bylgides (Harmothoe) sarsi*. Nowadays, the invasive polychaete *Marenzelleria* spp. that can live in an environment of clear oxygen deficiency is the dominant taxon on the soft seabed of the Gulf of Finland. The highest abundance of macrozoobenthos measured in 1995 was over 7,000 individuals/m² whereas in years 2010-2011 the maximum abundances on the studied areas varied between 18 – 225 ind./m² and the number of taxa was only three. In addition to the invasive polychaete *Marenzelleria* spp. the other species determined were the polychaete *Harmothoe sarsi* and the bivalve *Macoma baltica* (Bruun et al. 2011).

Benthos samples taken near the tie-in site during the Nord Stream Project in 2010 revealed that the number of macrozoobenthos taxa (0 – 2) and abundances (0 - 54 ind./m²) were very low or the benthic animals were totally lacking (Ramboll 2011). That was because of generally low oxygen levels and low amount of organic matter on the seabed. Water depth at the site was on average 79 metres.

In shallower areas nearer to the coastline, where oxygen conditions in the sediment-water interface are good and stable, macrozoobenthos communities are more diversified than in the open sea areas of the Gulf of Finland.

5.3.2 Plankton

The phytoplankton is the main constituent of the suspended particulate matter in the Baltic Sea. It consists of about two thousand microscopic, mainly unicellular species with various size and shape. In comparison there are about twenty zooplankton species living in the sea (Bruun et al. 2010).

² taxon/taxa= any group(s) of organisms having natural relations

5.3.2.1 Phytoplankton

The euphotic zone is the upper layer of water that is exposed to sufficient sunlight for photosynthesis to occur. It extends from the water surface to a depth where light intensity falls to 1 percent of that at the surface (euphotic layer). In the Baltic Sea, this depth is at the most between 15-20 meters. Since primary production only occurs in the euphotic zone the phytoplankton particles are produced in this layer. In Figure 5.12 the main role of phytoplankton in a eutrophication process is described.

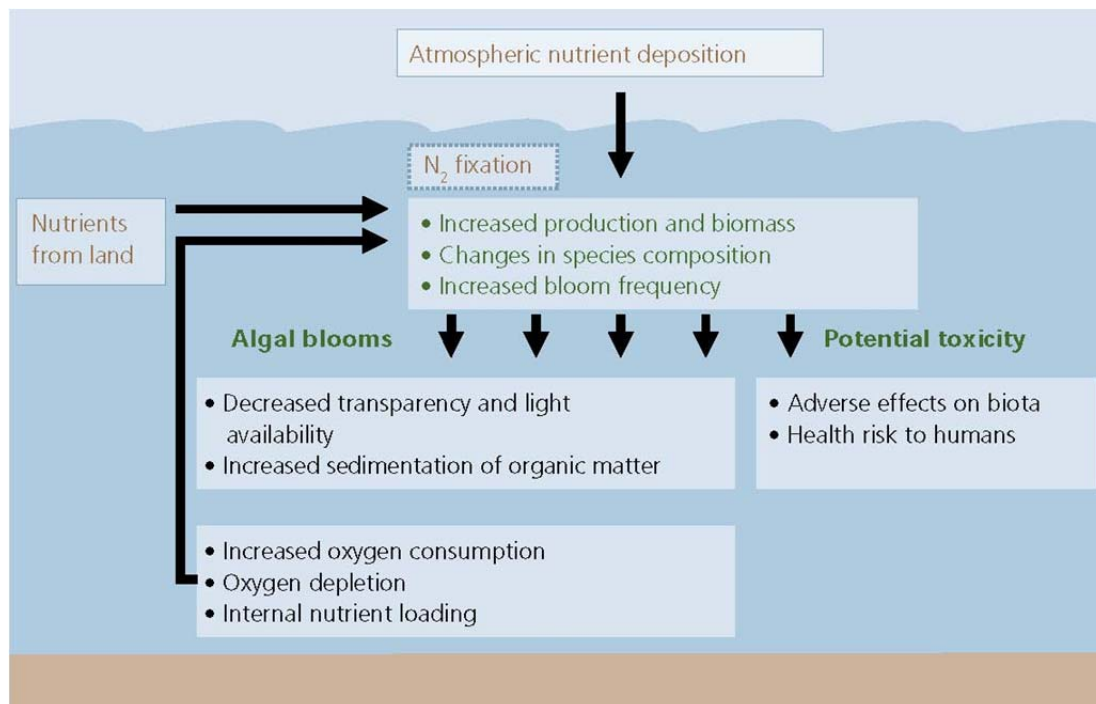


Figure 5.12 Conceptual model of the relationship of phytoplankton to eutrophication in the Baltic Sea (HELCOM 2009).

The Baltic Sea has about 80 species of planktonic cyanobacteria, which can be found in relatively small quantities all year round. Mass blooms are most common during the summer months. In surface waters in the open sea areas these blooms are typically formed largely by the species *Aphanizomenon flos-aquae* and *Nodularia spumigena* (Bruun et al. 2010).

Cyanobacteria or blue-green algae forms blooms in late summer especially in the Baltic Proper and in the Gulf of Finland (Figure 5.13). The spatial and temporal extent as well as the intensity of the blooms may vary from year to year. According to Bruun et al. (2010) this can be roughly estimated based on the ratio of dissolved phosphorus to nitrogen after the spring bloom.

Other major phytoplankton groups living in the Baltic Sea are Flagellates, Dinoflagellates and Diatoms. Diatoms are an important and highly species-diverse group of algae, with as many as 700-800 species so far observed. Many species occur in small quantities all year round. In mid and late summer smaller disc-shaped diatoms often proliferate, especially in areas affected by eutrophication.



Figure 5.13 Aerial photo of a cyanobacterial surface accumulation in the Gulf of Finland (*Bruun et al. 2010*).

5.3.2.2 Zooplankton

The Baltic Sea zooplankton is dominated by the taxonomical groups Protozoa, Rotatoria and Crustacea (Copepoda and Cladocera).

Species composition and abundances of the zooplankton community in the Baltic Sea change with the seasons. Being able to migrate to water layers with high food availability, the total zooplankton abundance can temporally be notably high in the surface layer, especially in summer, whereas in winter most of the zooplankton individuals are gathered in the water layer close to the halocline.

During winter, the biomass of zooplankton is low. Summer is the high season for zooplankton: growth is fast and generation cycles are short due to warm waters and abundant food. The zooplankton biomass reaches its peak during late summer and early autumn months when the waters are still warm. During the same time the predation pressure from larger animals feeding on zooplankton like fish, such as Baltic herring and sprat reaches its peak. During September-October zooplankton abundances decrease both due to decreasing reproduction rates and predation (Bruun et al. 2010).

5.3.3 Fish

In the Gulf of Finland and Northern Baltic Proper brackish water and the prevailing environmental conditions are suitable for only a few fish species. Low salinity is a limiting factor for many marine fish species. The low oxygen content or lack of oxygen in deeper areas limits the amount of suitable habitats for demersal fish species.

In the open seas along the alternatives the fish community is dominated by sprat (*Sprattus sprattus* L.) and Baltic herring (*Clupea harengus* L.) and during winter also by three-spined stickleback (*Gasterosteus aculeatus*). Migratory anadromous fish species – which spend most of their adult life in the sea but spawn and spend their juvenile stage in rivers – are salmon (*Salmo salar*), sea trout (*Salmo trutta* L.) and whitefish (*Coregonus lavaretus*) in the Finnish project area.

The commercially exploited fish species in the Finnish project area are sprat, Baltic herring and salmon. In the archipelago and near the coast there are also other important target species for Finnish coastal

fisheries: Sea trout, pike-perch (*Stizostedion lucioperca*), whitefish, perch (*Perca fluviatilis*), pike (*Esox lucius*) and flounder (*Platichthys flesus*).

Presence of persistent organic pollutants (POP) in fish of the Baltic Sea has been monitored in the EU level. The last study called EU Fish II (Hallikainen et al. 2011) shows that contents of many POP compounds have declined in fish caught from the Gulf of Finland. According to Commission Regulation (EC) No 1881/2006 fish and fish products are not allowed to sell if the muscle meat of fish contains more than 4 pg/g (wet weight) of dioxins (WHO-PCDD/F-TEQ). Finland and Sweden have an exception for that regulation and they are allowed to sell big (>17 cm) Baltic herring in their own territory and Salmon also to the other countries. The content of dioxins in the offshore fishery target species outside of the City of Hanko and outside of the City of Kotka in 2009 is shown in Table 5.5.

Table 5.5 Dioxin (WHO-PCDD/F-TEQ) contents in Salmon, Baltic herring and Sprat in the Gulf of Finland in 2009 (Hallikainen et al. 2011).

Species	The Gulf of Finland, Hanko		The Gulf of Finland, Kotka	
	Age, years	WHO-PCDD/F-TEQ	Age, years	WHO-PCDD/F-TEQ
Salmon	2 sea years	3.57	2 sea years	4.24 - 4.79
Baltic Herring	1-9	0.65 - 1.63	2-7	0.91 - 3.70
Sprat	1-4	0.66 - 1.31	1-6	0.76 - 1.77

5.3.4 Marine mammals

Two species of seals live and breed in the Gulf of Finland, the Grey Seal (*Halichoerus grypus*) in the western and central Gulf of Finland and the Baltic Ringed Seal (*Pusa hispida botnica*) in the eastern Gulf of Finland. The Grey Seal is nowadays common and the population is increasing. In the Gulf of Finland an estimated number is about 800 individuals (2010 counts resulted in 615 individuals, Finnish Game and Fisheries Research Institute 2010). The population of the Baltic Ringed Seal is around 200-300 individuals at most. The species is classified as near threatened, but there are differences between subpopulations. The subpopulation of the Archipelago Sea is declining, with some 300 individuals left. The Estonian north-west archipelago has a population of more than 1,000 individuals. There is evidence that some ringed seals move between the Archipelago Sea and the Estonian waters. Weakest subpopulation is in the Gulf of Finland, where ringed seals are concentrated to the eastern part. During 2010 and 2011 only a few individuals have been observed at the Finnish side, and also the number in the Russian waters has been declining dramatically. There are perhaps only about 100 individuals left (Nordström et al. 2011).

The Grey Seal breed on ice or on land depending on ice conditions. The breeding season of the Grey Seal is from February to April in the Gulf of Finland. The Baltic Ringed Seal calves only on ice, which limits its presence especially in mild winters. Calving occurs from February to March.

The Baltic Ringed Seal is protected in line with the EU Habitats Directive 2006/105/EC and the Bern Convention. The entire Baltic Grey Seal population is listed as vulnerable by the International Union for the Conservation of Nature (IUCN). The Baltic Grey Seal is listed among the protected species in the EU Habitats Directive 2006/105/EC and the Bern Convention (Rassi et al. 2001). However, the Grey Seal was struck off the list of endangered species in 2010 due to a favourable development of the population (Rassi et al. 2010). Chapter 5.4.5 gives information on protected areas for seals.

The hunting season for the Grey Seal is during 16 April - 31 December and it is protected from hunting during 1 January - 15 April in line with the Hunting Decree of 12 July 1993. The hunting season for the Baltic Ringed Seal is during 1 September - 15 October and 16 April - 31 May, and it is protected from hunting during 16 October - 15 April and 1 June - 31 August. However, no hunting permits are granted for the Baltic Ringed Seals, at present.

The Harbour Porpoise (*Phocoena phocoena*) population has a low density in the Baltic Sea and comprises only some 600 individuals. The distribution of the Baltic subpopulation of Harbour Porpoise is mostly limited to the southern Baltic Proper. Harbour Porpoise have been rarely observed in Finnish waters, and on these limited occasions they have occurred mostly close to the coastline. Because of ice coverage, Harbour Porpoise can't live year round in Finnish coastal waters.

Finland is a party to the Agreement on the Conservation of Small Cetaceans of the Baltic, Nord East Atlantic, Irish and North Seas (ASCOBANS), which pledges international cooperation to achieve and maintain favourable conservation status for small cetaceans, including the Harbour Porpoise.

In Finland Harbour Porpoise is classified as regionally extinct.

5.3.5 Birds

Finnish waters are not very important for wintering seabirds. During mild winters only Åland Islands host remarkable numbers of wintering seabirds. If winter is cold and severe, almost all seabird species leave Finnish waters and move to southern parts of Baltic Sea.

The Gulf of Finland and the Archipelago Sea, however, are very important breeding areas for ducks, gulls, terns and waders. Breeding season begins in March-April and continues until July and early August, when young birds leave their nesting sites.

The archipelago of the eastern Gulf of Finland is very rich in breeding and migrating seabird species. Some 200 bird species (migrants and breeders) can be frequently observed along the shores of the Gulf of Finland. There are about 30-40 species of seabirds (ducks, geese, waders, gulls and divers) that are common breeders or migrants.

Most of the breeding species nest on rocky and stony islands and islets in the outer and middle archipelago, but there are also several important vegetation-rich shallow bays along the coastline. Near the Finnish coast, there are also several larger, forested islands. Finnish coast of the Gulf of Finland is mostly hard bedrock. Special habitats, as sandy reefs and sandy shores, are quite rare, but more common near Hanko Peninsula.

Twice a year, huge numbers of Arctic birds cross the Baltic Sea on their way to breeding or wintering areas. The Gulf of Finland is one of the most central flight routes. The spring migration typically takes place between 1 May and 10 June and the autumn migration usually between 1 July and 15 November.

Important Bird Areas (IBAs) and Finnish Important Bird Areas (FINIBAs) in Finnish waters are presented in Chapter 5.4.7. Several bird species listed on the EC Birds Directive Annex I regularly occur in many of the marine IBA and FINIBA areas. They include: Whooper Swan (*Cygnus cygnus*), Tundra Swan (*Cygnus columbianus*), Barnacle Goose (*Branta leucopsis*), Steller's Eider (*Polysticta stelleri*), Smew (*Mergus albellus*), White-tailed Sea Eagle (*Haliaeetus albicilla*), Little Tern (*Sterna albifrons*), Caspian Tern (*S. caspia*), Common Tern (*S. hirundo*) and Arctic Tern (*S. paradisaea*). Annex I species in the FINIBA areas that are mainly breeders in vegetation-rich shallow coastal bays far away from the pipeline zone or are rare visitors have not been listed here.

The White-tailed Sea Eagle and the Caspian Tern are the only species from the Finnish Nature Protection Act's list of specially protected bird species that breed in the archipelagos near the pipeline area (distance 10-20 km). Other species from the list are very rare passage visitors.

5.4 Protected areas

Several protected areas are located in Finnish waters in the Gulf of Finland and Archipelago Sea. The protection status of the areas varies: some are established by national legislation, some by international conventions or directives and some by international or national programmes.

Protected areas in Finnish waters in the Gulf of Finland and Archipelago Sea are concentrated on the coastal areas. Most of them are located within territorial waters and only three areas extend into the Finnish EEZ.

The survey area for ALT 1 and ALT 1a do not cross any of the protected areas. The Sandkallan Natura 2000 area is the closest one with the closest distance of 6 m to the survey area (Figure 5.14). All other protected areas are located at more than 4.8 km distance from the survey area.

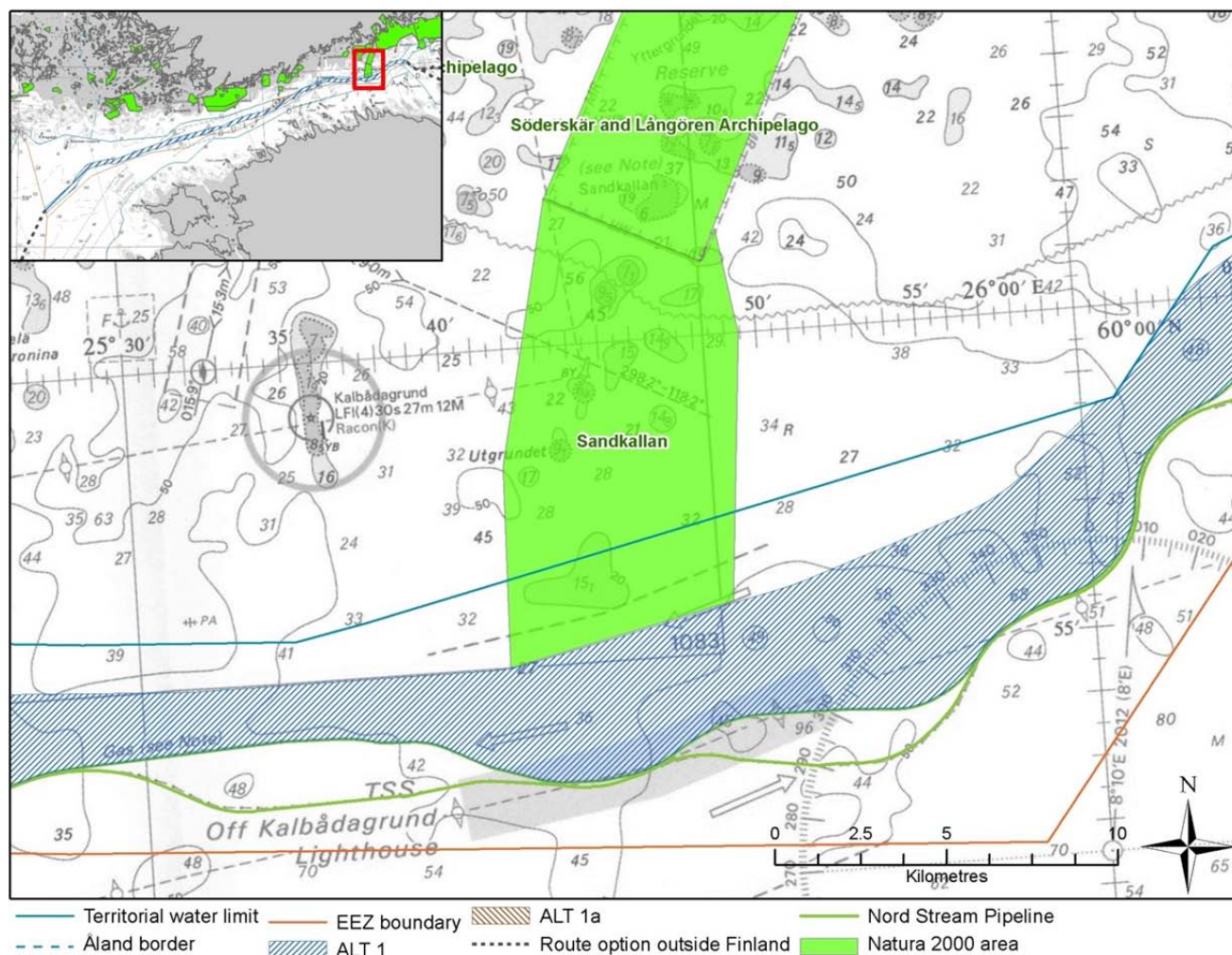


Figure 5.14 Sandkallan Natura 2000 area is located adjacent to ALT 1. Closest distance is 6 m from the edge of the survey area. (Source for Natura 2000 areas: HELCOM)

5.4.1 Natura 2000 areas

Natura 2000 is a network of protected areas established by the European Union. The aim is to protect threatened species and habitats in the EU. The network includes Special Areas of Conservation (SAC) based on the Habitats directive (1992) and Special Protection Areas (SPA) under the Birds directive (1979). Sites of Community Importance (SCI) are areas proposed by a member state to the European Commission to be included in the Natura 2000 network.

There are numerous Natura 2000 areas in Finnish waters in the Gulf of Finland and Archipelago Sea (Appendix 1, Map 1). Three of them reach the Finnish EEZ. Table 5.6 lists the Natura 2000 areas which are located nearest to ALT 1 and ALT 1a. In addition, there are other very small Natura 2000 areas near the listed areas and located more than 20 km from ALT 1 or ALT 1a.

Table 5.6 Natura 2000 areas in Finnish waters nearest to ALT 1 and ALT 1a

Natura 2000 area	Category	Area code	Distance from ALT 1 and (ALT 1a), km
Eastern Gulf of Finland Archipelago and waters	SPA/SCI	FI0408001	21.1
Pernaja and Pernaja Archipelago	SPA/SCI	FI0100078	12.1
Söderskär and Långören Archipelago	SPA/SCI	FI0100077	9.7
Kirkkonummi Archipelago	SPA/SCI	FI0100026	10.4
Kalbådans islets and water	SPA/SCI	FI0100089	8.1 (6.3)
Inkoo Archipelago	SPA/SCI	FI0100017	18.3 (14.9)
Tammisaari and Hanko Archipelago	SPA/SCI	FI0100005	15.0
Tulliniemi	SPA/SCI	FI01000006	26.0
Archipelago Sea	SPA/SCI	FI0200090	25.0
Länsiletto	SCI	FI0400001	27.4
Luodematalat	SCI	FI0400002	17.3
Sandkallan	SCI	FI0100106	0.0
Hangon itäinen selkä	SCI	FI0100107	11.5

5.4.2 National parks

National parks aim to protect the most valuable areas in Finland, both nationally and internationally, as well as their species, habitats and landscape. They are open for public, but they will be kept in as natural state as possible.

The national parks presented in Table 5.7 and Appendix 1 (Map 2) are located the nearest to ALT 1.

Table 5.7 National parks in Finnish waters nearest to ALT 1

National park	Area code	Distance from ALT 1, km *
The Eastern Gulf of Finland National Park	KPU050007	21.1
The Tammisaari Archipelago	KPU010001	15.3
The Archipelago Sea National Park	KPU020002	23.5

* Note: All National parks closer to ALT 1 than ALT 1a

5.4.3 Baltic Sea Protected Areas

HELCOM (Helsinki Commission, Baltic Marine Environment Protection Commission) has defined Baltic Sea Protected Areas (BSPAs) in 1994. In Finnish coastal areas they follow the Natura 2000 area boundaries. Appendix 1 (Map 2) shows the BSPAs in the Gulf of Finland and the Archipelago Sea. In Table 5.8 eight BSPAs located nearest to ALT 1 have been listed.

Table 5.8 Baltic Sea Protected Areas (BSPAs) in Finnish waters nearest to ALT 1

Baltic Sea Protected Area (BSPA)	Area code	Distance from ALT 1, km *
The Eastern Gulf of Finland National Park	145	21.1
Pernaja and Pernaja Archipelago MPAs	161	12.1
Porvoonjoki estuary - Stensböle	160	41.2
Söderskär and Långören Archipelago	159	9.7
Kirkkonummi Archipelago	158	10.3
Tammisaari and Hanko Archipelago and Pojo Bay MPAs	144	14.9
Tulliniemi bird protection area	157	26.0
Archipelago Sea	143	25.2

* Note: All BSPAs closer to ALT 1 than ALT 1a

5.4.4 UNESCO areas

UNESCO Biosphere Reserves are areas recognized under Man and the Biosphere Programme by UNESCO to promote sustainable development based on local community efforts and sound science. In Finland there is one UNESCO Biosphere Reserve, The Finnish Archipelago Sea.

In addition to the UNESCO biosphere reserve site, there is one UNESCO World Heritage Site in the coast of the Gulf of Finland, the Fortress of Suomenlinna. Table 5.9 and Appendix 1 (Map 2) show the UNESCO sites nearest to ALT 1.

Table 5.9 UNESCO sites in Finnish waters and coastal areas nearest to ALT 1

UNESCO site	Site type	Distance from ALT 1, km
Finnish Archipelago Sea	Biosphere Reserve Area	16.3
Fortress of Suomenlinna	World Heritage Site	26.9

5.4.5 Seal sanctuaries

Seal sanctuaries were established on state owned sea areas in 2001 to protect grey seals and their habitats. Some of the sanctuaries are important also for the protection of ringed seals.

Table 5.10 and Appendix 1 (Map 3) present the four seal sanctuaries in Finnish waters in the Gulf of Finland.

Table 5.10 Seal sanctuaries in Finnish waters nearest to ALT 1 and ALT 1a

Seal sanctuary	Distance from ALT 1 and (ALT 1a), km
Sandkallan - Stora Kôlhällan	9.6
Kallbâdan	6.7 (4.8)
Mastbâdan	32.8
Grimsörarna	36.9

5.4.6 Ramsar sites

The Convention of Wetlands of International Importance or Ramsar Convention is an intergovernmental treaty adopted in 1971. It provides a framework for the conservation and wise use of wetlands and their resources. Ramsar sites are wetlands designated by contracting parties to the List of Wetlands of International Importance. In Finnish waters the Ramsar sites follow the boundaries of Natura 2000 areas. Table 5.11 and Appendix 1 (Map 2) present the nine Ramsar sites in Finnish coastal areas of the Gulf of Finland.

Table 5.11 Ramsar sites in Finnish coastal areas of the Gulf of Finland

Ramsar site	Area code	Distance from ALT 1, km *
Aspskär Islands	3FI001	22.3
Söderskär and Långören Archipelago	3FI002	9.7
Björkör and Lågsjär Archipelago	3FI003	85.9
Porvoonjoki Estuary	3FI007	41.2
Vanhankaupunginlahti and Laajalahti Bays	3FI008	29.7
Bird Wetlands of Hanko and Tammisaari	3FI016	14.9
Kirkon-Vilkkiläntura Bay **	3FI022	89.2
Lake Kirkkojärvi and Lupinlahti Bay **	3FI023	73.3
Pernajanlahti Bay	3FI036	44.5

* Note: All Ramsar sites closer to ALT 1 than ALT 1a

** Not shown in Appendix 1 (Map 2) (east of map window)

5.4.7 Important Bird Areas

Important Bird Areas Programme by BirdLife International aims to identify, monitor and protect key sites for birds all over the world. Important Bird Areas (IBAs) are chosen by using internationally agreed criteria and aim to form a coherent network for birds. Finnish Important Bird Areas (FINIBAs) include all nationally important bird areas in Finland.

Table 5.12 and Appendix 1 (Map 3) present the ten Important Bird Areas in Finnish coastal area of the Gulf of Finland and in Archipelago Sea. FINIBAs are not listed here, but they are shown in Appendix 1 (Map 3).

