BALTICCONNECTOR

Natural gas pipeline between Finland and Estonia

January 2014

Environmental Impact Assessment Programme

Gasum

RAMBØLL

Contact information

Developer

Gasum Oy
Add. Miestentie 1, P.O.BOX 21, FI-02151 Espoo, Finland
Email: firstname.surname@gasum.fi
Tel.: +358 20 4471
Contact person: **Eero Isoranta**

Coordinating Authority for the EIA procedure in Finland

Uusimaa Centre for Economic Development, Transport and the Environment (ELY Centre)
Add. Opastinsilta 12 B, P.O. BOX 36, FI-00521 Helsinki, Finland
Email: firstname.surname@ely-keskus.fi
Tel.: +358 295 021 000
Contact person: **Leena Eerola**

Permitting Authority for the EIA procedure in Estonia

Ministry of Economic Affairs and Communications
Add. Harju 11, Tallinn 15072
Email: info@mkm.ee
Tel.: +372 62 56 342
Fax: +372 6 313 660
Contact person: **Taivo Linnamägi**

EIA programme consultant

Ramboll
Add: Säterinkatu 6, P.O. Box 25, FI-02601 Espoo, Finland
Email: firstname.surname@ramboll.fi
Tel.: +358 20 755 611
Fax: +358 20 755 6201
Contact persons: **Tommi Marjamäki**
Veronika Verš

Publication	Gasum Ltd
ISBN	978-952-93-3480-3
ISBN (pdf)	978-952-93-3481-0
Maps	© Logica, maanmittaustoimisto lupa nro 3/MML/13
Printing	Picaset Oy, Helsinki

Foreword

Gasum Oy is planning for a natural gas pipeline, which connects Finland and Estonia. The name of the project is Balticconnector. This environmental impact assessment programme launches the environmental impact assessment procedure (EIA procedure) in Finland and Estonia. The EIA procedure will be applied in both countries according to national legislation. Due to the international dimension of the project, the obligations of the Espoo Convention on Environmental Impact Assessment in a Transboundary Context as well as the bilateral agreement between the Government of the Republic of Finland and the Government of the Republic of Estonia on Environmental Impact Assessment in a Transboundary Context will also be observed in the EIA procedure.

The goal of the environmental impact assessment is to investigate the environmental impacts of the project in Finland and Estonia. The location of the natural gas pipeline from Inkoo in Finland to Paldiski in Estonia is examined in the EIA procedure. The studied pipeline route includes alternative alignments in Finland and Estonia. The aim of the Balticconnector offshore pipeline is to connect the gas transmission networks of Finland and Estonia, which would significantly improve the regional availability and supply of gas, and thus promote the reliability of gas transmission in different circumstances in Finland and the Baltic countries.

The Balticconnector natural gas pipeline project is categorised as a priority project in the European Union and has therefore already been previously granted Community financial assistance from the TEN (Trans-European Networks) -programme founded by the EU. Balticconnector is included in the list of "Projects for Common Interest" (PCI), which was published in autumn 2013. The EU support applications for this part will be submitted during 2014.

The Balticconnector natural gas pipeline will be connected to the existing gas network in Finland and Estonia as well as to the planned Finngulf LNG-terminal in Inkoo. The development of the LNG terminal project is underway. The offshore pipeline will also be equipped with a compressor station in both countries, which will also enable bidirectional flow without the operation of the planned LNG terminal.

Gasum Oy, Espoo, February 2014

Summary

Purpose of the project

The Balticconnector natural gas pipeline will connect the gas transmission pipeline networks of Finland and Estonia. Connecting national gas transmission networks would significantly improve the regional availability and security of supply of gas and thus enhance the reliability of energy transmission in various circumstances in Finland and the Baltic countries (Figure 1).

Balticconnector is categorised as a priority project and has therefore been granted Community financial assistance. Previously, the Balticconnector offshore pipeline project became part of the EU founding Trans-European Energy Network (TEN-E) programme. Connecting Finland and Estonia gas infrastructures it will guarantee a more coherent and diversified natural gas grid within the Baltic Sea Region, and there-

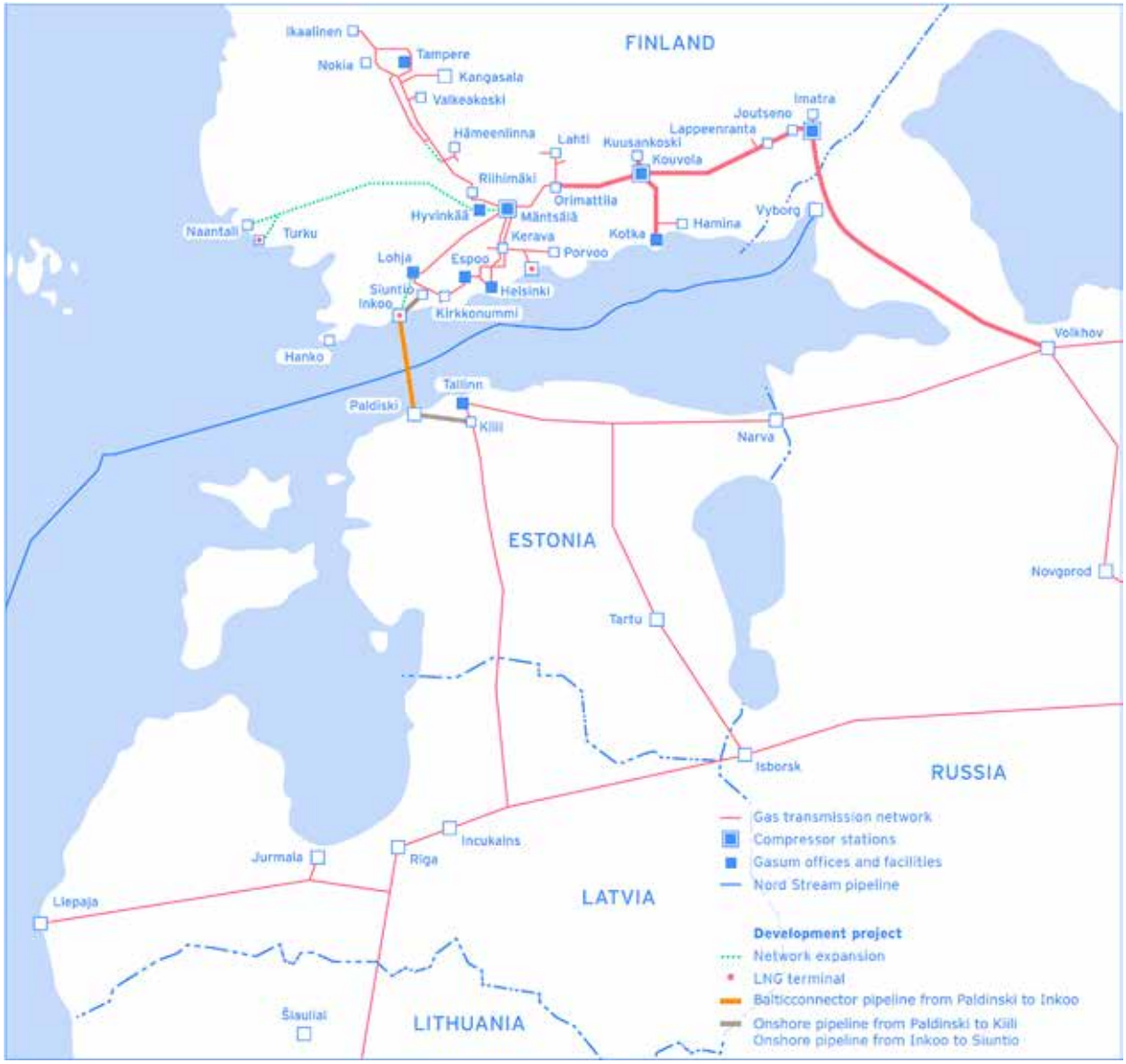

Figure 1. Natural gas pipeline network in the area of the Gulf of Finland

by improve the security of supply of natural gas to the north-easterly EU member states. The offshore pipeline would enable the exchange of natural gas between Finland and Estonia, and at the same time offer the possibility for making use of the underground natural gas storage facilities in Latvia. The pipeline would be able to operate in both directions – as a true 'interconnector' pipeline – making it also possible to transfer natural gas through Finland to Estonia.

If the Baltic Sea regional LNG terminal location will be decided to be in Inkoo, the Balticconnector pipeline will be connected to existing gas network in Finland and to the planned Finngulf LNG terminal in Inkoo. Development of Inkoo LNG terminal project is going on and the environmental impact assessment (EIA report) has been submitted to coordinating authority. Linked to large-scale LNG terminal, Balticconnector would create a coherent natural gas network in the Baltic States and Finland. However, the offshore pipeline will be equipped with a compressor station at both ends to allow bidirectional flow also without the operation of the LNG terminal.

Project description

In the scope of EIA the Balticconnector natural gas pipeline project includes:

- Offshore pipeline from Inkoo to Paldiski;
- Receiving stations (both Finland and Estonia);
- Onshore pipeline from point of landfall to compressor station in Inkoo and from point of landfall to receiving station in Paldiski Kersalu;
- Compressor station in Inkoo.

The developer of the Balticconnector gas pipeline project is Gasum Oy. The offshore pipeline route has been studied and extensive marine surveys conducted in 2006. Additional environmental surveys are carried out in autumn 2013 – spring 2014. The developer's view of the schedule is that it would be possible to start the Balticconnector construction works in the beginning of 2016 and to commission the pipeline during 2017.

Technical overview

Injection capacity to the Balticconnector pipeline will be about 7.2 million m^3/day i.e. about 300.000 Nm^3/h. The annual throughput from the terminal to Balticconnector is estimated to be 5 TWh/a. The planned annual gas transfer capacity of Balticconnector will be two billion cubic meters. In the preliminary plans, the offshore pipeline is of size 20 inches (= 508 mm). The length of the offshore pipeline is about 81 kilometres. The optimisation of the route will take place in connection with the detailed route planning based on geotechnical and geophysical surveys.

The offshore pipeline will be installed by means of a pipe lay vessel of either an anchored or dynamically positioned (DP) type (Figure 2). In deep parts of the Gulf of Finland, the pipeline will remain exposed on the sea bottom. Rock mattresses are used when crossing existing pipelines or cables. The steps of pipeline pre-commissioning include flooding, cleaning and gauging, pressure tests, dewatering and drying / conditioning and gas filling.

Figure 2. S-lay with DP pipelay vessel (Allseas.com, 2013)

Figure 3. Pipe joint provide with PE coating (black) outneath the concrete weight coating

The compressor and receiving station will be placed near the point of landfall of the offshore pipeline and close to the onshore pipeline sections. The gas pressure and flow rate will be raised in compressor station to a level required by the network operation status.

The compressor station will be designed and built according to the requirements defined in EN 12583:2000 (Gas supply systems – Compressor stations – Functional requirements) and other relevant international safety and environmental-protection standards. Noise, flue gas and methane emissions occur to some extent in the vicinity of a compressor station. However, these will not exceed national emission limits and regulations. If a gas turbine driven compressors units are evaluated most suitable for the task and selected task, approximately 60 – 150 t of local CH_4 and 15 – 30 t NO_x flue gas emissions will be emitted per year.

The gas pipeline and Inkoo compressor station will be controlled and monitored from the control centre located in the Kouvola (Finland) natural gas centre, which is permanently staffed. During the operating life of the gas pipes, both internal and external inspections of the pipes will be made on a regular basis. Lifespan of the pipeline is about 50 years. The pipe taken out of use is typically left in place.

Alternatives of the project

In the EIA the following alternatives will be assessed (Figure 4):

- **ALT 0:** Non-implementation of the Balticconnector pipeline. The natural gas pipeline from Paldiski to Inkoo will not be constructed.

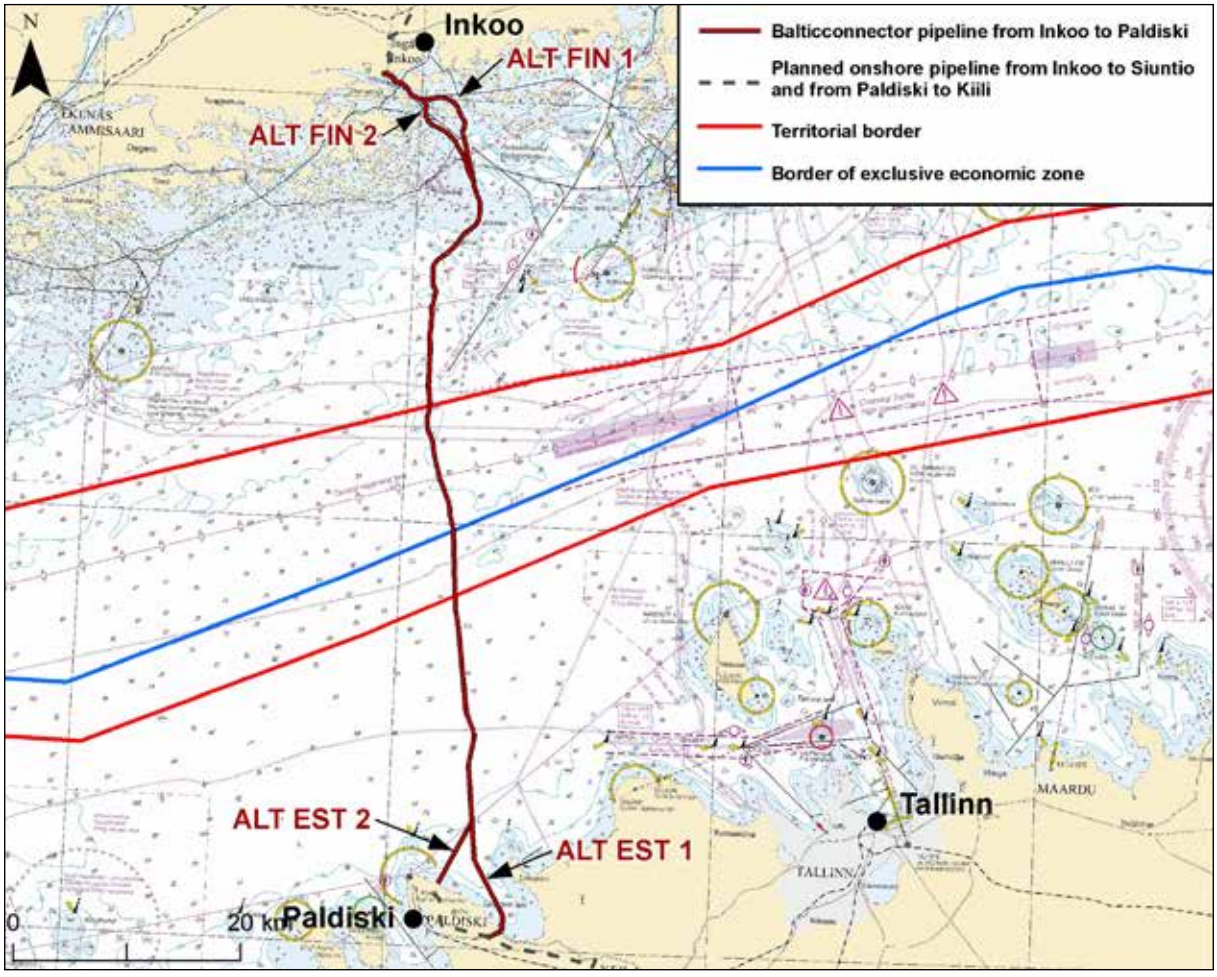

Figure 4. The route of the Balticconnector offshore pipeline

- **ALT FIN 1:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia, to Inkoo, Finland, route north of Stora Fagerön.
- **ALT FIN 2:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia, to Inkoo, Finland, route south of Stora Fagerön.
- **ALT EST 1:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia, to Inkoo, Finland, point of landfall in Kersalu in Estonia.
- **ALT EST 2:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia, to Inkoo, Finland, point of landfall in Pakrineeme in Estonia.

The planned point of landfall in Finland is located on Fjusö Peninsula, about two kilometres east of the Inkoo harbour. The area to the north of the planned point of landfall includes a strongly remolded harbor, power plant, quarry and heavy industrial area. There are also functions of the National Emergency Supply Agency, fish harbour and winter storage area for boats. In the Inkoo archipelago, the route of planned pipeline has been examined in two alternatives: north and south of the island Stora Fagerön (Figure 5).

In Estonia, there are two possible points of landfall (Kersalu ALT EST 1 and Pakrineeme ALT EST 2) on the shore of the Pakri Peninsula in the territory of Paldiski municipality (figure 6). The landfall site in Kersalu (Estonia) has been determined to be most suitable by a related spatial plan e.g. taking into account the connection to existing gas network. The optional landfall site in Parkineeme will be considered related to the proposed LNG terminal site in Paldiski.

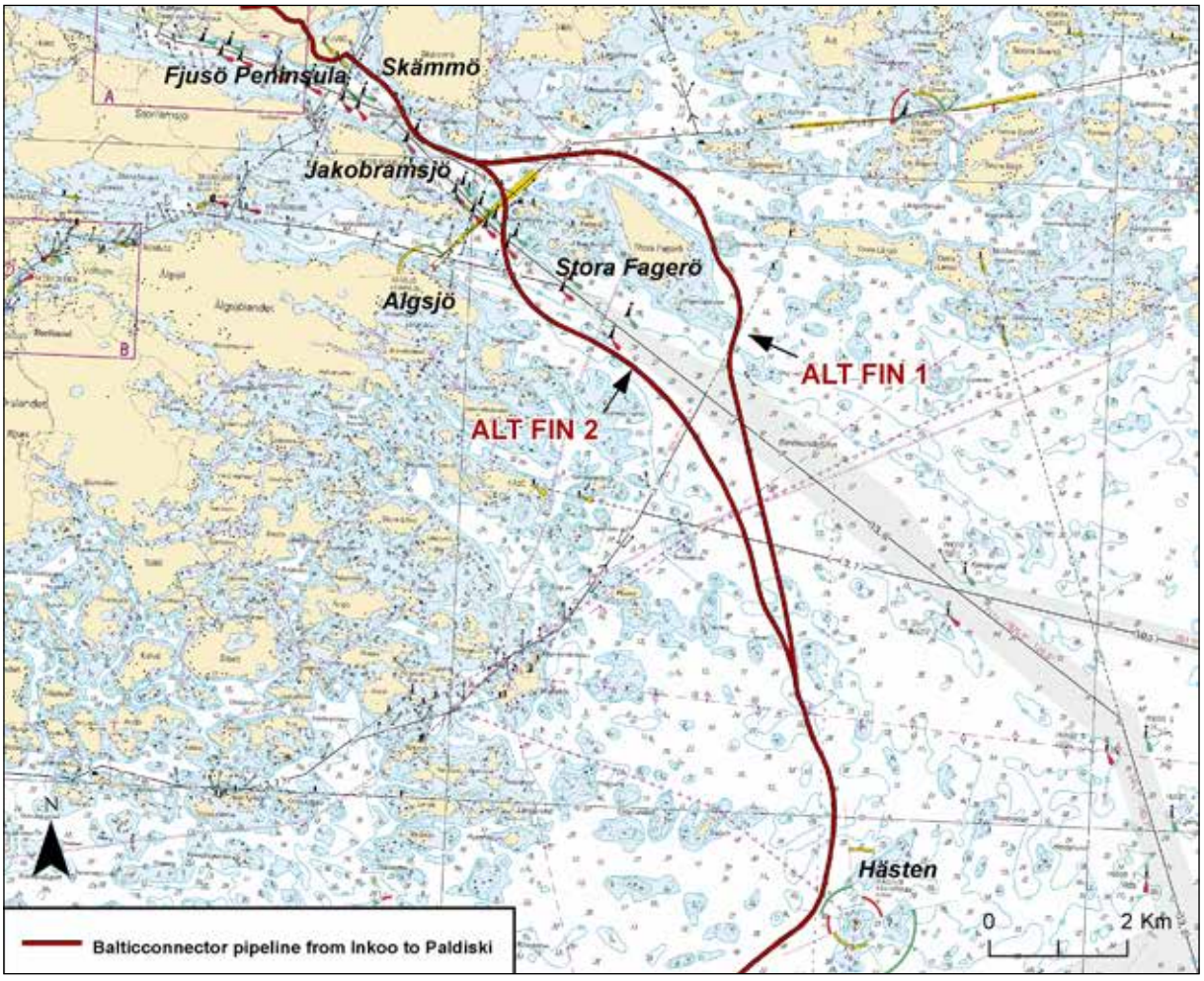

Figure 5. Route alternatives for the gas pipeline in the Inkoo archipelago

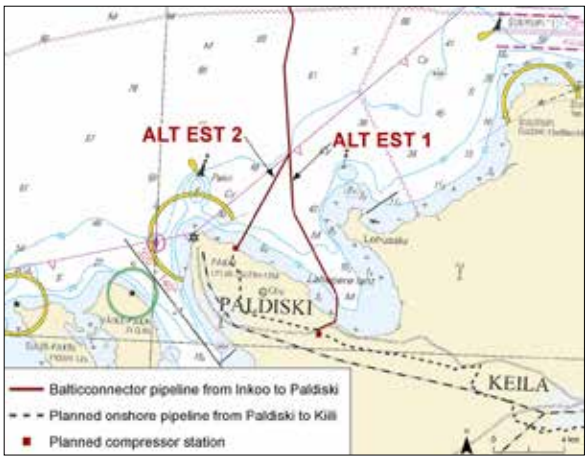

Figure 6. Alternative points of landfall at Pakri peninsula

Current situation in the project area

The planned offshore pipeline crosses the routes of regular ship traffic along nearly the entire route. Both of the route alternatives of the offshore pipeline cross the Inkoo fairway (13.0 m) at one point. The Finnish alternative 1 crosses the fairway at a point where the fairway is wider and somewhat deeper. The Inkoo fairway is about 34 kilometres long and has low traffic and most of it is frequenting the power plant harbour.

In the Inkoo archipelago, there is a high concentration of summer cottages (2,000), in addition to permanent residents (300). For this reason, small boat traffic is very vivacious. Many professional fishermen also move in the Inkoo archipelago on the route of the gas pipeline. Fishing is an important industry for many residents in the archipelago. Bottom trawling is practised only near the coast of Estonia in the Gulf of Finland. In the Pakri peninsula, the low density area suitable for farm buildings and area of summer houses have been preserved in the zone. There are no urban residential areas in close vicinity of alternative points of landfall in Estonia.

In the Finnish offshore project area there are five Natura 2000 areas within 10 kilometres from the planned pipeline. Balticconnector will run through one of the areas, the Inkoo Archipelago. There are also many smaller conservation areas in the vicinity of the planned offshore pipeline, but most of these locate inside the borders of the Natura 2000 areas.

In Estonia, the sea area surrounding the whole Pakri Peninsula (except the aquatoria of harbours of Paldiski) is included in the special conservation area of Pakri Natura 2000. There are also two potential Natura areas onshore at the Pakri Peninsula in the vicinity of the planned pipeline. Project area in the vicinity of the pipeline is mainly dominated by forest lands and bosks on former agricultural lands.

Impacts to be studied

The following impact themes will be included in the environmental impact assessment:

- impacts on the seabed and water quality
- impacts on natural organisms, such as animals, fish and plants
- impacts on protected areas and values and Natura 2000
- impacts on ship traffic and boating
- impacts on land use and land use planning
- impacts on human living conditions, fishing and safety
- impacts on landscape and cultural heritage
- impacts on tourism and recreational use of the areas
- impacts on utilization of natural resources
- impacts on air quality
- noise
- impacts on scientific heritage.

In the assessment, direct and indirect impacts will be assessed during construction, operation and decommissioning. Additionally, cumulative impacts of other related projects (i.e. Nord Stream natural gas pipelines, planned LNG terminal in Inkoo and in Paldiski and the planned onshore pipeline from Paldiski to Kiili) will be taken into account in the assessment.

EIA report will include a separate chapter about transboundary impacts (i.e. impacts on ship traffic). In that chapter likely significant transboundary impacts, which might extend to Baltic Sea region countries, will be described. Other relevant countries (e.g. Sweden, Latvia and Lithuania) to be notified will be decided by the Competent Authorities (ministries of environment) of Estonia and Finland.

The most significant impacts will probably be caused by the pipeline installation operations, such as dredging, blasting, filling and rock placement to even the seabed under the pipeline structures and prevent free-spans. In the operation phase, impacts caused by the project will probably be quite minor mainly including impacts on fishery and ship traffic. Impacts of decommissioning can be assessed after the methods for decommissioning are defined during the planning process. Current situation in the Gulf of Finland and in the project area is characterized in the EIA programme and it will be fulfilled in the EIA report.

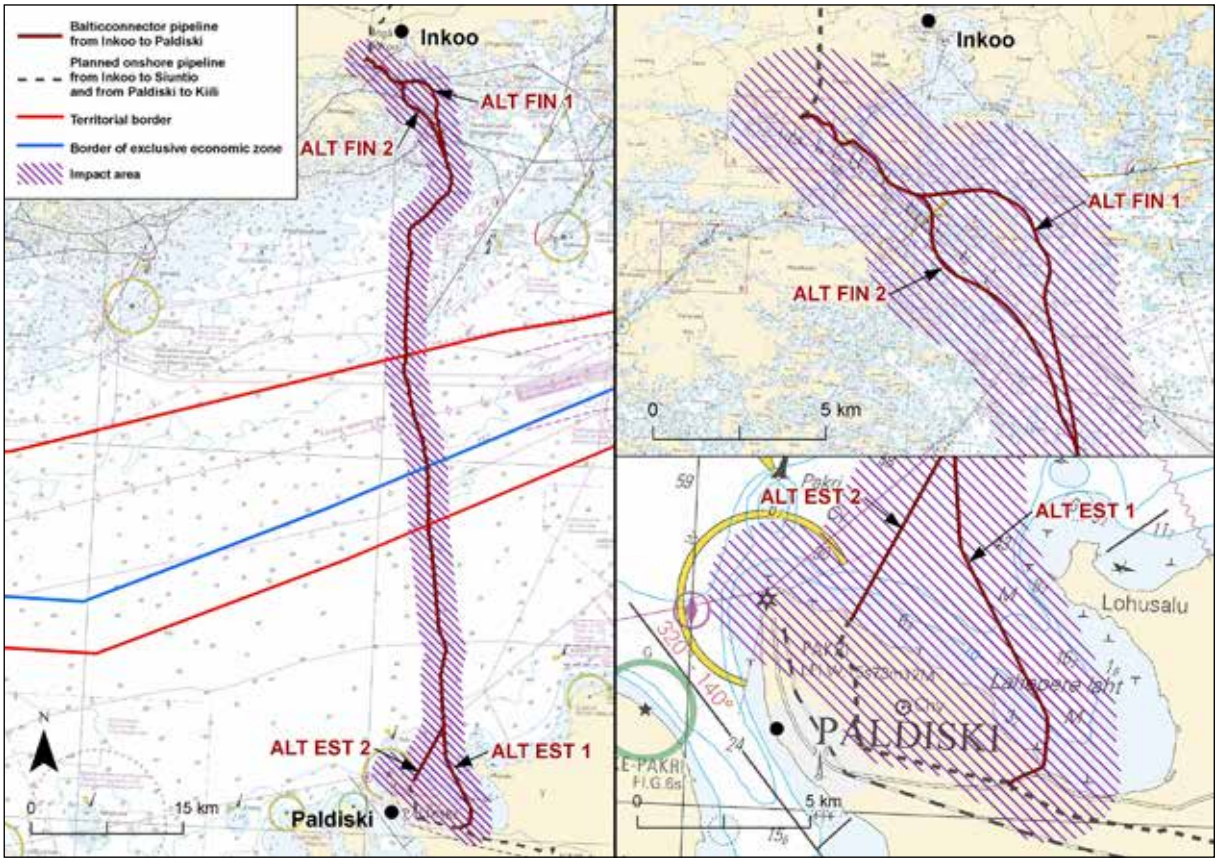

Figure 7. Proposed impact area to be studied

The following methods are used to assess environmental impacts:

- analysis of existing data
- studying the results of existing geotechnical and physical studies
- new field studies (surveys) made along the pipeline corridor and around the points of landfall
- consultations with authorities and institutions
- modelling the distribution of environmental impacts
- expert opinions.

Assessments methods will be determined by the EIA consultant compiling the report, taking account the national requirements for assessment methods. Appropriate assessment of the impacts on Natura 2000 areas will be carried out during the EIA procedure. The report of this assessment will be attached to / part of the EIA report. Ramboll is developer`s consultant. The EIA report will compiled by Pöyry Finland Oy (and it's subcontractors).

Proposed impact area to be studied is shown in the figure 7.

EIA procedure for the project

Because the project has an international dimension, there are two primary international procedures to be followed:

- The Espoo Convention (UNECE Convention on Environmental Impact Assessment in a Transboundary Context)

- The Bilateral Agreement on EIA between Finland and Estonia (Agreement between Finland and Estonia on Environmental Impact Assessment in a Transboundary Context).

The need for assessing the environmental impacts of the project for the part concerning Finland is based on the Finnish Act on Environmental Impact Assessment Procedure. In Estonia, the need for the assessment is based on the EIA and Environmental Management System Act.