Table 5.12 Important Bird Areas in Finnish coastal areas of the Gulf of Finland and in the Archipelago Sea

Important Bird Area	Area code	Distance from ALT 1, km *
Kirkon-Vilkkiläntura Bay **	FI073	89.2
Eastern Gulf of Finland National Park	FI072	21.1
Pernaja outer archipelago	FI075	12.2
Porvoonjoki delta	FI076	41.2
Porvoo outer archipelago	FI077	18.8
Laajalahti Bay, Vanhankaupunginlahti Bay and Viikki	FI078	29.6
Kirkkonummi Archipelago	FI082	10.4
Tammisaari and Inkoo western archipelago	FI080	15.0
Hanko western archipelago	FI081	21.7
Korppoo and Nauvo Southern Archipelago	FI089	34.8

* Note: All Important Bird Areas closer to ALT 1 than ALT 1a

** Not shown in Appendix 1 (Map 3) (east of map window)

5.5 Socio-economic conditions

5.5.1 Ship traffic

Through the Gulf of Finland ALT 1 and ALT 1a crosses or runs parallel to areas with high ship traffic intensity. Furthermore, ALT 1 crosses a number of shipping lanes with less intensity in the Northern Baltic Proper. The ship traffic in the middle of the Gulf of Finland is dominated by the main east/west shipping lanes and complicated by the north/south traffic between Helsinki and Tallinn. Smaller ships travel along the coastal and nearshore routes.

Most of the Baltic Sea varied cargo traffic is shipped to or from eastern side of the Gulf of Finland. This includes oil transported from Russian ports. There are also a high number of ferries and cruise ships particularly in the Helsinki/Tallinn area.

The international sea transport to and from Finnish ports in 2011 was:

- Arrivals to coastal ports more than 30,200 vessels;
- Goods about 98.5 million tonnes;
- Number of vehicles more than 2.3 million;
- Number of containers about 1.4 million;
- Transit transport 7.5 million tonnes;
- Passenger traffic over 17.7 million.

In 2011 the three top ports in Finland based on vessel arrivals in foreign traffic were Helsinki (8619), Mariehamn (3895) and Hamina/Kotka (2718). On the southern coast ports in Hanko (1145) and Kilpilahti/Sköldvik in Porvoo (886) were high in statistics. (Finnish Transport Agency 2011)

The traffic density map based on data from the Automatic Identification System (AIS) data during the period from the first six months of 2009 shows that the Gulf of Finland is heavily trafficked (Figure 5.15).

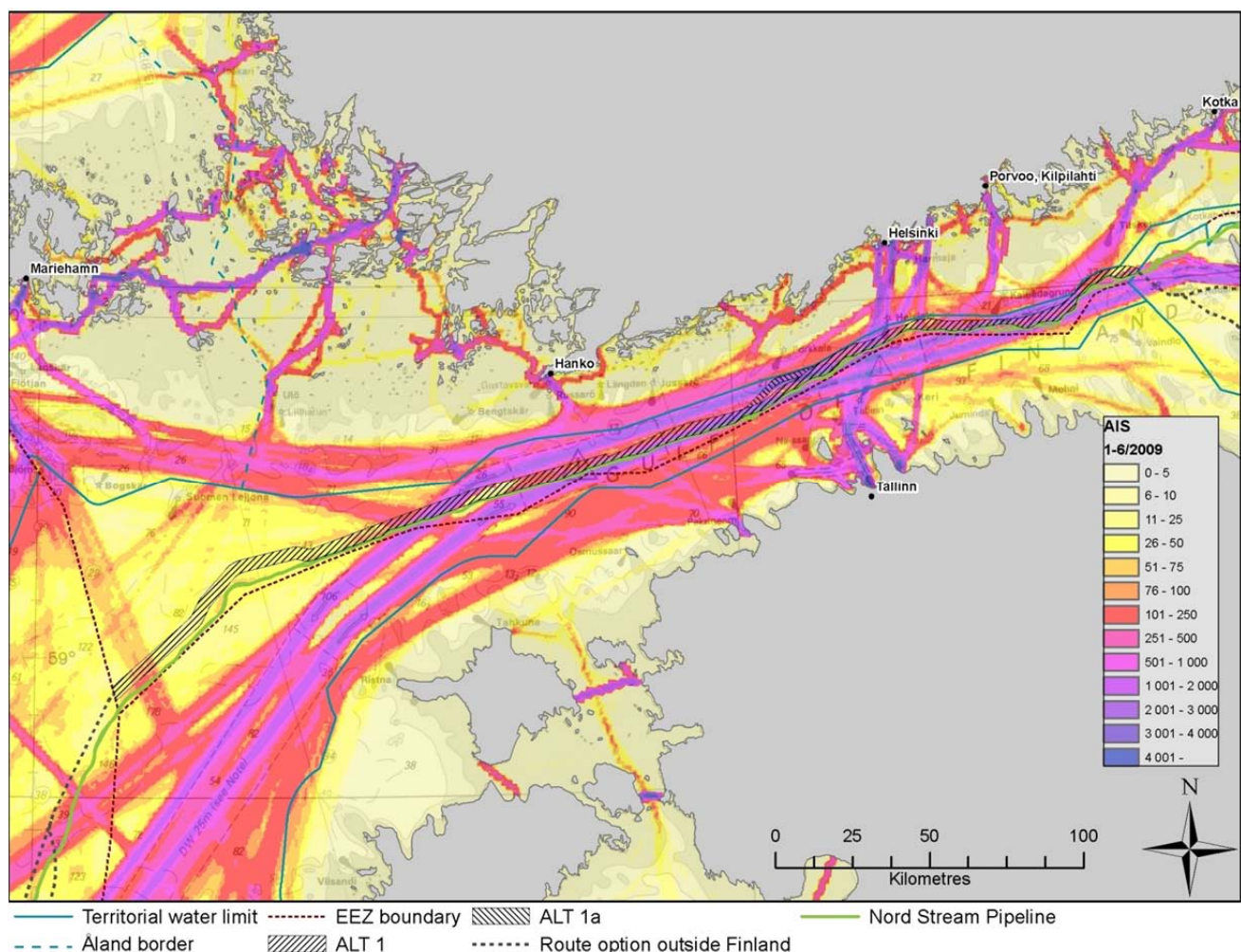


Figure 5.15 AIS data map for the Gulf of Finland and the Northern Baltic Proper (1-6/2009)

There are three ship traffic separation schemes (TSS) in the project area in the Finnish EEZ (Gulf of Finland). These are TSS Off Porkkala Lighthouse, TSS Off Kalbådagrund Lighthouse and TSS Off Hankoniemi Peninsula. The TSS ensure a separation of the east and west bound traffic, avoid shoal areas and manage the traffic entering and departing the TSS areas to the north or south. Amendments to these three TSS areas were implemented in December 2010 which post dates the AIS data shown in Figure 5.15.

Ship traffic in the Gulf of Finland is monitored under GOFREP (Gulf of Finland mandatory ship reporting system). The purpose of GOFREP is to increase maritime safety thereby increasing the protection to the marine environment and monitor compliance with international for preventing collisions at sea.

Navigational charts indicate a number of areas/locations along the southern Finnish coastline as "Anchoring areas". These are areas where ships can anchor up for shorter periods of time and are primarily located in coastal areas in the territorial waters

Based on the EU directive (Directive 2009/17/EC), the Finnish Traffic Agency is investigating accommodation of ships in need of assistance (safety areas for ships that have been involved in accidents). To take ships closer to ports would be a bigger risk for the environment (Helsingin Sanomat 2012). Appendix 1 (Map 4) shows the TSS, anchoring areas and preliminary safety areas for ships as well as coastal navigational lanes.

5.5.2 Fishery

At the end of 2011, the register of professional fishermen in Finland included 2,199 fishermen who operated at sea (Söderkultalahti 2012). One-fourth of them earned at least 30% of their income from fishing. The number of professional fishermen was highest in South-western and Western Finland. Professional fishery in the Gulf of Finland and the Northern Baltic Proper includes both coastal and offshore fishing. Offshore fishing is comprised of trawling and long-line fishing. In the coastal areas, mostly nets and trap nets are used.

Trawls are the principal gear type used in commercial fishery in the open waters of the Baltic Sea. Mid-water trawls are used to capture Herring and Sprat and are also used by Finnish fishermen in the offshore areas of the Gulf of Finland and the Northern Baltic Proper. Mid-water trawls are used in the middle water column but can be used at the near bottom as well when fish schools are located in deep water. Long-line fishing is used to catch Salmon in the offshore waters.

Sprat and Herring are commercially the most important species, comprising by weight about 95% of the total commercial catch in the Finnish EEZ fisheries in the Gulf of Finland, the Archipelago Sea and the Northern Baltic Proper. In 2011, the most important waters for fishery regarding the Project in the Finnish EEZ were at the entrance to the Gulf of Finland and in the Northern Baltic Proper. The fishing method for these species is trawling, either by single boat or by two boats. By far the most important area for the Finns to fish Herring is the Bothnian Sea which is not near the planned project area. Majority (77 %) of the Herring catch in 2011 was captured in the Bothnian Sea. From the project area on the Finnish EEZ the proportion of Sprat and Herring catch was 14 %.

Recreational fishery is concentrated mainly in the coastal and archipelago areas. In the offshore area salmon trolling is also practised by recreational anglers.

5.5.3 Military areas

Military areas located in the Gulf of Finland and the Archipelago Sea are either firing danger areas or restricted areas. They are shown in Appendix 1 (Map 5).

The restricted areas are in territorial waters but a few of them are close to the EEZ border. Two areas, Upinniemi and Hanko, are at the EEZ border. The restricted areas do not limit the movement within restricted areas anymore, except for movement in the proximity of marked military objectives located within the restricted areas. For instance following activities are not allowed without permission within a restricted area; Scuba diving, fishing without permission with fishing tackle dragged along the bottom, anchoring other than pleasure craft outside anchorages marked on the Finnish sea charts, movement in a public water area outside public fairways 100 m closer to such land areas used by the Finnish Defence Forces at which landing, based on law, has been marked as prohibited. (Act on Territorial Surveillance, Section17)

Firing danger areas are reserved for Defence Forces training purposes. Most of the areas are mainly in territorial waters, but can also be located in the Finnish EEZ. One area also extends into the Estonian EEZ. According to the Defence Forces training is primarily performed in territorial waters.

5.5.4 Munitions

The Baltic Sea is an area with a history of significant strategic naval importance. The legacy of World War I and World War II is the presence of conventional and chemical munitions. The estimated number of mines laid in the Baltic Sea is over 170,000. Many of these have been cleared during the years, but many tens of thousands of mines may remain in the Gulf of Finland (see Nord Stream AG 2013a). In addition to the strategically placed mines, remnants of marine warfare such as torpedoes, artillery shells and air dropped bombs are encountered. There is no available information on chemical munition dump sites in the Finnish EEZ.

The most common mines deployed are contact mines. There are three types, these being moored, bottom and drifting contact mines. Moored contact mines are connected to a release system deployed on the seabed and are designed to float at or near the surface. Mines that are still attached to the anchor have failed to release or filled with water on deployment.

The mines were deployed in lines by various navies. The lines were deployed at various times with the mines designed to float at varying depths thus creating complex curtains. Databases are available that define the locations of the mine lines but these are incomplete; however, they still provide a guide to areas of elevated risk. (Nord Stream 2009)

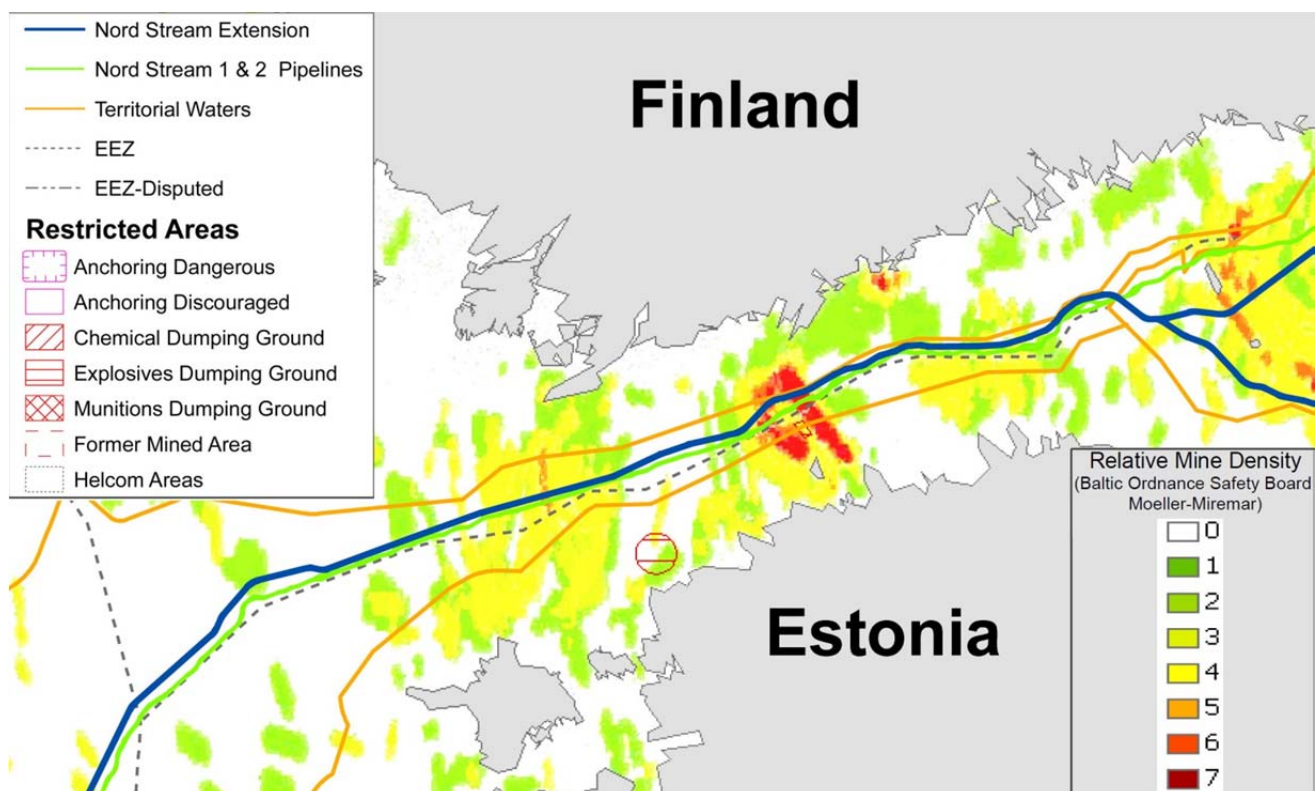


Figure 5.16 Munition areas in the Gulf of Finland and the Northern Baltic Proper. Note that the route in the Finnish EEZ is only indicatively drawn. (Nord Stream AG 2013a, reproduced by Nord Stream AG)

In preparation of the construction of Nord Stream pipelines 1 and 2 in the Finnish project area, in total 49 munitions were cleared through detonation and six relocated. Based on the Nord Stream experience and

the amount of munitions still present in the Gulf of Finland and the Northern Baltic Proper, similar amount of munitions are likely to be cleared or relocated, depending on the munition type, for the Nord Stream Extension. The exact amount will be known when the detailed surveys have been performed (see Chapter 10 for surveys) and route optimisation completed.

5.5.5 Barrels

There are barrels and other containers located on the seabed in the Gulf of Finland and the Northern Baltic Proper and especially close to shipping lanes, as these have been thrown overboard from vessels.

In the Finnish Exclusive Economic Zone the total of some 630 barrels and other containers were found within the installation and anchoring corridors of the Nord Stream Pipelines 1 and 2. The condition of the barrels varied greatly. The majority of the barrels were either broken or otherwise open. A number of the barrels appeared completely intact and closed and so are likely to contain the original contents. The barrels were divided into four different classes on the bases of their condition and exposure of their content to the sea water. It is noted that any potential contaminants in barrels will in any case be released to the environment with time, when the still intact containers break due to corrosion. (Ramboll 2010)

As barrels are found in detailed surveys it is not possible at this stage to assess how many barrels will be inside ALT 1 and ALT 1a. Based on the Nord Stream experience and the location of the route a similar amount of barrels is assumed to be inside ALT 1 and ALT 1a as for Nord Stream pipeline corridors. The exact amount will be finally known when the detailed surveys have been performed (see Chapter 10 for surveys).

5.5.6 Existing and planned infrastructure

5.5.6.1 Pipelines

Nord Stream Pipelines 1 and 2 run through the Finnish EEZ from Russian territorial waters to the Swedish EEZ (see e.g. Figure 1.7). Both pipelines cross the route option in Russian territorial waters near the Finnish EEZ border.

Balticconnector is a planned gas pipeline connection between Finland and Estonia. The planned route of the pipeline crosses ALT 1.

See Appendix 1 (Map 6) for Nord Stream Pipelines 1 and 2 and Balticconnector planned pipeline.

5.5.6.2 Cables

Several power and telecommunications cables run in the Finnish project area. 18 cables cross ALT 1 or ALT 1a. Table 5.13 presents all these cables; note that inactive and planned cables are also included. Appendix 1 (Map 6) shows cables in the Gulf of Finland, the Northern Baltic Proper and the Archipelago Sea.

Finland is planning a telecommunications cable from Finland to Germany through the Baltic Sea. Route alignment is not known yet.

Table 5.13 Active, inactive and planned cables that cross ALT 1 or ALT 1a

Cable	Type	Route	Status	Distance from the ALT 1 and (ALT 1a) , km
UCCBF	Military	St Petersburg (Russia) – Kaliningrad (Russia)	Inactive	Crosses
Estlink II	Power	Finland – Estonia	Planned (to be laid in autumn 2012)	Crosses
Jollas-Leningrad	Telecommunications	Jollas (Finland) – St Petersburg (Russia)	Inactive	Crosses
FEC 1	Telecommunications	Porkkala (Finland) – Kakumae (Estonia)	Active	Crosses
FEC 2	Telecommunications	Lauttasaari (Finland) – Randvere (Estonia)	Active	Crosses
Pangea	Telecommunications	Helsinki (Finland) – Tallinn (Estonia) and Sandhamn (Sweden) – Hiiumaa (Estonia)	Active	Crosses
EE-SF2	Telecommunications	Helsinki (Finland) – Tallinn (Estonia)	Active	Crosses
IP-Only	Telecommunications	Helsinki (Finland) – Tallinn (Estonia) – Hanko (Finland)	Planned	Crosses
unknown	Telecommunications	Finland – Estonia	Inactive	Crosses
unknown	Telecommunications	Finland – Estonia	Inactive	Crosses
EE-SF3	Telecommunications	Lauttasaari (Finland) – Meremoisa (Estonia)	Active	Crosses
UESF2	Telecommunications	Helsinki (Finland) – Hanko (Finland)	Active	Crosses
UESF1	Telecommunications	Helsinki (Finland) – Hanko (Finland)	Active	Crosses
Estlink	Power	Finland – Estonia	Active	Crosses
BCS_North_Phase_II_Teliasonera	Telecommunications	Helsinki (Finland) – Hanko (Finland)	Active	0.3 (Crosses)
UPT	Telecommunications	Russia – Kaliningrad (Russia)	Active	Crosses
EE-S1	Telecommunications	Stavsnas (Sweden) – Tahkune (Estonia)	Active	Crosses
Libau-Jollas	Telecommunications	Latvia – Finland	Inactive	Crosses

5.5.6.3 Extraction and spoil dump areas

Four active gravel extraction sites exist in Finnish territorial waters in the Gulf of Finland or the Northern Baltic Proper: Itätonttu, Soratonttu, Eestinluoto and Merisora Loviisa.

There are also active and planned spoil dump sites in Finnish territorial waters: Mustakupu (active), Taulukari (active), Lökkiluoto (planned), Koirasaari (planned), Koirasaarenluodot (planned), Mustamatala (planned), Rövagrundet (active), 13 (planned), 15 (planned) and Boskalis (Loviisa, active). Shortest distance between the sites and ALT 1 or ALT 1a is approximately 13 km.

Appendix 1 (Map 6) shows the extraction and spoil dump areas in Finnish waters in the Gulf of Finland or the Northern Baltic Proper.

5.5.6.4 Planned wind parks

In Regional Land Use Plans there are several reservations for wind parks in Finnish territorial waters in the Gulf of Finland or Northern Baltic Proper. Closest reservation area is at 4 km distance from ALT 1.

Inkoo-Raasepori wind park (Suomen Merituuli Oy) is at the moment the only planned wind park in Finnish waters in the Gulf of Finland or Northern Baltic Proper. It covers approximately 5 x 20 km sea area in Finnish territorial waters (see Appendix 1 (Map 6)). Approximate distance from the planned wind park to ALT 1 is 17 km.

5.5.7 Scientific heritage

5.5.7.1 Long term monitoring stations

In Finnish waters in the Gulf of Finland or Northern Baltic Proper there are numerous long term monitoring stations managed by several countries around the Baltic Sea. Most of the stations are managed by Finnish Environment Institute (SYKE). A total of 28 long term monitoring stations are located within 5 km distance from ALT 1 or ALT 1a. Six of them are located inside and six within 1km from the ALT 1 or ALT 1a. Table 5.14 and Appendix 1 (Map 7) present the monitoring stations located nearest to ALT 1 and ALT 1a in Finnish waters.

Table 5.14 Long term monitoring stations located nearest to ALT 1 in Finnish waters

Station	Country	Distance from ALT 1, km *
25	Estonian	1.5
AALTO_HKI	Finnish	3.9
AALTO_PI	Finnish	2.6
BY27	Swedish	Inside
CTD_JV_1	Finnish	2.4
F1	Estonian	2.6
F25	Russian	Inside
H1	Estonian	2.1
JML	Finnish	3.1
KASUUNI	Finnish	4.8
LL10	Finnish	Inside
LL11	Finnish	0.5
LL11A	Finnish	4.0
LL12	Finnish	2.0
LL3A	Finnish	2.7
LL4A	Finnish	0.8
LL5	Finnish	0.02
LL5BEN_A	Finnish	1.7
LL5BEN_B	Finnish	4.8
LL6A	Finnish	Inside
LL6ABEN_A	Finnish	1.2
LL6ABEN_B	Finnish	3.3
LL7	Finnish	0.7
LL7BEN_A	Finnish	Inside
LL7BEN_B	Finnish	0.7
LL9	Finnish	0.7
NCB	Finnish	Inside
TPDEEP	Finnish	3.9

* Note: All long term monitoring stations closer to ALT 1 than ALT 1a

5.5.7.2 Whale remains

During Nord Stream surveys in 2007-2008, the remains of potential whale skeleton were found partly embedded in the seabed.

On request of FNBA, five bone samples were retrieved for further research. The samples were analysed in Denmark and the Netherlands to determine the age of the finding and the species in question. The results of the Carbon-14 analyses show that the age of the bone is approximately 6,000 years. However, DNA analyses of the bone were unable to reveal what the whale species was.

The whale remains are located at 70 m distance from ALT 1 (see Appendix 1, Map 7)

5.5.8 Cultural heritage

Cultural heritage can be defined as “all vestiges of human existence and consisting of places relating to all manifestations of human activity, abandoned structures, and remains of all kinds, together with all the portable cultural material associated with them. (National Board of Antiquities 2009)

Underwater traces of past human activity are called underwater cultural heritage. Historical wrecks of ships and other vessels, parts of them and their cargo make up the larger part of the underwater cultural heritage. Together with their surroundings underwater sites form a maritime cultural landscape. According to the Antiquities Act, the ship wrecks discovered in the sea or in inland waters, which can be considered to have sunk over one hundred years ago, or parts thereof, are officially protected. However, the Act is not in force in the Finnish EEZ. (National Board of Antiquities 2012)

The underwater cultural heritage in the Finnish EEZ consists mainly of wrecks. During the Nord Stream project several wrecks have been surveyed in the Finnish EEZ. The Finnish National Board of Antiquities (FNBA) wreck register includes additional wrecks in the Finnish EEZ not surveyed in the Nord Stream project.

Based on the document “Evaluation of Underwater Cultural Heritage in the Finnish EEZ, National Board of Antiquities, December 2009”, additional evaluations by FNBA and FNBA wreck register, several wrecks in the Finnish EEZ have been deemed as of cultural historical interest, fall under the legislation of the Defence Ministry or are otherwise important. Table 5.15 and Appendix 1 (Map 8) present the above mentioned wrecks in the Finnish EEZ.

Table 5.15 Wrecks in the Finnish EEZ

Wreck (Nord Stream ID)	FNBA code	Name	Description	Value	Distance from ALT 1 and (ALT 1a), km
S-13-31313			Wreck of a wooden sailing vessel	Of cultural historical interest	Inside
S-W8A-10289				Of cultural historical interest	0.03
10-52284		“THOR”	Wreck of a passenger steam ship	Of cultural historical interest	0.4
S-09-3025		Z36	Wreck of a large battle ship, probably a destroyer.	Falls under the legislation of the Defence Ministry	0.2 (2.7)
09-49220			Badly damaged wreck.	Of cultural historical interest	0.6 (3.7)
M-09-49220	FNBA2	Porkkala Open Sea W	Unidentified wreck of a wooden sailing ship.	Of cultural historical interest	0.4 (4.3)
08-45980			Wreck of a submarine, probably WWII	Falls under the legislation of the Defence Ministry	1.2
S-08-2939			Unidentified wooden sailing ship.	Of cultural historical interest	Inside
S-08-2610			Wreck of an unidentified aeroplane.	Falls under the legislation of the Defence Ministry	0.2

Wreck (Nord Stream ID)	FNBA code	Name	Description	Value	Distance from ALT 1 and (ALT 1a), km
MB-07-2736		Rusalka	Wreck of the Russian imperial battleship.	Of cultural historical interest	0.2
M-05-008			A small wooden sailing vessel.	Of cultural historical interest	0.9
05-24414	FNBA3/ MUS1	Andrei Zdanov	Russian passenger steam ship	Falls under the legislation of the Defence Ministry	1.3
S-15-35565			Wreck of a wooden sailing ship	Of cultural historical interest	1.0
S-16-36567			Unidentified wreck of a wooden sailing ship.	Of cultural historical interest	2.9
S-13-34523			Wreck of a large wooden sailing vessel.	Of cultural historical interest	1.2
08-S-20			A wooden wreck	Of cultural historical interest	0.03
	2498	Open sea	Part of an unidentified vessel broken into metal parts	Of cultural historical interest	Inside (2.2)
	2612	Open sea	Confirmed as a wreck based on survey 2006.	Of cultural historical interest	3.0
	2610	Open sea	Possible wreck	No information on cultural historical interest	1.9
	2500	Open sea	Wreck of a sailing vessel with two masts.	Of cultural historical interest	2.5
	2499	Open sea	Wreck of a sailing vessel	Of cultural historical interest	2.0
	2283	Gordyij-LKN	Russian destroyer	Important military object	2.4 (Inside)
	2611	Iris	Wreck of a steam ship.	Important wrecks, but not of cultural historical interest	6.1
	2501	Ulf Jarl	Wreck of a cargo vessel	Important wreck, but not of cultural historical interest	1.0
	Not yet in FNBA wreck register	Open sea	Wreck of a sailing vessel found 2011	Of cultural historical interest	Inside
	2279	Open sea Eastern Gulf of Finland	Seabed elevation due to a possible wreck of a vessel	Of cultural historical interest	25.1
	2278	Open sea Eastern Gulf of Finland	Seabed elevation due to a possible wreck of a vessel	Of cultural historical interest	27.6
S-11-3138			Unidentified wreck of a wooden sailing vessel. Less	No information on cultural value	0.1

Wreck (Nord Stream ID)	FNBA code	Name	Description	Value	Distance from ALT 1 and (ALT 1a), km
			than 100 years old.		
S-13-3526			Wreck of a sailings ship. Less than 100 years old.	No information on cultural value	0.05
S-16-36555			An SSS anomaly interpreted as a wreck	Not of cultural heritage	2.4
S-14-3569			Part of the wreck or buried in the sediment. Less than 100 years old	No information on cultural value	0.1
S-E6E-10504			Part of a wooden mast.	No information on cultural value	0.9
S-10-3237			Small. clinker-built sailing dinghy. 50-150 years old.	No information on cultural value	Inside

In addition the Finnish EEZ includes the wreck Estonia in the western Gulf of Finland, and the Karelia memorial south-west of Helsinki.

5.5.9 Tourism and recreation

The tourism in Finland has grown steadily year by year between 2000-2011 (Finnish Tourist Board/Statistics Finland 2011). Tourism is expected to continue growing. Most of the tourists in Finland are domestic or from neighbouring countries, Russia and Sweden being the largest groups of foreign visitors measured by the number of overnights. Based on preliminary statistics, in 2011 the number of foreign tourists grew more rapidly than the number of domestic visitors (overnights in registered accommodation facilities; Statistics Finland 2011). Leisure tourism in Southern Finland and the archipelago is highly seasonal and concentrated to the holiday season during summer. The islands, for example the Finnish and Swedish archipelagos are popular tourist attractions.

There are a number of recreation and summer cottages in the coastal areas and in the archipelago. Some of them are used all year-round. There are several recreational areas in the Gulf of Finland, for example national parks. Of the national parks in the Southern Finland nearest to ALT 1 are the National Park of Eastern Gulf of Finland, National Park of Tammisaari archipelago and Archipelago National Park (see Chapter 5.4.2).

Shopping tourism and cruises between Helsinki and Tallinn have increased their popularity continuously. Overnight cruises between Finland and Sweden are also popular. According to the Port of Helsinki statistics there are nearly 300 cruise ships and up to 360,000 cruise passengers visiting Helsinki yearly. International cruise ships dock in South Harbour, Katajanokka, West Harbour and Hernesaari (Port of Helsinki 2012).

5.6 Baseline in Russia, Estonia and Sweden

5.6.1 Overall transboundary baseline

The Finnish national EIA will include assessment of transboundary impacts from the project activities in Finland to Russia, Estonia and Sweden. Transboundary assessments of impacts to Finland will be part of the national assessments in the countries in question. Summary of the transboundary impact assessments will be included in the Espoo Report.

Long term monitoring stations belonging to Estonia, Sweden and Russia located within Finnish waters are proposed to be considered as potential transboundary impact targets (see Table 5.14).

Fishing is important to a large number of coastal communities in the countries around the Baltic Sea. The status of fishery in the neighbouring countries will be described in the EIA report as baseline for transboundary impact assessments.

The ship traffic in the middle of the Gulf of Finland is dominated by the main east/west shipping lanes and by the north/south traffic between Helsinki and Tallinn. Most of the Baltic Sea varied cargo traffic is shipped to or from eastern side of the Gulf of Finland. This includes oil transported from Russian ports. There are also a high number of ferries and cruise ships particularly in the Helsinki/Tallinn area. Ship traffic in the Gulf of Finland is presented in more detail in Chapter 5.5.1.

Below is an additional country-specific general baseline description of the status of the environment in Russia, Estonia and Sweden close to the Finnish border.

5.6.2 Baseline Russia

The environmental conditions in the conservatively estimated impact area in Russia close to the Finnish EEZ border are similar to the Finnish EEZ close to the border. Estimated impact area of dioxins in Russian waters originating from the River Kymijoki is presented in Figure 5.19.

There are known cables and the two existing Nord Stream pipelines within 5 km distance from ALT 1 (conservative estimate for the proposed impact area as described in Chapter 7.2) in Russia (see Appendix 1, Map 6).

5.6.3 Baseline Estonia

The Estonian Marine Management Planning is on-going and the first phase reports were published in 2012 and submitted to the EU Commission the same year. The reports in question and updated information will be published on the website of the Estonian Ministry of the Environment. The second phase, preparation of a marine monitoring programme, is scheduled to be finalised by the end of 2013. In 2014 the monitoring programme for continuous evaluation and regular updating of targets will be established and implemented. In 2015 the development of a measure programme to achieve or maintain a good environmental status and in 2016 the implementation of the measure programme will be started.

The environmental conditions in the potential impact area in the Estonian EEZ close to the Finnish EEZ border are similar to the Finnish EEZ close to the border, only slightly deeper on average. Based on monitoring results in 2010-2011 from the Nord Stream Project, waters near the seabed suffer at least occasionally clear oxygen deficit. This has a strong influence on the biota that inhabits the surface sediments.

During the Nord Stream Project sediment quality was monitored in the Estonian EEZ near the Finnish/Estonian border to find out if the construction works had caused any transboundary impacts through spreading of sediment and contaminants (see Figure 5.17). Samples were taken from three monitoring stations before and after the activities that could have disturbed sediments in the Finnish EEZ. The monitoring results reflected high variability and heterogenic conditions of the seabed. Like in the Finnish waters the general level of analysed concentrations of heavy metals and dioxins/furans was low. However, typically there were random peak values of some metals that exceeded the threshold levels for slightly contaminated or contaminated sediments. Also the organotin compound TBT was randomly elevated from the background (Figure 5.18).

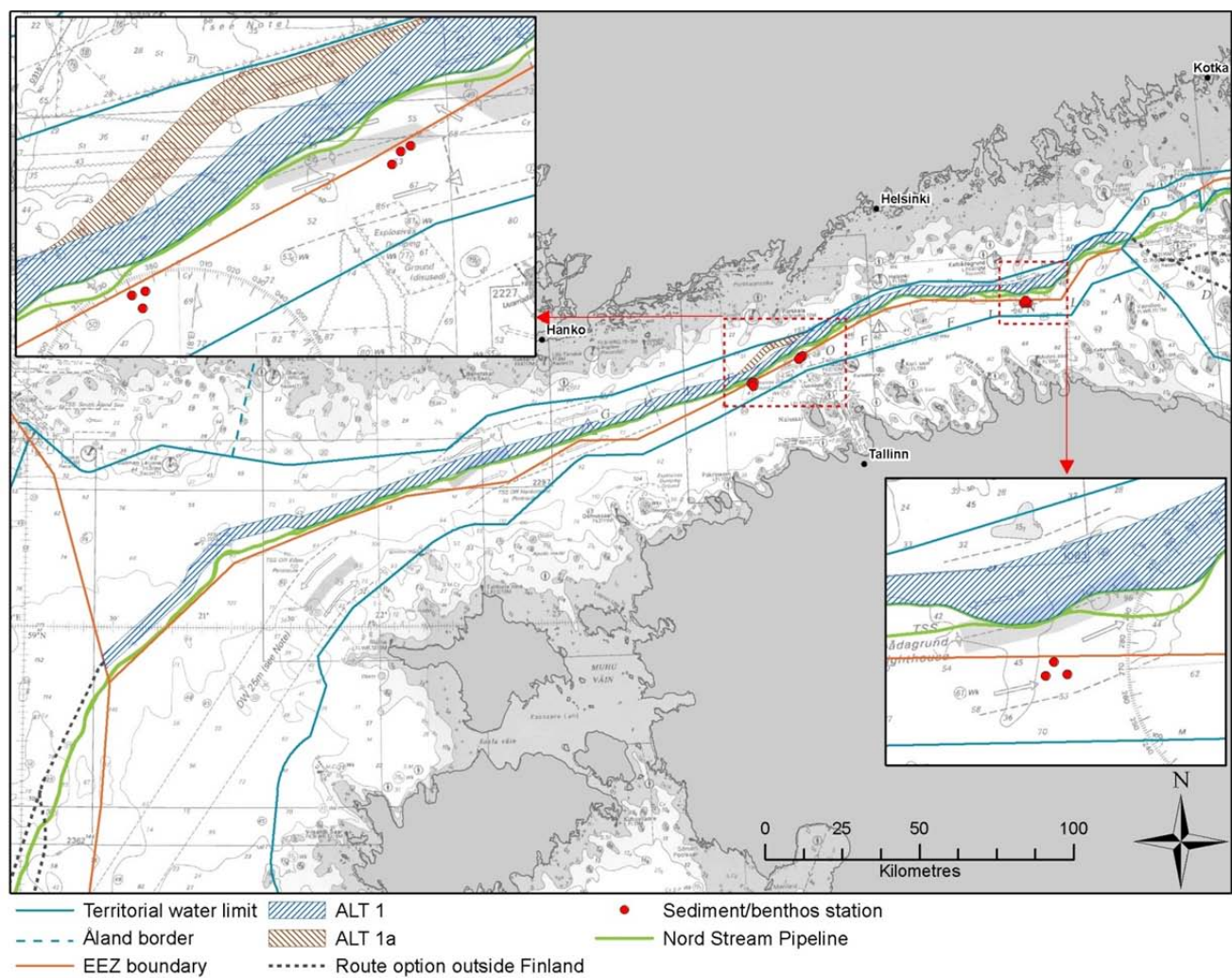


Figure 5.17 Monitoring stations for transboundary impacts in Estonian waters during the Nord Stream Project in the Finnish EEZ

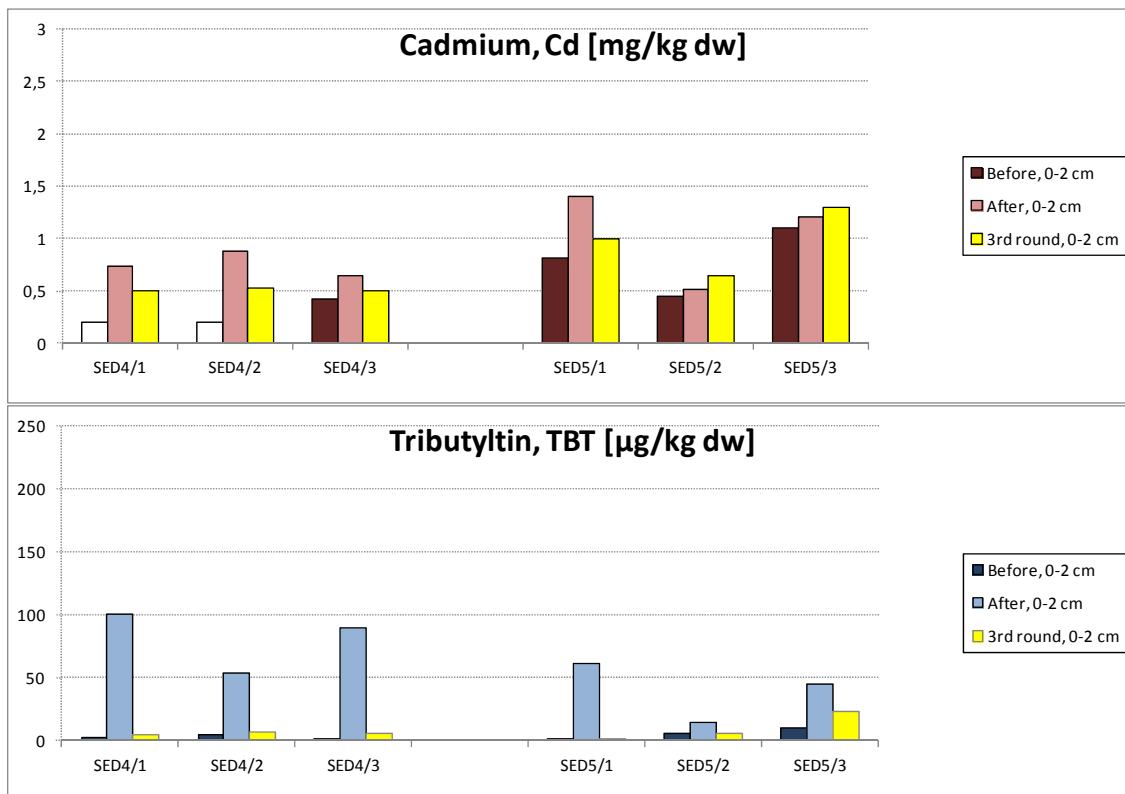


Figure 5.18 Analysed concentrations of cadmium and tributyltin (TBT) in the surface sediment at the stations near the Estonian/Finnish EEZ border before and after munitions clearance and after completion of construction of Pipeline 1 (Luode Consulting Oy 2012).

Natural variability of seabed properties explains the monitored differences in concentrations between the sampling campaigns. No measurable transboundary impacts to the Estonian EEZ could be detected (Ramboll 2011, 2012b).

Based on the monitoring results of benthos communities in the Estonian waters near the Finnish / Estonian border, the number of taxa of macrozoobenthos varies considerably on a small scale due to the heterogeneity of surface sediments and is locally limited by clear oxygen deficit in water mass near the seabed. According to the results of the benthos sampling campaigns at one station (three locations per station) during the Nord Stream Project in 2010, the number of macrozoobenthos taxa varied between 0-5 and the abundances from 9 to 924 ind./m² (Luode consulting Oy 2011). The highest number of individuals in one location consisted mostly (>90 %) of one dominating species, *Macoma baltica*, (Bivalvia) that lives in soft seabed sediments. Because of spatial heterogeneity the nearest location to this (distance approx. 900 m) was almost lifeless, only 21 ind./m². The oxygen level at the locations of the station, near the seabed, varied between 3-6 mg O₂/l. Oxygen was not the determinant for the large differences in the abundances between the sampling locations. At the two other stations, where oxygen deficit was a permanent feature (0.3-2.5 mg O₂/l) during the field campaigns, the number of taxa varied from 0 to 3 and the abundances between 0-165 ind./m² (Luode Consulting Oy 2010). Typically the dominating taxon was the polychaeta *Marenzelleria* spp. which can tolerate poor oxygen conditions in its living environment. Based on the monitored benthos, sediment and water quality results the conclusion is that the construction activities in the Finnish EEZ did not affect benthos communities in the Estonian EEZ.

Potential impact targets within 5 km from ALT 1 in the Estonian EEZ are long term monitoring stations (Finnish station LL6 and Estonian station F3), a wreck and a munitions dumping ground. In addition, the estimated impact area of dioxins originating from the polluted sediments of the River Kymijoki extends to Estonian waters. See Figure 5.19 for these potential impact targets.

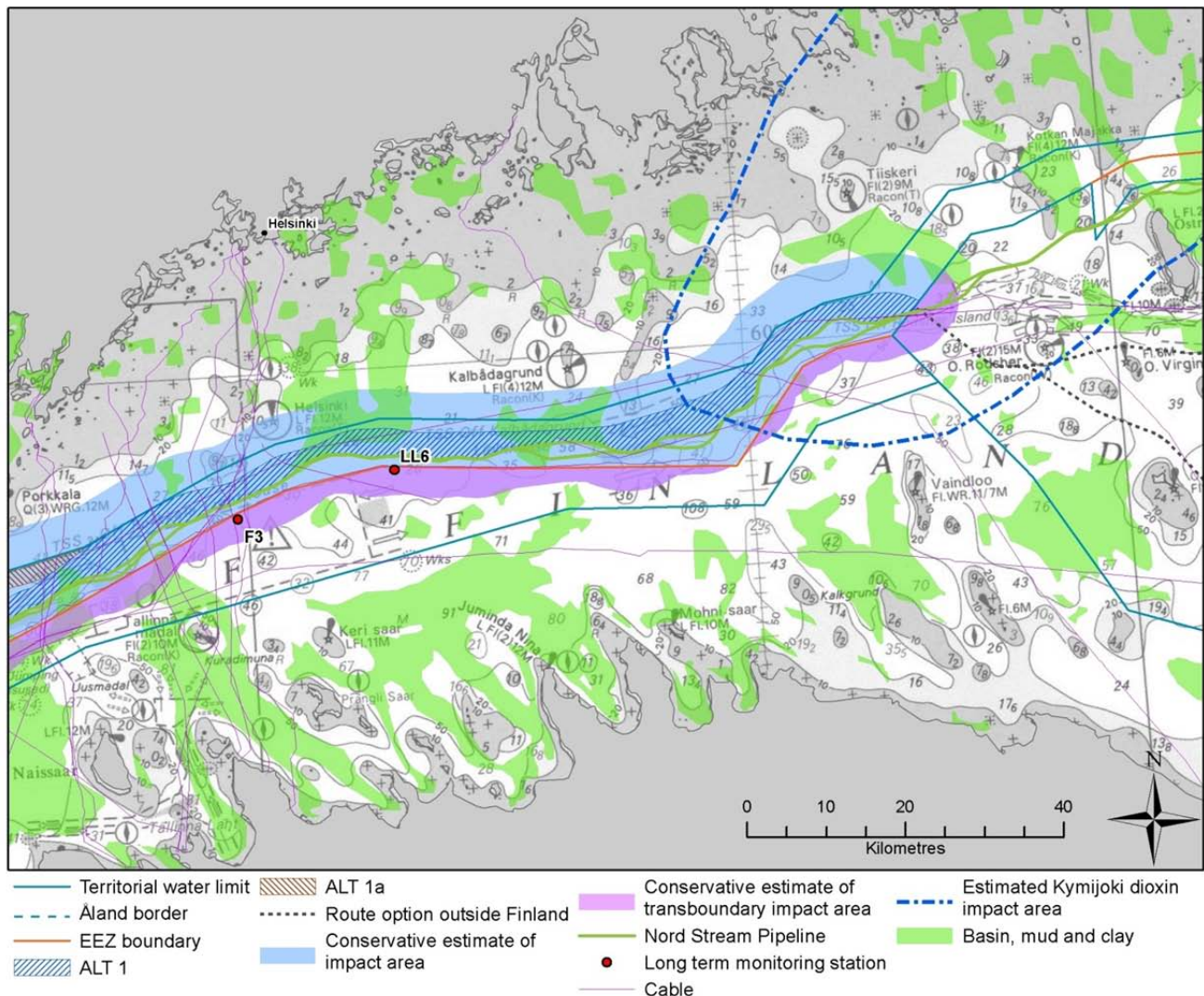


Figure 5.19 Potential impact targets in the Estonian EEZ within 5 km from ALT 1 and estimated impact area of dioxins originating from the polluted sediments of the River Kymijoki (Source: Geological Survey of Finland (GTK), HELCOM, Nord Stream AG).

In addition, there are known cables in the vicinity of Finnish/Estonian EEZ border (see Appendix 1, Map 6).

5.6.4 Baseline Sweden

The marine management planning in Sweden is under preparation and provisions for planning should be included in a new law, which is expected to enter into force in 2013. The marine management plan is composed of maps and statements about how the marine environment will be used, protected and managed, and interests of attention. The objective of the plan is to use sea areas for the purpose they are most suitable for. The Swedish planning area extends to the Finnish EEZ border. (Havs- och vattenmyndigheten 2012)

The environmental conditions in the Swedish EEZ are similar to the Finnish EEZ close to the border, only deeper. There is one known cable and the two existing Nord Stream pipelines within 5 km distance from ALT 1 in the Swedish EEZ (see Appendix 1, Map 6). The waters near the seabed suffer either hypoxia or at least occasionally clear oxygen deficit which has a strong influence on the biota that inhabits the surface sediments.

6 BASELINE ONSHORE

An outline of the present state of the onshore area in the Kotka region is presented below. The content covers issues which are deemed to be relevant in connection with the Project EIA for the ancillary onshore activities.

6.1 Land use

6.1.1 Land use planning

Regional plan

The City of Kotka is part of the Kymenlaakso region in southern Finland. A regional plan has been developed for the region and was validated by the Ministry of the Environment in 2008 and in 2010. The city is located on the southern coast as well as on islands immediately adjacent to the coast. An extract from the regional plan (Figure 6.1) shows that the southeastern part of the Mussalo island is designated as an harbour traffic area. Due to chemical storage tanks at the Mussalo liquid bulk terminal the port area has specific consultation procedures for land use planning in accordance with the SEVESO II directive (96/82/EC).

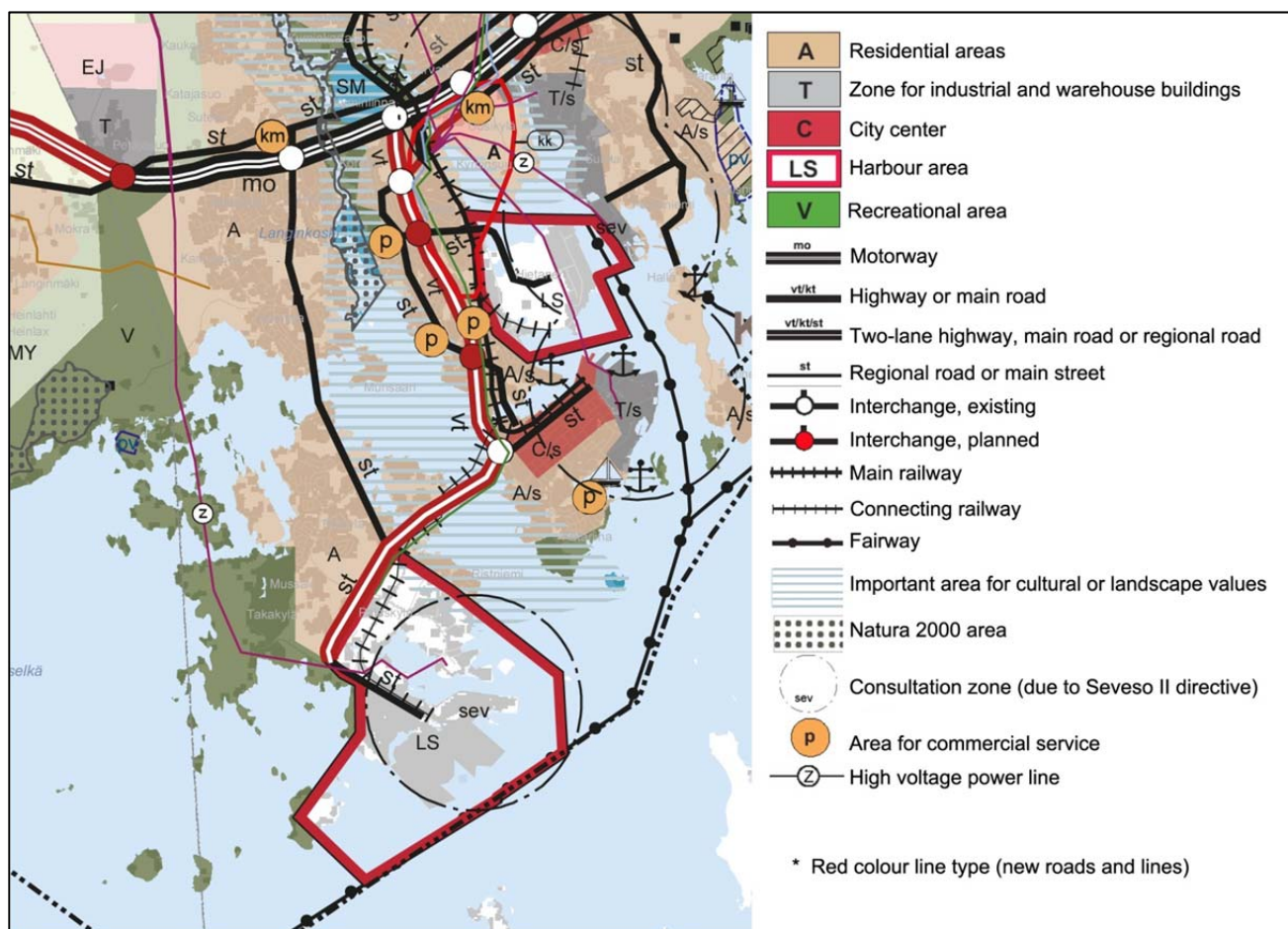


Figure 6.1 Extract from Kymenlaakso regional plan (Source: Kymenlaakso Regional Council)

Local master plan

The Kotka Town Council has approved a partial local master plan of Mussalo in 1992 (Figure 6.2). It has been drawn up as a local master plan with no legal consequences.

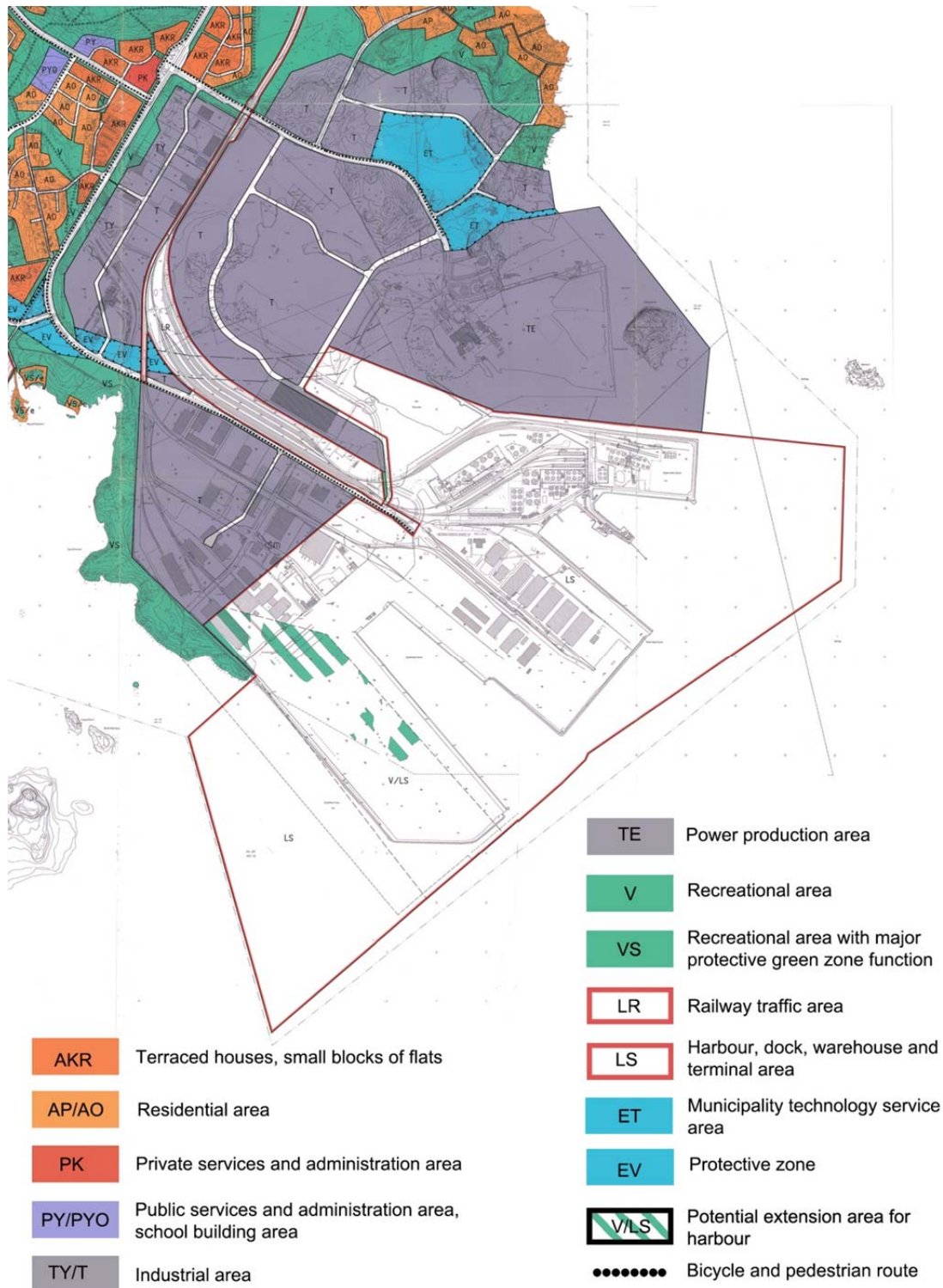


Figure 6.2 Extract from partial local master plan of Mussalo (Source: City of Kotka)

Local detailed plan

The Kotka Town Council approved the local detailed plan of Mussalo area in 1999 (Figure 6.3). A large area servicing Mussalo port is designated as a zone for harbour traffic area and another area almost equivalent in size is designated as a zone for industrial and warehouse buildings.