The EIA procedure both in Finland and Estonia is divided into two phases:

- In the first phase, the assessment programme presents the impacts to be assessed and the methods to be used in assessing the impacts.
- In the second phase, the actual impact assessment is carried out and the results are compiled in an environmental impact assessment report. The EIA report will be compiled according to national reguirements (both Finnish and Estonian legislation).

The environmental impact assessment will be conducted in an interactive way with various interest groups and authorities. During the display of the assessment programme and report authorities, public and other non-governmental will have the opportunity to express their opinions. The assessment programme and report will be published in Estonian, Finnish, Swedish and in English. In Finland, the competent authority on EIA is the Uusimaa Centre for Economic Development, Transport and the Environment. In Estonia, the Ministry of Economic Affairs and Communications is the permitting authority (announces about the EIA publication in Estonian) and the Government of Estonia is the decision-maker concerning superficies license. The EIA supervisor in Estonia is the Ministry of Environment, as it is a case of transboundary EIA.

Permits needed for the project

Below is a summary (table 1) of licences and permits required in both countries regarding the alignment of the route, construction, operation and chemical and gas safety as well as the safety storage and use of the LNG facilities related to the project.

Table 1. Permits needed for the Balticconnector pipeline project in Finland and Estonia

Activity	Permits in Estonia	Permits in Finland
Pipeline construction and pre-operational testing activities in territorial waters and EEZ	Special water usage permit according to Water Act §8 section 2 points 1,7 and 9 from the Ministry of the Environment (MoE)	Water permit from the Southern Finland Regional State Administrative Agency, ESAVI (construction and use, Water Act)
Environmental surveys concerning pipeline route location	Consent from the Estonian Government, permission granted from the Ministry of Foreign Affairs (MFA) to conduct surveys in the Estonian territorial waters and EEZ until 30.12.2013.	Consent from the Council of State via Ministry of Employment and the Economy (EEZ Act)
Pipeline route in EEZ's (right to use)	EEZ consent from the Estonian Government via MFA (EEZ Act); Superficies licence according to Water act §22[5] from the Estonian Government (permit to burden Estonian sea area with a pipeline)	EEZ consent of the Council of State via Ministry of Employment and the Economy (EEZ Act)
Import and transmission of gas in Estonian territory	Activity permit and 'gas market' permit from the Estonian Competition Authority (ECA) (Natural Gas Act §27, 29 and 47)	-
The construction of the cross-border natural gas transmission pipeline	Permission from the Estonian Government (Natural Gas Act §18[1])	Project license from the Ministry of Employment and the Economy (Natural Gas Market Act, 'gas market' permit)
Gaseous fuel safety in Estonian territory	Protection zone of the gas equipment determined by Estonian Government and registration by Estonian Technical Surveillance Authority (Gaseous Fuel Safety Act §10 section 3 and §19 section 2)	–

Activity	Permits in Estonia	Permits in Finland
Operating as service provider	Permission from the Estonian Competition Authority	–
On-shore pipeline section from the point of landfall to the compressor station	Technical requirements for next steps and other relevant permits(e.g construction permit, etc) from the local municipality (Paldiski municipal government)	–
Safe construction of the pipelines in Finnish territory (onshore, offshore)	–	Construction licence from the Safety Technology Authority (Tukes) according to the Chemical Security Act and the Decree on the Safety Processing of Natural Gas
The storage of natural gas in Finnish territory (onshore, offshore)	–	Construction licence from Tukes, the Chemical Security Act and the Decree on the Safety Processing of Natural Gas
Safe storage of gas in liquid form in Finnish territory	–	Construction licence from Tukes, Chemical Security Act and Dangerous Chemical Decree
State technical inspections	Estonian Technical Surveillance Authority(Gaseous Fuel Safety Act)	Private certified bodies (the Decree on the Safety Processing of Natural Gas Pressure Equipment Act)

Time schedule and participation

The EIA is planned to start by delivering the EIA programme to the competent authority in Finland and by official initiation of EIA procedure by the Government of Estonia. The EIA report is planned to be issued for publication in autumn 2014.

After the EIA programme and report are completed, they will be set on public display in Estonia and in Finland. The summary of EIA programme will be sent to other Baltic Sea region countries with the notification. The summary of the EIA report will be sent for comments to those Parties of the Espoo Convention which have indicated their wish to participate in the EIA procedure.

In Finland, public meetings will be organised during the display of both the EIA programme and the EIA report. In Estonia, similar public meetings will be organised at the end of the display of the programme and the report. Public meetings will be organized in the communities of the impact area of the project, at least in Inkoo in Finland and in Paldiski / Tallinn in Estonia. The EIA procedure concludes in Finland with a statement of the coordinating authority (Uusimaa ELY Centre) and in Estonia with approval of the EIA report by the EIA supervisor (Ministry of Environment).

The preliminary time schedule of the EIA procedure and permitting is shown in the figure 8.

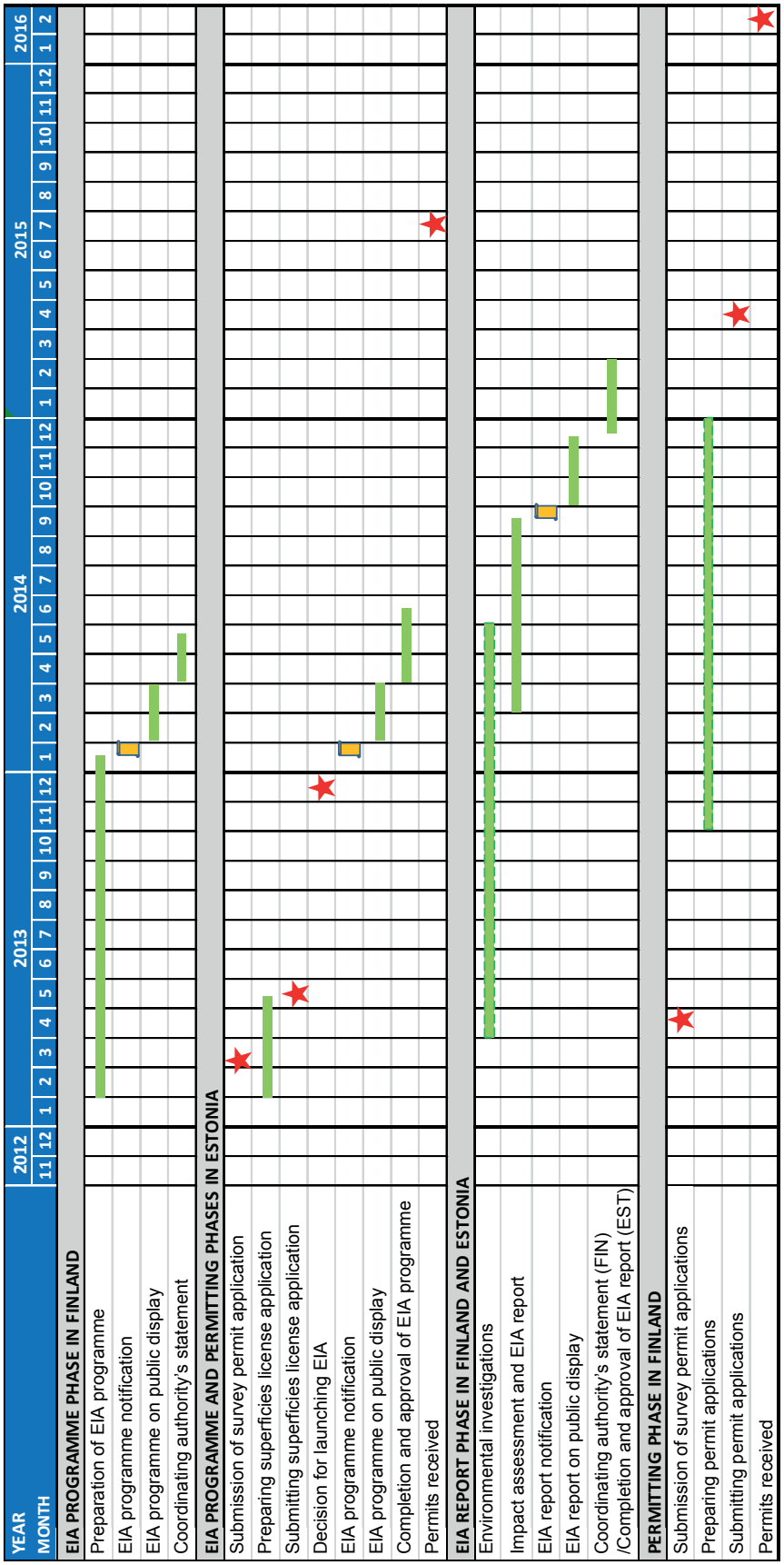

Figure 8. The preliminary time schedule of the Balticconnector EIA procedure and permitting

Contents

1 Project description

1.1 Purpose of the project

The Balticconnector natural gas pipeline will connect the gas transmission pipeline networks of Finland and Estonia. The connection of national gas transmission networks would significantly improve the regional availability and security of supply of gas, and thus enhance the reliability of energy transmission in various circumstances in Finland and the Baltic countries.

Balticconnector is categorised as a priority project and has therefore been granted Community financial assistance. Previously, the Balticconnector offshore pipeline project became part of Trans-European Energy Network (TEN-E) programme founded by the EU. Connecting Finland and Estonia gas infrastructure it will guarantee a more coherent and diversified natural gas grid within the Baltic Sea Region, and thereby improve the security of supply of natural gas to the north-easterly EU member states. The offshore pipeline would enable the exchange of natural gas between Finland and Estonia, and at the same time offer the possibility for making use of the underground natural gas storage facilities in Latvia. The pipeline would be able to operate in both directions – as a true 'interconnector' pipeline – making it also possible to transfer natural gas through Finland to Estonia.

The planned Finngulf LNG terminal in Inkoo will be directly connected to the Balticconnector pipeline. The LNG terminal project is going on and the environmental impact assessment (EIA report) has been submitted to the coordinating authority, which will announce its statement on the report in September 2013. Linked to the large-scale LNG terminal, Balticconnector would create a coherent natural gas network in the Baltic States and Finland. However, the offshore pipeline will be equipped with a compressor station at both ends to allow for a bidirectional flow also without the operation of the planned LNG terminal.

1.2 Background of the project

Finland has been importing natural gas from Russia since 1974. At present, the length of the gas pipeline network in Finland is over 1,000 kilometres. Annual gas consumption is approximately 3.5 billion cubic metres, which corresponds to 8.5 per cent of Finland's total energy consumption. Gasum Oy has been the sole importer of gas to Finland since 1994. Gas imports are based on an agreement between Gasum Oy and OAO Gazprom, which is valid until 2025.

Natural gas is imported into Estonia from Russia and from the Inchukalns underground gas storage in Latvia. Gas is distributed to customers through gas pipelines, distribution stations and gas pressure reducing stations. In Estonia, the main distributor of natural gas into Estonian economy is the Eesti Gaas Group (share of retail market of over 90 %) through its different businesses: AS Eesti Gaas, AS Eesti Gaas Ehitus and AS EG Võrguteenus. According to Eesti Gaas economic report of 2011, the company sold nearly 631 million cubic metres of natural gas. A share of 91% of this quantity was purchased by free consumers (ie. industries) and less than 9 % by households.

New alternative routes for natural gas transport could significantly improve the availability and security of supply of gas, and thus increase natural gas consumption in Finland and the Baltic countries. Balticconnector is categorised as a priority project and has therefore been granted Community financial assistance. Funding has partially financed the preliminary technical engineering of the offshore pipeline, geotechnical and geophysical surveys and environmental studies.

Offshore pipeline project would only be justified on economic and operational grounds – as well as security of supply considerations – if gas supply to the region could be secured through import by means of Liquefied Natural Gas (LNG) carriers. The EIA process in Finland for Finngulf LNG project, which is closely connected to the Balticconnector project, is finished.

0 shows the existing gas pipeline connections in the Gulf of Finland region and the proposed route of the Balticconnector offshore pipeline.

1.3 Project developer

The developer of the Balticconnector gas pipeline project is Gasum Oy. The Gasum Group comprises the parent company Gasum Oy (Business ID 0969819-3) with its subsidiaries Gasum Paikallisjakelu Oy (Business ID 2393280-4) and Gasum Energiapalvelut Oy (Business ID 1680021-3), Kaasupörssi Oy, Helsingin Kaupunkikaasu Oy, Gasum Tekniikka Oy and Ga-

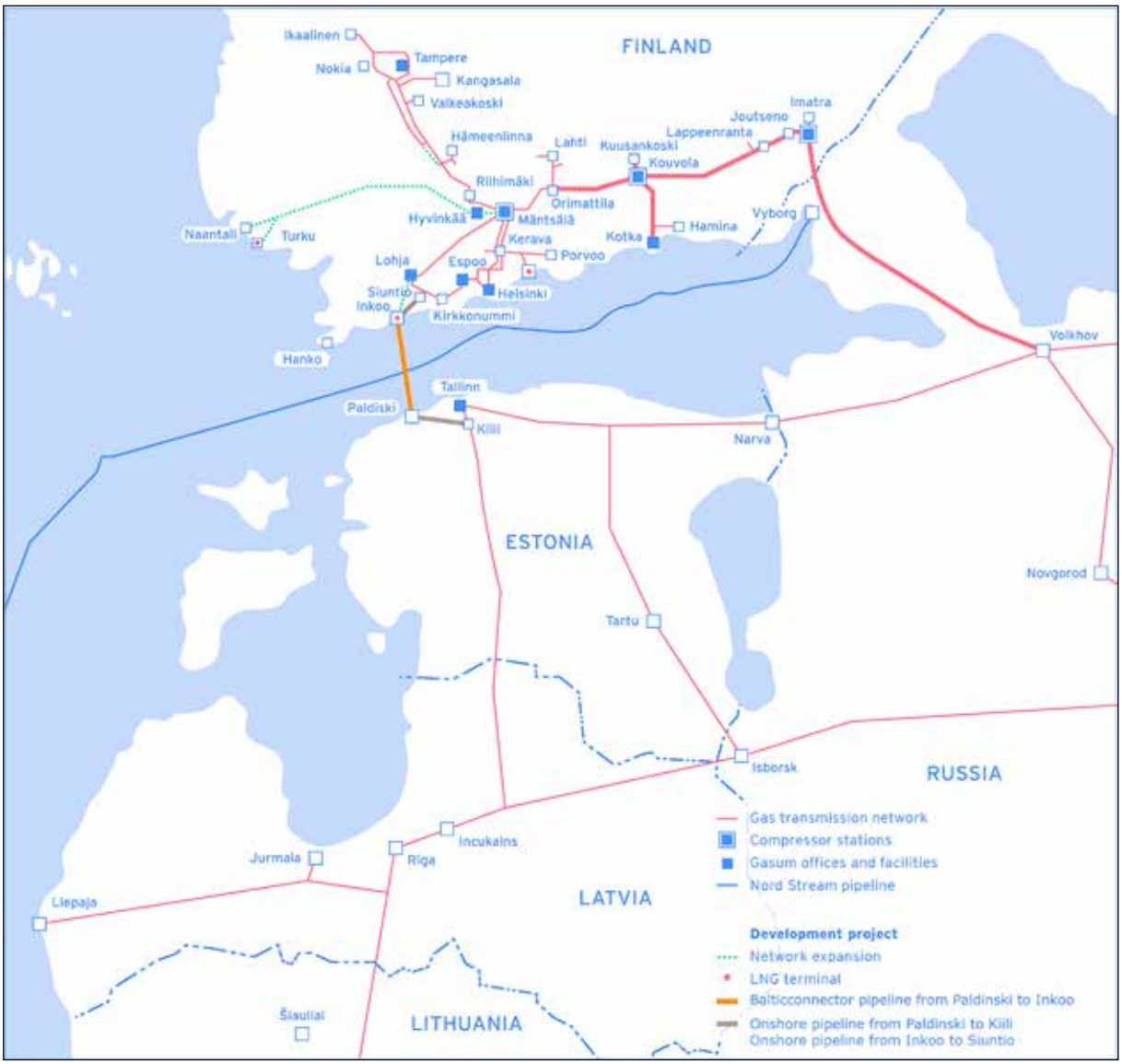

Figure 1.1. Natural gas pipeline network in the area of the Gulf of Finland

sum Eesti AS. Pursuant to the Regulation (EC) No 1893/2006 the statistical classification of economic activity (EU NACE Code) of Gasum Oy is 46.71 (Wholesale of solid, liquid and gaseous fuels and related products). Gasum Oy has been ordered in its natural gas network license to take the responsibility for the technical operability and reliable operation of the natural gas transmission system and to tend to the duties related to the balance responsibility of the transmission system in an appropriate manner and in a way that is objective and non-discriminatory in respect of the parties to the natural gas market (systems responsibility). Gasum is set to be the Finnish national TSO (Transmission System Operator).

The project partner of Gasum Oy in Estonia is AS EG Võrguteenus, which is an Estonian transmission system operator.

1.4 Balticconnector gas pipeline project

The EIA procedure of the Balticconnector pipeline project should include the assessments of:

- Balticconnector offshore pipeline from Inkoo to Paldiski;
- Receiving stations both Finland and Estonia;
- Onshore pipelines from point of landfall to compressor station in Inkoo and from point of landfall to receiving station in Paldiski Kersalu;
- Compressor station in Inkoo.

During 2013, Gasum will organise environmental surveys, which are needed for the assessment of impacts caused by the project (see chapter 8.2.1 Environmental surveys).

1.4.1 Route of the gas pipeline

A whole range of factors have been taken into consideration in the identification of the route of offshore pipeline including: the length of the route, the adjoining areas, fairways, military activity, anchoring areas, geophysical characteristics, and bathymetry. Geotechnical and geophysical surveys via offshore route have been undertaken in 2006 by Marin Mätteknik AB.

The proposed route is the result of an assessment of different alter-natives. When comparing the alternatives, efforts have been made to find a route that meets strategic, technical, environmental and economic criteria. The proposed route has the following characteristics:

- Offshore section from Paldiski to Inkoo is approximately 81 km;
- The section from the Finnish point of landfall to the compressor station in Inkoo is preliminary 1–2 km (depending upon the alternative);
- The section from the Estonian point of landfall to receiving station in Paldiski Kersalu (ALT EST 1), length approximately 1.3 km.

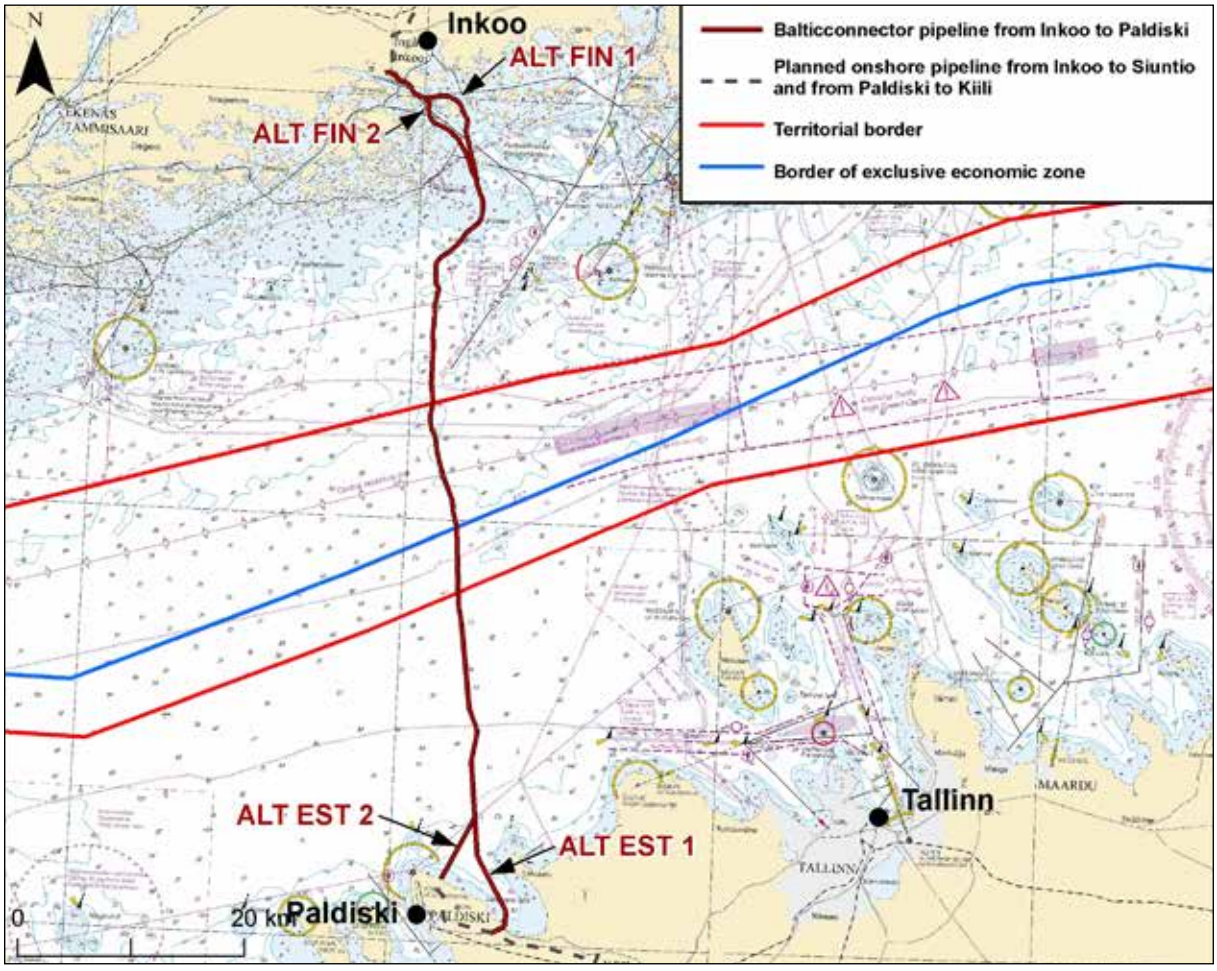

Figure 1.2. The planned route of the Balticconnector offshore pipeline

The final route of the pipeline will be determined on the basis studies of the surroundings of the possible pipeline routes, points of landfall and locations of land-based facilities. Gasum Oy has applied for a consent to conduct surveys in the Estonian waters on 11 March 2013. The consent has been issued and the surveys will be done until 30th of December 2013.

Factors to be considered, when assessing the suitability of an area, include:

- proximity to residences;
- environmental aspects;
- existing gas network;
- location and suitability of areas for project buildings;
- land use planning regulations and guidelines;
- other official guidelines and requirements.

The planned route of the Balticconnector offshore pipeline is shown in Figure 1.2.

1.4.2 Route of the gas pipeline in Finland

There are two route alternatives that have been investigated for the approach to the Inkoo harbour. The Finnish alternative route 1 passes to the north and east of Stora Fagerön and crosses the fairway southeast of Stora Fagerön. The Finnish alternative route 2 crosses the fairway west of Stora Fagerön closer to the Inkoo harbour and proceeds southward between Stora Fagerön and Älgsjön (Figure 1.3). Routes meet before passing west of the Hästen lighthouse. From there, the route goes into deeper parts of the archipelago towards Estonia, passing the Enoksgrund shoal, to the east.

In the Inkoo archipelago, the route alternative 1 crosses the fairway at a point where it is wide and relatively deep, whereas route alternative 2, after crossing the fairway, runs parallel to it for several kilometres. In terms of potential risk caused by ship traffic to the pipeline, the alternative route 1 is more

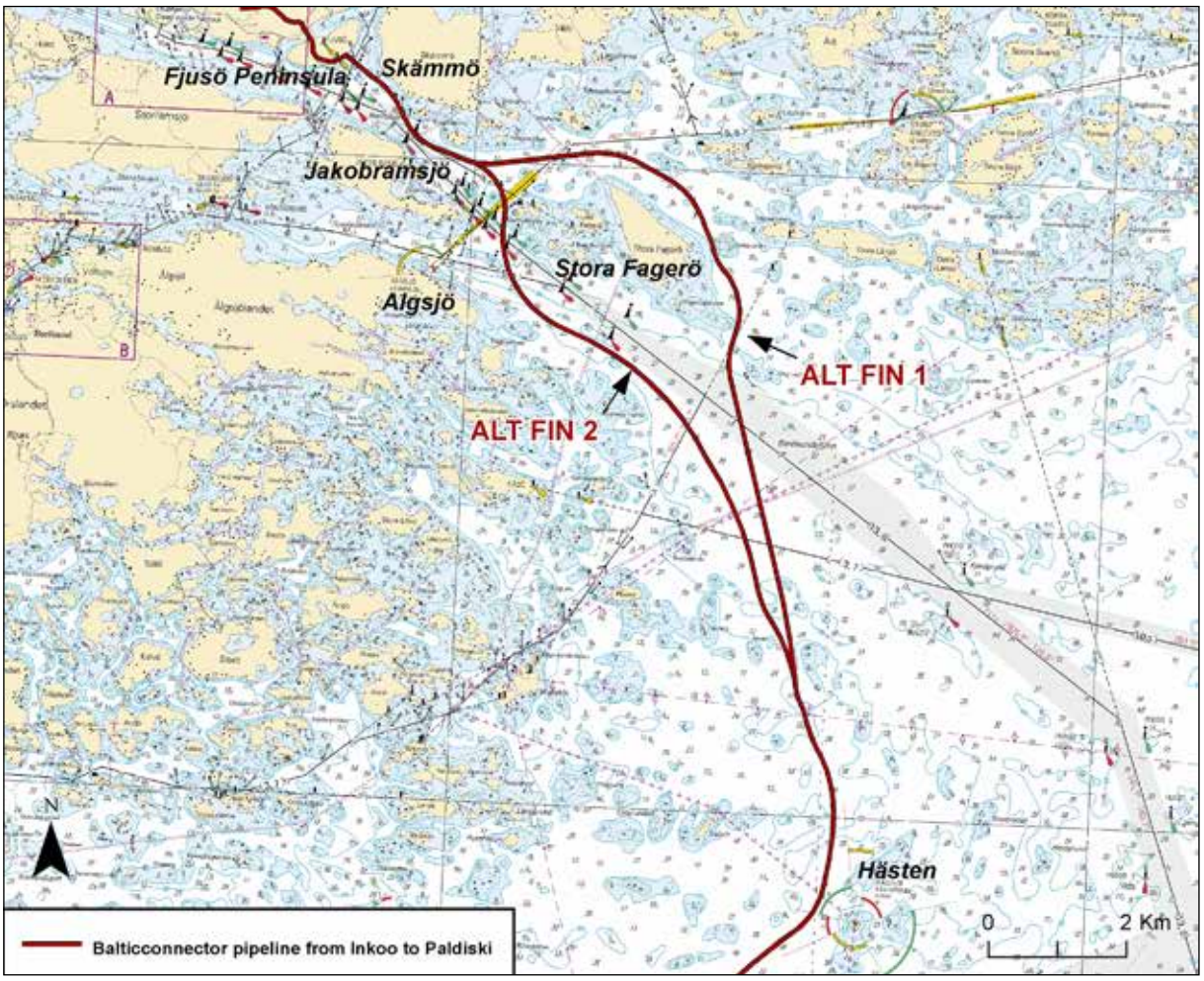

Figure 1.3. The Finnish route alternatives for the gas pipeline in the Inkoo archipelago

preferable, although it is longer than the other alternative. The final selection between the two alternatives will be made on the basis of environmental impact assessment and surveys including bathymetry, geotechnical and geophysical characteristics, risk analyses etc.

In Finland, the preliminary point of landfall is located on the Fjusö Peninsula (Figure 1.4 and Figure 1.5), about two kilometres east of the Inkoo harbour. The exact point of landfall is to the north of the ship-turning area between the Inkoo fairway (13 m) and the islands of Jakob Ramsjö and Skämmö. The water depth at the intersection of the fairway and the gas pipeline (ALT FIN1 and ALT FIN2) is approximately 23–30 metres.