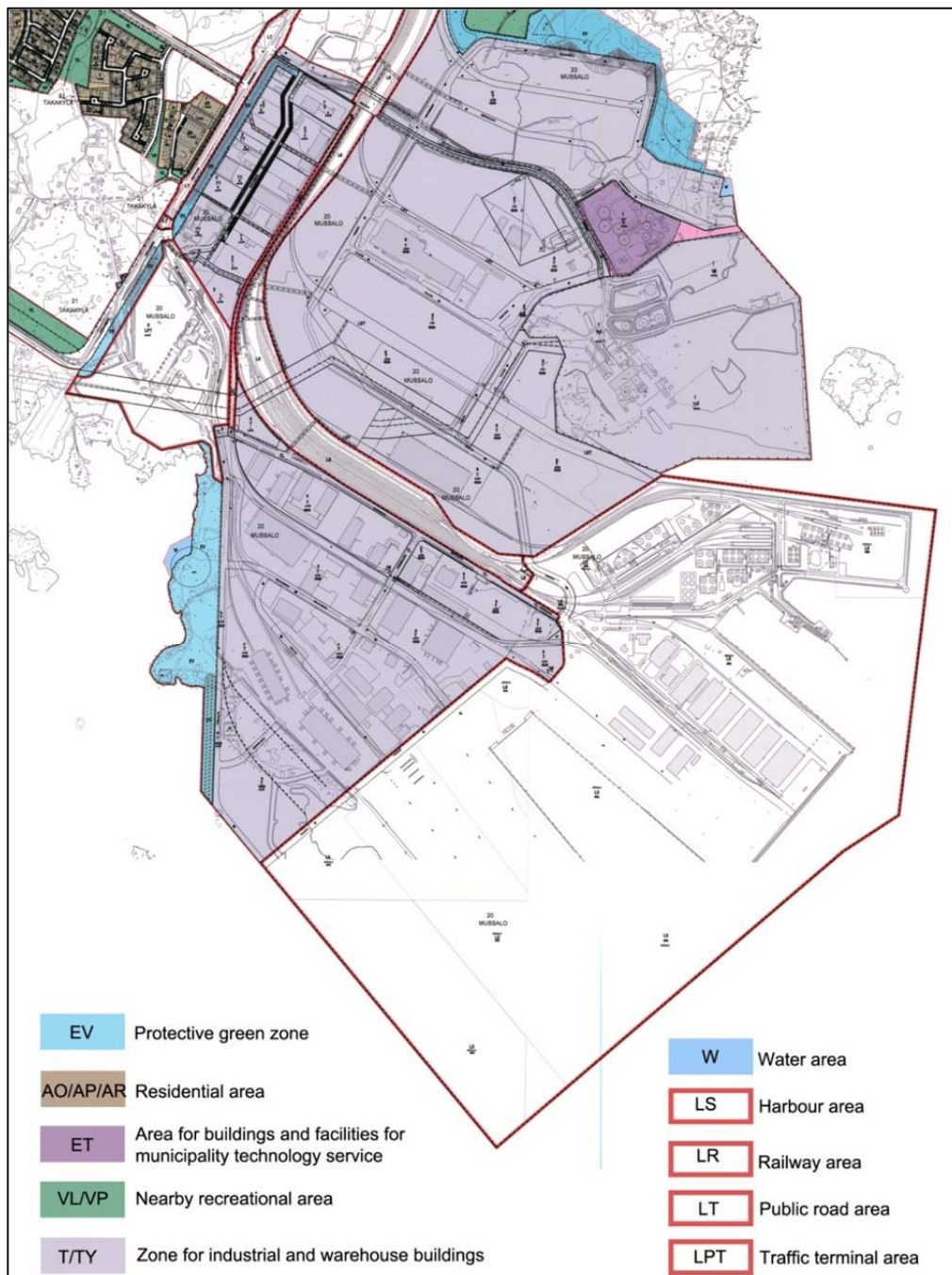


Figure 6.3 Extract from the local detailed plan combination at Kotka, Mussalo (Source: City of Kotka)

6.1.2 Functions located in and around the operation area

Mussalo port is situated at the southeastern part of Mussalo island. The nearest residential areas are situated beyond the industrial and warehouse area, about 1 km from the harbour. The nearest summer cottages are located about 0.8-1 km from the port.

The regional road 355 (Merituulentie) from Mussalo port runs through Mussalo island and continues as a main road 15 (Hyväntuulentie) to intersection of motorway 7. At the mainland, residential areas, Hovinsaari Power Plant (157 MW) of Kotka Energia and the Sweetener factory of Danisco are situated on the western side of Hyväntuulentie. Also the Central Hospital of Kymenlaakso is situated nearby. The eastern side of Hyväntuulentie is characterized mainly as small-scale industrial area (Hovinsaari - Jylppy - Huunantie). On the eastern side there is also a railway yard and beyond that the port of Hietanen.

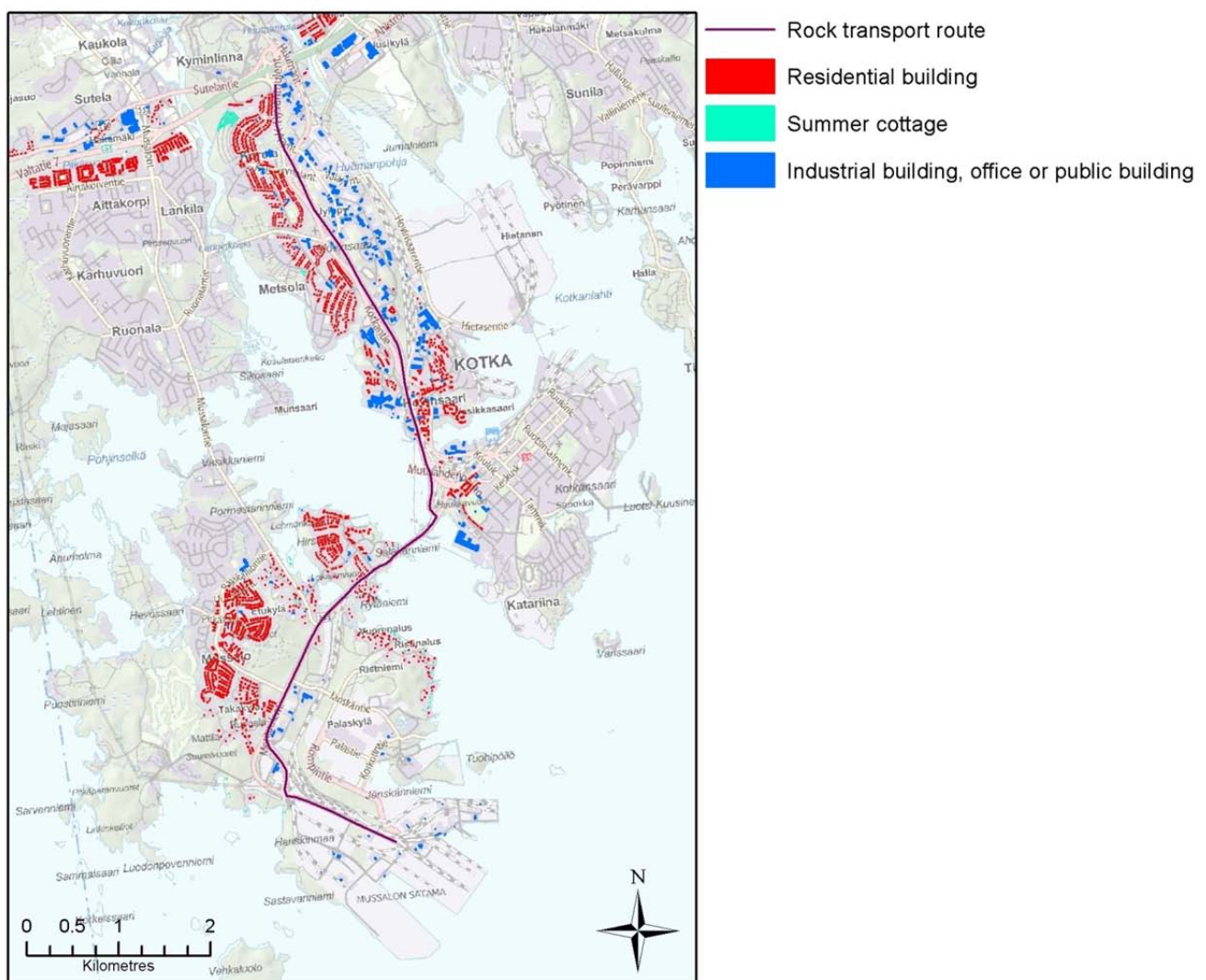


Figure 6.4 Residential, recreational, industrial, office and public buildings located in the vicinity (about 1 km) of the port and the possible rock transport route (Source: National Land Survey of Finland)

6.1.3 Mussalo port

Mussalo is the newest port of HaminaKotka Port, which is by far the largest general port in Finland. Mussalo consists of a container terminal (annual capacity of 1 million teu), dry bulk terminal, a liquid bulk terminal, a logistics area (500 ha) and full harbour services. The port also embraces the Jämskä quay, which was used to handle pipes for the Nord Stream Project (Figure 6.5).



Figure 6.5 Mussalo port and locations for Nord Stream activities during construction of Pipelines 1 and 2. Port map taken from Port of HaminaKotka (2013), additions by Ramboll.

Mussalo has comprehensive domestic and international transport connections – by road, rail and sea. The port is open 24 hours a day, 365 days a year and it allows vessels with a maximum draught of 15.3 metres to enter the harbour. The port is also kept open during the winter period, as icebreaking is provided when necessary.

Mussalo container terminal has 1,800 m quays, 12 berths and 7 container cranes (30-40 tonnes). Mussalo bulk terminal has 600 m quays, 4 berths and 4 cranes (one 40 tonnes and two 8 tonnes). Mussalo liquid terminal has 2 quays and 2 berths. Jämskä has a 133 m quay and 2 berths. The Port of HaminaKotka works in accordance with ISO 9001 and ISO 14001.

An environmental impact assessment was conducted for an extension to the Mussalo port in 2006. A general land use plan exists that dates from 2007. The plan covers a 160 ha extension area on the western side of Mussalo port. The extension project will be implemented in phases. Part of the extension project has valid environmental permits for construction and dock work. Initial construction activities have started on a 35 ha part of the extension including general ground work on side embankments and general landfills.

6.2 Physical and chemical environment

6.2.1 Soil, bedrock and groundwater

Bedrock of Mussalo island is mostly Vyborgite, typical "Rapakivi" granite. Nowadays soil of Mussalo harbour area is largely fill, and gravel moraine or sand moraine. Along the rock transport route, bedrock and soil properties are similar to Mussalo island with an exception of less fill.

No classified or other groundwater areas are located at Mussalo island. Groundwater is used by a number of households (Ristniemi and Takakylä) for irrigation and household consumption.

6.2.2 Water quality

The current ecological status of the coastal waters in the Kotka region is classified as tolerable and further from the coast as satisfactory. The influence of discharges (especially dioxins) from the River Kymijoki on the state of the seabed is strong especially in the delta areas of the river but the impacted area extends tens of kilometres towards offshore waters in the eastern Gulf of Finland (see Chapter 5.2.2).

No lakes or rivers exist in the area through which the rock transport route passess from harbour to the motorway.

6.2.3 Air quality and climate

Air quality in Kotka region is affected by various sources such as power plants, pulp and paper factories, fiberglass and foundry industries, harbours and emissions from abroad. Pulp factories and ship traffic produces the largest emissions. Direct and indirect emissions from road traffic are significant on heavily operated built-up and harbour areas, and also particle emissions from wood burning as a heat source for residential buildings.

According to the monitoring of recent years, the air quality in Kotka has been mostly good or satisfactory. Typical for Kotka the air quality has quite low yearly and monthly concentrations of particulate matter (PM₁₀), nitrogen oxides (NO_x) and total reduced sulphurs (TRS). Short-term concentrations on fault and episode situations can occasionally be high. Altogether Kotka air quality does not differ from the air quality of similar cities in Finland. In the long run air quality has been stable or slightly improved.

6.2.4 Noise

The main cause of noise stress in the Kotka region is the main road 7 (E18). The construction of highway 7 as motorway E18 between Loviisa and Kotka is in progress. When traffic moves to the new motorway, the noise levels will decrease significantly in the vicinity of the motorway compared with the present situation due to the new road alignment and due to new noise protection barriers, fences and embankments.

6.3 Biotic environment and protected areas

There are no Natura 2000 areas in the immediate vicinity of the Mussalo harbour and industrial district or in the area through which the rock transport will take place. There are a few sites of protected habitat types (according to the Nature Conservation Act) near the harbour at Sastavaniemi and Syvänniemi peninsulas.

6.4 Socio-economic conditions

6.4.1 Traffic and safety

Road traffic from main highway 7 to Mussalo harbour is directed via Hyväntuulentie (Main road 15) and Merituulentie (regional road 355). The average traffic volumes (vehicles per day) in 2011 on main road 15 and regional road 355 are presented in Figure 6.6.

The average traffic volume on main road 15 in 2011 was 21,400 vehicles per day (2,100 heavy vehicles per day). The average traffic volume on regional road 355 were between 7,000 – 10,600 vehicles (1,200 – 1,600 heavy). The proportion of heavy vehicles increased towards Mussalo harbour from 10 % to 17 %. This period includes the rock transport associated with Nord Stream Project in 2011.

In the city of Kotka, police has reported yearly more than 300 road accidents (years 2008-2011). In 2011, 311 road accidents were reported, of which one fatal and 62 personal injury accidents. However, these numbers are underestimates since roughly only one fifth of personal injury accidents are reported. Accidents often occur in city centres of Kotka and Karhula, and at entrance and exit roads to city centres. (Hietsalo 2012)

A residents' survey of the environmental nuisance caused by operations in the harbour and in industrial areas in the Kotka Mussalo was carried out 2012. The questionnaire was delivered to 261 households and the response rate was 49 %. The majority of respondents felt that traffic, especially the daytime road traffic, is the most common nuisance caused by operations in Kotka Mussalo harbour and industrial areas. The second most common nuisance was harm to the living environment. The majority of respondents also experienced noise pollution, especially in the daytime. According to the survey, nuisance caused by harbour and industrial areas have increased in the past five years excluding vibration and odour nuisance. (Lindroos 2012)

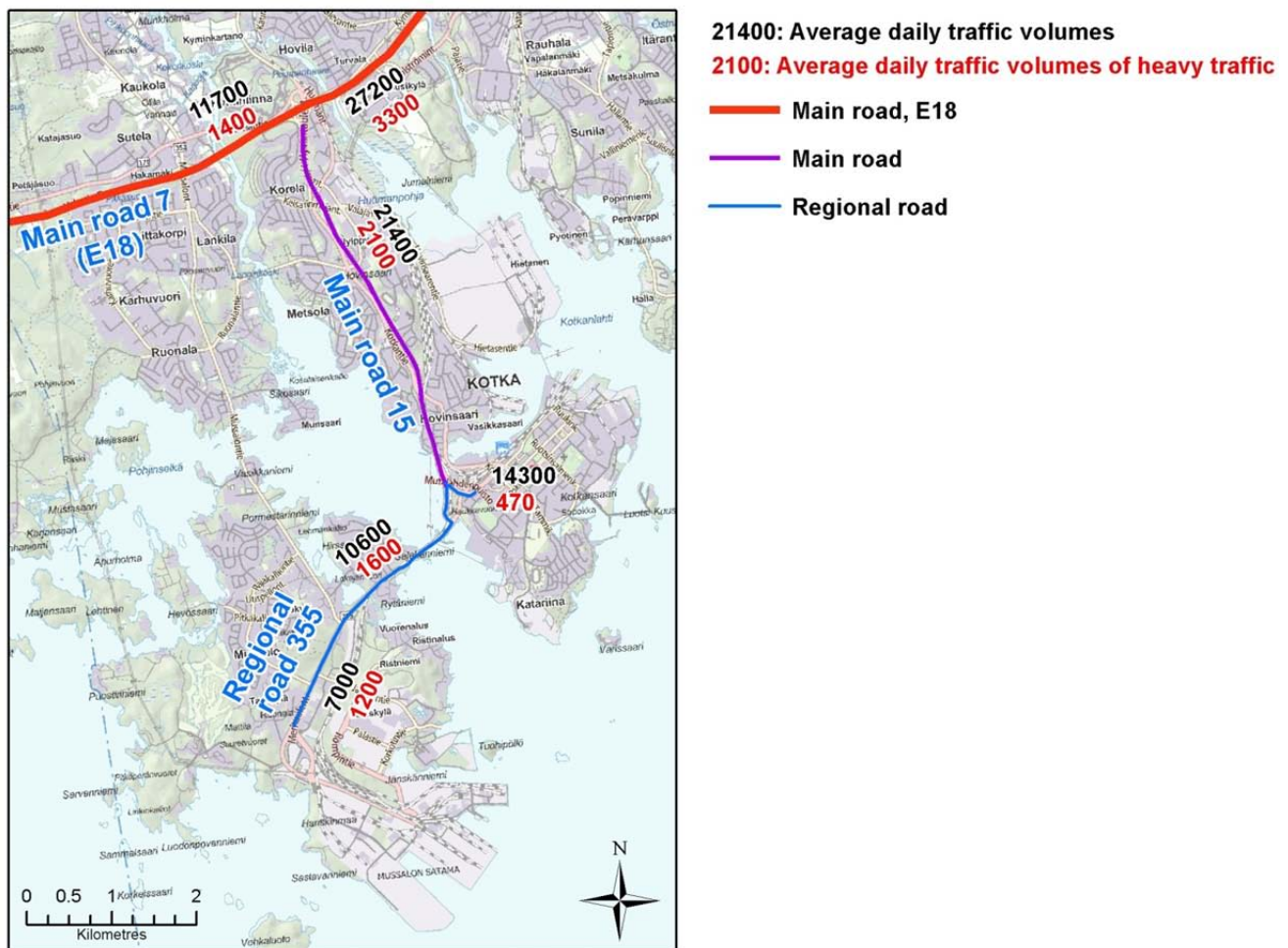


Figure 6.6 The average daily traffic volumes in 2011 (Liikennevirasto 2012). Figures for all traffic (black numbers) and heavy traffic (red numbers) are presented.

6.4.2 People and society

The city of Kotka is located on the coast of the Gulf of Finland at the Kymi River delta. Kotka is part of the Kymenlaakso County in southern Finland. Kotka is located 130 km east from Helsinki and 290 km west from St. Petersburg; the main E18 highway runs through Kotka. The city centre of Kotka is located at Kotkansaari Island. The other centre is Karhula. Kotka has a population of about 55,000 and covers an area of 950 km² of which 678 km² is water. The population density is 202 inhabitants per km².

6.4.3 Landscape

The area is characterized as harbour and industrial area. The coastline of Mussalo island has been intensively constructed as a harbour district. The harbour is brightly lit at nights. A high-level road network is available to the harbour, and neither upgrading or renewal of roads are needed for the onshore part of the project.

7 GENERAL DESCRIPTION OF IMPACT ASSESSMENT

Impacts of the project alternatives will be assessed in line with the national EIA Act and Decree on the environmental impact assessment procedure.

The impact targets were chosen based on assessments during the EIA phase of the Nord Stream Project and the monitoring results related to the construction of the Nord Stream Pipelines.

7.1 Impacts to be assessed

According to the EIA legislation (EIA Act, section 2) the following impact categories are examined in the procedure:

- 1) impacts on human health, living conditions and amenity
- 2) impacts on soil, water, air, climate, organism and biological diversity
- 3) impacts on the community structure, buildings, landscape, townscape and cultural heritage
- 4) impacts on the utilization of natural resources
- 5) impacts on the interaction between other projects (planned, on-going, implemented) in the area and the factors referred above

Although not all impact groups may be relevant in this project, all categories are presented in this EIA programme.

The results of the Nord Stream environmental monitoring during construction of Pipeline 1 and Pipeline 2 in 2009-2012 in the Finnish EEZ, have confirmed that the impacts were local, intermittent, short-term and minor in significance. This conclusion has been taken into account when potential impact targets of the Project have been tentatively analysed. As a consequence, some impacts are proposed to be left outside of the assessment. The overall view of impact targets is shown in Table 7.1. Description of the potential targets impacted and impact assessment methods are presented in Chapter 8 and 9.

Table 7.1 Overall view on impact targets and impacts to be assessed based on current knowledge

Impact target			Impacts to be assessed for the phases * / **	
	Category	Sub-category	Construction	Operation
Offshore	Marine policies, strategies and plans	Objectives of the policies, strategies and plans	X	X
	Physical and chemical environment	Seabed integrity	X	X
		Seabed morphology and sediments	X	X
		Hydrology and water quality	X	X
		Air quality and climate	X	
		Noise	X	X
	Biotic environment	Benthos	X	X
		Plankton		
		Fish	X	
		Marine mammals	X	
		Birds	X ***	
	Protected areas		X	X
	Socio-economic conditions	Ship traffic	X	X
		Fishery	X	X
		Military areas	X	X
		Munitions ****		
		Barrels ****		
		Existing and planned infrastructure	X	X
		Utilization of natural resources	X	X
		Scientific heritage	X	X
		Cultural heritage	X	X
		Tourism and recreation	X	
		Social impacts	X	X
		Human health		
Onshore	Land use		X	
	Physical and chemical environment	Soil, bedrock and groundwater		
		Water quality		
		Air quality and climate	X	
		Noise	X	
	Biotic environment and protected areas			
	Socio-economic conditions	Traffic and safety	X	
		People and society	X	
		Landscape		

* X = to be assessed

** Impact assessment methodology related to decommissioning presented in Chapter 8.6

*** Only impacts from munitions clearance will be assessed.

**** Munitions and barrels are not impact targets but environmental risks. Chapter 8.5.4 will present the impact assessment proposed for munitions clearance.

7.2 Proposed impact area to be studied

The extent of the investigation area or study area depends on the environmental impact being examined. Investigation area refers to the area within which the environmental impact is estimated to occur in accordance with the assessment. The actual impact areas, affected areas, are likely smaller than the investigation areas, and will be defined in the EIA report as a result of the assessment work.

7.2.1 Proposed offshore impact area

The distance from ALT 1 to the Finnish mainland varies between 16 – 35 kilometres. Direct impacts of the pipeline system in the Gulf of Finland will mainly occur in the EEZ or in territorial waters close to the EEZ. The proposed impact area from offshore activities to be studied shown below is a conservative estimate of the maximum distance (5 km) for possible direct impacts and indirect impacts associated with sediment spreading, however it is likely that, based on Nord Stream experience, the maximum impact distance is less than 2 km. Specific indirect impacts, such as social impacts, can extend further than this.