Figure 1.4. Balticconnector offshore pipeline preliminary point of landfall in the Fjusö Peninsula in Finland (Ramboll 2010)

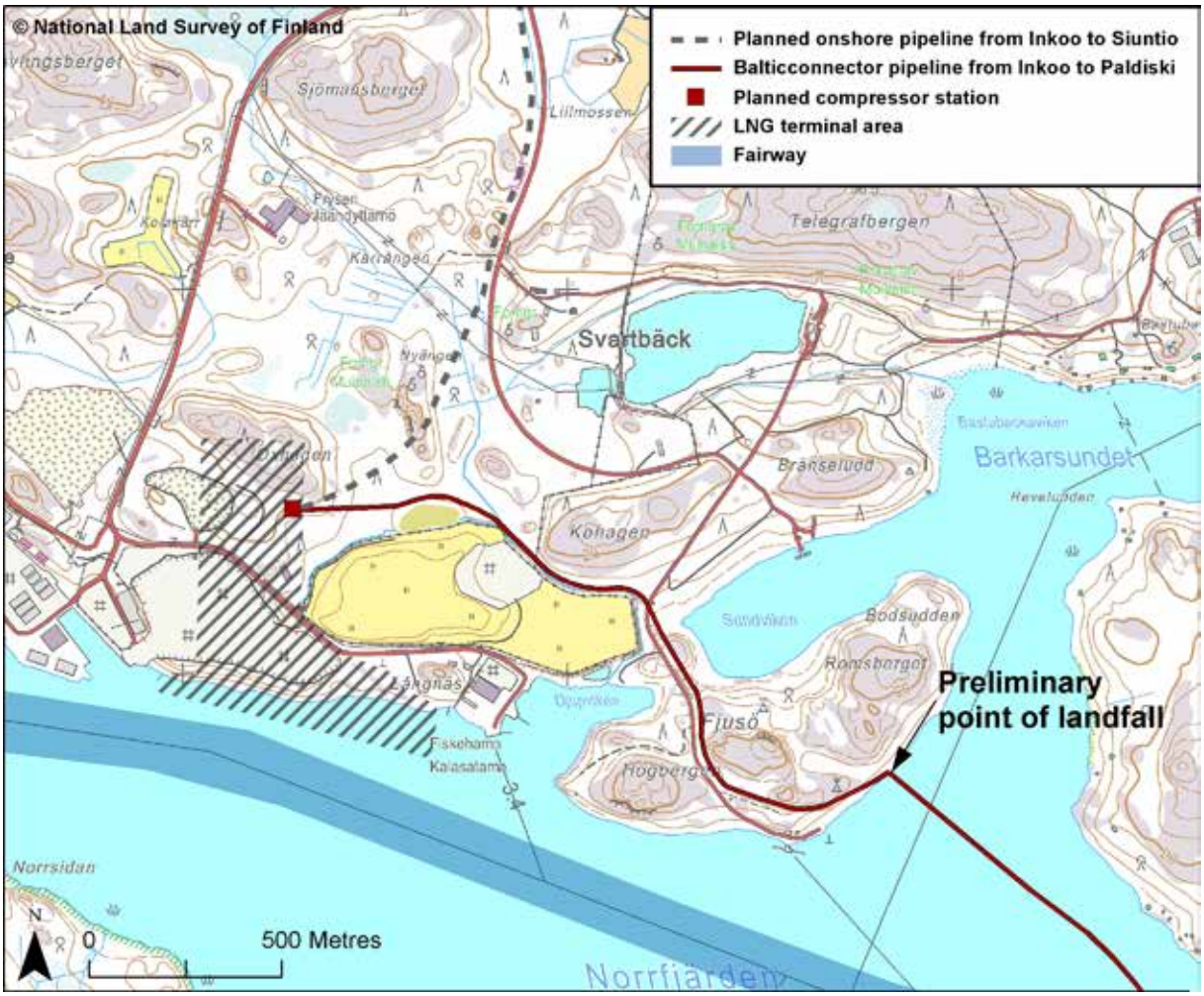

Figure 1.5. Gas pipeline preliminary point of landfall in Inkoo, connection to the Inkoo–Siuntio gas pipeline, the planned LNG terminal alternative 2 and the preliminary location of the compressor station

1.4.3 Route of the gas pipeline in Estonia

There are two possible alternatives for points of landfall in Pakri peninsula in Estonia: Kersalu (ALT EST 1) and Pakrineeme (ALT EST 2) (See Figure 1.6).

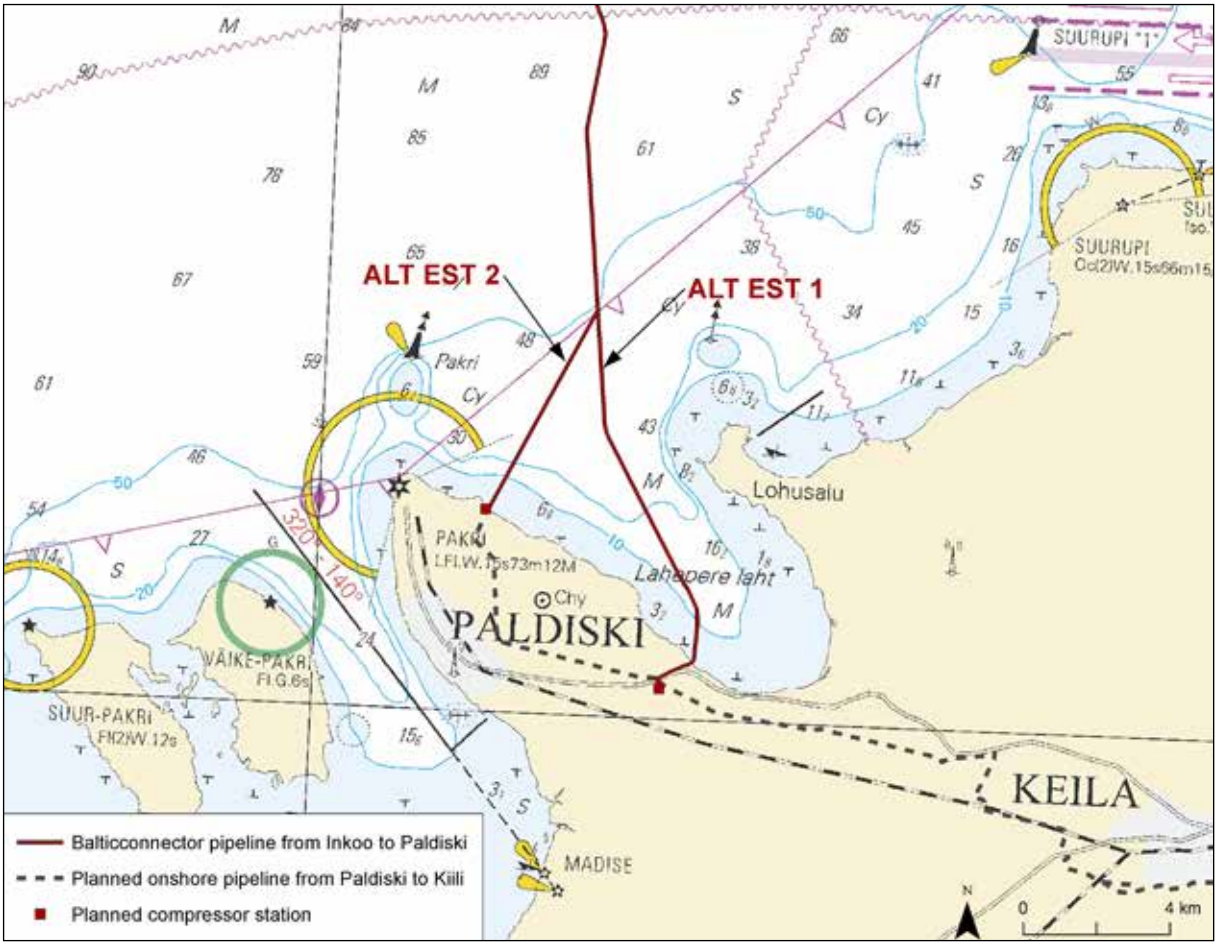

Figure 1.6. Alternative points of landfall at Pakri peninsula

The ALT EST 1 for the point of landfall is located in the shallow Lahepere Bay and the pipeline reaches the land in Kersalu very close to the border of the Paldiski municipality and Keila parish (Figure 1.7). The distance from the point of landfall to the centre of Paldiski municipality is about 6.5 kilometres, and the distance to Tallinn is about 50 kilometres.

The possible alternative 2 (Pakrineeme) for the point of landfall in Estonia is on the north-eastern shore of the Pakri peninsula in the territory of the Paldiski municipality (Figure 1.8).

The point of landfall in Kersalu, section from the point of landfall to the compressor station and the location of the compressor station are determined by Paldiski city's comprehensive plan`s thematic plan called "D-category natural gas pipeline location on the Paldiski city territory", which has been approved by the local Paldiski city council on 22 December 2011 (Paldiski city 2013a).

The optional point of landfall in Pakrineeme (ALT EST 2) will be considered related to the proposed LNG terminal site in Paldiski.

The onshore pipelines from receiving stations to compressor stations will be part of another project (by Estonian developers) (Figure 1.9).

Figure 1.7. Point of landfall in Kersalu Estonia (Ramboll 2013)

Figure 1.8. Point of landfall in Pakrineeme in Estonia (Ramboll 2013)

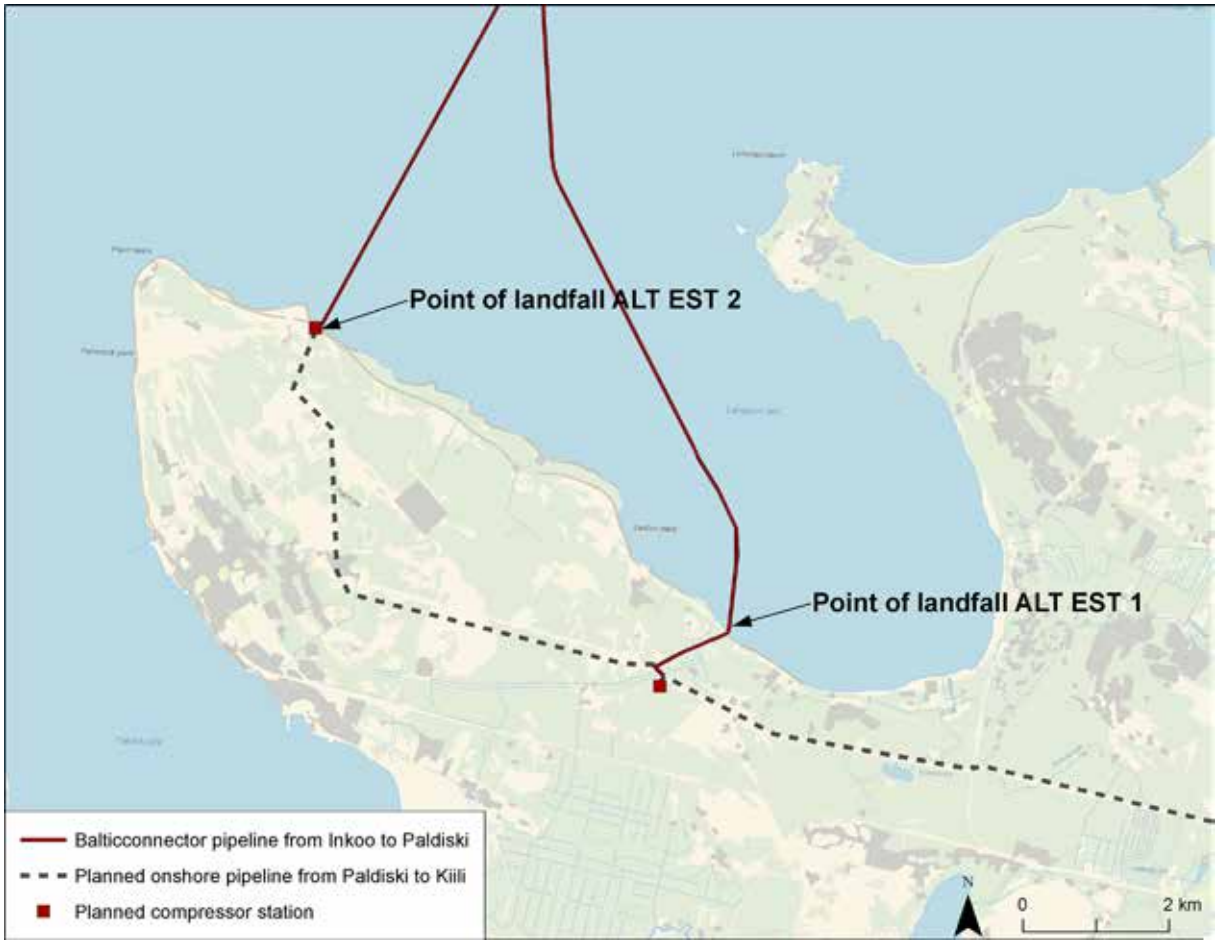

Figure 1.9. Gas pipeline points of landfall in Paldiski, preliminary connection to the Paldiski – Kiili gas pipeline and location of the planned compressor stations

1.4.4 Lifespan of the pipeline

The following Figure 1.10 shows the relevant phases of the lifespan of the pipeline.

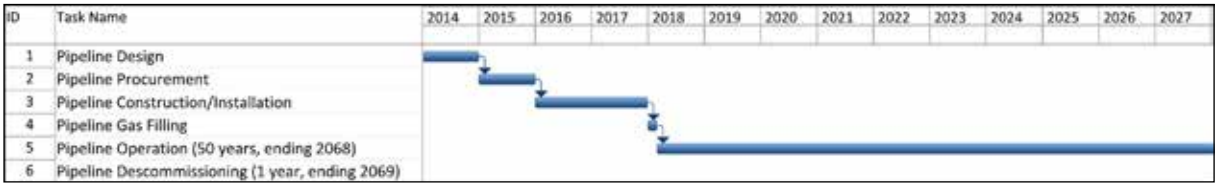

Figure 1.10. Lifespan and the relevant phases of the pipeline

1.4.5 Characteristics and installation of the gas pipeline

The injection capacity to the Balticconnector pipeline will be about 7.2 million m^3/day i.e. about 300,000 Nm^3/h. In the preliminary plans, the pipeline is of size 20 inches (=508 mm). The offshore pipeline will be installed by means of a pipe lay vessel of either an anchored or dynamically positioned (DP) type. Depending on the choice of lay vessel, it will be supported by anchor handling tugs, pipe supply vessels and survey (monitoring) vessels (Figure 1.11).

Figure 1.11. Typical pipelay vessels - DP pipelay vessel (Solitaire) and a pipelay barge (Castroro Sei)

The individual pipe sections will be approximately 12 metres long. When they are delivered to the lay vessel, they will be assembled into a continuous pipe string and laid to the seabed. The process on-board the lay vessel comprises the following general steps, which take place in a continuous cycle:

- Welding of pipe
- Non-destructive testing (NDT) of welds
- Field joint preparation
- Laying on seabed

The welding of new single pipes into the continuous pipe string onboard the lay vessel will be performed as either a semi- or fully automated welding process.

After welding the field-joint welds will be checked by NDT (Non-destructive testing) in order to identify damage and irregularities in materials. The testing will be performed by automatic ultrasonic testing, which will locate, measure and record defects. Welding defect acceptance criteria will be established prior to the start of construction and it will be subject to approval by appointed certifying agencies. After welding and testing, the field joints will be protected against corrosion.

When the welding process is complete, the vessel will be moved forward, a distance corresponding to the length of one or two pipe sections. Following this move, a new pipe section will be added to the pipe as described above. As the lay vessel is moved forward, the continuous pipe string exits at the rear end of the vessel into the water supported by a 'stinger' extending 40 – 140 m behind and below the vessel. The stinger has the function of controlling and supporting the pipe configuration.

Pipe-laying will be performed as a conventional S-lay (Figure 1.12). A typical S-lay procedure has three main components:

- The stinger, which extends the ramp to reduce the length of the sag bend. The overbend usually starts behind the tensioners and describes the curve under which the pipeline is entering the water.
- The tensioner, which reduces the stress in the overbend and sag bends. The sag bend describes the bending, under which the pipeline is laid on the seabed.
- The positioning system, which controls the position of the vessel. The vessel position must be kept under the specified tension needed to keep the sag bend within the bending limitations of the pipe.

Figure 1.12. S-lay with DP pipelay vessel (Allseas.com, 2013)

To ensure minimum interference with pipe-laying operations by ship traffic, an exclusion zone will be established around the lay vessel. The width of the area will be identified in the EIA report. Unauthorized ship traffic, including fishing vessels, will not be permitted to enter the exclusion zone during the construction period. The diameter of the exclusion zone will depend upon the type of lay vessel used and be subject to negotiations with the relevant authorities. When using an anchored lay vessel, detailed preparation of the construction activities is required determining the anchor patterns to be used. In the case of the pipe lay in the Gulf of Finland, this is particularly important due to the prevailing munitions, barrels and wrecks on the sea floor that must be avoided.

The pipeline will typically be installed on the seafloor, however in some areas it may be required to protect the pipeline e.g. dragged ship anchors. Protection can be provided either by trenching the pipeline into the seabed or covering it by rocks (Figure 1.13).

Normally, the pipeline will be trenched or covered by rocks close to the point of landfall to ensure pipeline stability. Furthermore, rock mattresses are used when crossing the existing pipelines or cables.

In deep parts of the Gulf of Finland, the pipeline will remain exposed on the sea bottom. To prevent scraping by ice scouring, the pipeline will be buried near the coast and shoals.

Depending upon the geophysical characteristics of the seabed and the bathymetry, the pipeline may require to be buried. After pipeline installation, the pipeline may have to be trenched by using a pipeline plough or by jetting.

After trenching, the pipeline will be resting in the trench (Figure 1.14).

Figure 1.13. Typical trenching spreads – During launching with A-frame and on deck

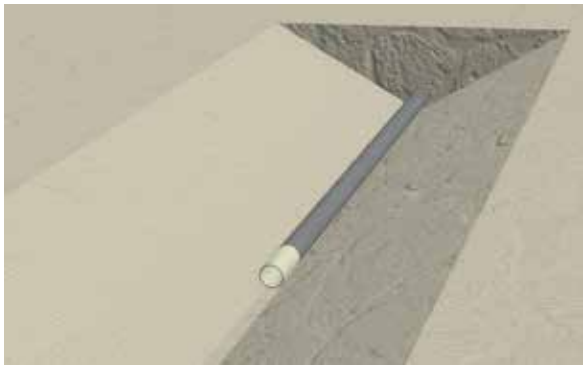

Figure 1.14. Cross-section of a trenched pipeline

Once the pipeline is in the trench, it may be covered with seabed sediment or rocks.

At points of landfall it may be required to make a pipeline trench by excavation and/or subsea blasting.

The pipelines will typically be internally coated with an epoxy-based material in order to reduce friction and improve the flow conditions.

The outside of the pipes will be provided with an anti-corrosion coating. Various types of anti-corrosion coating exists e.g. polyethylene- (PE), polypropylene (PP) or asphalt enamel (AE) coating systems (Figure 1.15).

Figure 1.15. Pipe joint provided with PE coating (black) outneath the concrete weight coating

In addition to the (passive) anti-corrosion protection system, the pipeline system will also be provided with an active protection system consisting of sacrificial aluminium anodes.

Typically, large diameter pipelines are also provided with concrete weight coating (CWC) to ensure on-bottom stability due to hydrodynamic wave- and current loads, for both temporary and operational conditions, but the concrete also provides protection against impacts from fishing gear etc.

At points, where the pipeline and communication cables intersect, the communication cables will normally be buried deeper into the sea bottom than the gas pipeline. Typically, design requirements demand a vertical separation of 0.3 – 0.5 m.

To ensure the separation various concepts can be used e.g.:
- Installation of flexible mattresses over the existing cable /pipeline.
- Installation of a rock carpet.
- Installation of rock berms on either side of the crossing bridging of the new pipeline over the existing cable / pipeline.

Owners of active cables will be approached with the aim of reaching mutual crossing agreements covering liabilities and procedures for crossing methods. Abandoned cables will be removed before the pipeline is installed. Removal / cutting of out-of-use cables will be reported to owners, if known, or to relevant authorities.

Seabed intervention works

The geophysical and geotechnical characteristics vary along the pipeline route from stretches with soft sediment to bedrock. The bathymetry along the proposed route varies as well with rocky outcrops and cliffs / chasms typical near the Finnish coastline. Detailed surveys are carried out to identify the most optimal route, which avoids seabed intervention works to the greatest possible extent. Once the pipeline route has been optimised, calculations can be made for the extent of necessary seabed intervention works.

The seabed conditions via the pipeline route can be optimised in the following ways:
- Re-aligning the pipeline route when the plan is revised (avoiding difficult points);
- Levelling peaks (quarrying or dredging hard ridges and exposures);
- Rock placement to avoid free spans.

The optimisation will take place in connection with the detailed route planning (See Figure 1.16).

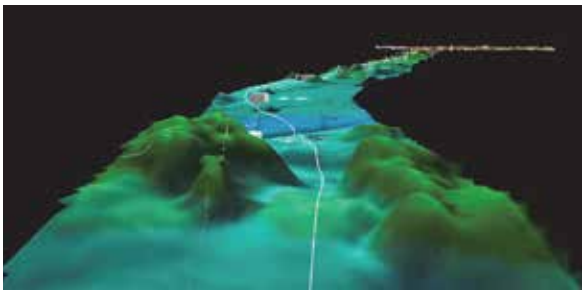

Figure 1.16. Optimisation of the pipeline route at the seabed. Balticconnector route studies by Marine Mätteknik AB for Gasum, 2006

The Balticconnector pipeline is envisaged to cross uneven terrain, and hence it is most likely required that some seabed intervention works will be performed by installing rock support for the pipeline to reduce length of free spans. Rock is typically installed by a fall pipe vessel as illustrated in Figure 1.17.

Figure 1.17. Rock installation using specialized fall pipe vessel

Pre-commissioning

Inspections of the installed pipeline will be performed before it is put into operation. The aim is to ensure that the pipeline is intact and that the set requirements have been met. The involved steps include:

- Flooding, cleaning and gauging – by sending pigs through the pipeline;
- Pressure test;
- Dewatering and drying/conditioning – by sending pigs through the pipeline;
- Gas filling.

The water used for the pressure tests is typically filtered sea water inhibited with chemicals, e.g. oxygen scavenger, biocide and dye.

Oxygen scavenger is added to the sea water in order to reduce internal corrosion and biocide is inhibited to prevent bacteriological growth.

After a pipe has been pressurised, it will be dewatered and the water will be directed to the sea, which may have a temporary impact on the marine flora and fauna.

When a pipe is pressurised with gas, the air in the pipe is blown out through exhaust blowers.

Operation and monitoring during use

The gas pipeline will be controlled and monitored from the control centre located in the Kouvola (Finland) natural gas centre, which is permanently staffed. From the control centre, process data from the pipeline and compressor stations can be monitored and the necessary commands can be given.

During the operating life of gas pipes, both internal and external inspections of the pipes will be made on a regular basis. External inspection steps include, among others, inspection of the position and condition of the pipes and corrosion protection. Internal inspections are made with the aid of a so-called intelligent-pig inspection device. The device is carried along in the same direction as the gas flow through the gas pipe and it can identify corrosion or bulges in the pipeline structure. There are high-resolution sensors in the inspection device, which detect even small irregularities in the pipes.

Decommissioning

A pipeline is an energy transfer system designed for continuous use, and its condition is constantly maintained. As its technical operating life approaches its end, a gas pipe is normally replaced by another parallel pipe (looping). The pipe taken out of use is typically left in place. Decommissioning of the pipeline will occur in accordance with the prevailing legislation at the given point in time.

Pipe removal will be handled in more detail in the environmental impact assessment report. More precise procedures for removal from use will be planned in connection with the technical planning for the gas pipeline.

1.4.6 Compressor and receiving stations

The compressor and receiving station planned for Inkoo and Paldiski will be placed near the point of landfall of the offshore pipeline and close to the onshore pipeline sections. This EIA includes a compressor station in Inkoo, onshore pipelines to the receiving sta-

tion at both ends and receiving stations at both ends. The compressor station in Paldiski will be developed by an Estonian company AS EG Võrguehitus.

Compressor will be utilized to supply gas to both directions: to onshore or offshore pipeline. The output pressure of the gas from the compressor station to the offshore or onshore pipeline section can be dimensioned as desired and the compressor power can be optimally exploited. A compressor and receiving station normally consists of a gas compressor using either electromotor or gas turbine or engine, a gas cooler, gas-filtering equipment, gas measuring and analysis equipment and various safety and control devices (See Figure 1.18).

The needed compression power depends on the operating mode and network status during operation. The maximum needed compression power will be in the order of 15 to 20 megawatts. The needed compression work will be realized either with a single one or two parallel operated compressor units. The final choice between one or two units and their driver type will be done during the basic planning phase of the compressor station project.

The gas pressure and flow rate will be raised to a level required by the network operation status. The compressor station will be able to adapt to different operating conditions. The discharge pressure can be set from 50 to 70 bars. The flow rate of the compressor station can be set from 200,000 Nm^3/h to 440,000 Nm^3/h depending the operation mode and network status.

The compressor station will be designed and built according to the requirements defined in EN 12583:2000 (Gas supply systems – Compressor stations – Functional requirements) and other relevant international safety and environmental-protection standards.

Compressor stations will be remotely-controlled and unmanned, and their operation is controlled and monitored from a 24/7 manned dispatch centre located at Gasum Oy's Kouvola site. Safe operation of the compressor station is ensured with various local and automated safety systems which automatically monitors and controls all relevant and safety critical process variables.

The station will be equipped with gas leak detection and fire detection systems. The critical components

Figure 1.18. A 10 MW gas turbine driven pipeline compressor station in Kouvola in Finland (Gasum Oy)

such as compressor units and electrical equipment room will be equipped with fire extinguishing systems.

Noise, flue gas and methane emissions occur to some extent in the vicinity of a compressor station. However, these will not exceed national emission limits and regulations.

The flue gas emissions created will depend on the type, number and operating power of the compressor units. If a gas turbine driven compressors units are evaluated most suitable for the task and selected task, approximately 60 – 150 t of local CH_4 and 15 – 30 t NO_x flue gas emissions will be emitted per year.

If electrical driven units are evaluated most suitable for the task and selected no local flue gas emissions are created. The electrical driven units require a 2 km 110 kv electrical line and local transformer facilities at the site.

The compressor units will be pressurised all the time so only minimal methane emissions are created when units are operated. The venting occurs in maintenance situation when the units are de-pressurised and vented before the maintenance service can be performed.

The approximated CH_4 emissions due to operation and planned maintenance are 15 – 20 t/a. The CH_4 is vented to atmosphere via silencer equipped venting stack. Venting stack will be located in such distance and direction from other appliances that no danger of ignition of the blow out methane cloud is possible.

Small amounts of special waste, such as lubricating oil, gas turbine washing fluid, glycol arise from operation of the compressors and from pipeline pigging operations. The appropriate regulations for handling them will be observed.

The protection distances according to the Natural Gas Statute will be used in the work.

2 The EIA procedure for the project

2.1 The international EIA procedure

The offshore pipeline would enable the exchange of natural gas between Finland and Estonia, and at the same time offer the possibility for making use of the underground natural gas storage facilities in Latvia. Because the Balticconnector project has an international dimension, there are two primary international procedures to be followed:

- The Espoo Convention (UNECE Convention on Environmental Impact Assessment in a Transboundary Context)
- The Bilateral Agreement on EIA between Finland and Estonia (Agreement between Finland and Estonia on Environmental Impact Assessment in a Transboundary Context).

The need for assessing the environmental impacts of the project for the part concerning Finland is based on the Finnish Act on Environmental Impact Assessment Procedure. In Estonia, the need for the assessment is based on the EIA and Environmental Management System Act.

The Environmental Impact Assessment (EIA) procedure both in Finland and Estonia is divided into two phases:

- In the first phase, the assessment programme presents the impacts to be assessed and the methods to be used in assessing the impacts.
- In the second phase, the actual impact assessment is carried out and the results are compiled in an environmental impact assessment report. The EIA report will be compiled according to national reguirements (both Finnish and Estonian legislation).

The environmental impact assessment will be conducted in an interactive way with various interest groups and authorities. During the display of the assessment programme and the report, authorities, public and other non-governmental will have an opportunity to express their opinions. The assessment programme and report will be published in Estonian, Finnish, Swedish and in English. In Finland, the competent authority on the EIA is the Uusimaa Centre for Economic Development, Transport and the Environment. In Estonia, the Ministry of Economic Affairs and Communications is the permitting authority (announces about the EIA publication in Estonian) and the Government of Estonia is the decision-maker concerning superficies license. The EIA supervisor in Estonia is the Ministry of Environment, as it is a case of transboundary EIA.

2.1.1 The Espoo Convention

The Espoo Convention on Environmental Impact Assessment in a Transboundary Context is a United Nations Economic Commission for Europe (UNECE) convention signed in Espoo, Finland in 1991 and which entered into force in 1997. The Convention sets out the obligations of parties (States that have agreed to be bound by the Convention), to carry out an EIA of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration, that are likely to have significant adverse environmental impacts across boundaries. Finland and Estonia have both signed and ratified the Convention.

The very nature of the Balticconnector project, which includes an offshore pipeline crossing international boundaries means, that it could potentially cause transboundary environmental impacts to the parties of origin (Estonia and Finland). Therefore, the Balticconnector project qualifies to abide by the obligations laid out in the Espoo Convention. In addition to transboundary environmental impacts to the parties of origin, the project may also affect third parties, referred to as, affected parties. According to the Espoo Convention Russia as a neighbouring country will be notified. Other relevant countries (e.g. Sweden, Latvia and Lithuania) to be notified will be decided by the Competent Authorities (ministries of environment) of Estonia and Finland.

The Balticconnector natural gas pipeline is subject to an obligatory EIA procedure by virtue of Appendix I, section 8 (Large-diameter oil and gas pipelines) of the Espoo Convention.

2.1.2 Bilateral agreement – Finland and Estonia

A bilateral agreement between the Government of the Republic of Finland and the Government of the Republic of Estonia on Environmental Impact Assessment in a Transboundary Context entered into force on 6 June 2002[1]. In the bilateral agreement, the principles for applying the Espoo convention are specified. According to Appendix I, section 8 – Large-diameter oil and gas pipelines. Underwater pipelines in the Baltic Sea – the Balticconnector project is catagorised as mandatory EIA project, if the proposed activity may cause significant adverse transboundary environmental impacts.