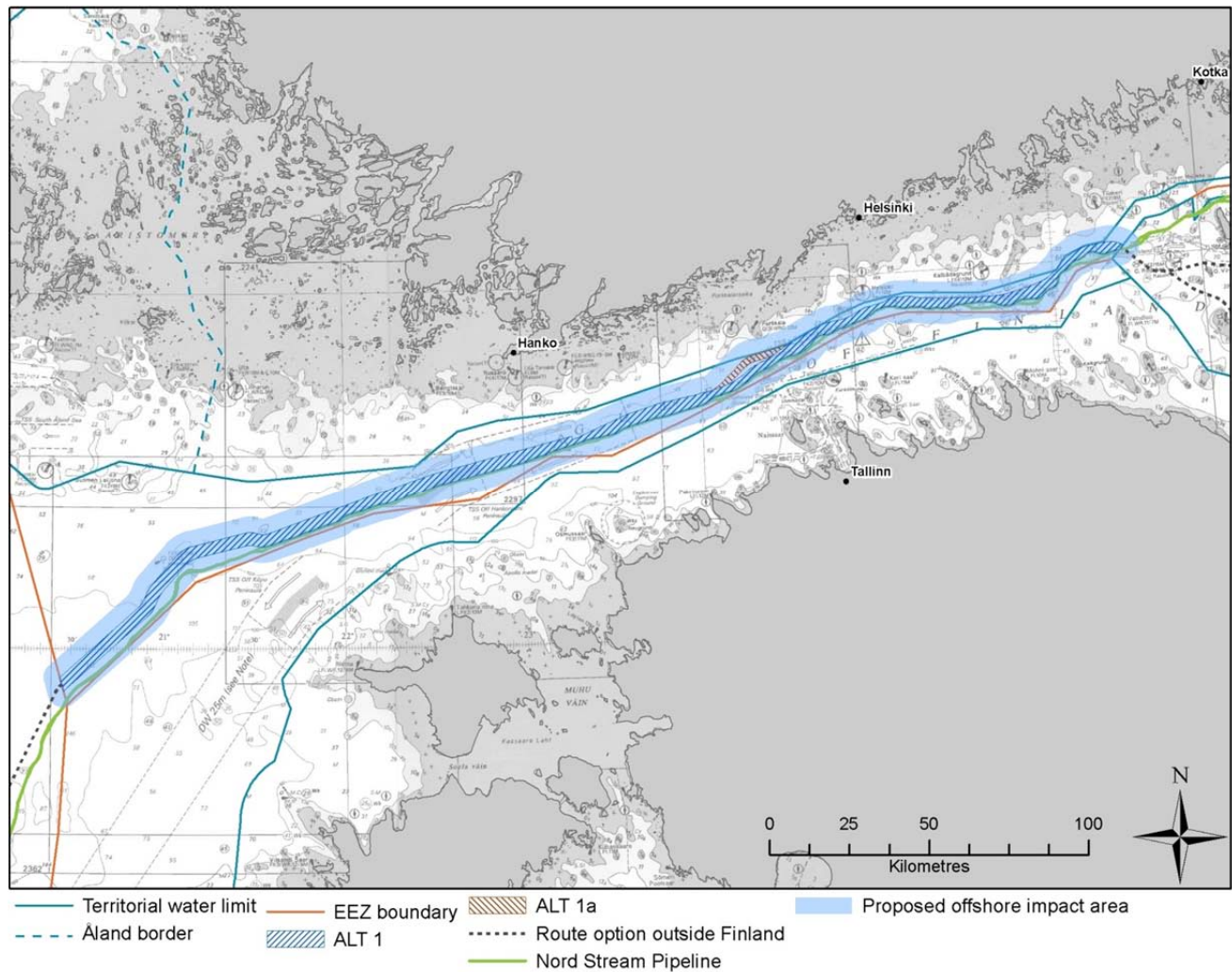


Figure 7.1 Conservative estimate of an area for possible direct and indirect impacts associated with sediment spreading from the Project

7.2.2 Proposed onshore impact area

Estimated impact area from onshore ancillary activities is presented in Figure 7.2. The EIA procedure will primarily assess the environmental impacts of ancillary operations taking place on the harbour site and transportation of rock material. Environmental impacts of quarries are beyond the scope of this EIA. It is assumed that the effects of the rock traffic are insignificant considering the total traffic of highway E18 and therefore not in the scope of this EIA. Along roads 15 and 355 the possible changes of noise levels and air quality are expected to occur only close to the road and the estimated maximum distance for possible impacts are 200 m from the road (400 m corridor).

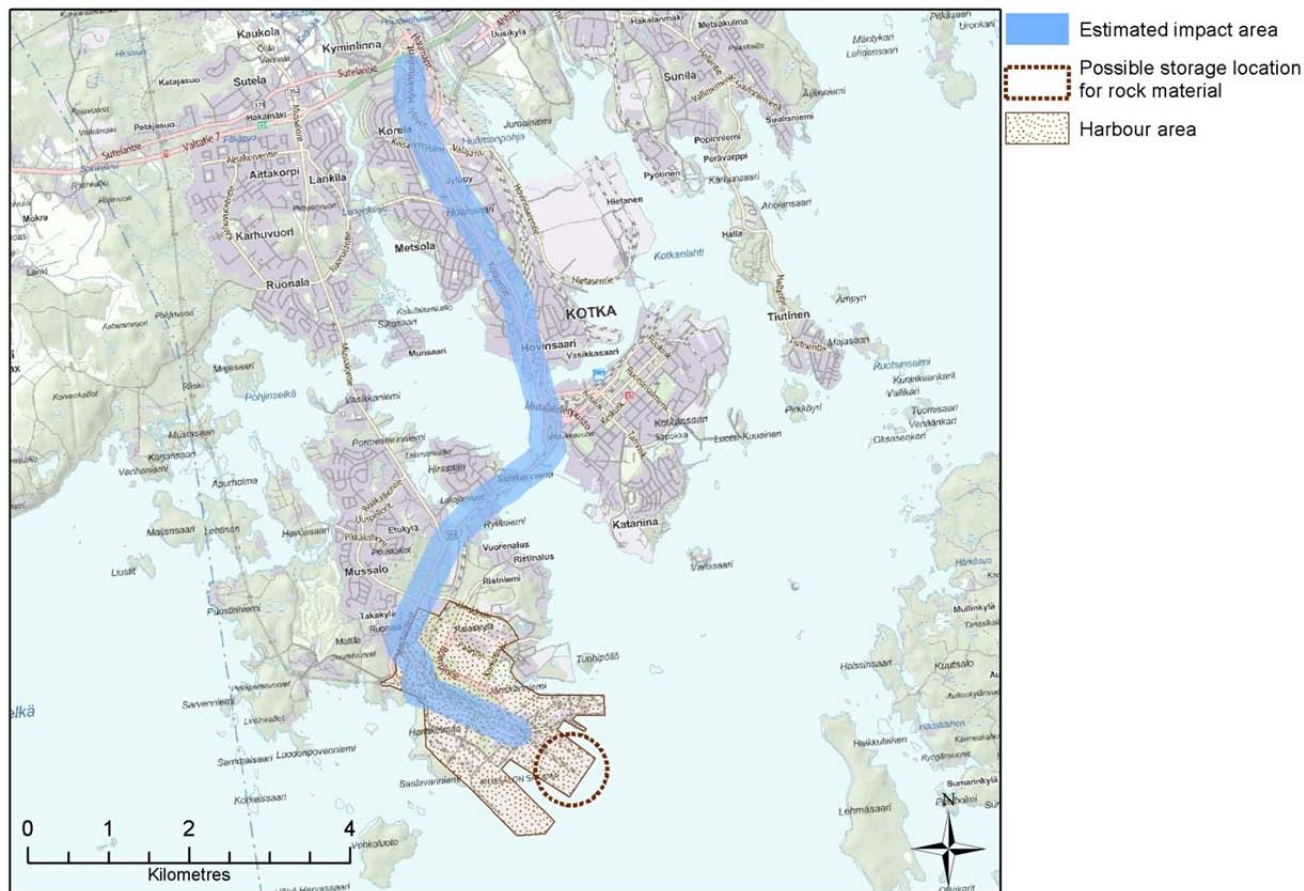


Figure 7.2 Estimated impact area of onshore ancillary activities near Kotka

7.3 Methods for impact assessment and evaluation criteria

Environmental impact assessment is a process to identify and evaluate the probable impacts and their magnitude of a project on the physical, biological and socio-economic environment. If significant impacts are assessed, mitigation measures will be developed and presented in order to avoid, minimize or reduce harmful consequences of the project.

The criteria for the significance of the impacts are presented in Table 7.2.

Table 7.2 Criteria for evaluating the overall significance of the impacts assessed during the EIA process of the Project.

Scale of effect	Type of effect	Geographical extent of effect	Duration of effect	Reversibility	Sensitivity	Overall significance of impact
No Minor Medium Large	Direct Indirect Cumulative	Local Regional National Transboundary Global	Short-term/temporary Medium-term Long-term Permanent	Reversible Partly reversible Irreversible	Low Medium High	No impact Minor impact Moderate impact Significant impact

A verbal description of the different categories presented in the table above is as follows:

Scale of effects

- No effect: there will be no effects on structure or function within the affected area
- Minor effect: there will be minor effects on structure or function inside the affected area
- Medium effect: there will be partial effects on structure or function inside the affected area
- Large effect: there will be a complete change within the affected area

Type of effect

- Direct: effects that result from a direct interaction between a project activity and the environment
- Indirect: effects related to other activities as a consequence of the project
- Cumulative: effects that act together with other effects (including third party activities) to the same impact target

Geographical extent of effects

- Local effects: there will be changes in the immediate vicinity of the pipelines/construction site. Effects are restricted to ± 1 km from the pipeline routes
- Regional effects: there will be effects outside the immediate vicinity of the pipelines (local effects)
- National effects: there will be effects on a national scale
- Transboundary effects: there will be effects extending into other countries in the Baltic Sea.
- Global effects: there will be effects on a global scale (e.g. emission of greenhouse gases)

Duration of effects

- Short-term/temporary: effects during and immediately after the construction period
- Medium-term: effects up to two years after the construction period ends
- Long-term: effects lasting more than two years beyond the end of the construction period
- Permanent: effects that cause a permanent change in the impact target, a resource or receptor

Reversibility

- Reversible: An impact target will quickly return to its original state when activities end
- Partly reversible: An impact target will partly return to its original state when activities end
- Irreversible: An impact target will not return to its original state when activities end

Sensitivity

- Low: A resource or receptor that is not important for the functionality of the ecosystem, or which is important but resistant to changes caused by the project
- Medium: A resource or receptor that is important for the functionality of the ecosystem and not fully resistant to changes caused by the project
- High: A resource or receptor that is vital for the functionality of the ecosystem and not resistant to changes caused by the project

Overall significance of impacts

- No impact: there will be no impacts on the environment
- Minor impact: the structure or functions in the area will be affected partially, but there will be no impact outside the affected area, and impacts will be short-long term without significant impacts on the environment
- Moderate impact: the structure or function in the area will be changed, but the impact will have no significant effects outside the affected area. Impacts will be medium-long term without significant impacts on the environment
- Significant impact: the structure or function in the area will be changed, and the impact will also have effects outside the area. Impacts will be long-term and significant

8 IMPACT ASSESSMENT OFFSHORE

8.1 Strategies and policies for the marine environment

The Marine Management Plan (MMP), Maritime Transport Strategy (MTS) and Marine Spatial Planning (MSP) are described in Chapter 5.1.

During the EIA report phase the status these strategies and plans will be updated with latest information from published reports in consultation with relevant authorities. The EIA report will assess possible impacts from the strategies and plans on the project and the possible impacts from the project on achieving the objectives of the strategies and plans.

The assessment will result in a conclusion whether the project will have an impact on achieving the good status of the environment in the planning area in 2020, which is set as the target year in the MMP. The assessment will focus on those qualitative descriptors (presented in Chapter 5.1), which are considered to be relevant in the EIA. Such qualitative descriptors are at least biological diversity, sea-floor integrity and underwater noise.

Similarly the assessment will conclude whether the project will have an impact on the good status of transport sector in the planning area in 2030, as defined in the MTS. The assessment will focus on at least three of the eight focus areas, these being:

- Environmental issues in the transport sector,
- Vessel traffic services, maritime safety and rescue services and
- Fairways, transport chains and winter navigation.

The development of the MSP and the EU directive in question (see Chapter 5.1) will be followed during the assessment phase. Approach to impact assessment methodology will be as for the MMP and MTS, if there will be certain received objectives defined for the MSP during the assessment phase.

The assessment will be performed as expert opinion in dialogue with relevant authorities.

Table 8.1 Strategies and policies for the marine environment as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Marine policies , strategies and plans	Construction	Change in achieving the objectives of the MMP, MTS and MSP	All construction activities
	Operation	Change in achieving the objectives of the MMP, MTS and MSP.	Pipeline on seabed

8.2 Physical and chemical environment

8.2.1 Seabed integrity

The approximate footprint of the pipeline and the rock berms will be compared with the total seabed area in these off-shore regions. The physical-chemical and biological condition of the seabed to be covered is an important criterion, when the significance of the footprint in order to maintain the biodiversity of the seabed (see Chapter 5.1.1) is evaluated.

Impacts will be assessed as expert opinion based on the technical description of the project, previous experience, assessments of the relevant impact targets (benthos, noise) and baseline surveys in different parts of the project area.

8.2.2 Seabed morphology and sediments

Disturbance of the seabed during construction activities may cause sediment particles to suspend into sea water. In suspension most of the contaminants are strictly bound to organic and/or clay particles. Therefore major bioaccumulation of these substances is not probable. The impacts of dissolved metals and organic compounds (especially dioxins/furans and organotins (TBT)) in sea water on biota will be evaluated as expert opinion.

To analyse the impact on sediments behaviour when disturbed, mathematical modelling will be used. The mathematical model that will be used for the assessments of the Project will make use of the experience gained with mathematical modelling for the impact assessment of Nord Stream pipelines 1 and 2 and the results of Nord Stream's environmental monitoring. A dedicated current model improvement study will be performed prior application of the model for the actual assessments. The objective of this study is to assure that the current model that is used for the assessments:

- has a higher local sensitivity and is well fit for the purpose;
- does not require the use of uncertainty factors (as used for Nord Stream 1 and 2 assessments);
- is acceptable for the competent authorities

The decision on the modelling approach will be taken in consultation with authorities and research institutes.

Table 8.2 Seabed as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Seabed	Construction	Relocation of disturbed sediments	Pipelay Anchor handling Rock placement
	Operation	Occupation of seabed	Pipelines and rock berms on seabed

8.2.3 Hydrology and water quality

To carry out an assessment of the possible impacts on the physical-chemical environment (water quality, currents) the latest results of sea water quality, modelling results on spreading of the suspended sediments and contaminants (Chapter 8.2.2) and the results of the properties describing the state of the seabed are needed. Technical descriptions of the project and the timing of the works are valuable as background information.

Impacts on hydrology and water quality will be based on mathematical modelling (Chapter 8.2.2) and expert opinion.

Table 8.3 Hydrology and water quality as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Hydrology and water quality	Construction	Suspension and spreading of disturbed sediments Spreading of nutrients and contaminants	Rock placement Pipelay Anchor handling
	Operation	Release of contaminants from anodes Change in currents close to pipeline	Pipeline on seabed

8.2.4 Air quality and climate

The magnitude of the emission loads from the Project vessels in Finnish waters will be calculated. The emissions of the three main pollutants from the working vessels: carbon dioxide (CO₂), nitrogen oxides (NO_x) and sulphur dioxide (SO₂) will be estimated based on fuel consumption of each type of vessel and appropriate emission factors. Estimated emission loads from the Project will be compared with the emission loads from the existing ship traffic in the Finnish EEZ.

Table 8.4 Air quality and climate as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Air quality and climate	Construction	Emissions of air pollutants	All construction activities

8.2.5 Noise

Noise impacts will be identified by considering the various project activities during construction and operation. Construction activities will result in both atmospheric and underwater (acoustic) noise. Ship's motors, cranes and generators will be the main source of atmospheric noise, whereas rock placement will be the main source of acoustic noise. Depending on the level and intensity, noise can be disturbing and cause avoidance reactions among fish and seals. Gas flowing through the pipeline generates some noise during operation.

The impacts from offshore activities on underwater noise levels at various distances from the sound source will be predicted by a computer model. The model generates noise contour plots showing the areas and distances from the source. The graphic contour is the working tool for impact assessments.

The impacts on the biological environment will be assessed as expert opinion using relevant, comparable noise values, noise plots for underwater noise from the model and guidelines from literature.

Table 8.5 Noise as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Noise	Construction	Airborne and underwater noise	All construction activities
	Operation	Underwater noise emissions	Gas flowing in pipeline

8.3 Biotic environment

8.3.1 Benthos

Evaluation of the impacts of construction works on macrozoobenthos will focus on the areas in which the main construction activities coincide with seabed areas that are suitable for life to exist. Special attention will be paid to sections along the route where baseline surveys have indicated that benthic communities are richest. In these areas, water depths are shallow, oxygen concentrations are more or less permanently good and the seabed type is optimal for the development of diverse benthic communities. One location that fulfils these criteria, with its hard bottom reef environments, is the Kalbådagrund region outside ALT 1.

Impacts of the construction works on benthos can be classified as direct or indirect. Where the seabed is covered with rock material or the pipeline itself, any existing life will be destroyed. The significance of this depends on local circumstances, which ultimately determine the abundance of benthic species. The most important factor is the presence of oxygen in the sediment water interface. Indirect effects may happen in areas where relocation of suspended sediments, because of disturbance of the construction works, will cover benthos communities. The possibility and degree of this phenomenon will be assessed by modelling the spreading of sediments (Chapter 8.2.2). The overall significance to the local and areal benthic communities (recovery time) will be evaluated based on the modelling results and on the general knowledge of the living requirements of the species in question.

Impacts on macrozoobenthos will be assessed as expert opinion. The modelling results and survey results on seabed properties and benthos along ALT 1 will be used as background data.

Table 8.6 Benthos as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Benthos	Construction	Changes or loss of benthos due to direct impact on seabed Changes of benthos due to relocation of disturbed sediments	Rock placement Pipelay Anchor handling
	Operation	Creation of new hard substrate habitats Release of contaminants from anodes	Pipeline on seabed

8.3.2 Plankton

Based on results of monitoring during the construction of the Nord Stream gas pipelines (2009-2011), the overall impacts on food webs were assessed to have been negligible. The reason was the local character of sediment disturbances during construction activities. In the deepest areas a permanent halocline effectively prevents nutrients dissolved in sea water from reaching the uppermost layers. Moreover, phosphorus and nitrogen are mostly bound to organic or clay particles and therefore are not available for the growth of algae in the photic zone.

Based on earlier assessments and experience, no significant impacts on plankton communities, that could lead, e.g. to enhancement of eutrophication processes in the Baltic Sea or diminishment of plankton populations, are to be expected. Consequently, no impact assessment is proposed, with regard to plankton communities.

8.3.3 Fish

Impacts on fish will be identified by considering the various project activities during construction , especially rock placement because they will cause most of the changes in water quality and physical environment (noise; see Chapter 8.2.5). The impact assessment will be based on information on the geographical distribution of physical and chemical changes in the water column. The assessment focuses on Baltic herring and sprat, two important commercial fish species in the open sea areas of the Gulf of Finland. Due to relatively limited amount of maintenance activities, no impacts are foreseen during operation phase, and consequently no assessments for this phase are proposed.

Impacts on fish will be assessed as expert opinion based on modelling results of sediment spreading (Chapter 8.2.2), earlier experiences and relevant literature on behaviour of the fish species in question.

Table 8.7 Fish as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Fish	Construction	Avoidance reactions and breeding success of fish	Rock placement Anchor handling

8.3.4 Marine mammals

Impacts on marine mammals will be identified by considering the various project activities during construction. The assumption is that all construction activities will be performed in ice-free conditions. The scale of the impact on water quality and noise will be the largest from construction activities, especially rock placement.

The potential direct impact from different project activities (excluding munitions clearance) is avoidance reaction. Indirect impacts could be possible through changes in food availability. Due to relatively limited amount of maintenance activities, no impacts are foreseen during operation phase, and consequently no assessments for this phase are proposed.

Impacts on marine mammals will be assessed as expert opinion based on modelling results of sediment spreading (Chapter 8.2.2), assessments of impacts on physical and chemical environment, information of the presence of seal populations in the project area and earlier experience.

Table 8.8 Marine mammals as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Marine mammals	Construction	Disturbance due to noise and sediment spreading	All construction activities

8.3.5 Birds

The distance from ALT 1 to the closest important bird area is over 10 km (see Table 5.12, Chapter 5.4.7). Due to the great distance impact on birds are extremely unlikely and therefore it is proposed that no impacts on birds, excluding munitions clearance activity (see Table 7.1 and Chapter 8.5.4) would be assessed in the EIA. In case there are changes in the protected areas the issue can be re-evaluated.

8.4 Protected areas

Impacts on the protected areas will be identified by considering the various activities during the project. The potential interference of the construction of the pipelines with the protected areas will most likely be related to water quality. Impacts will be assessed on different types of protected areas along ALT 1 (Natura 2000 areas, National Parks, BSPA areas, UNESCO biosphere areas, Ramsar wetland areas, Seal Sanctuaries, IBA bird areas and FINIBA bird areas in Finland). The definition of the significance of possible impacts will be based on protection objectives and principles. The significance depends on how well the protection status can be maintained.

Impacts will be assessed as expert opinion, based on modelling results of sediments spreading (Chapter 8.2.2), results of the baseline surveys, earlier experience and relevant literature.

Natura assessment

The impacts on the Natura 2000 areas has to be assessed in accordance with the Nature Protection Act (20.12.1996/1096) 65 §, if it alone or together with other projects causes significant weakening of the natural values that are the basis why the area has been included into the Natura 2000 network. The authority is not allowed to grant a permit if the project is proven to cause significant negative impacts on the Natura 2000 area.

A screening of the need of an actual Natura assessment will be conducted to every Natura 2000 area within the impact area. An actual Natura assessment will be carried out when needed and the report will be included in the EIA report. The assumption is that the Sandkallan area (FI0100106) will be subject to a Natura assessment according to the Nature Protection Act.

Table 8.9 Protected areas as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Protected areas	Construction	Suspension and spreading of disturbed sediments	Rock placement Pipelay Anchor-handling

8.5 Socio-economic conditions

8.5.1 Ship traffic

Impacts on ship traffic and possible risks to ship traffic will be assessed in a structured manner for the construction and operational phase of the pipelines.

During the construction of the pipeline impacts to the general ship traffic in the Gulf of Finland will occur. A safety zone, clear of third party ships, will be established around all construction vessels. Furthermore, pipe supply vessels will transport pipes to the lay vessel and fall-pipe vessels will transport crushed rock to the seabed intervention sites.

Impacts on traffic separation scheme (TSS) in the Gulf of Finland will be evaluated during the EIA report phase based on analysis of ships behaviour during the construction of the first two pipelines, experience from the pipelay contractor and GOFREP reports (if available). The assessment will also evaluate the information and communication directed to the ship traffic control during the construction. Real-time information concerning the construction activities is crucial to the maritime safety.

The type of vessels to be used in construction spreads, the extent of their safety zones and the impact on third party vessels will be assessed. Additionally the amount of traffic generated by possible onshore supply bases and the associated sailing routes will be evaluated.

A risk assessment of the construction phase will be performed and the necessary mitigation measures defined to ensure that the residual risk is acceptable.

To assess the impacts on ship traffic the routes and traffic volumes need to be examined accurately using Automatic Identification System (AIS) data. Available information from Gulf of Finland Reporting (GOFREP) shall also be part of the assessment. AIS data will be used to study and assess the ship traffic patterns and intensity in the Gulf of Finland. AIS data used for assessment will be from January 2011 onwards due to amendment of the TSS areas.

During operation the pipeline footprint may restrict emergency anchoring of ships. Current ship traffic guidance requires that there are emergency anchoring areas in the Finnish EEZ. The construction of additional gas pipelines would mean further restrictions to emergency anchoring i.e. a narrower zone where emergency anchoring could take place. Pipelines may also have an impact on planning of new fairways. Consequently, route development will be performed in consultation with the Finnish Transport Agency.

The assessment will take into consideration the development of Marine Traffic Strategy that is being prepared by the Ministry of Transport and Communications. The aim is to prepare a comprehensive strategy serving Finland's economy, commercial and industrial life and employment taking into account the latest environmental standards.

Table 8.10 Ship traffic as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Ship traffic	Construction	Sailing restrictions in safety zones and TSS areas	All construction activities
	Operation	Sailing restrictions in safety zones and TSS areas	Monitoring and surveying Maintenance rock placement as required
		Safety and risks: Emergency anchoring, dragged anchors, dropped objects and ship sinking Restrictions in planning of new fairways	Pipelines on seabed and gas flowing

8.5.2 Fishery

Impacts on fishery can occur due to safety zones around construction activities. All third party vessels including fishing vessels will be prohibited to enter the safety zone during constructing works. Fishing vessels may have to alter their fishing paths when approaching construction areas.

Construction activities, such as seabed intervention works, can cause sediment plumes that will affect fish to flee the construction site. This may impact fishery by forcing fishing vessels to spend more time to track fish shoals.

Impact on fishery can also be caused due to additional work when fishing vessels have to adjust their trawling depth to avoid contact with a free-spanning pipeline. Fishing nets may also wear and tear more rapidly in the contact with the pipeline's concrete coating.

Impacts on fishery and possible risks to fishing vessels will be assessed as expert opinion based on the experience from the findings related to the Nord Stream project and literature related to other pipeline projects in the North Sea.

Impacts on Finnish offshore fishery will be assessed by experience gathered during over-trawling test of the pipeline and the monitoring of the Nord Stream project. Monitoring of the impacts on fishery is based on analyses of the satellite tracking information of the Finnish offshore fishing fleet. All commercial fishing vessels longer than 15 m have to carry a satellite transponder (AIS) which record their position, direction and speed information. By utilizing that information it is possible to monitor whether the fishing fleet have been forced to alter its fishing pattern during the pipeline construction and operation.

Impacts on the commercial fishery will be also assessed by a specific survey targeted to fishermen. The survey questionnaire will include questions related to possible hindrance that Nord Stream Pipelines 1 and 2 have caused to the Finnish offshore fishery. In addition questions on Nord Stream Extension are planned to be added as basis for impact assessment. For more information see Chapter 3.1.5.

Table 8.11 Fishery as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Fishery	Construction	Safety zone preventing fishing activities	All construction activities
		Avoidance reactions by fish	Rock placement
	Operation	Hampering bottom trawling and damage to fishing equipment	Pipelines on seabed
		Safety zone preventing fishing activities	Monitoring and surveying Maintenance rock placement

8.5.3 Military areas

Impact on military areas can occur both during construction and operation. Construction activities that can cause impacts are munitions clearance, rock placement, pipelay, pipe transport to the lay vessel and anchoring. During operation impacts can occur from monitoring, pipeline maintenance and possible incidents.

Assessment will be based on the distance between the pipelines and the military areas and duration of the disturbance on use of the military areas. The assessment will be based on expert opinion in consultation with Finnish Defence authorities.

Table 8.12 Military areas as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Military areas	Construction	Restricted use of military area	All construction activities
	Operation	Restricted use of military area	Monitoring and surveying Maintenance rock placement

8.5.4 Munitions

The impact targets relevant to munitions clearance are summarised in Table 8.13. The impacts to be assessed specifically for munitions clearance are indicated by 'X'.

Table 8.13 The impact targets relevant to munitions clearance

Impact target		Impacts to be assessed from
Category	Sub-category	Munitions clearance
Physical and chemical environment	Seabed morphology and sediments	X
	Hydrology and water quality	X
	Air quality and climate	*
	Underwater noise/pressure wave	X
Biotic environment	Benthos	X
	Fish	X
	Marine mammals	X
	Seabirds	X
Protected areas		*
Socio-economic conditions	Ship traffic	*
	Fisheries	
	Military areas	
	Existing and planned infrastructure	X
	Scientific heritage	X
	Cultural heritage	X
	Tourism and recreation	*
	Social impacts	

* These impact targets are being assessed on 'project scale' as presented in other sub-sections of Chapter 8, not on the scale of individual munitions.