Based on article 5 of the EIA Agreement Estonia and Finland have established a joint advisory commission on EIA in a transboundary context. The members of the Commission have been assembled from environmental officials of Finland and Estonia. The Commission is organized as a sub-group under the Finnish – Estonian Working Group, which was established in 1991.

By virtue of Article 14, the competent authorities of the Parties are entitled to agree to carry out a joint environmental impact assessment (Joint EIA) within the framework of their national legislation. Taking account the nature of the Balticconnector project (pipeline between two countries), both countries will act as Party of Origin and Affected Party. That means both countries have to notify other countries about the EIA procedure, which will be conducted according to the national requirements. General authority cooperation based on the bilateral EIA agreement is shown in the following figure (Figure 2.1).

Besides the joint EIA procedure, the EIA agreement includes additional information on notifications, informing, transmittal of information to the other party, participation, consultations etc. compared to the Espoo Convention. It also includes a post-project analysis. The EIA agreement does not contradict with the Espoo Convention, but supplements and specifies it as well as offers specific administrative tools.

Detailed aspects of the EIA procedures and cooperation between two countries will be agreed on by the joint EIA commission and needs to be discussed with the Ministry of the Environment in both countries.

2.2 The EIA procedure in Finland

2.2.1 Applying the EIA procedure in Finland

The need for assessing the environmental impacts of the project for the part concerning Finland is based on the Finnish Act on Environmental Impact Assessment Procedure (468/1994, amendments 267/1999 and 458/2006).

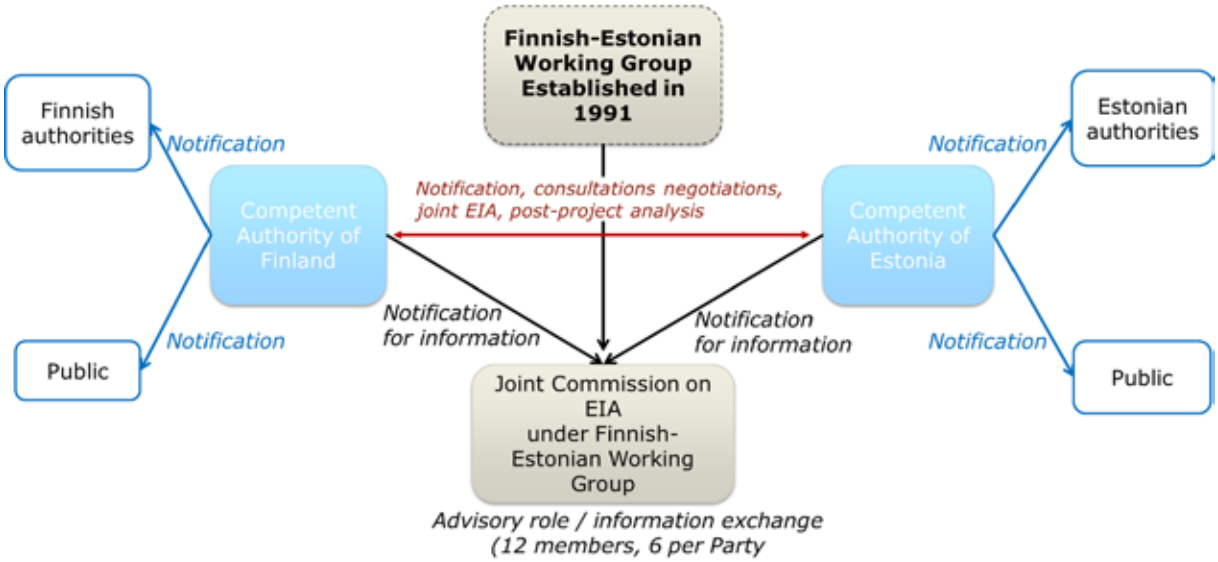

Figure 2.1. Authority cooperation under the EIA agreement

1 In Finland: SopS 51/2002, enforcement decree No 435/2002; in Estonia: www.riigiteataja.ee/akt/110017

According to Finland's EIA law, those environmental impacts of a project are assessed that are caused by:

- The offshore pipeline running in the territorial waters of Finland (to a distance of 12 nautical miles from the shore);
- The offshore pipeline situated in the Exclusive Economic Zone (EEZ) of Finland outside the territorial waters

The Act on Environmental Impact Assessment Procedure is valid in the Finnish EEZ as referred to in Section 1 of the Finnish Act on Exclusive Economic Zone (1058/2004). According to the Decree on Environmental Impact Assessment Procedure (713/2006), the EIA procedure is required for pipelines with a diameter (DN) of more than 800 millimetres and a length of more than 40 kilometres. The environmental authority can order an EIA procedure at their discretion to be applied also in projects that are smaller than this, if the project is estimated to have significant environmental impacts.

The aim of the law concerning the environmental impact assessment procedure (EIA procedure) in Finland is to promote the assessment of environmental impacts and take them into account in a uniform way in planning and decision-making. At the same time, the goal is to increase the information received by citizens and promote their opportunities to participate. The purpose of the EIA procedure is to ensure that the environmental impacts of a planned project are investigated with sufficient precision before decision-making.

The EIA procedure is divided into two phases. In the first phase, the responsible party for the project (project developer) submits an environmental assessment programme (EIA programme, plan for assessing impacts) to the coordinating authority for notification. In the second phase, the actual impact assessment is carried out as defined in the EIA programme and the results are compiled in an environmental impact assessment report (EIA report). The EIA procedure is concluded when the coordinating authority issues its statement on the assessment report.

2.2.2 EIA programme phase

The EIA programme presents the impacts that will be assessed, as well as how and by which methods the assessments will be conducted. In the assessment programme, the basis of the project, information about the present conditions of environment, studied alternatives and the permits needed, are presented. In addition, the plan for information and time schedule of the project are presented in the programme.

The Uusimaa Centre for Economic Development, Transport and the Environment in Finland acts as the coordinating authority, which announces the public display of the EIA programme. During the public display of the EIA programme, the coordinating authority requests statements on the assessment programme from various authorities. In addition, citizens and non-governmental organizations (NGOs) can express opinions to the coordinating authority, which collects the opinions and statements expressed of the assessment programme. Based on these opinions and statements, the coordinating authority issues its statement to the project developer. The assessment phase is carried out based on the EIA programme and the statement from the coordinating authority.

2.2.3 EIA report phase

The assessment report contains the necessary clarifications of the environment in the project area and the results of the impact assessment. It includes descriptions of the main characteristics of the project, a description of the operation, the material used in the assessment and references, environmental impacts of the studied alternatives, assessment methods, a comparison of alternatives, a proposal for a monitoring programme, and a summary of the assessment work. In addition, the assessment report describes the main uncertainties related to the assessment and measures to prevent and mitigate adverse environmental impacts.

The assessment report is finalised on the basis of feedback received during the work. The coordinating authority will notify about the assessment report in the same way as for the assessment programme. After the report is ready, public meetings will be organised. The assessment report will immediately be on display for about two months (maximum 60 days) during which the Finnish authorities, citizens and other interest groups will have the opportunity to submit their opinions to the coordinating authority. The coordinating authority will compile the statements and opinions. Based on them, the coordinating authority will issue its own statement within two months (maximum 60 days) after the end of public display and meetings.

The environmental impact assessment procedure concludes with the coordinating authority's statement on the EIA report. The assessment report and statement from the coordinating authority are taken into

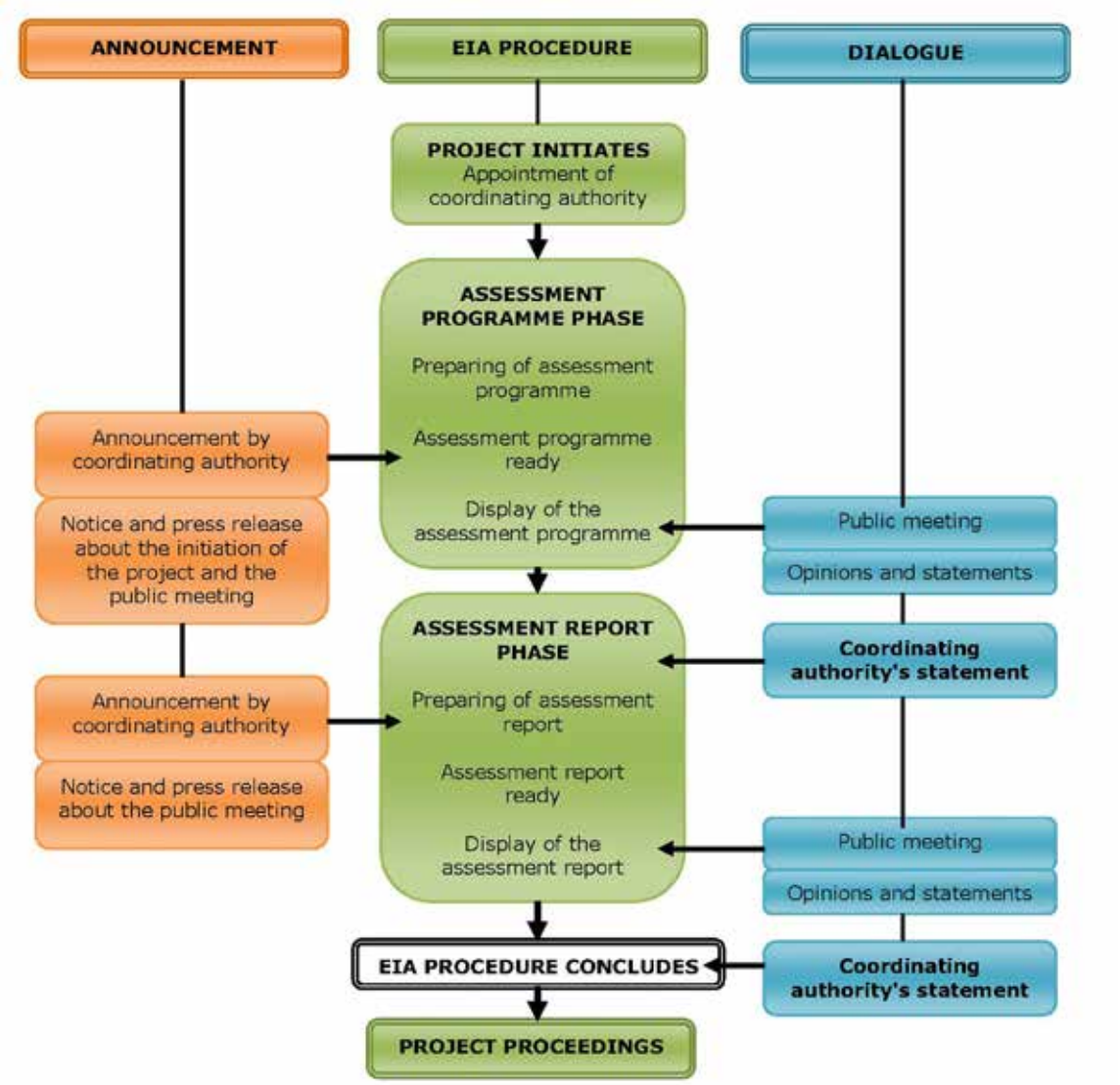

Figure 2.2. The EIA procedure in Finland

consideration in decision-making and permitting procedures.

The EIA procedure in Finland for the Balticconnector project is shown in Figure 2.2

2.2.4 Consideration of the EIA in the permitting phase

In Finland an authority may not grant a permit for the implementation of a project or take any other comparable decision before it has received an assessment report and the coordinating authority's statement on the report. A permit or comparable decision on a project shall state in which way the assessment report and the coordinating authority's statement have been taken into account.

2.3 The EIA procedure in Estonia

2.3.1 Applying the EIA procedure in Estonia

According to the EIA and Environmental Management System Act in Estonia, the objective of the environmental impact assessment (EIA) is:

1. To make a proposal regarding the choice of the most feasible solution for the proposed activities based on the results of the EIA. This makes it possible to prevent or reduce damage to the state of environment and to promote sustainable development.

2. To provide information to the permitting authority on environmental impacts of the proposed activity and feasible alternatives, and the possibilities to prevent or minimise negative environmental impacts.

3. To allow the results of the EIA to be taken into account in the proceedings for issuing a development consent.

Environmental impacts shall be assessed: 1) **upon application for or application for amendment of a development consent**, if the proposed activity, which is the basis for application for or amendment of the development consent potentially results in significant environmental impact; 2) if activities are proposed, which alone or in conjunction with other activities **may have the potential to significantly affect a Natura 2000 site**.

Environmental impact is significant, if it may potentially exceed the environmental capacity of a site, as irreversible changes to the environment endanger human health and well-being, the environment, cultural heritage or property.

The EIA is mandatory for the construction of high-pressure pipelines for the transport of natural gas, or main pipelines for the transport of petroleum or chemical products or other liquids, with a diameter of more than 800 mm and a length of more than 40 km.

According to the EIA act, the EIA has to be carried out by the expert holding an EIA licence (given by the Minister of the Environment).

2.3.2 Initiation of the EIA

In order to initiate the EIA procedure in Estonia, the developer submits a permit application (superficies licence) to the permitting authority, which will make a decision about the initiation of the EIA procedure.

After consulting (in March 2013) with the Ministry of the Environment (MoE) and the Ministry of Economic Affairs and Communications (MEAC), it was agreed that the developer submits the application for superficies licence to the MEAC for the Balticconnector project. The MEAC will make a proposal to the Estonian Government to initiate the procedure of application of superficies licence. Based on this proposal, the Government will make a decision to initiate the procedure of application of superficies licence and to initiate the EIA procedure. After the EIA is initiated, the procedure of application of superficies licence will be suspended until the EIA report will be approved.

As agreed with the MoE, a permit application for special use of water will be submitted to the MoE by the developer after the EIA is officially initiated.

The intention is to carry out an EIA, which gives information about possible impacts to all different permitting authorities, who will make a decision about permits related to the Balticconnector project (e.g superficies licence, permit for special use of water, building permit) and consider the necessity of the EIA.

After the initiation of the EIA, a two-phased EIA procedure follows (Figure 2.3). The EIA programme and report phases are described in more detail in the following sub-chapters.

2.3.3 EIA programme phase

The EIA programme is compiled by the EIA licensed expert, the EIA working group and the developer. The project developer submits the EIA programme to the permitting authority for arranging the publication of the programme.

The permitting authority will identify the interested parties (persons, authorities and organisations) to whom the public notice have to be sent.

The permitting authority informs about the publication (public display and public meeting) of the EIA programme within 14 days after the receipt of the programme. Permitting authority organizes the public display for a minimum 14 days. The duration of the public display will be decided by the permitting authority to-

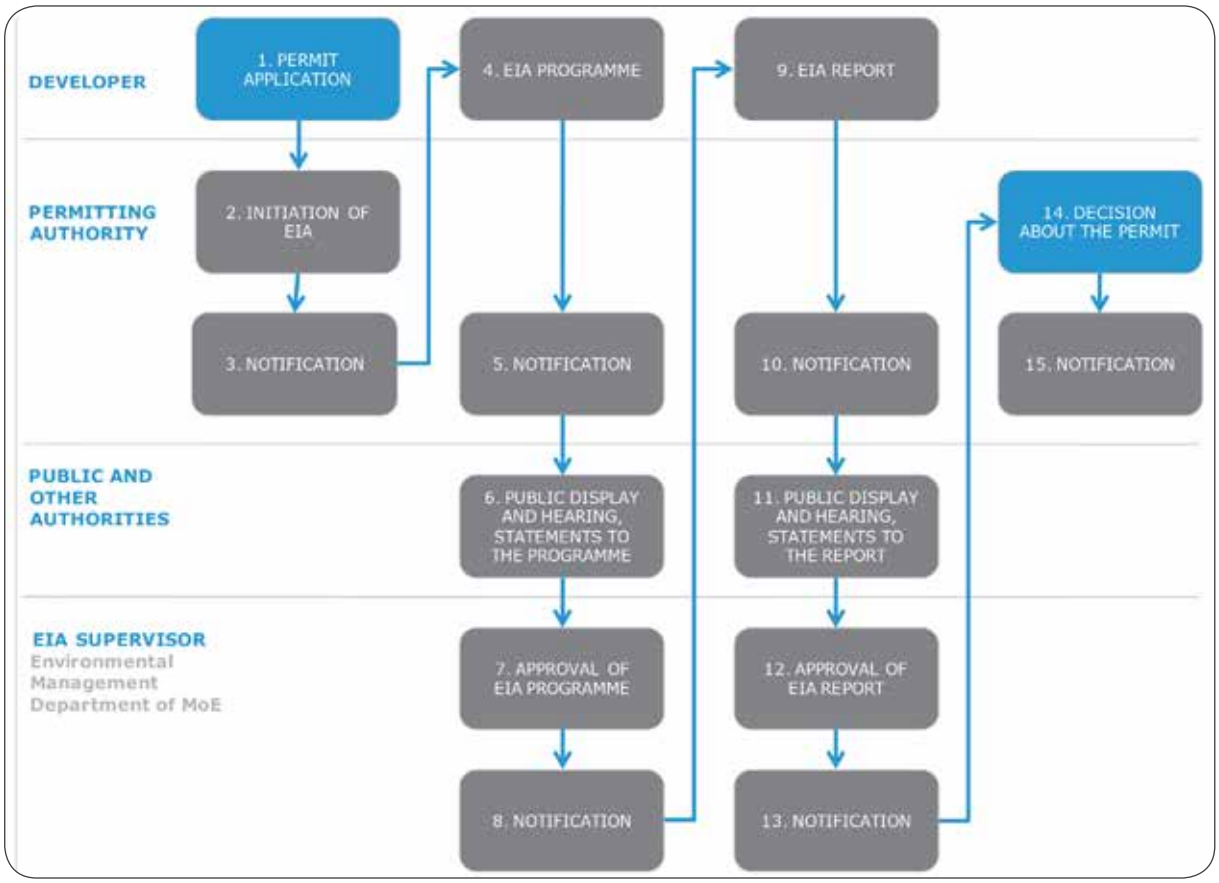

Figure 2.3. The EIA procedure in Estonia

gether with the developer and in cooperation with coordinating authorities in Estonia and Finland. The display in Estonia and Finland will begin simultaneously. Public meeting is organized by the developer.

During the public display, everyone has the right to make proposals and objections and ask questions about the EIA programme. Proposals are usually submitted to the permitting authority.

After the public meeting, the developer (together with the EIA licensed expert) compiles and sends replies to the persons who submitted proposals, objections and questions regarding the EIA programme. The EIA programme will be amended according to the results of publication and publication materials (public notices, minutes of the public meeting, received letters and answers to these letters) are added to the programme before submitting it for approval.

In Estonia, the Ministry of Environment (MoE) acts as the supervisor in the EIA procedure in Balticconnector (transboundary EIA) case.

The developer submits the amended EIA programme to the Ministry of Environment, which gives a decision about the approval of the EIA programme (within 30 days after the receipt of the programme). The Ministry of Environment informs about its decision in official announcements and by letter to the interested parties within 14 days after the decision is made.

2.3.4 EIA report phase

The EIA report is compiled by the EIA licensed expert and the EIA working group.The permitting authority will notify about the publication of the EIA report in the same way as with the EIA programme. The requirements of the publication and amending the EIA report are similar to the EIA programme.

After amending the EIA report, the developer submits it to the MoE for approval and determination of environmental requirements. The MoE makes a decision to approve the EIA report within 30 days after the receipt of the report and all related materials, and in-

forms the developer and permitting authority about its decision. The copy of the EIA report will be submitted to the permitting authority by the MoE.

The MoE informs about the approval of the EIA report and determination of environmental requirements in official announcements and by letter to the interested parties within 14 days after the decision is made.The EIA procedure concludes with the approval of EIA report by MoE/EIA supervisor.

2.3.5 Permitting phase

After the approval of the EIA report, the procedure of permit application will continue. The permitting authority shall take account the results of the EIA and the environmental requirements determined by the EIA supervisor.

If the EIA results and environmental requirements are not taken into account, the permitting authority has to give an argumented justification in the decision to issue or refuse to issue of the permit. A permit shall not be issued, if the developer is not able to comply with the determined environmental requirements.

2.4 Parties in the EIA procedure

Gasum Oy is responsible for the project and the EIA procedure (see Chapter 1.3). The environmental impact assessment will be carried out by a consultant company. The project consultant in the EIA programme phase is Ramboll. The consultant for compiling the EIA report is Pöyry Finland Oy (see Chapter 2.5).

The main members of the EIA steering group include:
- Gasum as the Project Developer;
- EIA consultant;
- Coordinating Authority in Finland – the Uusimaa Centre for Economic Development, Transport and the Environment; which will announce the display of the EIA programme and report;
- Permitting Authority in Estonia – the Ministry of Economic Affairs and Communications (MEAC) to which the application of superficies licence is submitted;
- Other possible stakeholders.

In Finland, the other main stakeholders of the EIA procedure include:
- The Ministry of the Environment; notification and international functions (the Espoo Convention and joint EIA coordination)
- The Finnish Defence Forces;
- provincial federations ;
- The Regional State Administrative Agencies;
- The National Board of Antiquities and Historical Monuments;
- The Finnish Environment Institute;
- The Finnish Meteorological Institute Finnish Safety and Chemicals Agency (Tukes)
- The Finnish Transport Agency;
- The Finnish Border Guard;
- Metsähallitus;
- Game and Fisheries Research;
- The Ministry of Agriculture and Forestry;
- The Ministry of Employment and the Economy;
- The Ministry of Transport and Communications;
- Inkoo Municipality
- Local citizens and companies in Inkoo commune related to the location of the proposed activity.

In Estonia, the other main stakeholders of the EIA procedure include (according to the EIA act):
- Supervisor of the EIA – the Ministry of Environment (MoE), which will approve the EIA programme and report. The MoE is also the competent authority for the related Espoo procedures (notifications, exchanging materials etc);
- The Estonian Government, who will initiate the procedures of superficies licence and the EIA;
- those county governments and local authorities, the territory of which the impacts of the project may extend – Paldiski Municipality, Keila Commune; Harju County;
- Environmental Inspectorate;
- administrator of the protected natural feature which has the potential to be significantly affected by the proposed activity – Environmental Board in Harju region;
- non-governmental environmental organisation (NGO) through organisation uniting them – the Estonian Council of Environmental NGOs (EKO);
- The Ministry of Internal Affairs;
- The Ministry of Defence;
- The Civil Aviation Administration;
- The Estonian Maritime Administration;
- The National Heritage Board;
- Local citizens and companies in Paldiski Municipality and Keila commune related to the location of the proposed activity.

Other relevant stakeholders will be discussed and a list will be agreed with the coordinating authority, the MEAC and the Ministry of Environment in Finland and Estonia during the preparation of the publication of the EIA programme.

The EIA programme was compiled by the following EIA expert group:

Ramboll Finland:

- Tommi Marjamäki – project management;
- Niels Holger Olesen – technical expertise;
- Lasse Christensen – technical expertise;
- Jari Mannila – leading expert (EIA licence number KMH0133A);
- Antti Lepola – leading expert, quality check, EIA-procedure, permitting;
- Maria Kangaskolkka – technical expertise, ship traffic and marine issues;
- Elina Wikström – EIA expert, biotic environment;
- Joni Heikkola – GIS expert, maps, pictures;
- Laura Lehtovuori – GIS expert, maps, pictures;
- Tomi Rinne – permitting, EIA legislation;
- Tuukka Räsänen – technical overview;
- Emilia Saarivuo – biotic environment;
- Reetta Suni – EIA expert, coordination of the EIA working group;
- Riina Känkänen – EIA expert, coordination of the EIA working group;
- Sanna Sopanen – environmental surveys, benthic flora and fauna;
- Otso Lintinen – environmental surveys, hydrology, fish, fishery;
- Jari Hosiokangas – noise, air quality;
- Ari Hanski – bathymetry, currents and water quality;
- Emilia Horttanainen – landscape, cultural heritage;
- Antti Meriläinen – traffic.

Ramboll Estonia:

- Veronika Verš – leading expert, coordination of the EIA working group in Estonia, EIA procedure, quality check (EIA licence number KMH0149);
- Aune Aunapuu – permitting, Natura assessment, environmental surveys (EIA licence number KMH0139);
- Hendrik Puhkim – permitting, environmental surveys , EIA tendering (EIA licence number KMH0135);
- Liis Tikerpuu – permitting, overview about marine areas, environmental surveys;
- Raimo Pajula – environmentally protected objects and areas, Natura assessment (EIA licence number KMH0140);
- Kersti Ritsberg – hydrogeology and geology (EIA licence number KMH0150; licence for performance of hydrogeological work number 330);
- Esta Rahno – noise and air emissions;
- Merje Lesta – GIS data, maps.

2.5 EIA expert for compiling the report

The EIA expert is as following:

FINNISH TEAM		ESTONIAN TEAM	
Project leader		**Project leader**	
Tiina Kähö	Pöyry	Andres Piirsalu	OÜ Entec Eesti
Project manager (EIA)		**Project manager (EIA)**	
Terhi Rauhamäki	Pöyry	Rein Kitsing (license KMH0020)	AS Merin
Project coordinator		**Project coordinator**	
Pirkko Seitsalo	Pöyry	Kerttu Kõll	OÜ Entec Eesti
Water permitting			
Lotta Lehtinen	Pöyry	Rein Kitsing	AS Merin
Kari Kainua	Pöyry	Jüri Teder	OÜ Entec Eesti
Pirkko Virta	Pöyry		
Nature, including protected areas, species, green network			
Soile Turkulainen	Pöyry	Natalja Kolesova	Marine Systems Institute at TTU
William Velmala	Pöyry	Inga Lips	Marine Systems Institute at TTU
		Kerttu Kõll	OÜ Entec Eesti

Natura assessment			
Soile Turkulainen	Pöyry	Natalja Kolesova	Marine Systems Institute at TTU
William Velmala	Pöyry	Mariliis Kõuts	Marine Systems Institute at TTU
Fishery			
Sauli Vatanen	Kala- ja vesitutkimus	Mariliis Kõuts	Marine Systems Institute at TTU
Ari Haikonen	Kala- ja vesitutkimus		
Eero Taskila	Pöyry		
Marine hydrology			
Kari Kainua	Pöyry	Urmas Lips	Marine Systems Institute at TTU
Lotta Lehtinen	Pöyry	Germo Väli	Marine Systems Institute at TTU
Hannu Lauri (modelling)	YVA Oy	Taavi Liblik	Marine Systems Institute at TTU
Marine biology			
Ari Ruuskanen	Monivesi Oy	Natalja Kolesova	Marine Systems Institute at TTU
Patrik Kraufelin	Movivesi Oy	Inga Lips	Marine Systems Institute at TTU
Lotta Lehtinen	Pöyry		
Pekka Majuri (benthos)	Pöyry		
Elisabeth Lundsør	NORCONSULT AS		
Marine Geology			
Henry Vallius	GTK	Kaarel Orviku	Tallinn University, Institute of Ecology
Aarno Kotilainen	GTK		
Groundwater			
Jukka Ikäheimo	Pöyry	Rein Kitsing	AS Merin
Soil and bedrock			
Piri Harju	Pöyry	Kaarel Orviku	Tallinn University, Institute of Ecology
Land use planning, landscape and cultural heritage			
Mariikka Manninen	Pöyry	Kerttu Kõll	OÜ Entec Eesti
Social impacts			
Ville Koskimäki	Pöyry	Kaur Lass	OÜ Head
Jari Laitakari	Pöyry		
Noise			
Carlo di Napoli	Pöyry	Aleksander Klauson	TTU
Air quality and climate			
Mirja Kosonen	Pöyry	Jüri Teder	OÜ Entec Eesti
Sea traffic			
Jyrki Latvala	Pöyry	Taavi Liblik	Marine Systems Institute at TTU
Jaakko Kettunen	Pöyry	Germo Väli	Marine Systems Institute at TTU
GIS (maps)			
Jari Ruohonen	Pöyry	Kerttu Kõll	OÜ Entec Eesti

Chemistry			
Antti Hasanen	Pöyry	Jüri Teder	OÜ Entec Eesti
Kyösti Viertola	Pöyry		
Jani Mäkelä	Pöyry		
Dredging			
Sakari Lotvonen	Pöyry	Urmas Lips	Marine Systems Institute at TTU
Jari Lassila	Pöyry	Taavi Liblik	Marine Systems Institute at TTU
High pressure pipeline			
Isto Arponen	Pöyry		
Jari Etholen	Pöyry		
Lauri Kansanen	Pöyry		
Risk evaluation			
Jaana Ojala	Pöyry		
Mari Ranttila	Pöyry		

2.6 Time schedule and participation in the EIA procedure

The environmental impact assessment work will be carried out in an interactive manner with various interest groups and authorities. The EIA is planned to start by delivering the EIA programme to the competent authority on the EIA in Finland and by officially initiating the EIA procedure by the Estonian Government. It is estimated that the EIA report will be issued in 2014. After the EIA programme and EIA report are completed, they will be set on public display. The summary of the EIA programme and the EIA report will be sent for comments to those Parties of the Espoo Convention, which have indicated their wish to participate in the EIA procedure.