Munitions clearance by detonation causes a crater in the seabed and a pressure wave radiating from the clearance location:

- The crater size determines the main input for the impact assessment on:
 - Seabed morphology
 - Sediment and water quality through re-suspension and spreading of sediments and contaminants
 - Benthos
 - Scientific heritage (long term monitoring stations)
- The pressure wave determines the main input for the impact assessment on:
 - Injuries and casualties of marine mammals
 - Fish
 - Seabirds
 - Cultural heritage (wrecks)
 - Existing infrastructure (cables and pipelines)

The impact assessment will start with the determination of the type and charge size of the munitions and the clearance method. This will result in the total charge size to be cleared through detonation that will provide the input for the crater size and pressure wave calculations.

The crater size will be determined on the basis of existing literature updated with the experience of the monitoring of actual crater sizes resulting from the munitions clearance performed for the Nord Stream Project. In general the actual measured crater sizes were confirmed to be smaller than the originally assessed crater dimensions; this valuable experience will be implemented in the assessment for the Project.

The dimensions of the craters determine the volume of sediment that will be released in the water column. The re-suspension and spreading of sediment and contaminants is subsequently calculated by a flow model that will result in predictions of concentrations, extent and duration of sediment plumes and re-sedimentation. The model that will be used is selected based on the outcomes of the dedicated current model improvement study in consultation with authorities and research institutes, as for the other construction activities.

The spreading of sediment may have an indirect impact on benthos or long term monitoring stations, if there are benthic communities or monitoring stations in the vicinity of clearance sites that can be affected by re-sedimentation. This impact will be assessed using the modelling results as well as the baseline and general information of the living conditions for benthos in the area.

The pressure wave will be calculated with the modelling tools developed and used for the munitions clearance assessment on munitions by munitions basis for the Nord Stream Project.

From the clearance location, the pressure wave radiates and the pressure acting on the impact targets is calculated as function of distance from the source. Existing literature will be used to assess the direct impacts of pressure waves on marine mammals and fish, and indirectly seabirds.

The calculated pressures (and forces) are used to determine the impact on wrecks, cables and pipelines. The extensive monitoring programme of munitions clearance for the Nord Stream Project provides valuable information to perform this assessment as reliable as possible.

As sediment plumes extend, and pressure waves propagate over significant distances, the transboundary impacts will be assessed as well using the same methods.

8.5.5 Barrels

Barrels on the seabed are an environmental risk if they contain hazardous substances. Impact on barrels can occur both during construction and operation. Construction activities that can cause impacts are munitions clearance (pressure wave), rock placement, pipelay and anchoring of the lay barge.

During operation impacts can occur from pipeline maintenance such as rock placement. The aim is to avoid any impact through interaction with intact barrels or pressure waves on barrels that may contain hazardous substances, both during surveys and construction and maintenance activities. Consequently, a detailed barrel baseline will be established during the survey campaigns.

The order of magnitude of barrels in the pipeline route will be known during the EIA phase, but not the exact amount as all the information from detailed surveys are not available at the time (see Chapter 10 for surveys planned to be performed).

Based on the Nord Stream monitoring impacts from the construction activities on barrels that may contain hazardous substances can be avoided through the implementation of appropriate mitigation measures. As such measures will be developed for the Project based on the barrel baseline, assessment of impacts on barrels is not proposed.

8.5.6 Existing and planned infrastructure

The construction activities associated with the Project could impact existing infrastructure and the resulting footprint of the installed pipelines could impact the implementation of future infrastructure projects to be carried out in the Finnish EEZ.

The assessment of impacts on existing infrastructure will be mainly related to the interaction between the planned pipelines and construction vessels and existing pipelines and cables.

The alignment and configuration of the existing infrastructure will be assessed through detailed surveys. Based on the as-found configuration, crossing structures where required will be designed and is planned to

be agreed with the cable and pipeline owners. Crossings will be designed such that there is no interaction, which would cause impact, between the pipeline and the existing infrastructure. Consequently, no impacts on the cables are expected during construction and operation.

The assessment of impacts on future infrastructure will be mainly related to ensuring that the risk of interaction leading to potential damage the pipelines is sufficiently low. The impact of the pipelines on future infrastructure developments in the Finnish EEZ is either negligible or very limited, depending on the type of development and the works to be performed:

- Future pipelines, and power and telecommunication cables in the Finnish EEZ should not be impacted and their use should not be constrained by the pipelines. Pipelines and cables regularly cross existing pipelines. Established crossing techniques as used in the North Sea are readily transferrable to the Nord Stream pipelines.
- The presence of the pipelines will cause a limited impact on any future subsea resource extraction projects in the Finnish EEZ. Consultations between the mining company and Nord Stream would establish the limits between unconstrained mining and the point at which subsea mining operations need to be risk-assessed and closely monitored.
- The presence of the pipelines will cause limited impact to any future wind farm and / or wave farm developments in the Finnish EEZ. Any interface between pipelines and wind farms would be eliminated by maintaining a minimum separation distance of for example 500 m around the pipelines.
- The construction of any tunnels beneath the Gulf of Finland in the future will not be impeded by the presence of the pipelines.

The main risks occur where works are undertaken in close proximity of the pipelines. Consequently, with future and existing infrastructure projects Nord Stream would agreed a notification area, where works within say 1,000 m from the pipelines (or pipeline works within 1,000 m of the infrastructure) will be notified to the other party, as the works, depending on the nature of them, may require additional planning. The amount of additional planning required will naturally depend on the works or infrastructure planned and would be assessed on a case by case basis.

No impacts are foreseen on wind parks reservation areas, registered extraction sites or spoil dump sites due to their distance from ALT 1.

Table 8.14 Existing and planned infrastructure as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Existing and planned infrastructure	Construction	Damage on cables and pipelines	Rock placement Pipelay Anchor-handling
	Operation	Damage on cables and pipelines	Maintenance rock placement
		Restriction in use of the occupied area	Pipeline on seabed

8.5.7 Utilization of natural resources

The footprint of the planned pipelines might restrict the utilization of natural resources below the seabed in the vicinity of the pipelines. It is also a cumulative impact with other infrastructure in the area. All possibilities to minimise the distances of the new pipelines from the already existing pipelines will be studied during the EIA process.

The impact on natural resources will be assessed as expert opinion. However, there should be no impact to future offshore oil and gas projects in the Finnish EEZ by the presence of the pipelines as modern technologies allow exploiting reserves under the pipelines.

In the Nord Stream project a total amount of 440,000 m³ rock were placed on the seabed in the Finnish EEZ. Most of the rock used in Finnish EEZ was taken from an existing quarry in Finland. Rock extracted in Finland was also used for rock berms in Russia and Sweden.

Table 8.15 Utilization of natural resources as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Utilization of natural resources	Construction	Decrease of natural resources available	Rock placement
	Operation	Restriction in use of the occupied area	Pipeline footprint on seabed

8.5.8 Scientific heritage

The assessment of impact on the scientific heritage, i.e. long term monitoring stations in the Finnish project area will consider the importance of the stations and the selection of parameters measured from the stations. The project may have an impact to scientific heritage if construction works or the presence of pipeline change chemical or hydrographic conditions at the locations of the monitoring stations. Impact on the scientific heritage will be assessed as expert opinion based on the results of modelling of sediment spreading and current modelling.

The developer is aware of the locations of the long term monitoring stations. Routing will avoid these seabed areas whenever possible. In case of potential impacts to a station setting a parallel station nearby the original station will be considered and discussed with relevant authorities.

Table 8.16 Scientific heritage as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Scientific heritage	Construction	Suspension and spreading of disturbed sediments	Rock placement Pipelay Anchor-handling
	Operation	Potential change in hydrographic conditions	Pipeline on seabed

8.5.9 Cultural heritage

Possible impacts on cultural heritage will be assessed for the construction and operation phases. Construction activities that will be assessed include munitions clearance (discussed separately in Chapter 8.5.4), rock placement, pipelay and anchor-handling. During operation impacts can occur from maintenance rock placement. The pipeline corridor will be surveyed prior to construction works. Identified wrecks will be avoided by minor routing adjustments or by implementing sufficient construction method (lay barge, anchor patterns etc.). During the EIA, negotiations on surveyed objects, evaluation of wrecks and assessments will be held regularly with FNBA.

Possible impacts can be mechanical damages of wrecks.

The impact assessment will be performed as an expert evaluation by a marine archaeologist. The assessment will be preliminarily based on available survey data.

Table 8.17 Cultural heritage as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Cultural heritage	Construction	Mechanical damage of cultural heritage on sea floor (ship wrecks)	Rock placement Pipelay Anchor-handling
	Operation	Mechanical damage of cultural heritage on sea floor (ship wrecks)	Maintenance rock placement

8.5.10 Tourism and recreation

Impacts on tourism and recreation are often presented within social impacts from the user point of view. In this case, tourism is separated from social impacts and observed as an important branch of industry. Recreation is linked to both tourism and other social impacts. As linked to tourism industry, will be assessed as a part of tourist activities.

Impacts on tourism and recreation are linked closely to other impacts. The impact can be direct (impact on scenery, noise, restrictions on the use of areas or land use) or in-direct (image). Changes in the environment and surroundings can have an impact on how the attractiveness of the area is perceived. This can affect the interest to visit the area, in positive or negative way. Impact on tourism industry or willingness to visit Finland is likely to be minor, but this is proposed to be included in the assessment. There might be impacts on recreation, e.g. on recreational sailing, during construction.

Assessment of impacts on tourism and recreation will be based on interviews with local and national tourist officials and recreational sailors, citizen survey, fishermen survey (as applicable) and statistics (e.g. The Finnish Tourist Board and Statistics Finland).

Even though the impacts on tourism and recreation in the Nord Stream EIA were assessed to be minor, it is not directly comparable as the planned pipeline alternatives are closer to the Finnish territorial waters. However, the operation phase impacts are considered to be negligible and are therefore proposed to be not assessed in the EIA.

Table 8.18 Tourism and recreation as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Tourism and recreation	Construction	Noise and visual disturbance from increased vessel movement Sailing restrictions in safety zones and increased vessel movement	All construction activities

8.5.11 Social impacts

Social impacts include the impacts caused by the project on individuals, community or society that causes changes in well-being. Impacts can be direct or indirect. Social impacts are closely linked to other impact assessments. Social impacts included in the assessment are e.g. impacts on welfare and living conditions on residential areas (can be caused by noise, changes in scenery, traffic), impacts on recreation, people's worries, fears, hopes and expectations (multiple underlying factors) as well as impact on public and private services and on industries.

Potential negative impacts on human's health due to construction works could be caused along food chains if disturbed sediments that contain contaminants are partly dissolved into water and finally bioaccumulated to fish species that are caught and consumed by humans. However, based on experience on the local and short-term character of the impacts on water quality during the construction activities of the Nord Stream Project, the probability of this scenario to happen to an extent that would cause real health problems to humans is very low. Therefore it is proposed not to include this in the impact assessment.

Social impacts will be assessed as an expert opinion comparing and proportioning the collected data.

The national guidelines for social impact assessment will be taken into account (Ministry of Social Affairs and Health 1999, National Institute for Health and Welfare 2011).

Assessment of social impact will be based on citizen surveys (Nord Stream 2008 and the planned Nord Stream Extension questionnaire for Finland), feedback from consultations during EIA programme and EIA report phase (written, spoken), feedback collected from project's map portal (so called map feedback system), and media coverage.

Table 8.19 The main potential social impacts to be assessed

Impact target	Project phase	Impact	Activity
Wellbeing of citizens, community and society	Construction and operation	Impacts on "sense of security" Impacts on civic confidence and community relations Impacts on living environment Impacts on use of the area	All project activities

8.6 Decommissioning of the pipelines in the Finnish EEZ

Decommissioning will be assessed on a generic level based on current knowledge. However, as presented in Chapter 2.9, the decommissioning programme will only be developed at the end of the operational life of the pipelines, and any changes in applicable regulations and technical know-how will be taken into account at that point in time.

8.7 Cumulative impacts

Cumulative impacts occur when various impacts cause different effect when taken together than when assessed each-by-each. Cumulative impact assessment should take into account other past, present and future human activities.

In this EIA, cumulative impacts will consider the presence of other infrastructure projects and their impacts as a whole to shipping and restrictions to other users of the Finnish EEZ. Each infrastructure project reserves area from other use of the seabed, and all infrastructures on the seabed should be considered as a whole.

No significant cumulative impacts caused by construction are expected to occur, since the impacts are typically of temporary nature. However, possible cumulative underwater noise impacts from different construction activities and other uses of the EEZ, e.g. ship traffic, will be considered in the assessment.

Possible cumulative impacts with Nord Stream Pipelines 1 and 2 are related to impacts during operation. Assessment of cumulative impacts during operation will consider at least restriction in use of areas, release of zinc from zinc anodes and impacts to bottom trawling.

8.7.1 Future use of the Finnish EEZ

The use of the Finnish EEZ is both use that is of stationary nature, such as cables and pipelines on the seabed, and use which is changing/moving over longer or shorter time, such as ship traffic. These different ways of using the EEZ and impact assessment methodology related are described in previous chapters, especially in Chapter 8.5.

Stationary use of the EEZ can be divided into:

- Existing and planned infrastructure (see Ch. 8.5.6)
- Utilization of natural resources (see Ch. 8.5.7)
- Scientific and cultural heritage (see Ch. 8.5.8 and 8.5.9)
- Protection of the marine environment (see Ch. 8.4).

Changing/moving use of the EEZ is:

- Ship traffic (see Ch. 8.5.1)
- Fishery (see Ch. 8.5.2).

Future use of the Finnish EEZ is related to and regulated by the different strategies and policies for the marine environment (see Chapters 5.1 and 8.1).

To assess the impacts on the use of the EEZ all existing and known future use will be described and shown on map with relevant safety/restriction zones around. The assessment will be done using a wide range of different technical and environmental expertise and consultations with relevant authorities.

8.8 Risk assessment

There are a number of risks associated with the construction and operation of the Project. It is proposed that during the EIA phase a thorough risk assessment is carried out on those risks that are assessed to be of relevance for the EIA i.e. those risks that could have environmental or socio-economic consequences. The findings of the individual assessments will be presented in the EIA and/or its supporting

documentation. Risks connected to the Project and considered to be of relevance for the EIA are shown in Table 8.20.

Table 8.20 Risks connected to construction and operation of pipelines

Risks during construction
Ship collisions and ship grounding
Oil spills from lay barge or supply vessels
Contact with objects on seabed (barrels, munitions, wrecks etc.)
Risks during operation
Material and mechanical defects on pipeline
Dragged munitions
Sinking ships
Dragged and dropped anchors
Dropped objects

The risk magnitude depends on the frequency of an accident occurring, the amount of damage incurred and the consequence (e.g. impact to the environment). The actual alignment of the pipeline route will influence the risk magnitude concerning ship collisions, sinking ships, dragged or dropped anchors and dropped objects that will be greater if the pipeline is located within or close to shipping lanes. The final route selection will also take into consideration the findings of the risk assessments of the identified risks of significance.

Consultations will be held with the relevant authorities in order to agree on the assumptions and input required for the risk assessments. Risk assessments will be performed equally for all route alternatives. A comparison of the potential risks to the different routes will indicate the best route alignment from a risk perspective. The findings of this assessment will be presented in the EIA.

8.9 Transboundary impacts

Transboundary impacts associated with the Project's construction and operation phases may result from planned activities as well as from potential unplanned (accidental) events (see Chapter 8.8). Construction activities that could cause transboundary impacts are pipelay by anchored lay barge, munitions clearance and rock placement (see Chapters 8.5.4, 8.2.2 and 8.2.3). Potentially affected countries are Russia, Estonia and Sweden.

Additionally for some impacts (ship traffic, fishery etc.), transboundary impacts to Denmark, Latvia, Lithuania, Poland and Germany may occur. Transport of pipe segments and possibly rock material by vessels from Kotka to the construction sites in Russian waters will cause increased shipping and emissions to air. If water will be taken from the Finnish EEZ during pre-commissioning and discharged at a landfall location, it may impact water quality in Russia or Germany. These and all the other transboundary impacts from the Project activities in the Finnish EEZ will be assessed in the national EIA procedure.

The transboundary assessments will be performed in a similar way and detail as the national assessments, however, taking into account the availability of baseline information in the affected countries. Available monitoring results of the Nord Stream Project and the environmental baseline surveys of the Nord Stream Extension Project at the sites close to the Finnish EEZ both in Finnish waters and waters of neighbouring countries will be taken into account in assessment work.

Based on the monitoring results during construction and first years of operation of the Nord Stream pipelines the construction works did not cause any significant transboundary impacts either to the environment or to socio-economic conditions. The situation is expected to be similar also for possible construction and operation of Nord Stream Extension.

In the following the main potential transboundary impact targets to be assessed during the EIA process are described.

8.9.1 Physical and chemical environment

Seabed sediments and water quality

The results of mathematical modelling (see Chapters 8.2.2 and 8.5.4) will be the basis in assessing the extent of spreading of disturbed sediment particles and contaminants and nutrients in suspension during the pipeline construction works in the Finnish EEZ. The focus in modelling are the areas where construction activities are planned to take place in areas of potentially contaminated sediments. These are known accumulation areas of harmful substances (e.g. dioxins; Figure 8.1). The area impacted and the significance of the changes will be assessed as expert opinion based on the modelling results.

Noise/ pressure waves

The propagation of underwater noise/pressure waves due to munitions clearance will be assessed as described in Chapter 8.5.4.

8.9.2 Biotic environment

Based on the assessment results of the transboundary impacts to sediment and water quality near the Finnish EEZ direct and indirect impacts to biota (benthos, fish, marine mammals) will be evaluated. The basis in the assessments is that organic compounds (e.g. dioxins and organotins) are normally strictly bound to sediment particles when in suspension. Baseline data on the physical-chemical conditions and the existence of life in these offshore sea areas will help assess the significance of the impacts.

Conservatively estimated transboundary impact area in Swedish waters in the Northern Baltic Proper is characterised by water depths over 100 m and permanent stratification (halocline) in a depth range between 60 – 80 m (Figure 8.2, Myrberg et al. 2006). As a consequence there are oxygen problems in the hypolimnion waters. Under circumstances of prolonged or permanent oxygen depletion (anoxia) no benthic invertebrates survive in these areas. Also fish avoid waters of low oxygen levels.

Possible transboundary impacts on marine mammals through underwater noise/pressure waves due to munitions clearance will be assessed based on the pressure wave calculations using existing literature (see Chapter 8.5.4).

8.9.3 Socio-economic conditions

Ship traffic and fishery

Transboundary impacts from the construction activities and pipeline operation to ship traffic and fishery in Russian, Estonian and Swedish waters will be assessed in a similar way as is presented in Chapters 8.5.1 and 8.5.2.

Scientific heritage

Special attention will be paid on the impacts on long term monitoring stations within the estimated impact area in the Estonian EEZ (Figure 8.1). In Swedish or Russian waters near the Finnish EEZ border any known long term monitoring stations do not exist (Figure 8.1 and 8.2). As in the Finnish EEZ, the assessment of impacts will consider the importance of the stations and the selection of parameters measured from the stations. The project may influence the representativeness of the stations if construction works or the existence of the pipeline on the seabed permanently or for extended period will change chemical or hydrographic conditions in the vicinity of the monitoring stations. Impact assessment will be performed as expert opinion based on the modelling results of sediment spreading and current behaviour (see Chapter 8.2.2).

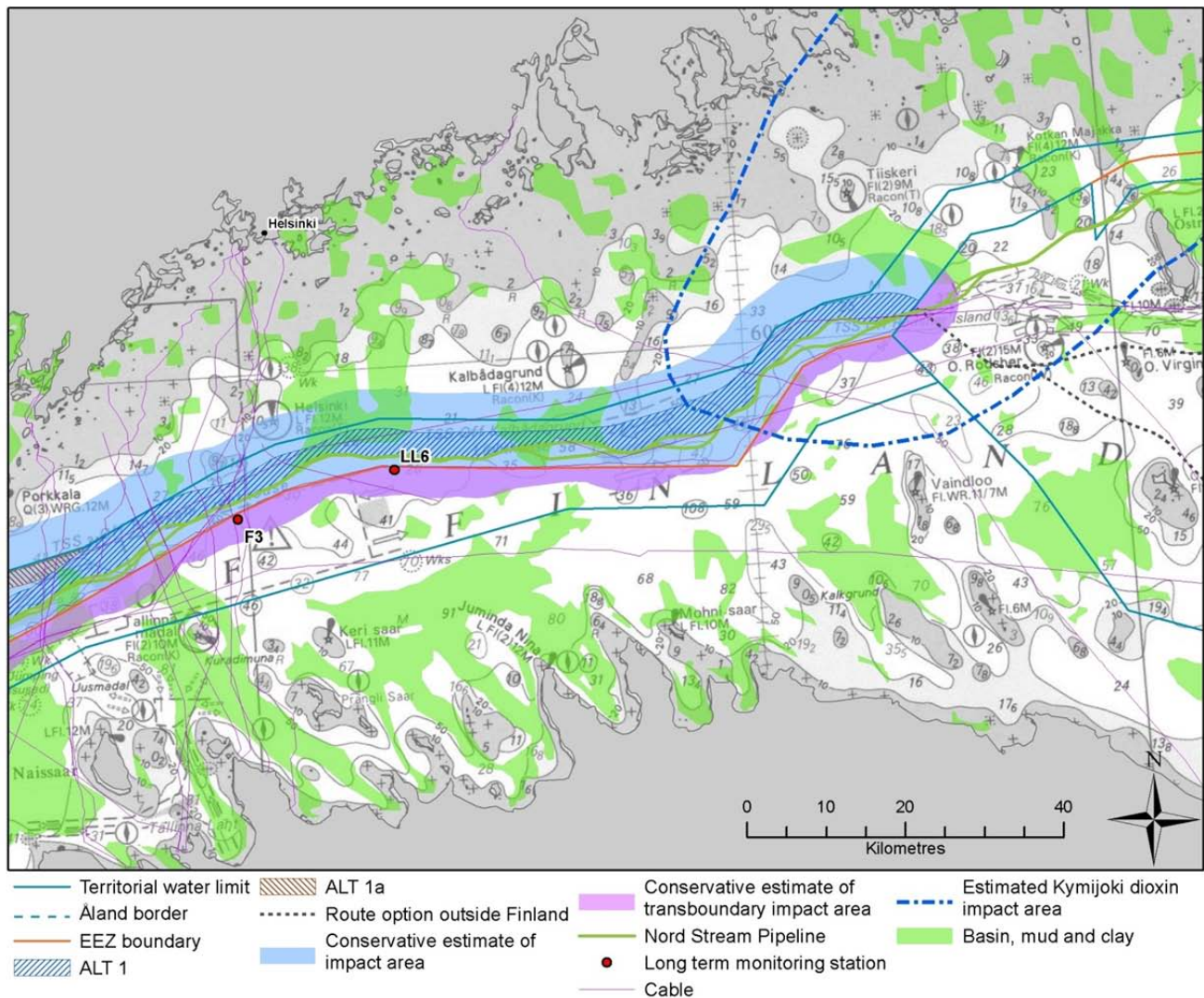


Figure 8.1 ALT 1 and conservatively estimated transboundary impact area in Russian and Estonian waters close to the Finnish EEZ and potential impact targets. (Source: Geological Survey of Finland (GTK), HELCOM, Nord Stream AG)

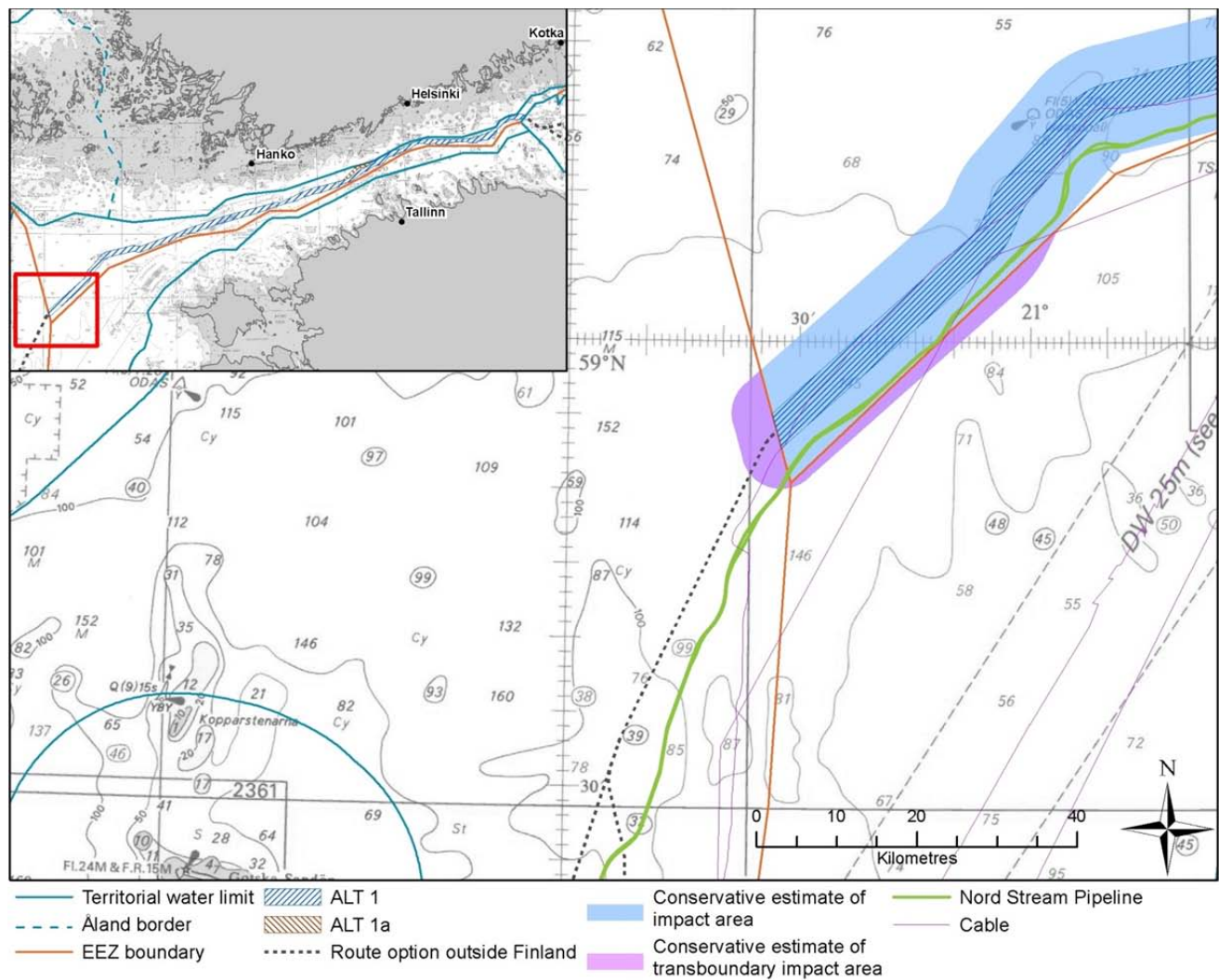


Figure 8.2 A section of ALT 1 crossing the EEZ border between Finland and Sweden. (Source: Nord Stream AG)

Social impacts

For the assessment of transboundary social impacts to Estonia a citizen survey is planned to be executed in a similar way as for Finland (see Chapter 8.5.11).