In Finland, public meetings will be organised during the display of both the EIA programme and the EIA report. **In Estonia,** similar public meetings will be organised at the end of the display of the programme and the report. Public meetings will be organized in the communities of the impact area of the project, at least in Inkoo in Finland and in Paldiski / Tallinn in Estonia.

The preliminary time schedule of the EIA procedure and permitting is presented in the following figure.

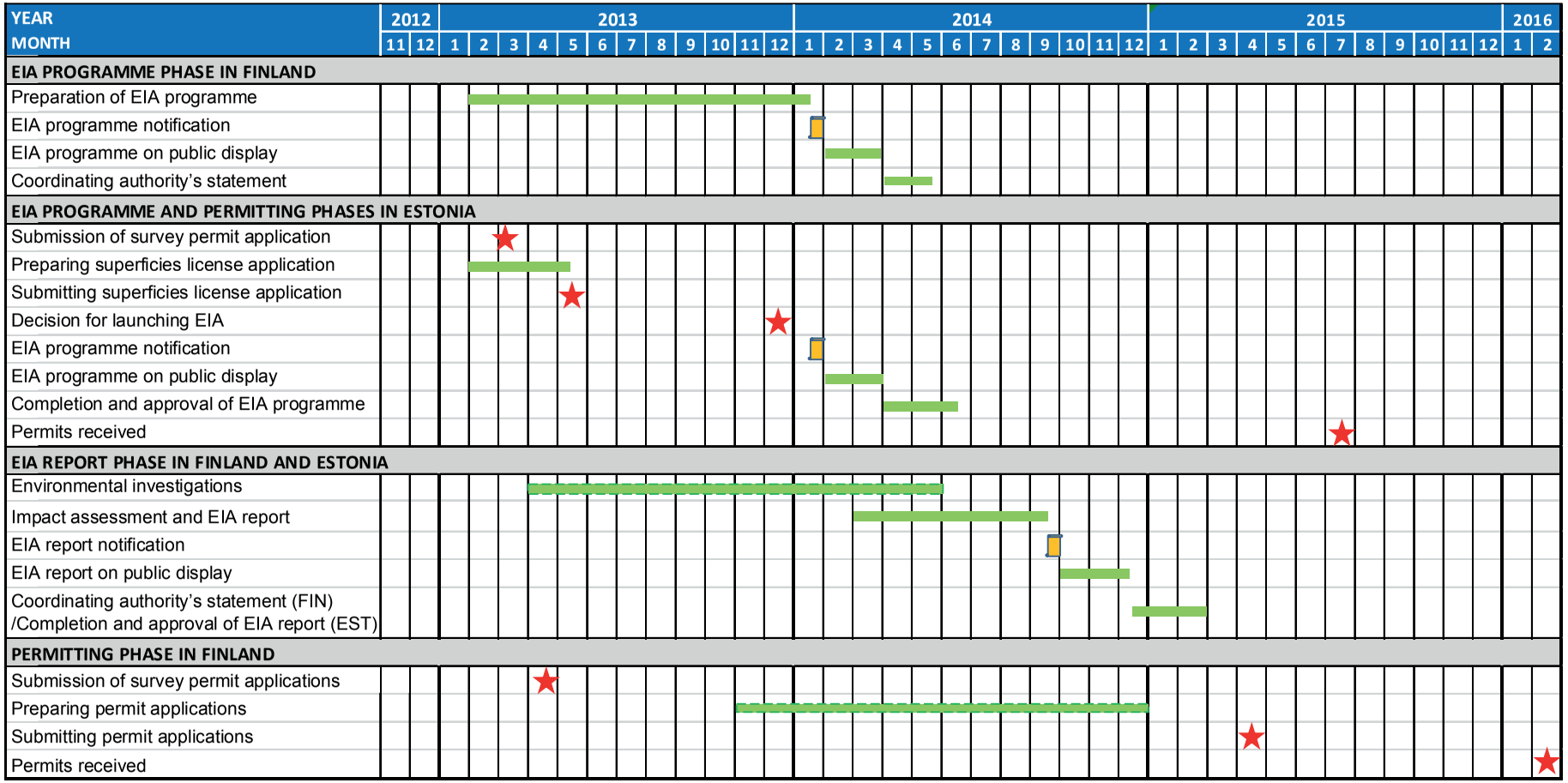

Figure 2.4. The preliminary time schedule of the EIA procedure and permitting

3 Current situation in the Gulf of Finland

3.1 General description

The Gulf of Finland is the easternmost part of the Baltic Sea, bordering Finland, Estonia and Russia. The share of the water volume of the Gulf is about 5 % (1,100 km^3) of the entire Baltic Sea. The length of the Gulf is 400 km, and the width varies between 48 and 135 km. The area of the Gulf of Finland is 29,600 km^2 and the average depth is 38 metres. The greatest depth is 123 metres. There are many significant harbour cities on the coast of the Gulf of Finland, such as Helsinki, Hanko, Porvoo, Kotka and Hamina. Finland's most important oil port is located in Sköldvik in Porvoo. In addition, there are St. Petersburg and Vysotsk on the Russian side, and Tallinn, Paldiski, and Muuga in Estonia.

3.2 Strategies, policies and land use in marine area

Regional Land Use Plans cover marine areas in the internal territorial waters. They are not applicable to the 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 legislations are applicable to inland and territorial waters.

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 in 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. The MSFD will be implemented in the Member States phase by phase as Acts and Decrees. The strategies are called the Marine Management Plans (MMP).

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 Marine Spatial Planning (MSP). EC initiated studies during 2008–2010 on various aspects of MSP, e.g. the legal aspects and the economic effects. A proposal for the EU directive is under preparation and the goal is to have a similar system in marine areas, which exists for land use plan system onshore. MSP is a tool for coordinating of the spatial use and balancing competing interests for 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.

3.3 Physical and chemical environment

3.3.1 Bathymetry

In the Inkoo archipelago, the gas pipeline will mostly be located in a fracture line, where the water depth is at least 20 metres. Only very close to shore, the water depth on the pipeline route is less than 20 metres. Close to shore and in the Inkoo archipelago, the subsoil of the pipeline will be levelled and the pipeline will be covered, i.e. because of the fairway, to make sure that the anchors from the ships will not damage the pipeline. In the middle of the western Gulf of Finland the water gradually deepens and the average depth is approximately 80 metres.

The coast of the Gulf of Finland is gentler in the Finnish side compared to the Estonian coast. At the Finnish coast, there is an archipelago zone, which is several kilometres wide and where water depth varies rapidly. At the Estonian coast, the water depth increases rapidly towards the open sea. The differences in the seabed profiles and the bathymetry at the ends of the planned pipeline route in Finland and Estonia are shown in Figure 3.1 and in Figure 3.2.

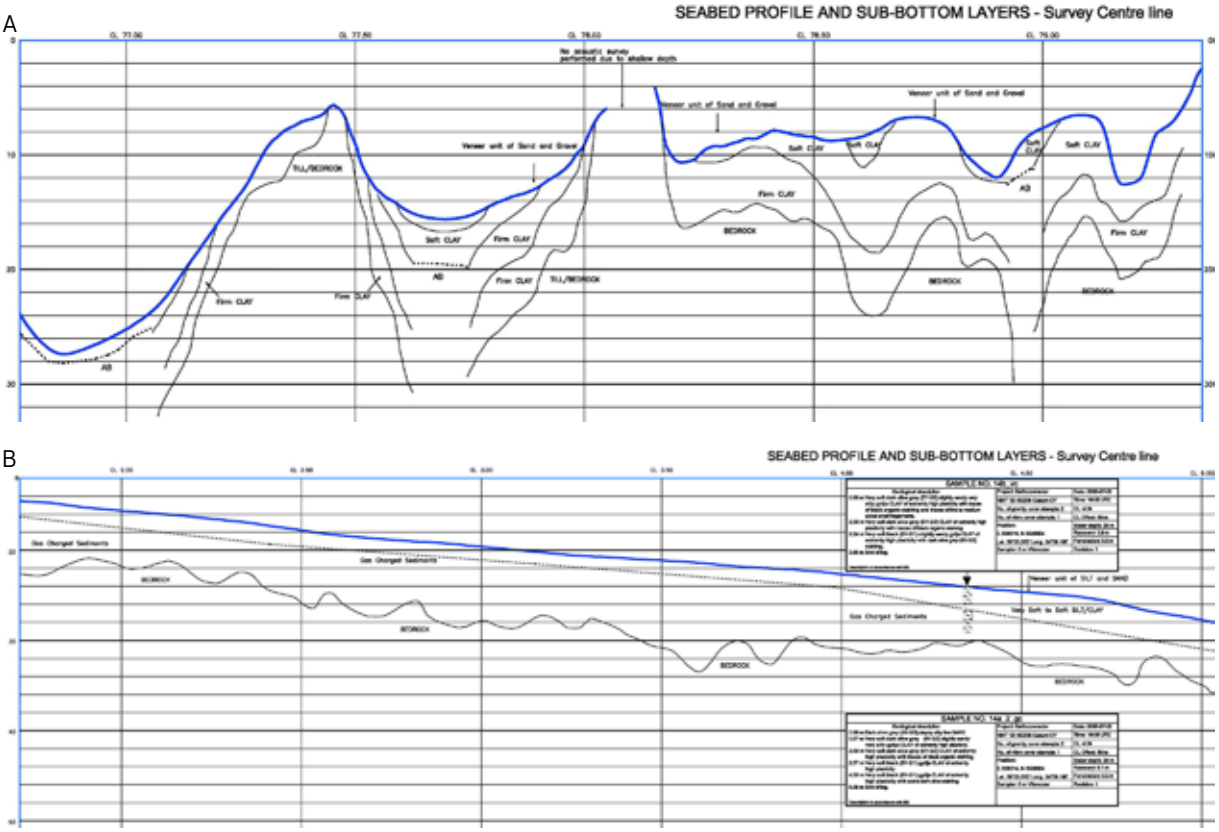

Figure 3.1. The seabed profiles at both ends of the surveyed pipeline area.
A shows the profile and sediment layers of the seabed in the Finnish point of landfall.
B shows the profile and sediment layers of the seabed at the Estonian shore.

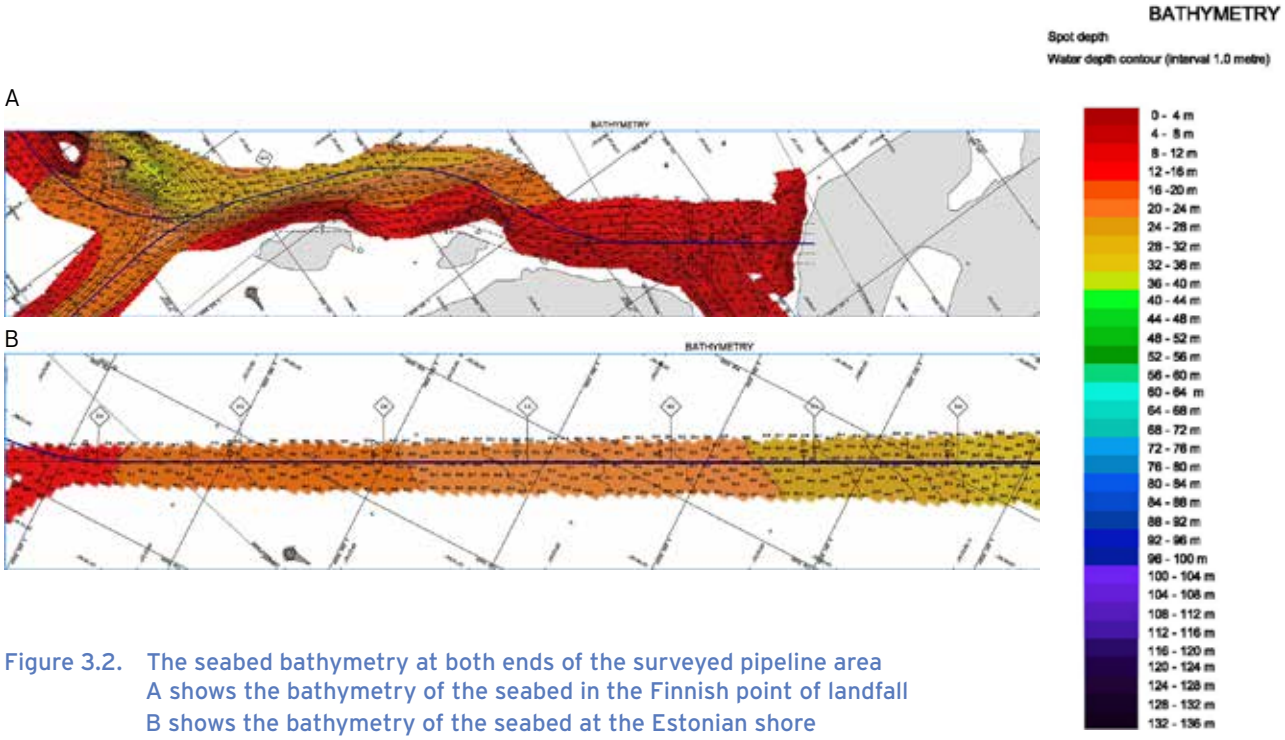

Figure 3.2. The seabed bathymetry at both ends of the surveyed pipeline area
A shows the bathymetry of the seabed in the Finnish point of landfall
B shows the bathymetry of the seabed at the Estonian shore

3.3.2 Seabed morphology and sediments

The physical conditions vary in different parts of the Gulf of Finland where the geology is characterised by several bedrock exposures with steep bluffs. Bluffs have often been formed as a result of rock types with different resistances, eroding at different speed. In shoals and the archipelago, the sea bottom is more sensitive to erosion. Sediment strata between bluffs generally consist of tight clay and silt layers that have accumulated on top of moraine and sand, soft clay, and surface layers of soft organic sludge. Sediments containing organic matter are loose in structure. For this reason, they easily drift to deeper basins, local depressions or more sheltered areas.

The Balticconnector pipeline will run through the middle part of the Gulf of Finland (Figure 3.3.). The geology is characterized by the position between the Fennoscandian Shield and the East European Platform. The northern part of the planned pipeline route is characterized by crystalline bedrock with irregular relief and steep slopes. Bedrock is commonly observed at seabed surface as distinct outcrops. Clay fills the depressions between bluffs and forms flat areas. Moraine contains large boulders. When going south the planned pipeline route enters the area of the Estonian shelf that is formed of sedimentary bedrock overlying the crystalline bedrock. Sedimentary bedrock strata increase southwards in thickness. Moraine, which is deposited over the bedrock, is rich in clay and has low coarse-grained content.

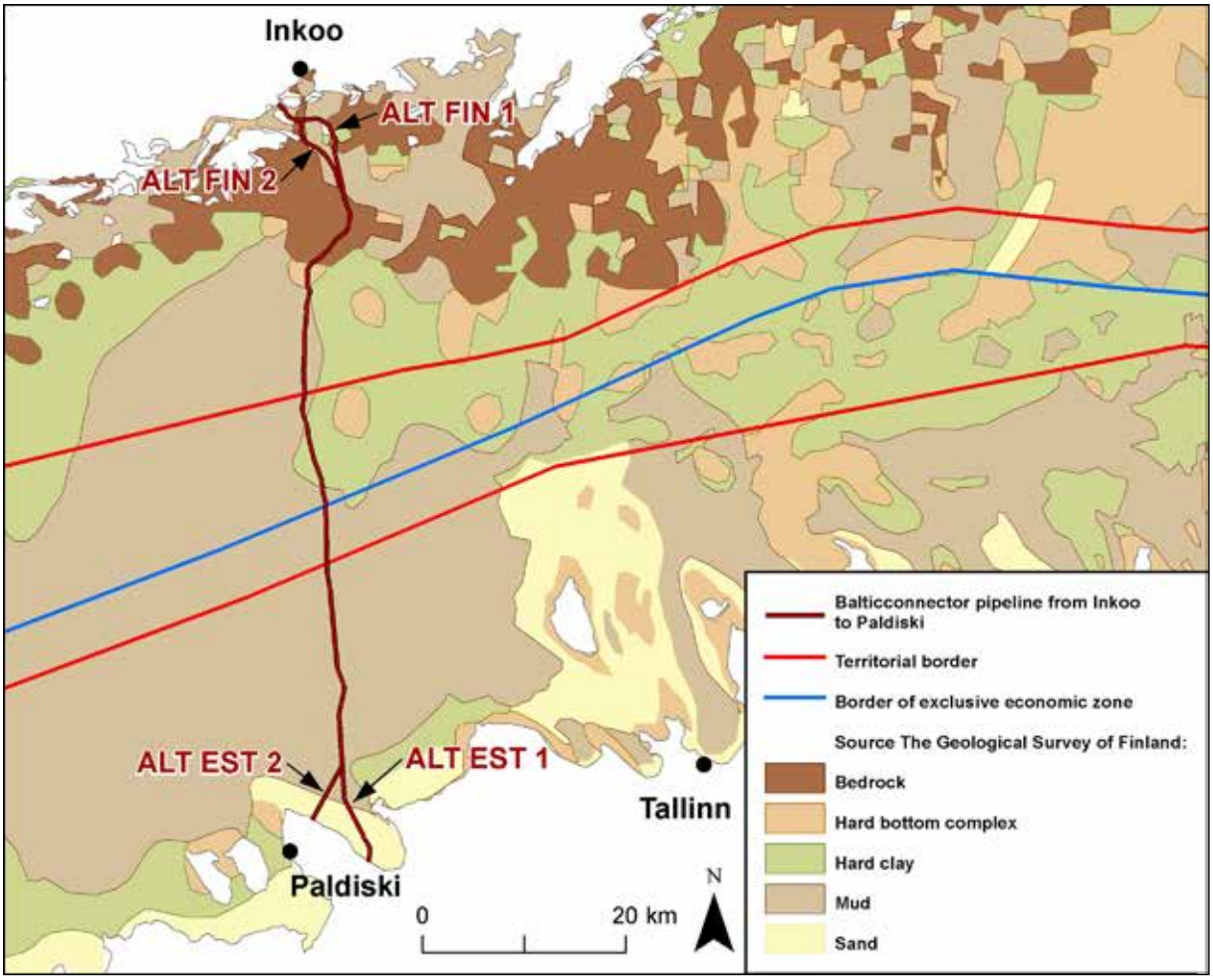

Figure 3.3. Seabed sediments along the route of the gas pipeline in the western Gulf of Finland

Sediment quality (hazardous substances) in the open waters of the Gulf of Finland was extensively studied in 2009 before the commencement of construction of the Nord Stream pipelines (Ramboll 2009). The core depth at the sampling locations was up to 0.5 m, depending on the seabed type. In the samples heavy metal concentrations did not exceed the threshold value for contaminated sediments of the Finnish quality criteria developed for the instructions for dredging and depositing dredged materials (the Ministry of the Environment 2004). Concentrations of organic contaminants (i.a. PAH, PCB, DDT) were low. Also, the dioxin concentrations were generally low.

Monitoring of surface sediments was carried out during construction of the Nord Stream pipelines in 2009–2011. Although heavy metal concentrations were normally low, due to the heterogeneous nature of the seabed, clearly elevated concentrations of some metals could be locally detected. Dioxin concentrations were low in the uppermost sediment layer. However, tributyltin (TBT) concentrations were randomly high in areas near shipping lanes (Ramboll 2013b). This organotin compound was previously used as an antifouling paint on the hulls of the vessels.

3.3.3 Currents

In the Gulf of Finland, surface water flows broadly from east to west close to the Finnish coast and from west to east close to the Estonian coast (Figure 3.4). The scattered structure of the archipelago zone causes local variations in the flow directions. The average flow velocity is in the order a few cm per second (Soomere et al. 2008).

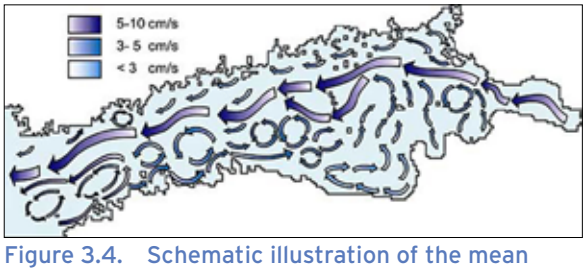

Figure 3.4. Schematic illustration of the mean circulation in the Gulf of Finland (Finnish Institute of Marine Research, 2008).

Based on the long-term monitoring results (late 2009 – late 2011) during the Nord Stream Project, local current speeds in the water column were observed to vary in both space and time. Average current magnitude was observed to be 0.04–0.06 m/s. 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 (Ramboll 2013a).

The dominant current direction differed between different stations confirming local topographic influence like 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 the most common (Ramboll, Witteveen+Bos and Luode Consulting Oy 2012).

3.3.4 Ice conditions

Ice conditions vary significantly in the Gulf of Finland, in terms of both area and season. The Gulf of Finland is usually covered by ice during one to five months of the year.

During most of the years, the eastern parts of the Gulf of Finland and part of the Finnish archipelago freeze. During average winter, the whole Gulf of Finland may be covered with ice. The maximum ice thickness will usually be reached in late February or March. In the Gulf of Finland, the ice thickness is usually 20–40 cm during the winter months. Drift ice can pile up and form pack ice extending to a depth of 10 metres. The visible part of floating pack ice is usually from 0.5 to 1.5 meters high and the part under the surface is six times higher. Close to the shore pack ice can also modify softer parts of the seabed.

Figure 3.5. The icebreakers keep fairways open, cutting channels ahead of ships when necessary (Marcusroos, 2007)

3.3.5 Hydrology and water quality

The Baltic Sea, where the Gulf of Finland forms its easternmost part, has unique brackish water conditions. The salt concentration in the sea water changes from 20 ‰ in the Kattegat to 0–2 ‰ in the eastern part of the Gulf of Finland. Salinity in the western Gulf of Finland is generally 5–6 ‰.

Oxygen conditions in the water column vary significantly according to season, stratification status and water depth. In the offshore areas, oxygen levels near the seabed are highly dependent on the mixing of different water columns that differ by their salinity characteristics. When the stratification is strong, it acts like a barrier between different water layers and might constrain vertical mixing and oxygen inflow to waters near the seabed. In the Gulf of Finland, a halocline is normally present in the western and central Gulf of Finland between 60–80 m (Myrberg et al. 2006). Therefore, waters beneath the halocline generally suffer from oxygen deficit problems. In the western part of the Gulf of Finland, where water depth in the open sea is about 80 m or more, the oxygen conditions close to the seabed have long been poor.

Another mechanism that prevents gas convection from top to bottom is the formation of thermocline (a layer of water that displays a rapid decline in temperature and which separates an upper warmer layer from a lower colder layer). The accurate form of a thermocline depends on the prevailing weather conditions during different seasons. The vertical temperature profile may vary in shape quite a lot.

The overall picture of the state of the water column near the seabed in the Northern Baltic Sea in late summer 2010–2012 is presented In Figure 3.6. It can be concluded from the images that the areas of the poorest oxygen conditions in the mouth of the Gulf of Finland in 2012 have increased compared to the previous years.

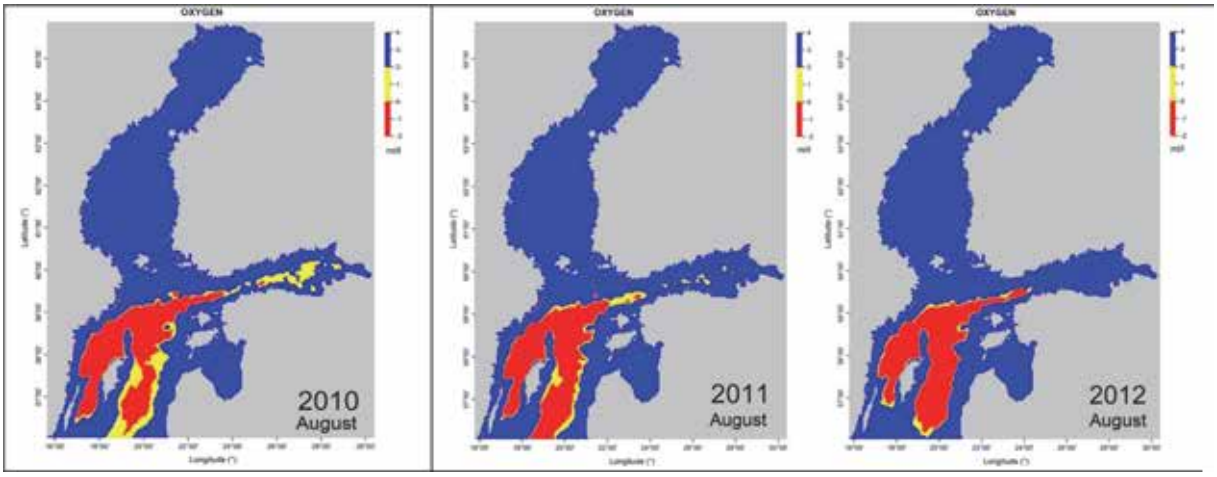

Figure 3.6. Oxygen conditions near the seabed in the northern Baltic Sea in August 2010–2012 according to SYKE /Finnish Environment Institute 2013/. Red areas refer to anoxic conditions.

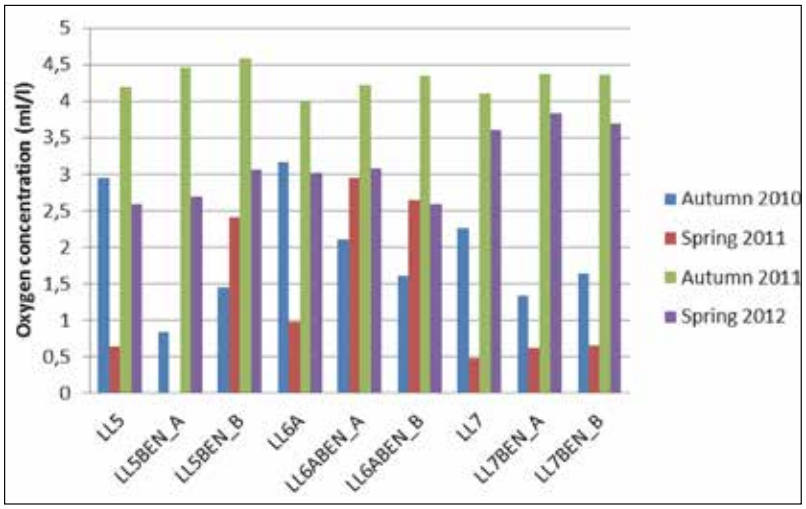

Figure 3.7. Variation in oxygen concentrations (ml O_2/l[2]; 1 m above the seabed) at the HELCOM benthos station areas between different years and seasons (Finnish Environment Institute 2013).

2 ml O_2/l = 1.43 mg O_2/l

Prevailing thermal and density stratification structure in the water mass determine the oxygen concentration levels near the seabed in the offshore areas. As can be seen in Figure 3.7, year to year variations in oxygen condition can be large even within the same area (depth range 60 – 80 m).

Situation is different in shallower areas. Near to the coastline in sheltered areas, eutrophication status in the water mass increases compared to the offshore areas.

In the following some water quality results from August 2012, when a clear thermocline existed, are presented from the stations of Skatafjärden 45 and Uus-28, Bågaskär (Environmental administration, HERTTA- information system). These monitoring stations are relatively close to the planned pipeline route. The total water depth at the stations is 30 m and 25 m, respectively. Oxygen concentration near the seabed (1.0 m above) was 58 – 59 % from the saturation value. Total phosphorus at this layer was 26 – 27 µg/l. In the surface water the corresponding values were 24 µg P/l and 26 µg P/l and total nitrogen was 310 µg N/l and 320 µg N/l.

As part of the monitoring in the Nord Stream gas pipeline project, water quality changes in the lowermost water layer were monitored permanently from the end of 2009 to 2012 i.a. in the western Gulf of Finland at a station in Tammisaari archipelago (Luode Consulting Oy 2013). This data served as background information for the monitoring results of the construction works. Water depth at the station (Control 1) approximately 20 km to the west from the planned pipeline route was 43 m. Time series data on salinity, turbidity and dissolved oxygen concentrations at this station in 2012 are presented in Figure 3.8.