8.10 Comparison of alternatives

A comparison of the studied alternatives, non-implementation (ALT 0) and the project alternatives (ALT 1 / ALT 1a), will be presented in the assessment report. As mentioned in Chapter 4, there might be sub-alternatives related to routing or technical solutions, which will be assessed and compared separately. The comparison will be quantitative and/or qualitative depending on impact target.

9 IMPACT ASSESSMENT ONSHORE

The assessment of environmental impacts of ancillary activities onshore, will focus on the areas surrounding Mussalo and Kotka.

9.1 Land use

The impacts from ancillary onshore activities on present and planned land use and the built environment will be assessed in terms of land use plans and the development of the area. The impacts on residential and recreational areas in the vicinity of the rock transport route and the harbour will be examined in particular.

The characteristics of the environment and the community structure in the vicinity of the operations area, as well as the sites of value in the landscape and cultural environment, will be described by means of text, maps and photographs in the EIA report.

The assessment will be performed as expert opinion.

Table 9.1 Land use as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Land use	Construction	Possible conflict on present and planned land use forms and infrastructure	Rock transport Rock storage

9.2 Physical and chemical environment

9.2.1 Air quality and climate

Rock transport traffic and discharge of the truck loads will locally generate particle emissions (dust) during operations. Heavy vehicles and machinery will cause atmospheric emissions (exhaust gas release). These emissions and their impacts on the environment will be assessed based on calculations of transport emissions based on traffic load. The assessment will be performed as expert opinion.

Table 9.2 Air quality and climate as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Air quality and climate	Construction	Emissions of air pollutants	Rock transport Rock storage

9.2.2 Noise

The noise impact and the impacts on living conditions caused by traffic will be assessed on the basis of the existing and predicted traffic volumes and distribution affecting residential areas. The rock transport traffic will be added to the traffic forecasts for the rock transport period (about 2 years). The SoundPLAN noise model will be used to calculate the change in day-time noise levels during the rock transport period. The noise levels will be shown on maps covering an area of about 1 km on either side of the rock transport route.

The assessment will be based on noise modeling and expert opinion.

Table 9.3 Noise as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Noise	Construction	Airborne noise	Rock transport Rock storage

9.3 Socio-economic conditions

9.3.1 Traffic and safety

Changes to the current traffic volumes arising from transport of rock, as well as the means and routes of transportation and the distribution of transportation, will be presented. The impact on traffic safety will be assessed and possible required changes to the traffic arrangements in the areas, as well as their impact, will be assessed.

The assessment will be performed as expert opinion.

Table 9.4 Traffic and safety as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
Traffic and safety	Construction	Fluency, safety and risks	Rock transport

9.3.2 People and society

The environmental impact assessment of onshore activities will study the impacts on people's health, comfort and living standards in terms of traffic impacts, traffic safety, noise, land use and employment impacts. The focus areas of the assessment will be selected based on the noise calculations, maps and on the feedback received from the residents in the area. A citizen survey will be carried out to investigate the attitudes of nearby residents towards the operations and to support the assessment of social impacts. The impact of the ancillary activities on living comfort and recreational opportunities will be assessed, e.g. on the basis of traffic volume changes. Noise impacts will be assessed by noise modelling based on the estimated traffic volumes and standards concerning the level of environmental noise.

The assessment report will in short estimate the amount of direct and indirect employment created in the Kotka region by the onshore rock transport and storage. In addition the impact on the regional and municipal economy and local enterprises will be briefly surveyed.

The assessment will be based on the citizen survey with specific questions regarding the ancillary onshore activities, possible targeted interviews and expert opinion.

Table 9.5 People and society as an impact target and the main potential impacts to be assessed

Impact target	Project phase	Impact	Activity
People and society	Construction	<p>Noise and visual disturbance from increased road transport</p> <p>Impact on sense of safety</p> <p>Impacts on living environment</p> <p>Impacts on use of the area</p> <p>Impacts on employment</p>	<p>Rock transport</p> <p>Rock storage</p>

9.4 Non-significant impacts

Based on the type of ancillary onshore activities and collected baseline information, it is not likely that any significant adverse environmental impacts will be caused to:

- Soil, bedrock and groundwater
- Water quality
- Biotic environment and protected areas
- Landscape

The ancillary onshore activities do not interfere with nature values, protected areas or use of waters. The planned transfer route is an existing main road to the harbour. The temporary rock storage will be situated in the harbour area preferably close to the quay. Therefore impacts on these impact targets will not be assessed.

10 ENVIRONMENTAL STUDIES AND SURVEYS

The Nord Stream Extension Project will benefit from the results and conclusions of the already performed environmental studies and surveys that have been carried out for the Nord Stream Project:

- Petergaz surveys for former NEGP (Nord Stream) Project
- Geotechnical, geophysical and environmental surveys for Pipeline 1 and 2,
- Visual inspections for the Nord Stream pipelines and objects on the seabed (wrecks, barrels and cables)
- Marin Mätteknik (MMT) survey at Kalbådagrund area in 2008
- Environmental sampling in 2007 (FIMR), 2008 (FIMR) and 2009 (Nord Stream)
- Background data, results and conclusions from Nord Stream's environmental monitoring in 2009 - 2014

Following additional surveys are planned to be performed in support of the EIA and engineering within the survey area as presented in Appendix 1, Map 9:

- Environmental baseline surveys 2013 (water quality and current measurements, sediment and benthos sampling)
- Geotechnical and geophysical surveys 2013 - 2014
- Visual inspections of objects on seabed, such as wrecks, munitions, barrels etc. 2013 - 2014

Following studies are planned to be performed during the assessment phase:

- Current model enhancement study
- Modelling of sediment and contaminant spreading from construction activities. Scope will be decided later in consultation with authorities.
- Modelling of the changes in current conditions due to the pipeline on the seabed
- Citizen survey and questionnaire to fishermen in 2014 as a basis for the assessment of fishery and social impacts
- Risk assessments for the construction phase
- Risk assessments for the operational phase
- Natura screening and possible assessment for Sandkallan Natura 2000 area
- Evaluation of cultural heritage based on surveys and visual inspections
- Evaluation of munitions based on surveys and visual inspections
- Preparation of traffic forecast for the Kotka region for the construction period
- Modelling of noise from onshore ancillary activities

11 PREVENTION AND MITIGATION MEASURES

Prevention and mitigation of negative impacts is an important part of project planning. The primary objective is to prevent any identified significant impact. If it is impossible to prevent an impact (e.g. if no other technical alternative is available), mitigation measures will be planned.

Preventative and mitigation measures in this project can be taken during: EIA procedure, detailed design, construction and operation.

Measures during the EIA procedure:

- Reconnaissance, visual and geotechnical surveys,
- Environmental baseline surveys,
- Route optimisation,
- Avoiding or minimising construction activities that are unsuitable in sensitive areas,
- Decision on type of lay barge (DP and/or anchored),
- Optimising the logistics concept and
- Consultations with authorities and third parties

Measures during the detailed design:

- Detailed geophysical and geotechnical surveys
- Munitions screening surveys
- Visual inspections
- Anchoring pattern plans
- Avoiding, minimising and/or optimising the construction activities (pipelay, rock placement, munitions clearance, rock transport etc.)
- Consultations with authorities and third parties

Measures during construction offshore:

- Reporting on construction activities to GOFREP to minimise impacts on 3rd party shipping
- Establishing safety zones around vessels in a construction fleet and possible support tugs at critical sections
- HSE guidelines and supervision for vessels
- Consultations with authorities and third parties
- Implementation of mitigation measures during munitions clearance through detonation to minimise impact on biota
- Monitoring surveys of construction activities

Measures during construction onshore:

- Implementation of mitigation measures for impacts from rock transport (noise and other emissions etc.)
- Some access roads to the harbour have special barriers and fences to reduce noise pollution
- Port's (temporary storage of rock) environmental permit and environmental management system includes typically e.g.
 - Monitoring of operations and vessels to prevent pollution
 - Keeping dust levels to a minimum at the bulk terminals
 - Regular training of port staff on hazardous goods and environmental issues
 - Emergency response management and drills

Measures during operation:

- Indication of pipelines on sea chart
- Implementation of Emergency Response Plan for Operation
- Monitoring of the condition of the pipelines
- Maintenance of pipelines
- Consultations with authorities.

12 UNCERTAINTIES

Uncertainties related to the information and methods used will influence the planning of the project and assessment of environmental impacts. There are always consequences that are ambiguous or impossible to measure. Uncertainties in the assessment will be described, and an evaluation of their significance will be made. The assessment procedure includes an account of how uncertainties could influence the realisation of the project and consideration of different alternatives.

13 PERMITS

The Nord Stream Extension in the Finnish EEZ will require a water permit as well as Council of State consent. An EIA procedure will be carried out for the project. An EIA report, which will present the assessment results, and the statement given by the Coordinating Authority, are required prior to granting permits.

The ancillary onshore activities, rock transport and rock storage which are proposed to be assessed in the national EIA do not need separate permits. For example Port of HaminaKotka has an environmental permit for Mussalo port operations granted in 2003 by Eastern Finland Environmental Permit Authority. The permit regulations will next be re-examined in 2013.

13.1 Survey permit

Nord Stream applied for the consent of the Council of State, with immediate enforcement, to conduct surveys for the Project in the Finnish EEZ. The application was submitted on 13 July 2012, and it was requested that the survey permit is valid until the end of 2014. The applied survey corridor, width was up to 6 km and limited to the Finnish EEZ.

On 6 November 2012 Nord Stream provided a rejoinder to the received statements. The rejoinder was sent out to relevant authorities for statements. Additional statements were received on the rejoinder. Nord Stream submitted a second rejoinder on 14 February 2013.

The second rejoinder includes a revised survey area and schedule. The revised survey area is presented in Figure 1.7. The revised survey schedule based on a start date with April 2013 is presented below (Figure 13.1).

Survey Activity	Q1 2013	Q2 2013	Q3 2013	Q4 2013	Q1 2014	Q2 2014	Q3 2014	Q4 2014
Reconnaissance survey								
Geotechnical Stage 1								
Visual inspections Stage 1								
Detailed geophysical survey								
Visual inspections Stage 2								
Geotechnical Stage 2								
Environmental baseline surveys								

Figure 13.1 Survey schedule (Nord Stream 2013b)

13.2 Construction permits

Two permits will be required for the construction, operations, maintenance and repair of the potential pipelines these are:

- Consent of the Council of State under the Finnish Act on the Exclusive Economic Zone
- Permit for munitions clearance, construction, operations, maintenance and repair under the Finnish Water Act

Permitting will follow the EIA phase, and is scheduled for 2015-2016. The EIA report and the statement to the EIA report by the Coordinating Authority will be part of the permitting documentation.

13.2.1 Council of State Consent according to the Law on the Finnish EEZ

The Finnish Council of State may, upon application, grant approval according to Section 6 of the EEZ Act for the exploitation of the seabed in the Finnish EEZ. Consent can be granted for a specific time period or for the time being.

The application will be submitted to the Ministry of Employment and Economy.

13.2.2 Permit for construction according to the Water Act

Construction works associated with the munitions clearance, pipeline construction, operations, maintenance and repair of the Nord Stream Extension pipelines is subject to a water permit according to the new Water Act, which entered into force at the beginning of 2012. The application must contain the plan of activity and clarification of impacts, as described in detail in the Water Decree.

A permit cannot be granted if the project causes considerable negative impact. The prerequisite for granting the permit is that the private or public benefit is considerable in comparison with the private or public losses caused by the project.

The EIA report and the Coordinating Authority statement on the report will be taken into account before the final decision on the permit is taken.

The permitting Authority (Regional State Administrative Agency in Southern Finland) may stipulate provisions in order to minimise the environmental impacts of the proposed project.

14 MONITORING

Based on the assessed impacts on different potential impact targets and their overall significance, a plan for monitoring of the environmental impacts during construction and operation of the gas pipelines will be drawn up and included in the EIA report. The plan will be updated in two phases; first when preparing the Water Permit Application and then according to the permit provisions. When the permit is lawful and the construction works are free to commence, the approved monitoring programme will be an integral part of the project.

In this project, the main objective of monitoring is to collect relevant information from the physical-chemical environment near construction activities. This data forms the basis for the conclusions of the possible impacts on the biotic environment. Based on the results, corrective measures can be taken if necessary to prevent harmful impacts. In monitoring, the entire life cycle of the project will be taken into account.

Port of HaminaKotka environmental permit require the Port to observe environmental issues continuously. The observation includes monitoring of usage, emissions and impact. The monitoring of emissions includes emission to the air and sea in addition to monitoring waste and noise pollution. Monitoring of the impacts includes the water and air quality. The monitoring is performed together with other operators in the area.

The content of the monitoring programme will be planned so that based on the results one can distinguish impacts caused by the project from the natural background variations in different quality parameters. One important goal of monitoring is to evaluate how well the impacts assessed during the EIA process and in the Water Permit Application correspond with monitored results.

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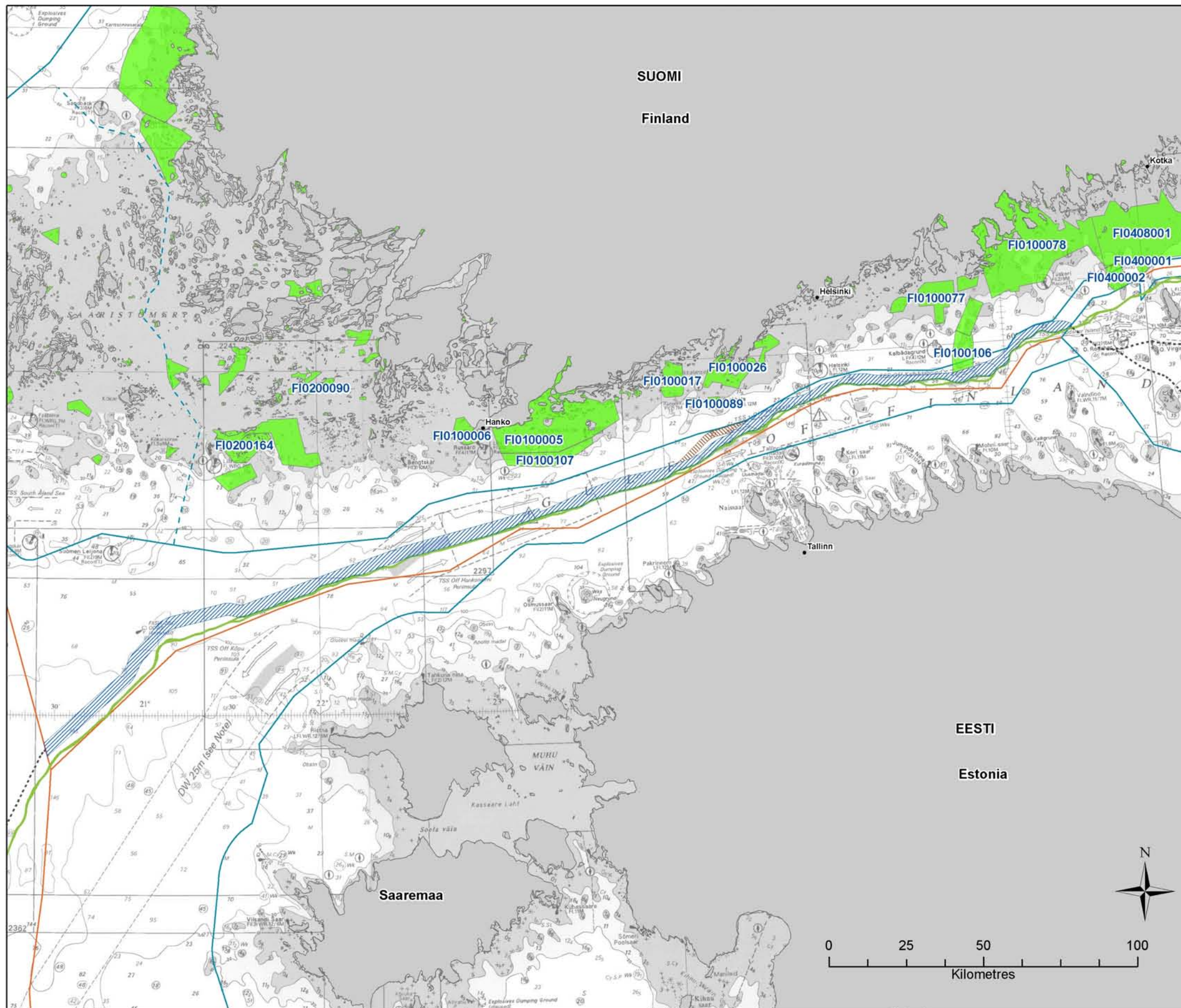
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APPENDIX 1: MAPS

- Map 1** Natura 2000 areas
Map of Natura 2000 areas in Finnish waters in the Gulf of Finland and the Archipelago Sea
Source: HELCOM
- Map 2** National parks, BSPAs, UNESCO sites and Ramsar sites
Map of national parks, Baltic Sea Protected Areas (BSPAs), UNESCO sites and Ramsar sites in Finnish waters in the Gulf of Finland and the Archipelago Sea
Sources: HELCOM, Metsähallitus
- Map 3** Seal sanctuaries, IBAs and FINIBAs
Map of seal sanctuaries, Important Bird Areas (IBAs) and Finnish Important Bird Areas (FINIBAs) in Finnish waters in the Gulf of Finland and the Archipelago Sea
Sources: Metsähallitus, BirdLife Finland
- Map 4** TSS, anchoring areas, preliminary safety areas and navigational lanes
Map of Traffic Separation Schemes (TSS), anchoring areas, preliminary safety areas for ships and navigational lanes in Finnish waters in the Gulf of Finland and the Archipelago Sea
Sources: Finnish Transport Agency, Helsingin Sanomat
- Map 5** Military areas
Map of restricted areas and firing danger areas of Finnish Defence Forces
Source: Finnish Defence Forces
- Map 6** Existing and planned infrastructure
Map of existing and planned infrastructure in the Gulf of Finland, the Northern Baltic Proper and the Archipelago Sea
Source: Nord Stream AG
- Map 7** Scientific heritage
Map of long term monitoring stations in Finnish waters within 5 km distance from Alternative 1 and the location of whale remains
Sources: HELCOM, SYKE
- Map 8** Cultural heritage
Map of cultural heritage in the Finnish EEZ
Sources: Finnish National Board of Antiquities, Nord Stream AG
- Map 9** Surveys
Map of Nord Stream Extension survey area and most important past environmental surveys
Source: Nord Stream AG



- Legend**
- Territorial water limit
 - - - Land border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - Route option outside Finland
 - Nord Stream Pipeline
 - Natura 2000 area

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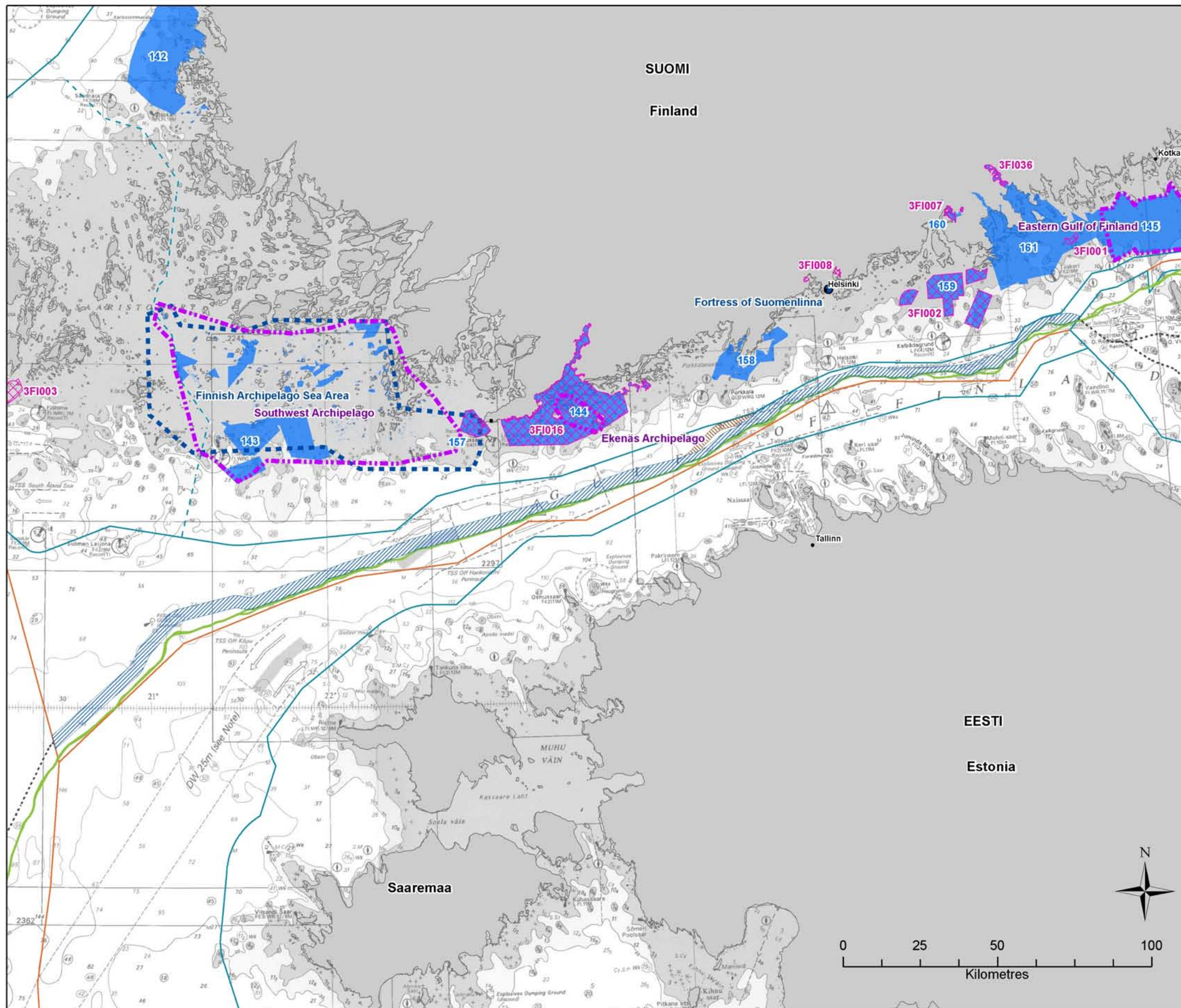
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Map 1

Nord Stream extension

Natura 2000 areas





- Legend**
- Territorial water limit
 - - - - - Land border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - Route option outside Finland
 - Nord Stream Pipeline
 - UNESCO world heritage site
 - UNESCO biosphere reserve
 - Ramsar area
 - National park
 - BSPA area

General references:

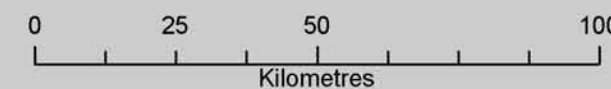
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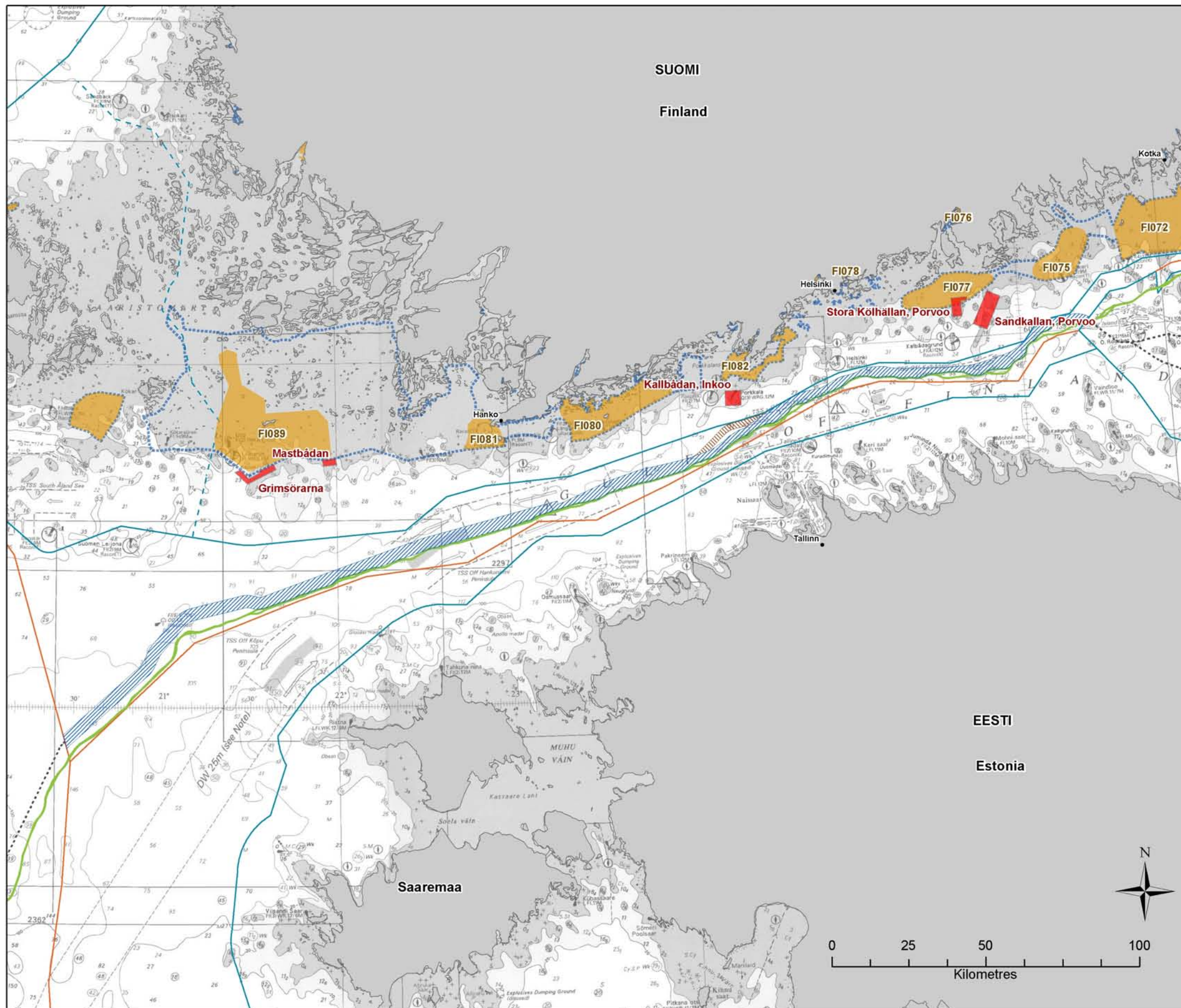
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Map 2