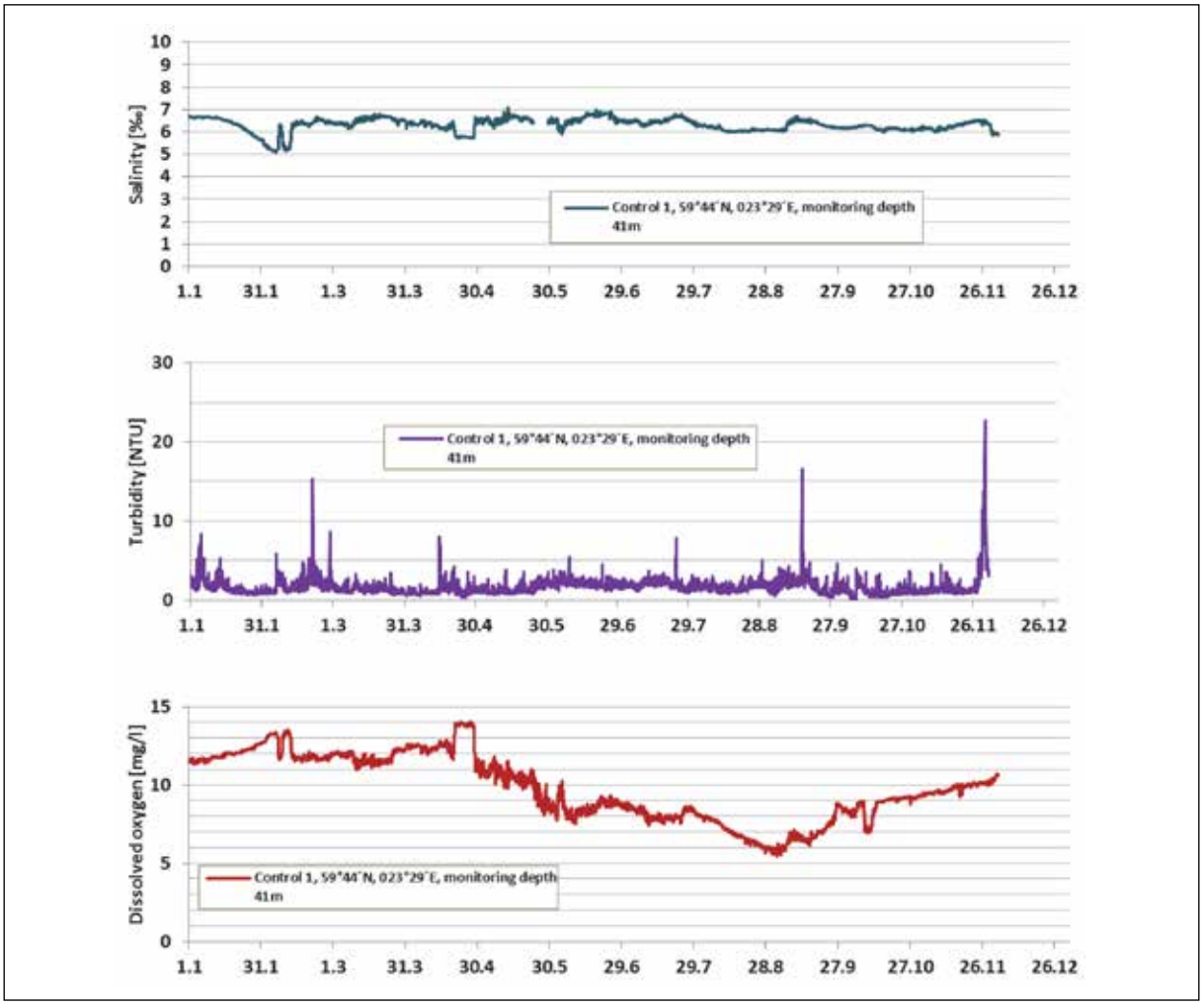

Figure 3.8. Time series data on salinity, turbidity and oxygen in sea water in 2012 one metre above the seabed at Control 1 (Luode Consulting Oy 2013).

During the monitored period, salinity near the seabed varied between 5–7.5 ‰. Minor differences between the years were recorded. Also within a year, as seen in the salinity graph above, some sharp fluctuations in values could be detected. Turbidity in this water layer remained generally low. In 2012, the highest peak (23 NTU) was recorded at the end of the year. Oxygen concentrations were at a relatively good level even at the end of summer stratification period. Rapid quality changes like some turbidity peaks were normally coincided with stormy weather. This in turn could induce changes in hydrographical conditions in the water column (e.g. strong currents).

During service visits to the station, water samples were collected from the monitoring depth. Metal concentrations in sea water were low or below the detection limit.

3.3.6 Air quality

The normal operation of a ship creates pollution through exhaust gas emissions. The main pollutants concerned are nitrogen oxides (NO_x) and sulphur oxides (SO_x). In addition, the released carbon dioxide (CO_2) contributes to global climate change. NO_x is emitted to the air mainly from the operation of diesel engines, while SOx emissions result from the combustion of marine fuels and directly depend on the sulphur content of the fuel (Helcom, 2010).

Air quality in contrast to the effect on human health is at good level in the vicinity of project impact area. Monthly average concentrations of NO_2 in seashore measurement station located in Lahemaa, Estonia, varied between 1,5 and 7 mikrograms/m^3 during year 2010. The air quality guideline of NO_2 for one year average is 40 mikrograms/m^3. (Bartnicki et.al., 2009).

NO_x emissions from ships contribute considerably to the eutrophication of the Baltic Sea. It is estimated, that in 2007 shipping in the Baltic Sea produced over 6 % of the total deposited nitrogen (Helcom, 2010).

Emissions from shipping are globally regulated by Annex VI 'Regulations for the Prevention of Air Pollution from Ships' to the MARPOL Convention.

The revised Annex VI requires worldwide that a marine diesel engine installed on a ship constructed on or after 1 January 2011 achieves a 15 % NO_x reduction level comparing to the current legislation. It also provides for the establishing of NO_x Emission Control Areas (NECA), requiring ships to be constructed on or after 1 January 2016 operating in NECA to reduce their NO_x emission by 80 % compared to the current situation. Additionally, pre-2000 ships (ships built on or after 1 January 1990 but prior to 1 January 2000), which have not been regulated so far, are required to meet the current NO_x reduction levels (Helcom, 2010).

Particulate Matter (PM) and SO_x emissions from Baltic Sea shipping have decreased (PM: -3 %, SO_x: -13 %) from 2010 because of the requirements of SO_x Emission Control Area and the EU sulphur directive 2005/33/EC. Year 2011 was the first year when both SECA and EU sulphur directive fuel requirements were effective throughout a full calendar year (Jalkanen et.al., 2012).

CO_2 and NO_x emissions as well as the total fuel consumption have increased (NO_x: 373 kt, +8 %, CO_2: 18.9 Mt, +10 %, fuel consumption: 6220 kt, +10 %), probably because of the recovery of economic activity in the Baltic Sea area (Jalkanen et.al., 2012).

3.3.7 Noise

Noise is a sound, especially one that is loud or unpleasant or that causes disturbance. Noise can be divided into airborne noise and underwater noise. Noise in air and underwater noise are both measured in decibels (dB). The term dB covers the logarithm to a ratio between the actual level and a reference level. The reference levels used for noise in air and underwater noise are, for practical reasons, different. Noise in air and underwater noise levels stated in dB cannot be directly compared.

There are no available reports concerning airborne noise levels in the Gulf of Finland. It can be assumed, that man-made noise is mostly caused by vessel traffic, and is concentrated along the main routes. There are also natural sounds, like sounds from waves, rain, thunder and birds.

Underwater noise is at the moment under intensive research in the Baltic Sea. The EU funded project BIAS targets the management of human-introduced underwater noise in the Baltic region. During 2014, the BIAS project will deploy 38 autonomous hydrophone rigs all over the Baltic Sea to measure the status of underwater noise.

The main sources of underwater noise are commercial shipping, fishing, military activities, construction activities, seismic explorations, recreational boating and operational wind farms. The noise may propagate at long distances from known sources and, depending on

intensity and frequency, may disturb marine mammals and fish (Helcom, 2010).

Most of the Baltic marine area is impacted at least by a level of noise that has been estimated to mask the communication of animals (Figure 3.9).

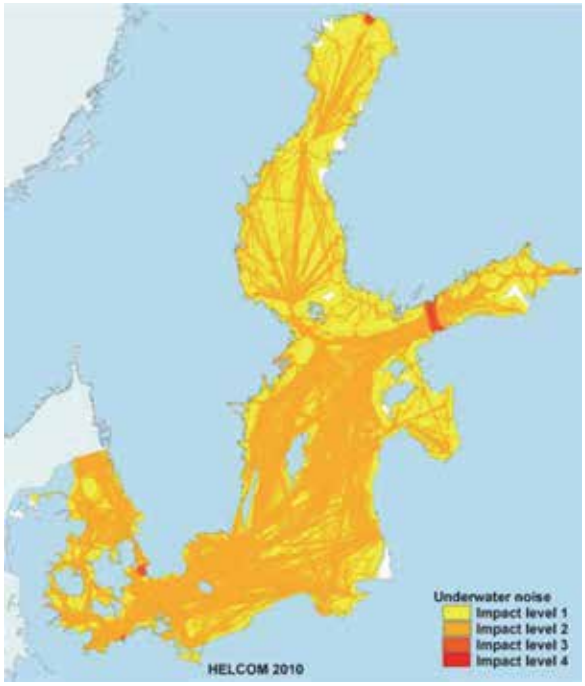

Figure 3.9. Distribution of underwater noise in the Baltic Sea during 2003–2007. Impact level 1 indicates that the noise is audible to biota; level 2 indicates that masking of communication occurs; level 3 indicates an avoidance reaction; level 4 indicates physiological impacts from construction work. (Helcom, 2010).

3.4 Biotic environment

The biodiversity of the Baltic Sea environment is characterised by a low number of species and abundance of individuals. In the Baltic Sea environment, biota is affected by stratification and horizontal gradients in many chemical and physical factors. Brackish water is often too saline for fresh water species and too dilute for the most of the marine species. Close to shores of the Gulf of Finland where salinity is the lowest, the diversity and abundance of fresh water species is highest, especially close to river mouths. Salinity is increasing westwards and in the western part of the Baltic Sea the diversity of marine species is the highest.

The surface layer of water that light penetrates and where photosynthesis is possible, is called photic zone. In the Baltic Sea, the photic zone reaches to a depth of 10–20 metres. Near the shore the photic zone reaches a maximum depth of 15 metres.

The populations of the species in the Baltic Sea mainly consist of marine or fresh water species that have not completely adapted to prevailing salinity conditions. Only few actual brackish water species exists in the Baltic Sea. One example of this is Baltic herring, which has adapted to the varying salinity conditions. Many Baltic Sea species live at the extreme edges of their range. This kind of ecosystem is fragile and can easily be disturbed.

The Gulf of Finland is one of the most important migration routes for arctic birds. A few dozen species of water birds are nesting on the shores and in the archipelago of the Gulf of Finland. Regarding mammals, four species are native to the Baltic Sea: Grey Seal (Halicoerus grypus), Ringed Seal (Pusa hispida botnica), Harbour Seal (Phoca vitulina) and Harbour Porpoise (Phocaena phocaena). Grey Seal and Ringed Seal are found in the area of the Gulf of Finland. Both of them are protected.

3.4.1 Benthic flora and fauna

In benthic environment the composition of biota (flora and fauna) depends on light conditions, salinity, dissolved oxygen and content of organic matter in sediment. Flora requires light to live and grow. Macrophytes appear only in shallow areas, mostly near the shore. In the central Gulf of Finland the maximum depth for benthic flora is 10–15 metres. In the easternmost part of the Gulf of Finland flora is only found to a depth of 6 metres. The boundary depth for macrophytes in most areas of the Baltic Sea is about 30 metres.

Benthic fauna is significantly denser on the coastal area of the Gulf of Finland than at the open sea area. The number and density of species decrease from west to east. Dissolved oxygen is a limiting factor for the appearance of benthic fauna. In varying oxygen conditions of the Baltic Sea, benthic communities periodically die out and recover in large areas. Under halocline oxygen conditions are highly dependent on oxygen-rich saline water inflows. Decomposition of debris from dead biota consumes oxygen. Eutrophication affects oxygen conditions of the Baltic Sea. These factors lead to even permanent oxygen depletion and absence of benthic fauna in deeper areas of the Baltic Sea and the Gulf of Finland.

3.4.2 Planktonic environment

Plankton is composition of small organisms drifting in the water. Plankton is divided into phytoplankton and zooplankton. Plankton composition in different locations is highly dependent on salinity, as the oceanic species require high salinity and fresh water species prefer fresh water. Season has influence through the amount of light, temperature and nutrients limiting growth and also through vertical mixing that moves plankton away from photic zone. This leads to certain seasonal patterns in species abundance.

As zooplankton mainly feeds on phytoplankton, there are also seasonal differences in the composition of zooplankton. Also, temperature and predation are limiting factors for the growth of the zooplankton population. During winter the plankton is reduced to minimum. When light increases, phytoplankton starts to grow rapidly. Growth ends when some essential nutrient (usually dissolved nitrogen) is depleted from the surface water. Excess of the produced biomass settles on the seabed decaying and consuming oxygen. Eutrophication has changed the composition of plankton species and cyanobacteria have benefited from this.

3.4.3 Birds

The coastal areas of the Baltic Sea are important wintering and nesting areas for many bird species. The sea birds consist of open water species, such as divers (Gavia arctica), gulls (Laridae), auks (Alca torda), and species that search food from the bottom, such as dabblers, ducks, mergansers, and coots. The Baltic Sea is an important migration route, especially for water birds and geese and waders that nest in tundra areas.

Several important bird areas in the Baltic Sea and in its direct vicinity have been defined as protected areas according to the Ramsar agreement or the EU Birds Directive. In addition, bird areas have been protected by national legislation. Finnish IBAs (Important Bird Areas) at the Gulf of Finland in the vicinity of the planned project area are shown in Figure 4.4. Regarding the IBA -areas FI080, Tammisaari and Inkoo western archipelago is closest to the planned project area. The IBA FI082, the Kirkkonummi archipelago corresponds to the Natura 2000 area with the same name. The important species of the western archipelago of Tammisaari and Inkoo are the White-tailed Eagle (Haliaeetus albicilla), Mew Gull (Larus canus), Caspian Tern (Sterna caspia), Great Black-backed Gull (Larus marinus) and Black Guillemot (Cephus grylle). Of these, the White-tailed Eagle is wintering in the area, and the other species nest there. The important species at the Kirkkonummi archipelago are the Barnacle Goose (Branta leucopsis) and Great Black-backed Gull (Larus marinus). Both species nest in the area.

3.4.4 Marine mammals

Four marine mammal species live in the Baltic Sea area. Three of these are seals: Harbour Seal (Phoca vitulina), Grey Seal (Halichoerus grypus), and Baltic Ringed Seal (Phoca hispida bothnica). Only Grey Seal and Ringed Seal are usually found in the Gulf of Finland. The fourth mammal species is Harbour Porpoise (Phocoena phocoena). It mainly lives in southern Baltic Sea and appears only occasionally in the Gulf of Finland.

In general, seal populations have declined dramatically. Grey Seal and Ringed Seal are protected species listed i.e. in the EC Habitats Directive (Annexes II and V). In spite of recent population growth, the Grey Seal is listed as endangered species (on the International Union for Conservation of Nature, IUCN, Red List). Ringed Seal is listed as vulnerable. Both seal species are also classified as nearly threatened species in the Finnish Nature Conservation Act. In Estonia the Ringed Seal is defined as II category protected species.

The Ringed Seal population in the Baltic Sea area is about 6,000–9,000 individuals. The size of the population in the Gulf of Finland is not exactly known. Observations indicate that there are few hundreds of individuals in the area. The species seems to be rare in both, Finnish and Estonian part of the Gulf of Finland. Most of the population is found at the Russian part of the gulf, where the ice conditions are most favourable. Hunting, pollution and drownings caused by fishing nets have reduced the Ringed Seal population.

The Grey Seal population has grown relatively rapidly within recent years. In seal observations of 2007, about 20,000 individuals were found in the Baltic Sea, of which less than 1,000 individuals in the Gulf of Finland. Grey Seals can migrate long distances between haul-outs and there are no clearly separate populations.

The closest seal sanctuary is located on the Krassi islet 17 km west from Pakrineeme point of landfall. The Krassi islet and surrounding coastal sea is designated for the protection as a Grey Seal breeding site.

Figure 3.10. Grey Seals (Halichoerus grypus) (Wikimedia Commons 2006)

It is possible that there are seal colonies on islets at the pipeline area of the Balticconnector gas pipeline. In the assessment phase, the important seal locations in the area will be determined and the impacts caused by the project will be assessed.

3.4.5 Fish

Due to the brackish water conditions of the Baltic Sea, there are fairly few fish species; approximately 70 marine species and 30–40 brackish or fresh water species. Low salinity is a limiting factor for many marine fish species in the Gulf of Finland and deeper areas are often poor habitats for demersal fish because of frequent oxygen deficiency. Economically, the most important species are Cod (Gadus morhua), Baltic Herring (Clupea harengus), Sprat (Sprattus sprattus), and Salmon (Salmo salar). Only these four species have the International Baltic Sea Fisheries Commissions (IBSFC) fishing quotas in the Baltic Sea area. Cod is common in the southern parts of the Baltic Sea area. After saline water pulses through the Danish straits, Cod can temporarily spread towards north.

Other species found in the Gulf of Finland are i.e. Eel (Anguilla Anguilla), Trout (Salmo trutta), Flounder (Plathichthys flesus), Pike (Esox lucius), Zander (Sander lucioperca), Perch (Perca fluviatilis), Smelt (Osmerus eperlanus), and Common Whitefish (Coregonus lavaretus). Freshwater species, like Silver Bream and Roach, are found in the archipelago area.

Spawning areas and seasons for different species vary. For example, Baltic Herring spawns in shallow coastal zone areas on vegetation covered hard bottoms during spring or autumn, whereas Sprat spawns in the open water column in the deep areas of the Baltic Sea between February and August. In the Gulf of Finland Sprat spawns during summer months.

3.5 Socioeconomic conditions

3.5.1 Ship traffic

A great number of vessels travel in the Gulf of Finland (GoF) each year. The main commercial traffic inside the GoF follows the traffic separation schemes (TSS) as indicated in the navigational sea chart in Figure 3.11. The traffic in GoF is monitored by the Traffic Centres in Helsinki, Tallinn and St. Petersburg as part of the mandatory ship reporting system GOFREP. Vessels above 300 gross tonnage (GT) are required to participate in the system.

In order to get a more detailed overview of the ship traffic along the pipeline route across the GoF from Finland to Estonia, Automatic Identification System (AIS) data has been analysed. AIS is a system used to exchange information between ships and between ships and land-based stations. A ship equipped with AIS continuously transmits information regarding its name, location, destination, speed, course etc.

The International Maritime Organization (IMO) decided that by the end of 2004 all ships exceeding a GT of 300 shall be equipped with AIS class A transponders. However, it should be noted that there are some exceptions. For example, naval ships are not obliged to carry AIS. In the recent years, there has been an increase of smaller ships (less than 300 GT) installing AIS class B transponders.

The historical AIS data has been obtained from the Danish Maritime Authorities, who are responsible for the HELCOM AIS server containing AIS data from the entire Baltic Sea. The AIS data from the entire year of 2012 has been used to compile the ship traffic statistics.

Ship traffic density

On the basis of the AIS data, it is possible to generate a ship traffic density plot showing the ship traffic pattern in a given area. Using the historical AIS data from 2012, a ship traffic density plot has been made covering the pipeline route and a part of the GoF.

The plot is shown in Figure 3.12. The colour scale in the image ranges from yellow, red to black and purple to green. Areas with yellow colour indicate areas with low traffic intensity, while areas with green indicate areas with more than 1,500 crossings per year. It can be observed that the majority of the ship traffic follows the TSS in and out of the GoF. There is also a high ship traffic density between Helsinki and Tallinn east of the pipeline route.

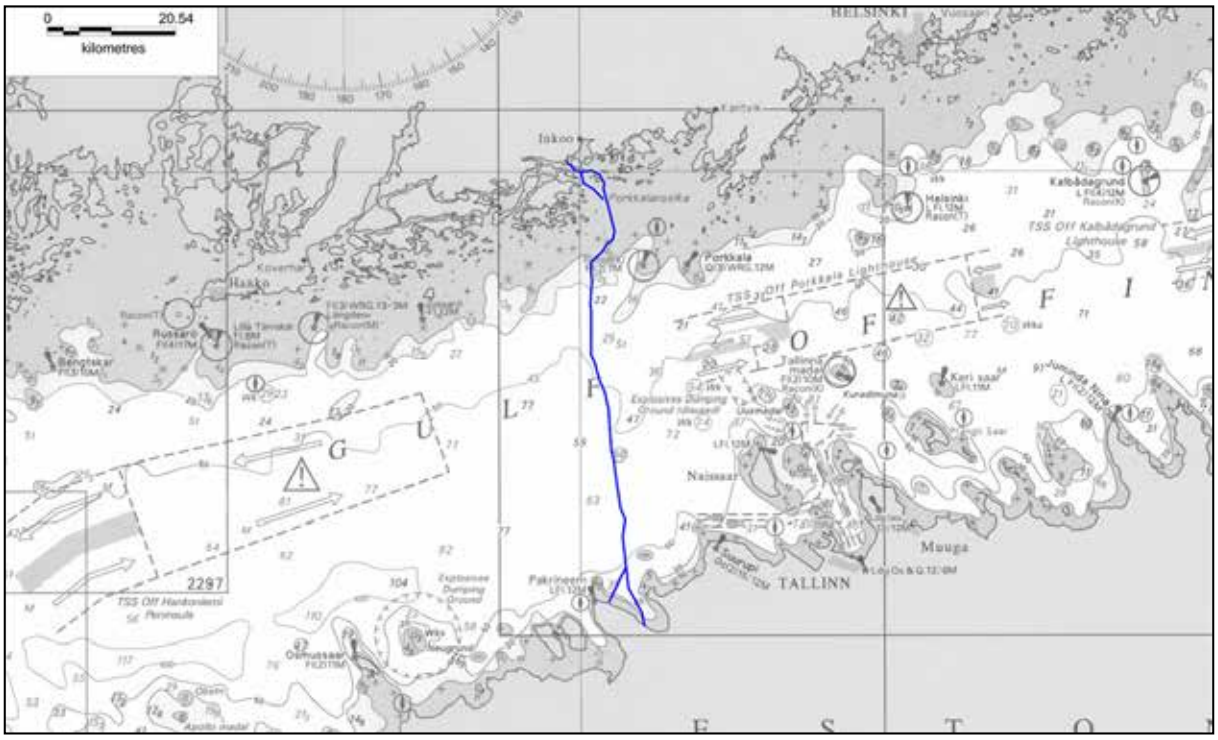

Figure 3.11. Navigational sea chart

Based on the ship traffic density plot, 10 different routes have been identified either crossing the pipeline or passing close by. The 10 routes are marked in Figure 3.12 along with the number of annual crossings. It can be observed that the majority of the traffic travels in (route G) / out (route F) of the GoF and crossing the pipeline approximately in the middle of the pipeline route.

Close to the Finnish shore, there are some near shore traffic routes (route A, B, C). In the archipelago of Inkoo and its nearby municipalities, there are many holiday residences and summer residents, in addition to permanent residents. For this reason, small boat traffic is very heavy in the archipelago area. The coastal fairway leading from Helsinki to Hanko is one of Finland's busiest coastal fairways. At Inkoo, thousands of boats may be moving during summer weekends along the coastal fairway. Many professional fishermen also move in the Inkoo archipelago on the route of the pipeline.

Route H also directs traffic to/from GoF, but vessels are taking a "short cut" south of the TSS. Route I is the west bound traffic to/from Tallinn, while route J is the traffic from Paldiski going east/north. Paldiski South Harbour is located 50 km west of Tallinn and it is the third largest harbour of the five harbours belonging to Port of Tallinn. The core activities of the harbour are focused on the handling of Estonian export and import cargo and transit cargo.

The annual number of crossings per route is shown in Table 3.1. The traffic load on the near shore route A, B and C is rather limited. It should be noted that the vessels using these routes are mainly leisure vessels, which are not obliged to carry AIS and the actual number of sailing vessels is thus higher.

Table 3.1. Annual number of passages on the identified routes (based on AIS data from 2012)

Route	Annual passages
A	350
B	450
C	250
D	1,200
E	1,800
F	12,500
G	11,900
H	1,350
I	3,150
J	650

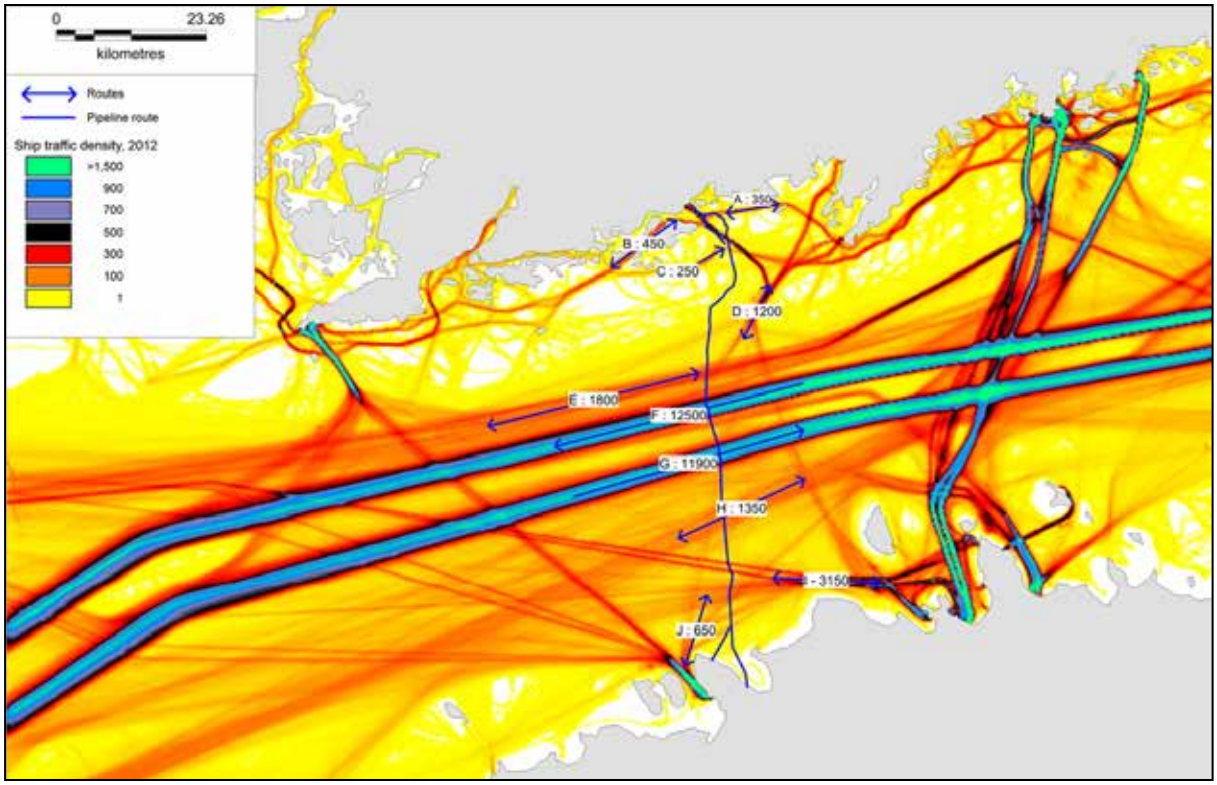

Figure 3.12. Ship traffic density plot. Based on AIS data from 2012

The ship type distribution on each route is presented in Table 3.2. The majority of the vessels sailing on route A, B and C (category "other") are pleasure and leisure vessels. On route C other category also includes search and rescue vessels. Routes D, F, G and H are dominated by cargo vessels and tankers. Route E passing north of TSS is dominated by passenger vessels such as MS Mariella and MS SPL Princess Anastasia travelling to/from ports in the GoF (Figure 3.13).

Table 3.2. Ship type distribution on the identified routes. Based on AIS data from 2012

Route	Passenger	Cargo	Tanker	Other
A	0.4%	1.6%	1.6%	96.4%
B	3.7%	9.5%	1.2%	85.7%
C	0.6%	5.3%	0.0%	94.1%
D	1.7%	75.4%	3.9%	19.0%
E	67.4%	27.0%	0.7%	4.9%
F	6.0%	63.3%	29.4%	1.3%
G	5.8%	63.1%	29.8%	1.3%
H	0.0%	95.0%	1.9%	3.1%
I	34.6%	27.8%	20.1%	17.6%
J	0.2%	35.1%	32.6%	32.1%

In order to get an idea of the size of the vessels travelling on the routes, the length distribution of the crossing vessels are considered. The vessels travelling on route A to C are very small ships below 25 meters. This corresponds very well with the pleasure and sailing vessels dominating these routes. Route D contains vessels mainly in the range from 50 to 100 meters, while the larger ferries travelling on route E have a length between 150 and 225 meters. The distribution on routes F and G in the TSS are very similar and widely spread from vessels with a length of 75 meters and upwards. Routes H is governed by vessels with a length from 75 to 150 meters. The vessels on route I is widely spread with 1/3 of the vessels having a length greater than 175 meters. The vessels on route J are mainly vessels with a length below 100 meters.

Figure 3.13. Up: MS Mariella. Down: MS SPL Princess Anastasia. From www.marinetraffic.com

Table 3.3. Ship length distribution on the identified routes. Based on AIS data from 2012

Route	0-25	25-50	50-75	75-100	100-125	125-150	150-175	175-200	200-225	>225
A	90.1%	5.7%	3.2%	0.7%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%
B	81.9%	10.8%	2.3%	4.8%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
C	92.3%	6.1%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
D	4.6%	11.0%	32.5%	31.1%	8.3%	5.7%	3.5%	3.1%	0.3%	0.0%
E	1.9%	2.3%	2.8%	9.3%	4.8%	1.7%	20.1%	25.7%	30.4%	1.1%
F	1.1%	0.5%	0.9%	15.5%	14.0%	18.2%	15.9%	15.6%	7.1%	11.1%
G	1.1%	0.5%	0.9%	15.1%	13.9%	18.0%	16.3%	15.5%	7.5%	11.1%
H	2.3%	1.5%	4.2%	61.5%	13.7%	15.4%	0.6%	0.2%	0.0%	0.6%
I	10.4%	5.4%	7.0%	25.2%	7.2%	5.2%	2.5%	19.2%	12.1%	5.8%
J	14.6%	20.1%	9.8%	41.5%	2.7%	8.3%	1.9%	0.7%	0.5%	0.0%

Based on year 2012 statistics on international and domestic shipping by the Finnish Transport Agency, there were app. 400 vessels arriving to the port of Inkoo. However, after power plant in Inkoo (Fortum) will be driven down, there will most probably be remarkable changes in the number of arriving vessels.

3.5.2 Fishery

There are quite a few professional fishermen operating in the Inkoo archipelago and also many recreational anglers. Fishing is an important industry for many residents in the archipelago. The fish catch in the Gulf of Finland was 11,792,000 kilos in 2011. More than half of the catch consisted of Sprat and less than half of Baltic Herring. In 2012, the fish catch in the Gulf of Finland was 8,900,000 kilos (-24.5 %). The catch of fish by recreational fishermen in year 2009 was in the region of Uusimaa and South-East Finland about 2.5 million kilos. The most caught species in professional fishery include Sprat, Baltic Herring and Zander, and in recreational fishery Perch, Pike, and Roach. (RKTL 2013 and 2012, Seppänen et al 2011)

There are 25 fishery regions in the southern coast of Finland that are members of the Federation of Finnish Fisheries Associations. A fishery region is a legal cooperative organisation that promotes fishery in its area. The basic tasks of a fishery region include management of fishing waters and supervising fishing. In the high sea, sub-squares 48H3 and 48H4 of the Gulf of Finland are the most significant for the Finnish professional fishery. The route for the Balticconnector runs in ICES area 32 (the Gulf of Finland) starting from Inkoo and ending to Paldiski through the sub-squares 49H4 (in Finnish internal territorial waters), 48H4 (in Finnish and Estonian territorial waters and economic zones), 47H4 (in Estonian territorial waters) (Figure 3.14). Trawling is form of fishery potentially affected by the pipeline.

The subcategories of pelagic trawls according to the official identification codes of trawl types are OTM (trawls towed at the side or behind the vessel), PTM (pair trawls) and TM (pelagic trawls, unspecified). Subcategories for bottom trawls are TBB (beam trawls), OTB (demersal trawls) (towed at the side or behind the vessel), PTB (pair trawls), TB (bottom trawls, unspecified). Other categories include OTT (double trawls), OT (trawls (unspecified), PT (pair trawls, unspecified) and TX (other trawls, unspecified). Vessels have been divided in sub-categories, such as open sea and coastal trawlers as well as bottom and pelagic trawlers. Most vessels operate with primary and secondary gears, if it is allowed in national legislation. The main gear pursuant to the Commission Regulation (EC) No 26/2004 and (EC) No 1386/2006 is a fishing gear considered to be the one most frequently used on board the vessel for a fishing period of a year or for a fishing campaign (Appendix 1). Gears have to be reported to the register. There are also separate statistics for coastal and open sea trawling and other fishery.

Fishing in EC waters is subject to a national Finnish and Estonian legislation, which are managed in line with the Common Fisheries Policy of the European Community, which is regulated by articles 17 and 20 and section 9 of Appendix I as well as by other provisions in the Council Regulation No. 2371/2002. Both countries have adopted their own legislation within common frames. The Estonian and Finnish fishermen have fishing rights in their own fishing areas and territorial waters. The sea frontier between Finland and Estonia in the Gulf of Finland has been agreed in the bilateral agreement on 18 October 1996 between the Republic of Finland and the Republic of Estonia on the sea frontier in the Gulf of Finland and in the northern Baltic Sea. In article 2 of the agreement is the list of coordinates. Furthermore, Finland, Estonia and Sweden have agreed on the point of incidence of sea zone frontiers (Article 1) in Tallinn in January 2001.

Fishing within the 12 mile wide coastal band is allowed only for the national fishermen, unless otherwise separately agreed. Fishing is open for other EC countries of the Baltic Sea outside of 12 mile area and territorial waters. However, such open area for fishing does not exist on the proposed route for the pipeline. Despite this, the Council annually sets regulations on fishing opportunities of certain fish species in the Baltic Sea, including national fishing areas. The internal frontier of the Estonian economic zone to the territorial sea is specified by the Parliament in 1 § of the Estonian EEZ Act. The baseline of Estonia is prescribed in Appendix 1 of the Estonian Sea Frontier Act.

There are around 30 possible Estonian trawling companies with the right to trawl as well as Estonian trawlers in the project area over the pipeline. The number of vessels actually engaged in trawling near the project area is estimated to be around 10 – 20. During the assessment procedure, crossing points, scrapping data and catch data will be reviewed, which will reduce the number of vessels that may potentially be impacted by the pipeline. The Fishery Department in the Estonian Ministry of Agriculture possesses satellite data and catch data to be reported to the EC fishery control. Scrapping data will be entered into the EC fishing vessel register.

Bottom trawling is exercised only near the coast of Estonia in the Gulf of Finland. The share of bottom trawl catches is under 3% of the total trawl catch. Uneven and rocky bottom conditions are not suitable for bottom trawling. In both countries, demersal trawling from near-bottom position will be in focus during the assessment procedure, when the pipeline is on the seabed. Estonian sprat catches by trawl gears from sub-square 48H4 were 8,000,000 kilograms in 2008, which is over 10 times bigger than the Finnish catches. Baltic Herring catches by trawls were around 3,000,000 kilograms in sub-square 48H4 in 2008. Catches were around 7,000,000 and 2,000,000 kilograms in 2006, and 9,000,000 and 2,500,000 kilograms in 2007. Estonian trawlers had in 2008 also large Sprat (around 1,650,000 kg) and Baltic Herring (almost 800,000 kg) catches near the coast in the Estonian sub-square 47H4. So the trawling in the Estonian waters is more intensive than in the Finnish waters.

However, no bottom trawl catches were registered in these sub-squares in 2006–2008. In Estonia, annual EC quotas are distributed further to fishing companies with exact tradable shares.

In Finland, quotas will be granted to fishing vessels without separate shares. Finnish trawlers with a length of over 16 meters have yearly about 10–40 fishing days in sub-square 48H4. In Finland, there are no bottom trawlers on the route for the pipeline and bottom-trawling by demersal trawler is now forbidden. The catch of Baltic herring by trawl gears has been from 140,000 kilograms to over 600,000 kilograms and the catch of sprat by trawl gears from 300,000 kilograms to over 600,000 kilograms. In the Finnish sub-square 49H4 near the coast, only nets and various types of traps have been utilized. The total catch has been less than 10,000 kilograms, mostly composing of Salmon and Baltic Herring.

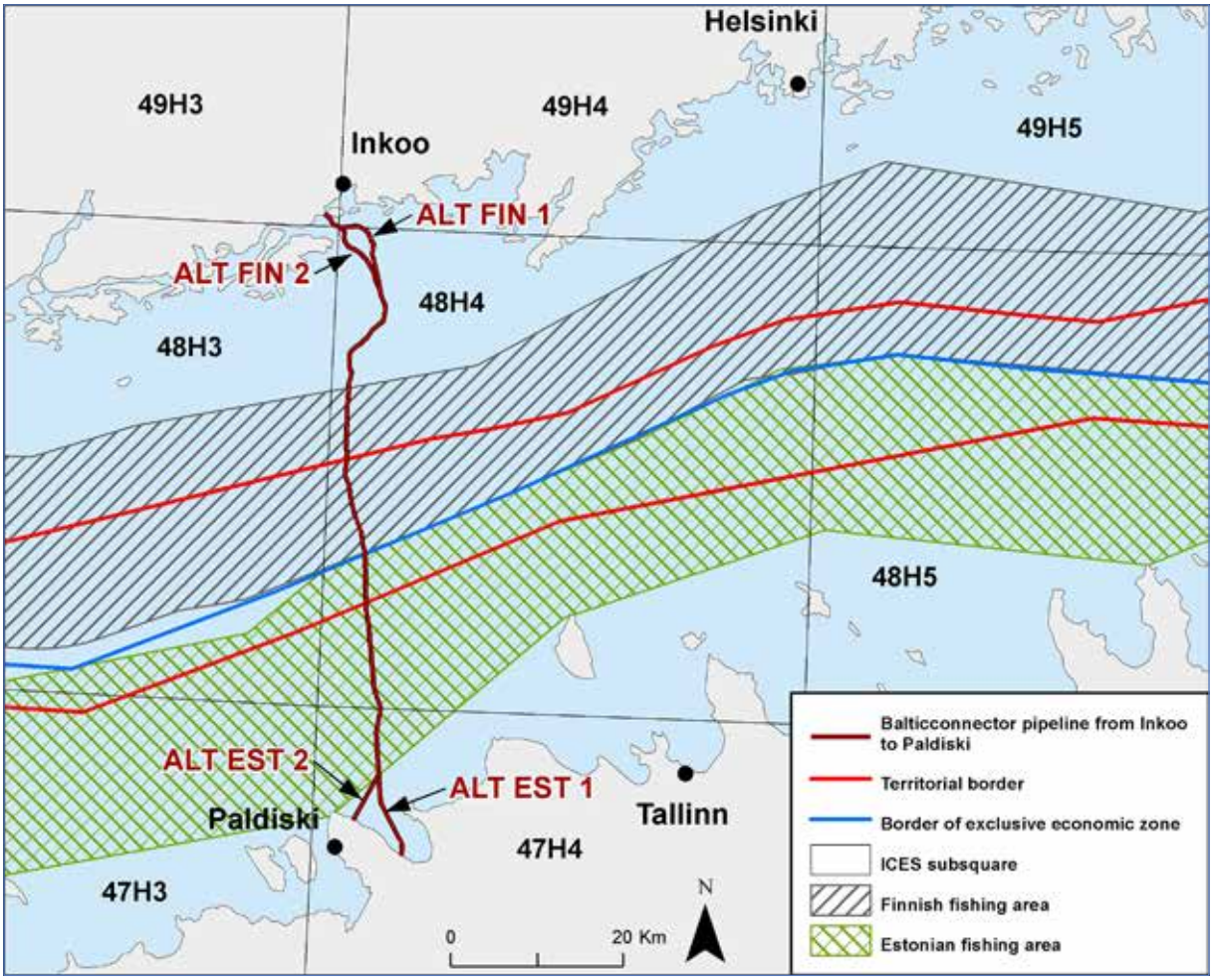

Figure 3.14. Finnish and Estonian fishing areas

Figure 3.15. Fishing boat (Verkkoapaja 2010)

3.5.3 Military areas, munitions and waste sunk in the sea

There are areas in use by the Finnish Defence Forces in the vicinity of the planned pipeline route (Figure 3.16). The planned pipeline route crosses the Upinniemi restricted area and the Upinniemi firing danger area of the Defence Forces. The purpose of the restricted areas is to contribute to the securing of the territorial integrity of Finland. They are important for the country's safety and the organizing of aerial surveillance, and are strictly defined areas of the Finnish territorial waters, for which specific restrictions have been set. In the restricted areas, it is not allowed to scuba dive or train underwater activities commonly unrelated to navigation, such as anchoring a buoy in the sea bed, excavation or heaping of the bottom sediments, cable-lay or echo sounding. Exploration and mapping of the seabed without permission is forbidden as well.

The pipeline route cuts through a firing danger area of the Finnish Defence Forces, where firings are regularly carried out. Strict operation restrictions have been set for the time period of the firings. In Finland the Defence Command and the Ministry of Defence have given their pre-statement for the pipeline routes and this has been taken into account in the route planning of the pipeline. In addition to the areas of the Finnish Defence Forces, also the Estonian Defence Forces have a practice area near the planned pipeline route in the Estonian coastal side of the Gulf of Finland. In Estonia it has been stated in cooperation with the ministries that the planned pipeline route is not crossing any areas unsuitable from the point of view of the Estonian Defence Forces.

There are several possible mine fields in the Gulf of Finland. Between 1939 and 1945, thousands of mines were laid into the Gulf of Finland, most of which were removed after the end of the war. However, there are mines that have separated from the mine fields and sunk. The planned pipeline route crosses such areas in the Finnish and Estonian territorial waters (Figure 3.16).

Besides mines, a large amount of other kinds of munitions have been sunk in the Gulf of Finland in the past decades. The Russian institute for navigation and hydrography (The National Scientific and Research Institute of Navigation and Hydrography, Ministry of Defence of the Russian Federation) has excavated munitions in the Baltic Sea, including in the Estonian coast.

Also Estonian Defence Forces are dealing with the munition clearence and exchanging information about it. Since year 1994 850 munitions have been defused in Estonian waters.[3]

A working group under HELCOM for chemical wastes immersed in the sea (HELCOM CHEMU) has examined chemical waste sunk in the Baltic Sea. Waste sunk in the sea may have floated from the place where they were originally left. Fishermen have found sunk wastes from time to time. According to existing information, no chemical weapons have been sunk in the Gulf of Finland.

In the seabed survey done for the Balticconnector project in 2006, no safety decreasing factors, such as mines, sunk weapons or hazardous waste, were found in the vicinity of the planned pipeline. At that time, equipment was used for measuring that scanned the seabed from a width of 150–400 metres and distinguished objects with a size of 20 centimetres or more. Besides the seabed itself, the equipment can display the soil type beneath the seabed. After all, it is possible that there are mines etc. in the vicinity of the planned pipeline, which are not found yet.

3 Website of Estonian Defence Forces: www.mil.ee/et/kaitsevagi/merevagi

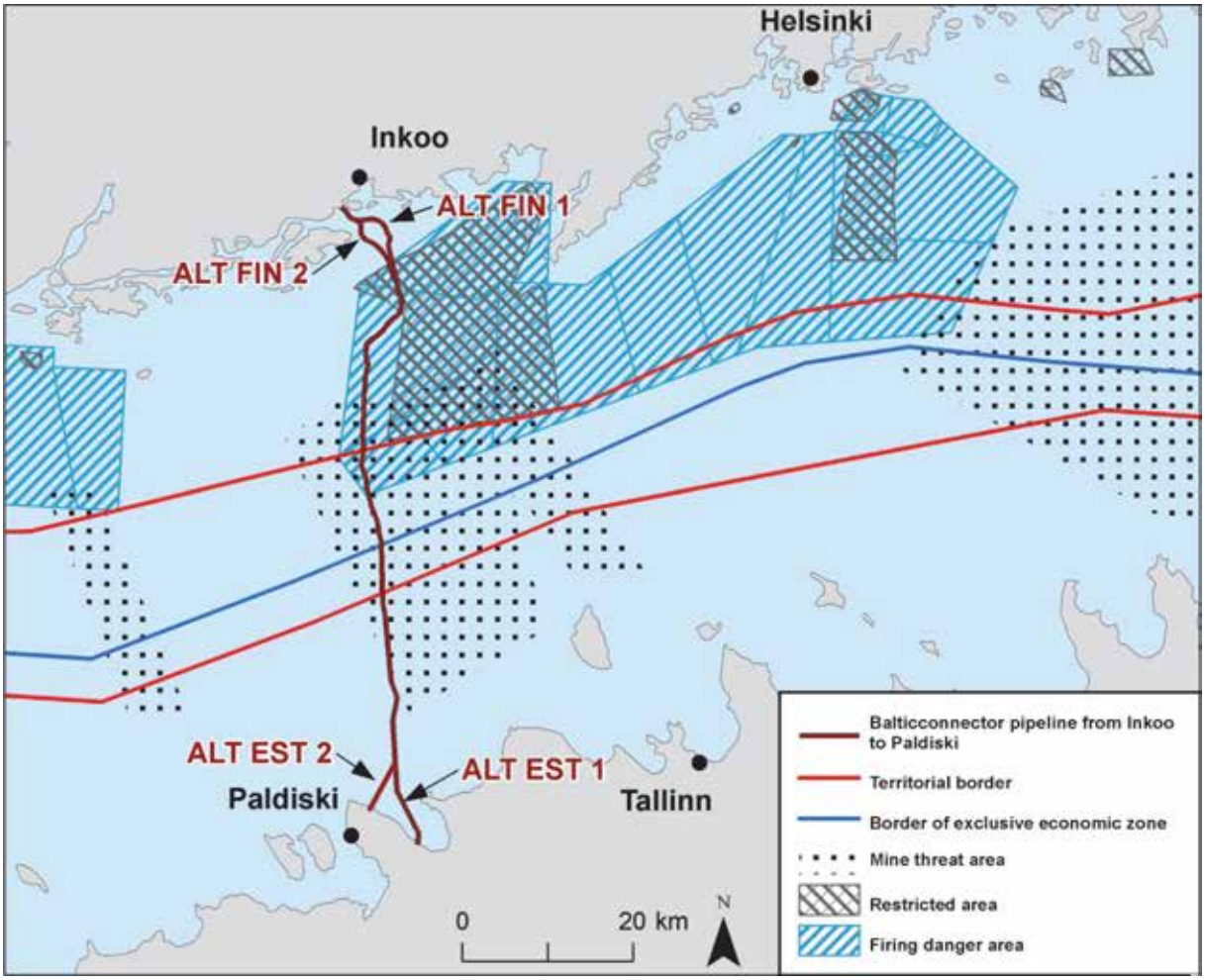

Figure 3.16. Military areas of the Finnish Defence Forces and mine threat areas in the vicinity of the pipeline

3.5.4 Cultural heritage

3.5.4.1 Cultural heritage in Finnish waters near the pipeline route

Cultural heritage objects, that are essential from the viewpoint of the planned project, mainly include ship wrecks and other sites of sea archaeology (Figure 3.17). Wrecks are mainly found from points on the shipping channels and in the vicinity of harbours. Other archaeological objects are generally encountered in shallow water areas that are above sea level. According to the National Board of Antiquities, there is one wreck in the direct vicinity of the planned pipeline (FIN ALT 2). This wreck (wooden wreck from the 18th century) is located south-east from Jacobramsjön Island. It is possible that there are more wrecks in the vicinity of the planned pipeline, which are not found yet. Thus, according to seabed survey made in 2006, there are no more wrecks in the direct vicinity of the planned pipeline than the already mentioned wooden wreck.

There are significant cultural historical sites near the planned gas pipeline, for example, cultural environments of Skeppö and Storramsjö, pilot stations in e.g. Bågaskär and guard houses in the islands of Stora and Lilla Fagerön. Regarding cultural landscape, the Östervik pastures are a nationally valuable site. The cultural landscape of Barösund is known for a six kilometre long fairway in the sheltered inlet between Barölandet and Orslandet. The archipelago of Barösund is located south from the cultural landscape of Barösund, which is known for a vast marine cultural landscape. There are a plenty of known onshore immovable relics near the coastline. A chain of relics can be found on the western side of the pipeline, which includes heaps of relics from the Bronze and Iron Age. An ancient fortress is known to have located in Älgsjöskatan.

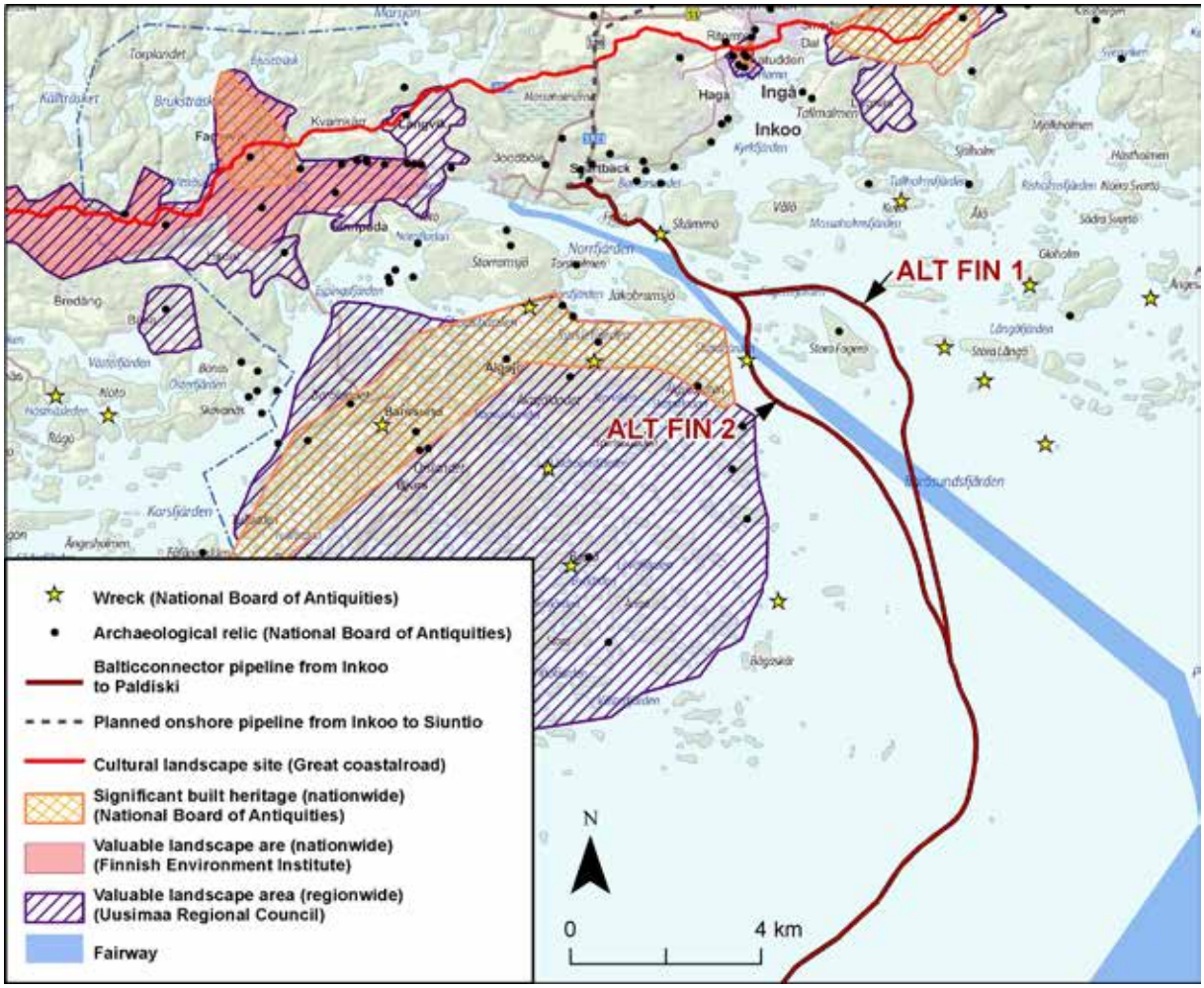

Figure 3.17. Cultural heritage areas in the vicinity of the pipeline off the coast of Finland

Increasing number of summer residences with related facilities and variable locations, boating as well as power plant and other industrial activities located in Joddböle have altered the cultural landscapes in the archipelago over the years.

3.5.4.2 Cultural heritage in Estonian waters near the pipeline route

According to the Estonian national heritage board's database (2013), there are two known cultural heritage objects in the vicinity of the project area in the Estonian coastal waters. The closest wreck (name not known) is located 5 km from the Pakrineeme point of landfall (ALT EST 2) not far from the tip of the Pakri peninsula. The other one is located off the coast of Lohusalu cape and it is called "Fennia", its distance from the points of landfall is more than 9 km. Other wrecks in the vicinity of the route near the Estonian coast are not known which, however, does not mean they do not exist.

3.5.5 Scientific heritage

There are long-term environmental monitoring stations in the Gulf of Finland managed by several countries around the Baltic Sea. Two of these are located within 1–4 km distance from the planned pipeline and will be taken into account in the assessment.

3.6 Protection of the Baltic Sea and conservation areas

National and international activities have been implemented to protect the Baltic Sea. The Finnish Governments Resolution on Baltic Sea protection objectives was published in 2002 and in June 2009 the government approved a recitation of the Finnish Baltic Sea policy, which gives the objectives a new definition. The biggest concerns include i.e. eutrophication due to nutrient load into the Baltic Sea from its catchment area, hazardous substances, emission and risks (like accidents and invasive species) due to shipping. By national programmes, Finland aims to improve the state of the coastal waters and to conserve natural values in the area. In the open sea area, the environment is protected by international cooperation. For example, several national park areas (Forest Administration) and conservation areas included in the international Natura 2000 network have been founded in the Finnish sea area. In addition, there are several other national and privately protected areas in the Northern Baltic Sea and the Gulf of Finland, many of which many are also included to in the Natura 2000 network.

The planned gas pipeline route goes through two conservation areas that are included in the Natura 2000 Network. These include the Inkoo archipelago Natura 2000 area in Finland and the Pakri coast Natura 2000 area in Estonia (see Figure 4.4 and Figure 5.8).

The Baltic Sea is also protected through different programmes. The Baltic Marine Environment Protection Commission (HELCOM or Helsinki Commission) is the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea area. The first convention was signed 1974 by all coastal states of the Baltic Sea. Coastal states and the European Community signed a new convention in 1992 and it entered into force in 2000. The HELCOM works through intergovernmental cooperation between its contracting parties. It aims to constrain nutrient loads and hazardous substances entering the Baltic Sea, to improve maritime safety and accident response capacity and to protect and conserve marine and coastal biodiversity.

The Council of Baltic Sea Countries approved a sustainable development programme for the Baltic Sea (Baltic Agenda 21) in 1998. Strategic areas for cooperation during the years 2010–2015 are related to climate change and sustainable development.

4 Current situation in the Inkoo area

4.1 General overview

The municipality of Inkoo is located in the Uusimaa region about 60 kilometres west of Helsinki. The neighbouring municipalilities of Inkoo are Raasepori in the west, Lohja in the north as well as Siuntio and Kirkkonummi in the east. Inkoo has about 5 500 inhabitants. Inkoo is part of an old cultural environment and the municipality has a large archipelago area.

The preliminary point of landfall of the Balticconnector gas pipeline in Finland is located in the Fjusö peninsula about two kilometres from the Inkoo deep-water harbour and about 4.5 kilometres from the centre of Inkoo. In addition to port activities, the area includes warehousing, quarrying, a municipal wastewater treatment plant, fishing harbour and marina as well as indoor boat storage facilities, a national fuel reserve supply and a coal power plant, which three units will be closed in the beginning of February 2014.

4.2 Physical and chemical environment

4.2.1 Geology

As a general feature, the bedrock varies within in the study area along the onshore segment of the Balticconnector gas pipeline. At the point of landfall, the bedrock consists of microcline granite, in the northern part of the study area, the bedrock consists of amphibolite and in the northwestern part the bedrock consists of quartz-feldbar gneiss.

The onshore segment of the Balticconnector gas pipeline is included in the Tammisaari map area (KL 2014), which was a subaquatic area completely covered with water since the Ice Age. After the Ice Age, the highest point of ancient Baltic Sea shoreline in the area was approximately 130–140 metres above sea level, while the highest point in the Tammisaari map area is less than 107 metres above sea level. The topography of the Fjusö peninsula varies between 0–20 metres above sea level.

The study area has a thin soil layer and intermittent outcrops. The thin soil is due to the rough topography of bedrock and wave erosion during the post-glacial period. Water and waves have washed away the thin moraine blanket from the upper slopes at the highest points. Moraine, clay and silt are found in the crevasses of rocky hills and in vast low-lying areas.

Clay is the most common soil type with a share of 24.1%. In addition, silt has a share of 1.2% of the soil types, and thus the share of fine-grained layers in the area is slightly over 25%. The second most common soil type is moraine with a share of 19.6% of the land area. Gravel and sand as shore deposits have a share of 4.6% and peat and sludge have a share of 3.4% of the land area in the map sheet. The share of rock is 47.1% of the land area in the map sheet. Rock includes areas, where the thickness of the moraine layer is less than one metre directly above the rock.

Fine-grained soil types, clay and silt, have been deposited to the lowest parts of the terrain. Fine-grained layers cover the dells of terrain as well as moraine and ice deposits, and level out the topography.

Excluding the glacial river deposits, moraine layers can be found on top of the bedrock forming a bed for other deposits. Therefore, the share of moraine of the land area is actually greater. The thickness of the moraine layer varies locally, but the average thickness is low. The thickest moraine layers of about 20 metres can be found in the crevasses of rocky hills and low-lying areas. The average grain size of moraine indicates sand moraine.

According to the soil data by the Geological Survey of Finland (GTK), the predominant soil type in the Fjusö peninsula in Inkoo is rock. In addition, clay as well as fine-grained sand, sand and moraine can be found between rock ridges (Figure 4.1).

4.2.2 Landscape

Regarding the division of national landscape districts (Report of the Working Group on Landscape Areas I, Ministry of the Environment 1993), Inkoo is part of the Gulf of Finland Archipelago Coast. The landscape structure of Inkoo consists of river valleys bifurcated by rock ridges as well as an extensive zonal archipelago. Fractures in northwest-southeast direction and also in northeast-southwest direction in the western archipelago can be seen in the landscape. The centre of Inkoo and Barösund are both located at centroids of landscape.