Nord Stream extension

National parks, BSPAs, UNESCO sites and Ramsar sites





- Legend**
- Territorial water limit
 - - - Åland border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - - - Route option outside Finland
 - Nord Stream Pipeline
 - IBA areas
 - FINIBA areas
 - Seal sanctuaries

General references:

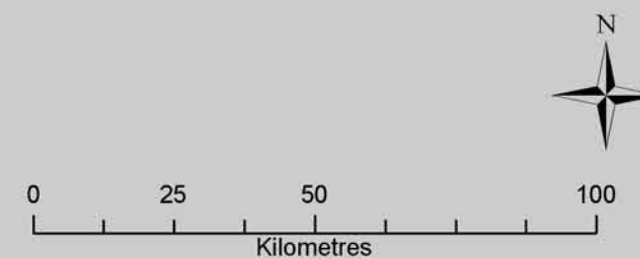
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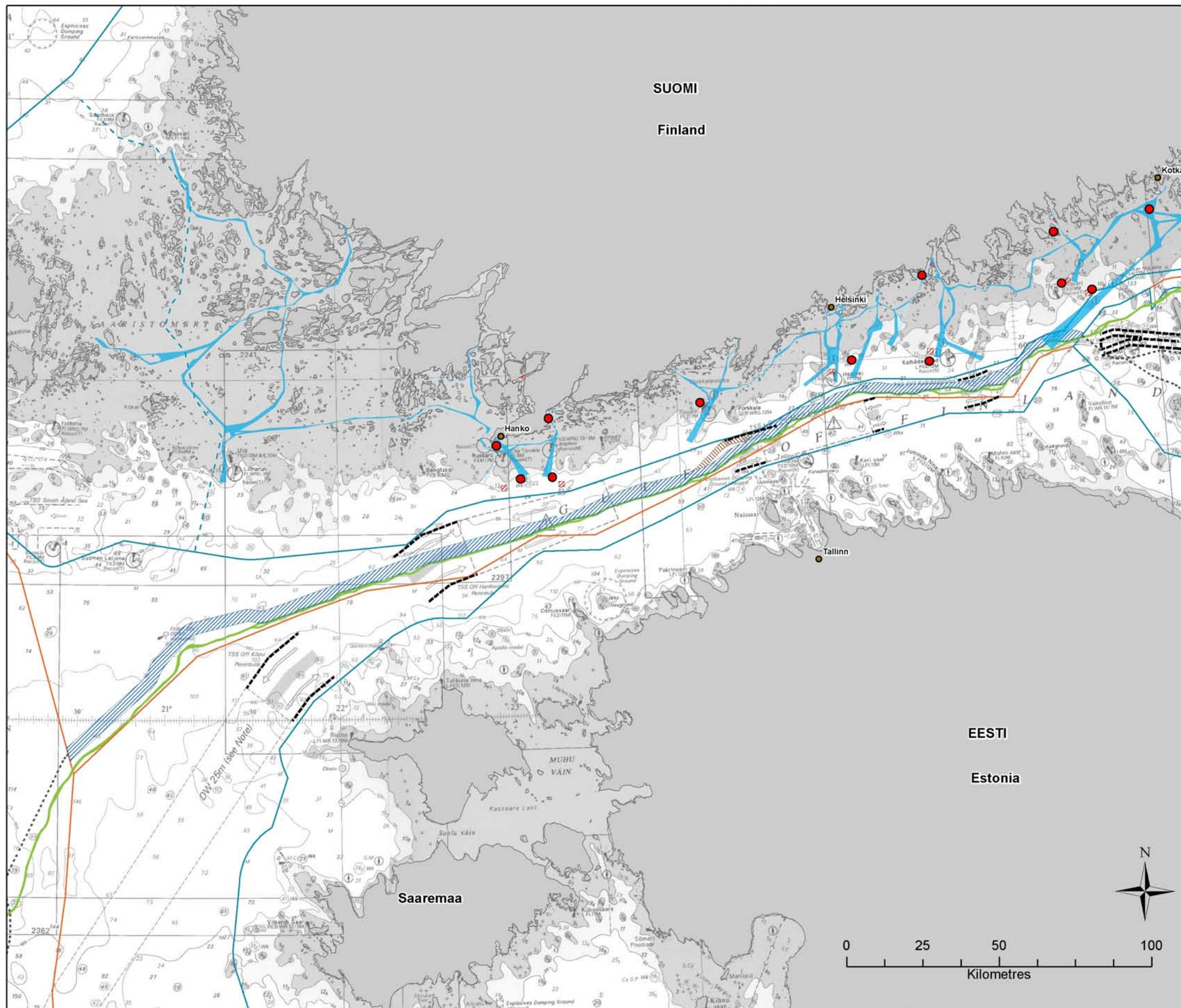
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Map 3

Nord Stream extension

Seal sanctuaries, IBAs and FINIBAs





- Legend**
- Territorial water limit
 - - - - - Land border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - Route option outside Finland
 - Nord Stream Pipeline
 - Preliminary safety areas
 - ▨ Anchoring area
 - TSS
 - Navigational lane, 4m - 8m
 - Navigational lane, over 8m

Note:
TSS in Russia will be changed and implemented on 1 June 2013. In this map the new TSS is presented.

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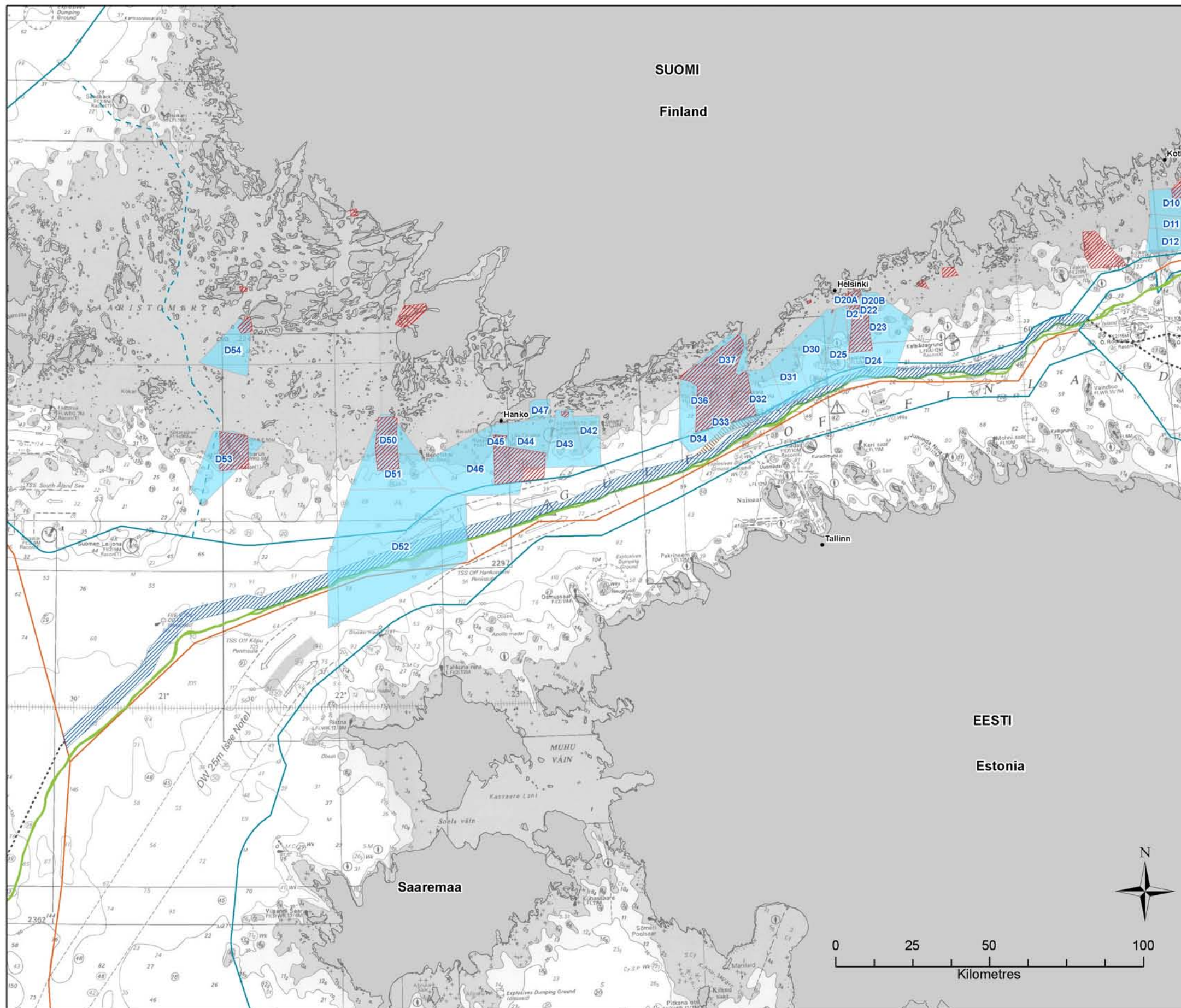
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Map 4

Nord Stream extension

TSS, anchoring areas, preliminary safety areas and navigational lanes





- Legend**
- Territorial water limit
 - - - - - Åland border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - Route option outside Finland
 - Nord Stream Pipeline
 - Restricted area
 - Firing danger area

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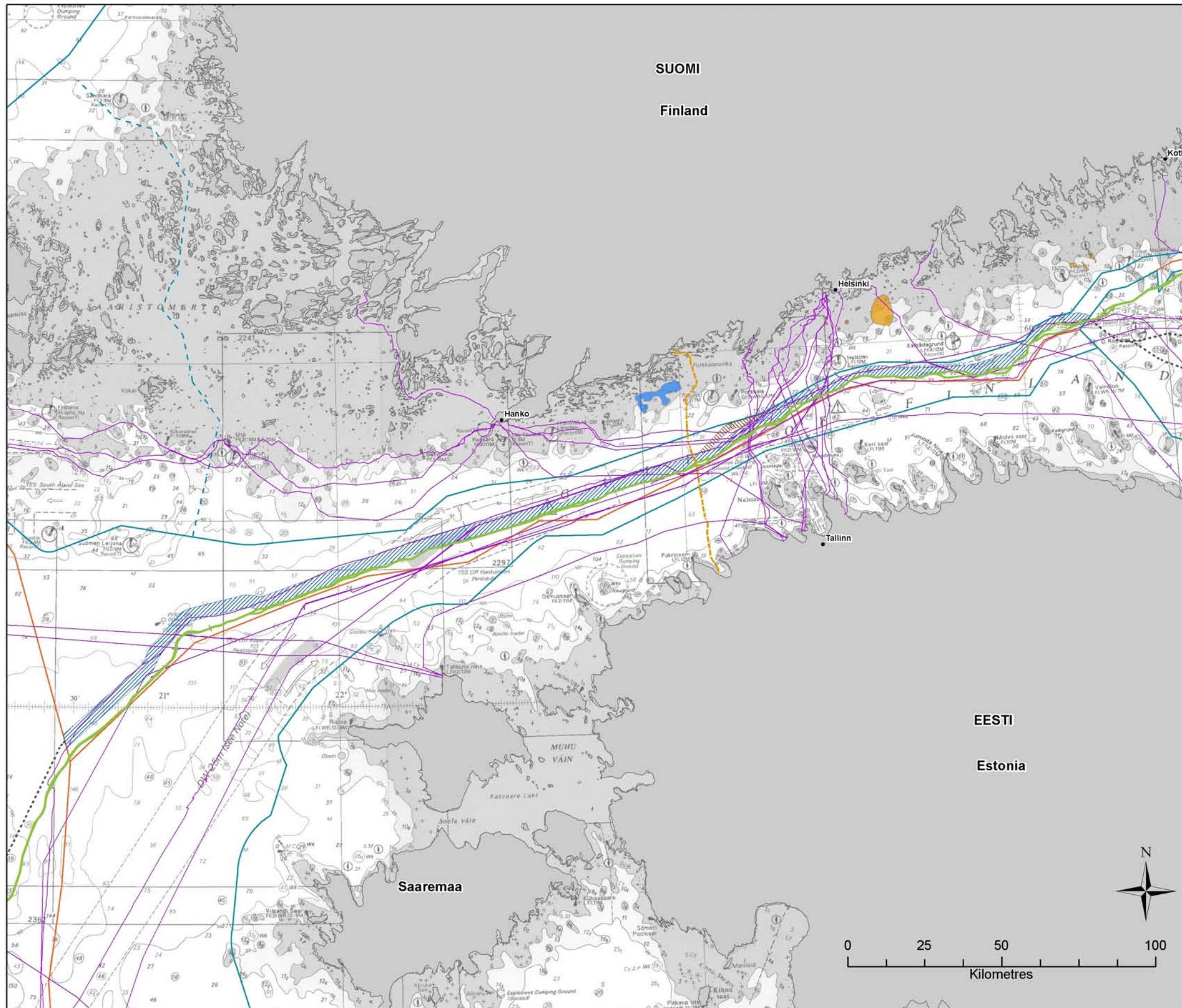
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Map 5

Nord Stream extension

Military areas





- Legend**
- Territorial water limit
 - - - Åland border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - Route option outside Finland
 - Active, inactive and planned cables
 - Nord Stream Pipelines 1 and 2
 - Planned Balticconnector pipeline
 - Proposed windpark
 - Extraction and spoil dumping site
 - Active
 - Planned

General references:

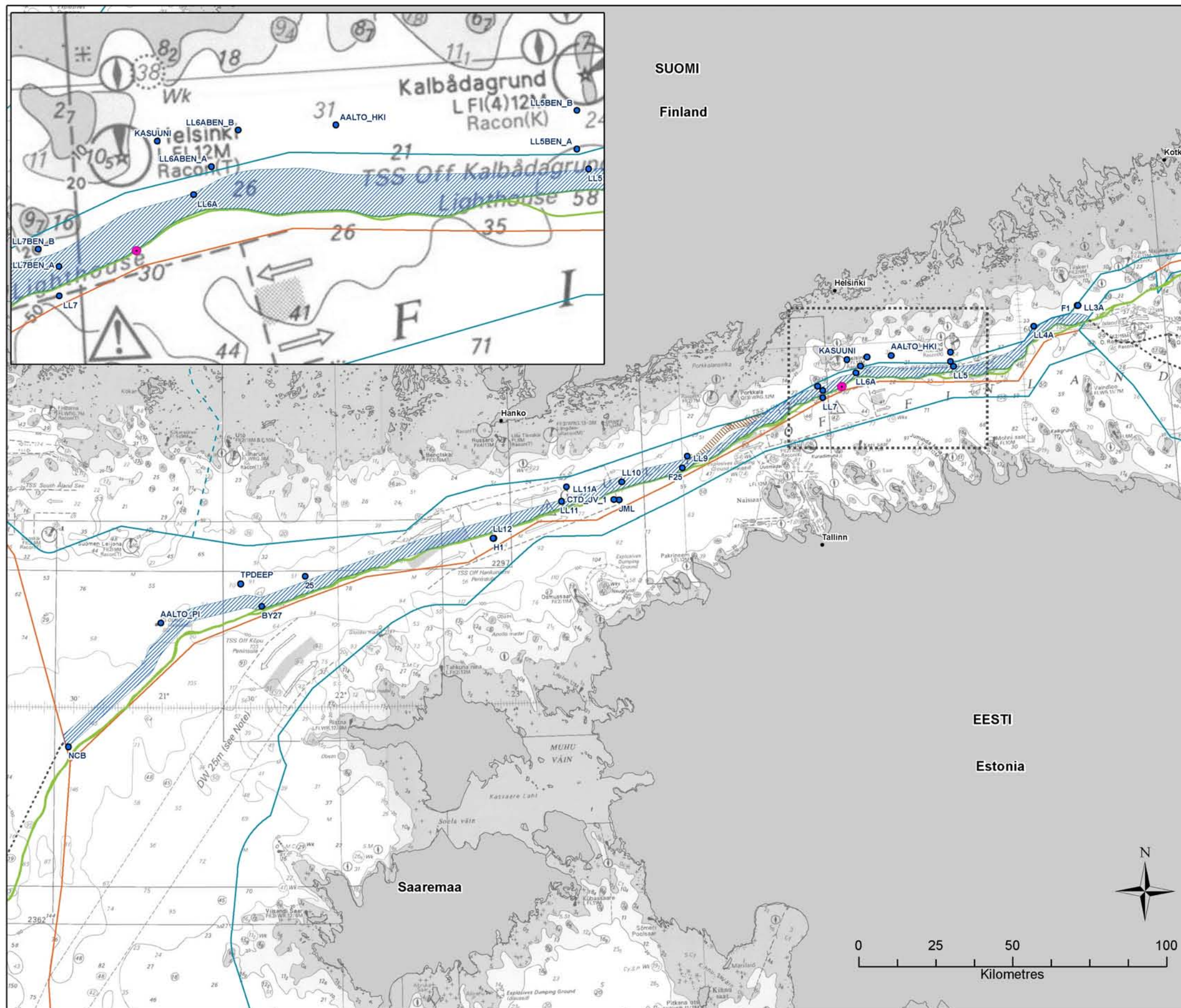
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Map 6

Nord Stream extension
Existing and planned infrastructure





- Legend
- Territorial water limit
 - - - - - Åland border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - Route option outside Finland
 - Nord Stream Pipeline
 - Long term monitoring station
 - Whale remains

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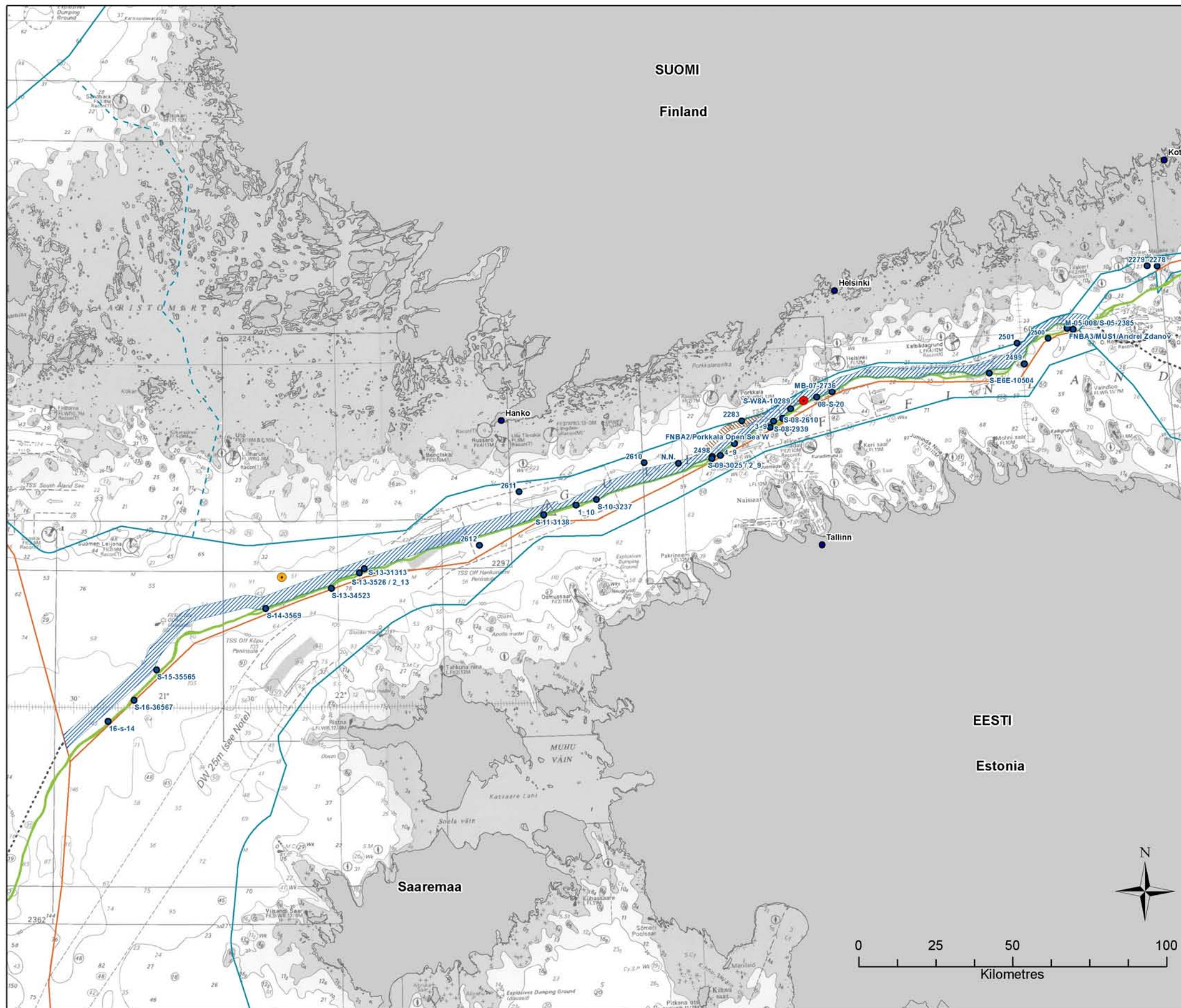
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Map 7

Nord Stream extension

Scientific heritage





- Legend**
- Territorial water limit
 - - - - - Åland border
 - EEZ boundary
 - ALT 1
 - ALT 1a
 - Route option outside Finland
 - Nord Stream Pipeline
 - Cultural heritage
 - Estonia wreck
 - Karella memorial

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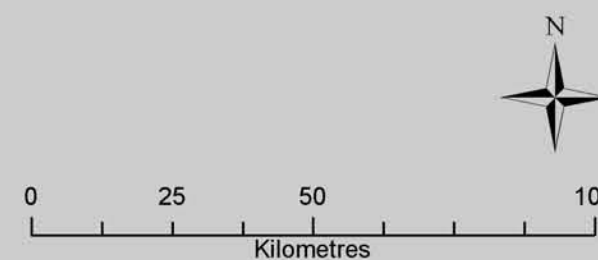
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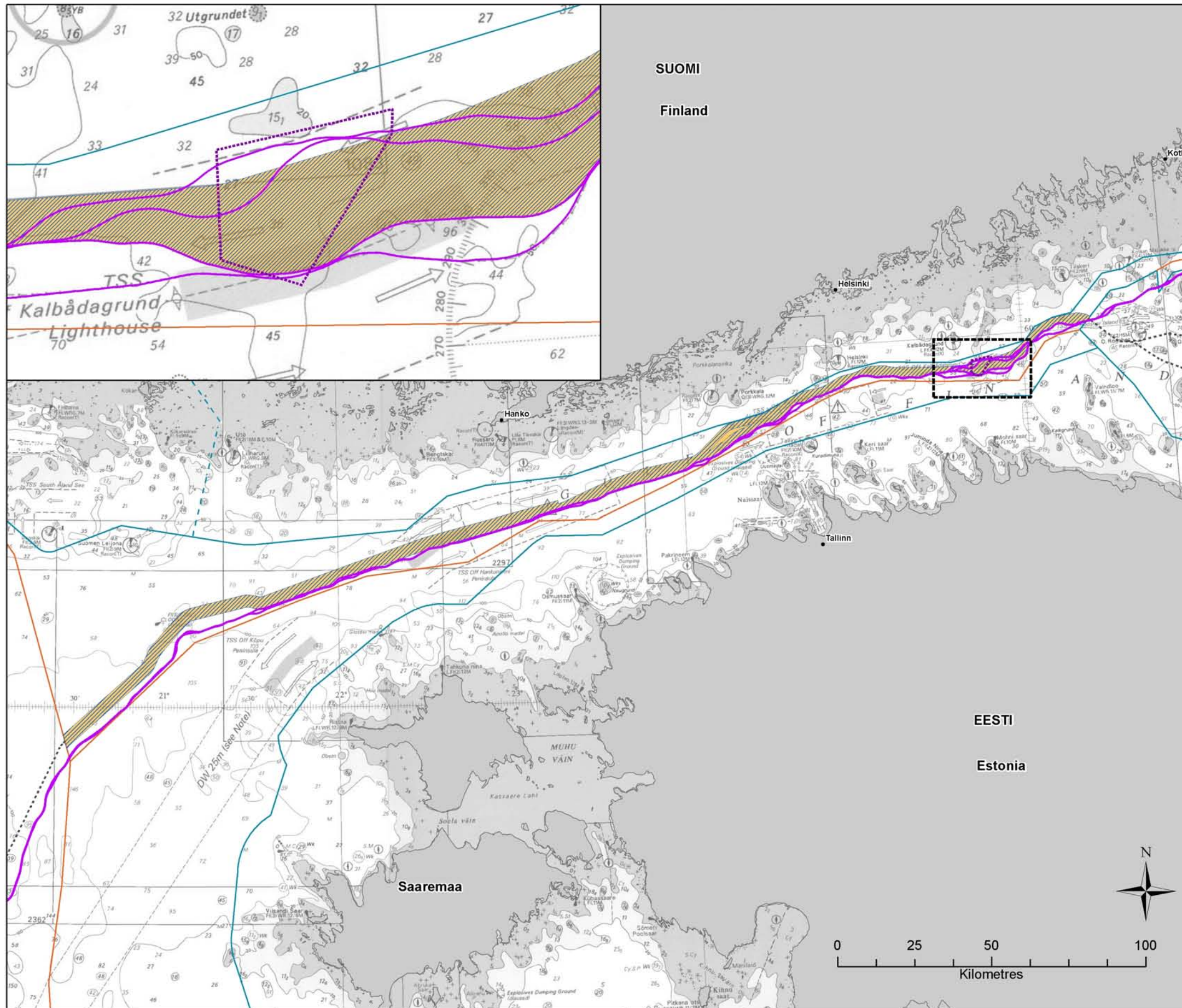
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Map 8

Nord Stream extension

Cultural heritage





- Legend**
- Territorial water limit
 - - - - - Åland border
 - EEZ boundary
 - /// Finnish Alternatives
 - Survey area
 - - - - - Route option outside Finland
 - Nord Stream environmental surveys along the Nord Stream Project route alternatives
 - MMT survey 2008: Kalbådagrund

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Map 9

**Nord Stream extension
 Surveys**