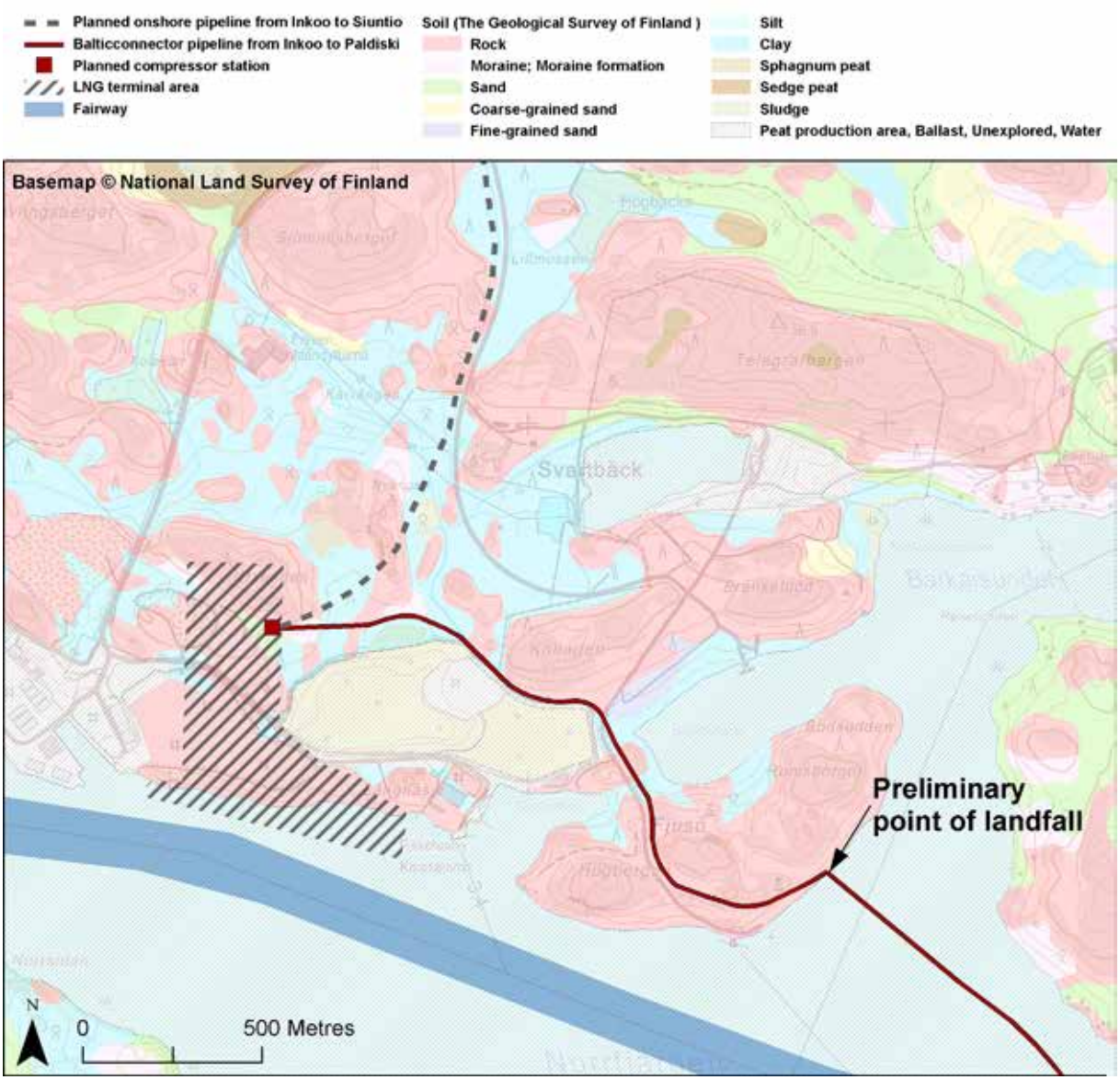

Figure 4.1. Soil type at the Inkoo preliminary point of landfall of the Balticconnector gas pipeline

Even at a global scale, the archipelago of the Gulf of Finland is a unique and valuable environment which is well represented by the Inkoo archipelago. Small-scale environment is a special feature in the archipelago. The archipelago is clearly composed of zones and can be defined by different landscape environments, namely inner, middle and outer archipelago (Laine 2011).

Flora in the inner archipelago islush and the inlets are reedy. There are several fladas and inlets in their natural state. The middle archipelago includes wooded and smaller, barren islands as well as islets.

The coast and archipelago of Inkoo have a long-standing population. In addition to agriculture, traditional sources of livelihood are related to fishing and shipping. The disappearance of cattle breeding has altered the traditional landscape of the archipelago. Boating and summer residences play a significant role in the landscape. Smokestacks of the power plant can be seen as a landmark from the archipelago and mainland.

4.2.3 Air quality

Generally, air quality in Inkoo is rather good. The only remarkable emission source in Inkoo is a 1000 MW coal fired power plant. The power plant is owned by Fortum and it is located in Fagervik about 3 km west from the point of landfall and 2 km from the compressor station.

According to the air quality monitoring results near the plant in 2005, the SO_2 concentrations were 16 %

and NO_2 concentrations 35 % of the air quality guidelines, respectively. However, Fortum has decided to discontinue electricity production at its Inkoo plant in February 2014. This will improve the air quality in Inkoo area.

The other activities that may affect the local air quality near the point of landfall and compressor site are port of Inkoo and rock quarrying activities. Both of them mainly emit particulate matter due to the handling of crushed rock. Concentrations of particulate matter were measured in Storramsjö island in 2008, and they were well below the air quality guidelines.

4.2.4 Noise

The coal power plant, the port of Inkoo and quarrying activities are causing environmental noise. However, the power plant will be closed in February 2014. This will improve the noise situation in the area.

Noise from the port has been measured in Storramsjö and Nötö in 2009 after the completion of noise abatement of crushed rock loading system. The measured noise level in Storramsjö was 44 - 45 dB and 45 dB in Nötö. This meets the noise guideline of 45 dB for holiday settlements which was set in the Council of State Decision 993/1992.

4.3 Biotic environment

4.3.1 Vegetation and valuable areas

The point of landfall is situated on continental coastline immediately north of the inner archipelago. The point of landfall lies on the coast of a fjord - Norrfjärden, which stretches from south-east to west. The area to the north of the point of landfall includes a strongly remolded harbor, power plant, quarry and heavy industrial area. There are also functions of the National Emergency Supply Agency, fish harbour and

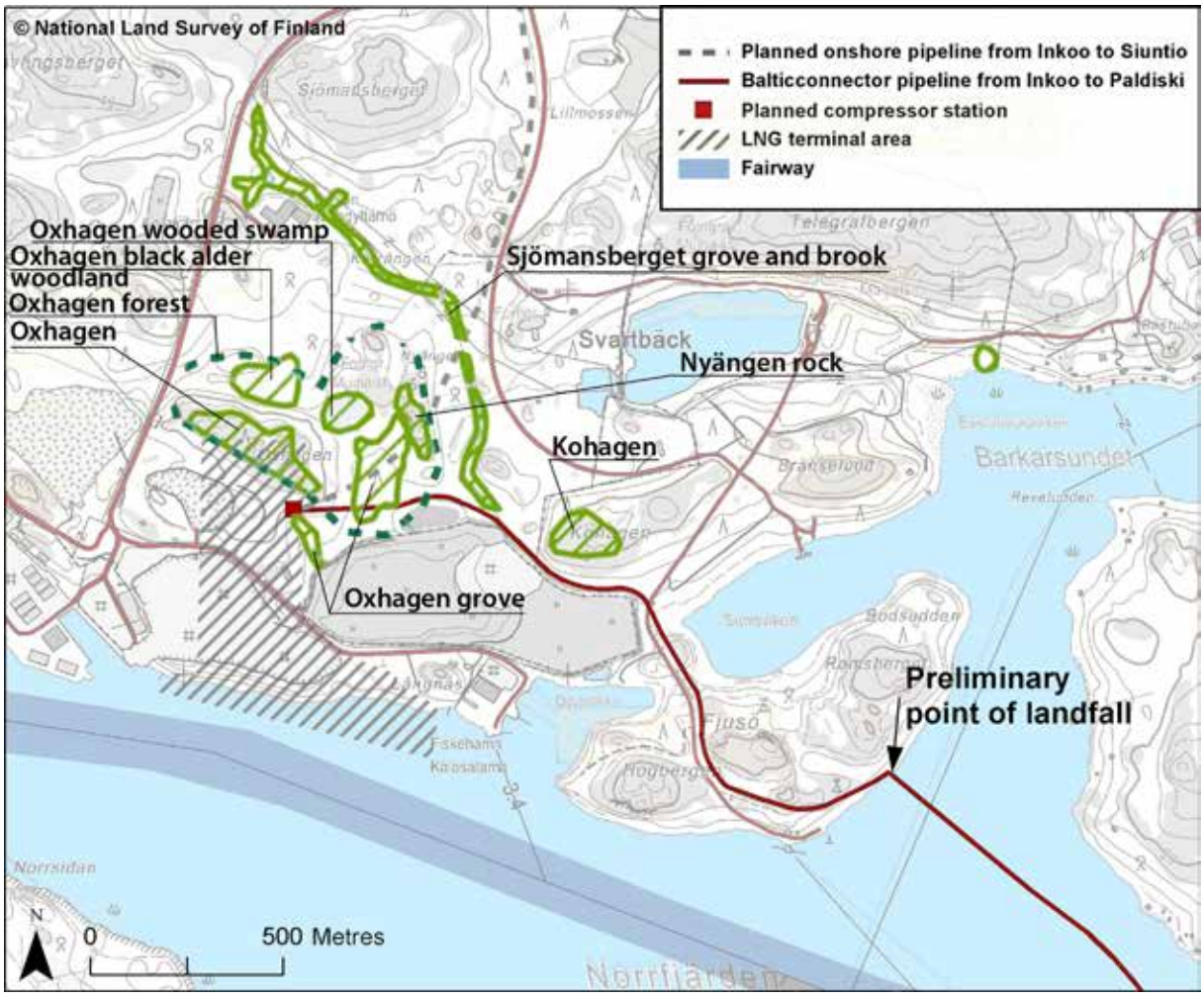

Figure 4.2. Valuable natural areas near the onshore pipeline in Inkoo

winter storage area for boats. All the buildings in the area serve industrial functions, and they are usually very large and visible.

The point of landfall itself is located on shore of a peninsula with a rocky and hilly landscape. There is typical rocky vegetation featured by pines grows on top of it. There are lush groves and woody depressions, but also barren rocky hills to the north of the industrial area. In the nature report made for land use plans (FCG Planeko 2008) there are several valuable natural places and targets: Oxhagen black alder woodland, Oxhagen groves and a few valuable rocky hills. (See 0 and Figure 4.3)

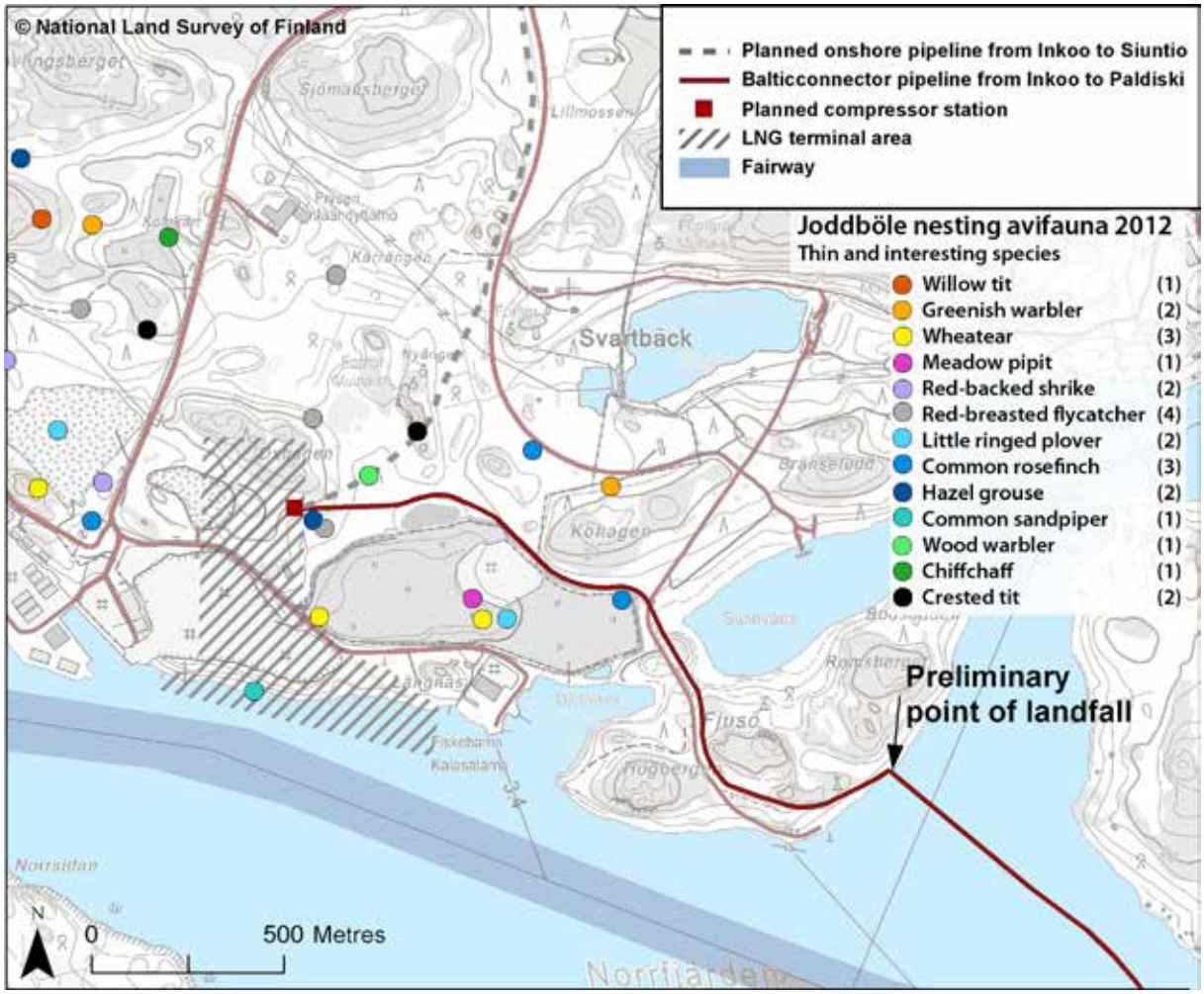

Figure 4.3. Nesting birds near the onshore pipeline in Inkoo

4.3.2 Protected areas in Inkoo

There are five Natura 2000 areas in the Finnish sea area within 10 kilometres from the planned Balticconnector pipeline. Balticconnector will run through one of the areas, the Inkoo Archipelago (Table 4.1). With the Natura 2000 network, the European Union (EU) aims to prevent biodiversity from decreasing. Different areas have been included in the Natura 2000 network to protect valuable biotopes (SCI areas) or bird areas (SPA areas). The criteria for including areas in the Natura 2000 network are designated in EU's Habitats Directive (92/43/EEC) and Birds Directive (2009/147/EC). Finland has designated areas that fill the directives criteria and the European Commission (EC) has approved suggested areas to be included in the Natura 2000 network. The Ministry of the Environment in Finland had a separate working group that surveyed the need for the Natura areas in the Gulf of Finland.

Table 4.1. The Natura 2000 areas within 10 kilometres from the planned Balticconnector gas pipeline in the Finnish sea area.

No.	Natura 2000 area	Status	Surface area (ha)	Closest distance to the pipeline (km)
1.	Inkoo Archipelago (FI0100017)	SPA/SCI	203	0
2.	Elisaari and Rövass groves (FI0100016)	SCI	23	4.5
3.	Tammisaari and Hanko Archipelago and the Pohjapitäjälahti marine protection area (FI0100005)	SPA/SCI	52,630	9
4.	Kirkkonummi Archipelago FI0100026	SPA/SCI	1,750	8
5.	Kallbådan islet and water area (FI0100089)	SCI	1,520	10

The location of the Natura areas is shown in Figure 4.4. The Natura areas are described shortly below.

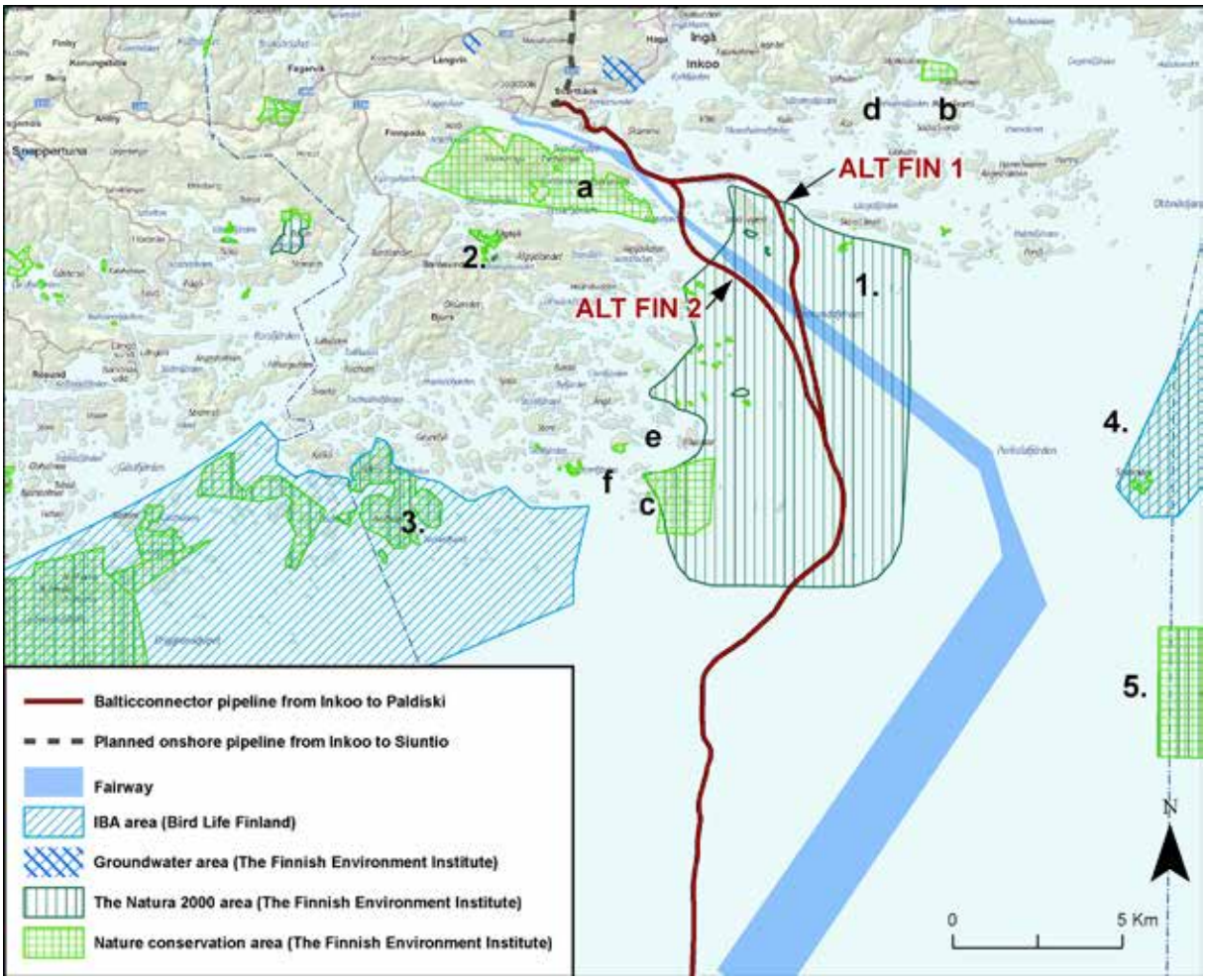

Figure 4.4. The Natura 2000 areas and nature conservation areas in the vicinity of the Balticconnector offshore pipeline

1. Inkoo Archipelago

The area is located in the outer archipelago of Inkoo and includes the land areas within the boundary, except for Hovskär, the south- western part of Stora Fagerö and Fagerögrund. Water area in the Timmerö protected area is the only water area included in the Natura area. The area is significant especially because of its bird population. Bird species nesting in the area include, for example, Caspian Tern (Sterna caspia), Black Guillemot (Cepphus grylle), Lesser Black-backed Gull (Larus fuscus), Ruddy Turnstone (Arenaria interpres) and numerous Common Terns (Sterna hirundo) and Arctic Terns (Sterna paradisaea). Individual Grey Seals (Halicoerus grypus) are found near Hästen Island, in the south-eastern part of the Natura area.

Figure 4.5. Black Guillemot (Cepphus grylle) (left) and Arctic Tern (Sterna paradisaea) (right) (GeographBot, 2010)

2. Elisaari and Rövass groves

The area is located in the sheltered inner archipelago of Inkoo at the north-western end of Elisaari and the northern part of Orslandet Island. There are valuable hardwood groves and pastures in the area. The oak forests of Elisaari are located on rock islets in the middle of fields and in pastures. The flora is quite dry, but more nutrient-rich nemoral forest areas are found in places. The southern part of the Rövass groves is dry. Oak and maple groves are dominant. The northern parts are more nutrient-rich.

3. Tammisaari and Hanko Archipelago and the Pohjanpitäjänlahti marine protection area

The site covers the marine areas of Pohjanpitäjänlahti, the marine areas of the Tammisaari archipelago, and the marine areas of the southern bays of Hanko. Because the area includes several zones extending from the outer sea to communities with almost freshwater conditions, it has exceptionally diverse flora and fauna. Its fladas and shallow sea bays are important nesting and resting areas for birds. The site consists partially of the BSPA network areas recommended by the HELCOM. In a report by the special Waterway Protection Committee of the Ministry of the Environment, the area was designated as a marine area in need of special conservation measures.

4. Kirkkonummi archipelago

This Natura 2000 area is a wide zone following the Kirkkonummi coast and extending to Sommarn in Inkoo to the west and near the border of the city of Espoo in the east. The area includes numerous islands and continental shores within its boundaries, and water areas of the established nature conservation areas and of Sommarn that already belong to the Natura area. The area is representative sample of archipelagic nature, including areas with varied conditions. The area is important for the protection of archipelagic habitats and several bird species. The boundaries of the Natura area are based on the national shore protection programme and the confirmed component master plan for the Kirkkonummi coast and archipelago. The included islands, with a couple of exceptions, are undeveloped, and according to the component master plan, building rights have been relocated elsewhere.

5. Kallbådan islet and water area

The Kallbådan Natura area is located in the open sea south-west of Cape Porkkala, with roughly half of the area extending beyond the Finnish territorial waters. The 0.7 hectare lighthouse islet of Kallbådan and several smaller islets and rocks around it are located in the middle of the area. Most of the Natura area consists of water area. The area is significant to the protection of grey seals. Grey seal is included in Annex II of the Habitats Directive and an endangered species in Finland. The Kallbådan islet group is an important seal haul-out location and also seal pups have been observed there.

Other conservation areas in the Finnish waters

There are also many smaller con-servation areas around the planned route of the Balticconnector offshore pipeline. Most of these are located inside the borders of the Natura 2000 areas. The conservation areas outside the Natura 2000 areas within 10 kilometres from the planned offshore pipeline are listed in Table 4.2.

Table 4.2. The conservation areas within 10 kilometres from the planned offshore pipeline and outside the Natura 2000 areas in Finnish waters.

	Name of the area	Status	Area (ha)	Closest distance to the pipeline (km) (alternatives a/b)
a	Stor-Ramsiö conservation area (YSA014191)	Private protected area	929	0.6
b	Rådkila conservation area (YSA010062)	Private protected area		5.6/8
c	Langlö northern seaside meadow (LTA010109)	Habitat area, protected according to the Nature Conservation Act		5.4
d	Rolling stone (YSA203373)	Private protected area		4.4/6.3
e	Granö conservation area (YSA202667)	Private protected area		5.8/5.5
f	Paradise islands (Tiftöklobbarna and Högklobben) conservation area (YSA014130)	Private protected area		7.2/6.9

4.4 Socioeconomic conditions

4.4.1 Settlement

There are approximately 5,600 inhabitants in Inkoo (Population Register Centre 2011). There are approximately 2,000 summer cottages and 300 permanent inhabitants in the Inkoo archipelago (Figure 4.6). The nearest residence buildings (summer cottages) for the planned offshore pipeline are located in the islands Skämmö, Lillskämmö, Bergskämmö and Jakobramsjö.

The shortest distance to residences is approximately 150 metres from the offshore pipeline alternative ALT FIN1 (Skämmö) and 130 metres for the alternative ALT FIN2 (south of Stora Fagerön).

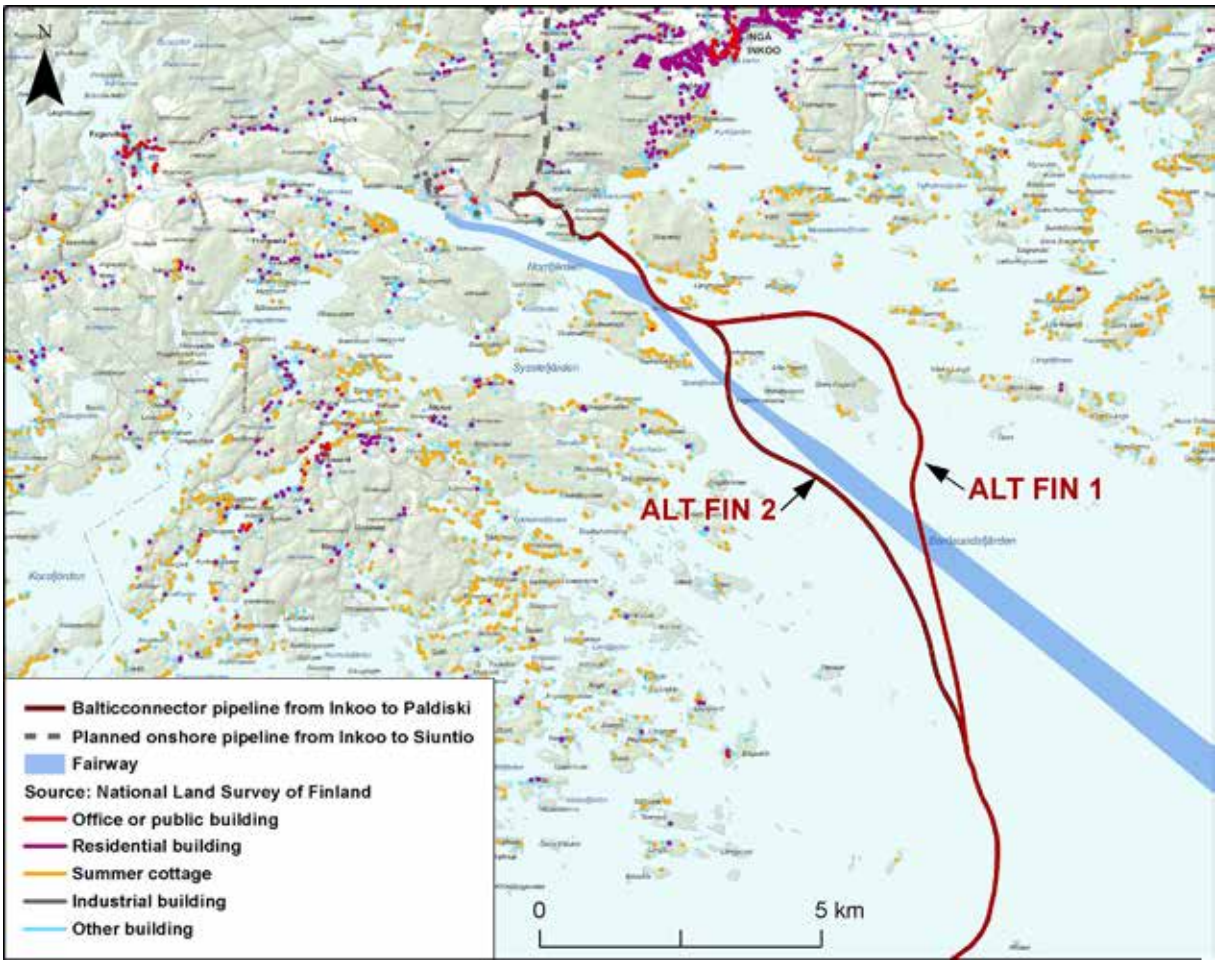

Figure 4.6. Permanent residences and summer cottages in the Inkoo archipelago

4.4.2 Land use plans

The location of the onshore pipeline is indicated in the Uusimaa regional land use plan confirmed in 2006. The tentative route of the pipeline is presented there.

In Inkoo, confirmed master plans in effect consist of three parts: the continental master plan and the master plan for the outer islands, which were confirmed in the early 2000s, and the master plan for the inner islands, which was confirmed in 1980s. A tentative route for the onshore gas pipeline is shown in the continental master plan.

The area has also been reserved for the pipe in the Inkoo master plan (Figure 4.8). Only a tentative route plan has been prepared for the above-mentioned land use plans. Detailed plans have not yet been prepared. The route plan will not be revised in connection with this EIA procedure, but investigations will be aimed at the areas indicated in the land use plans.

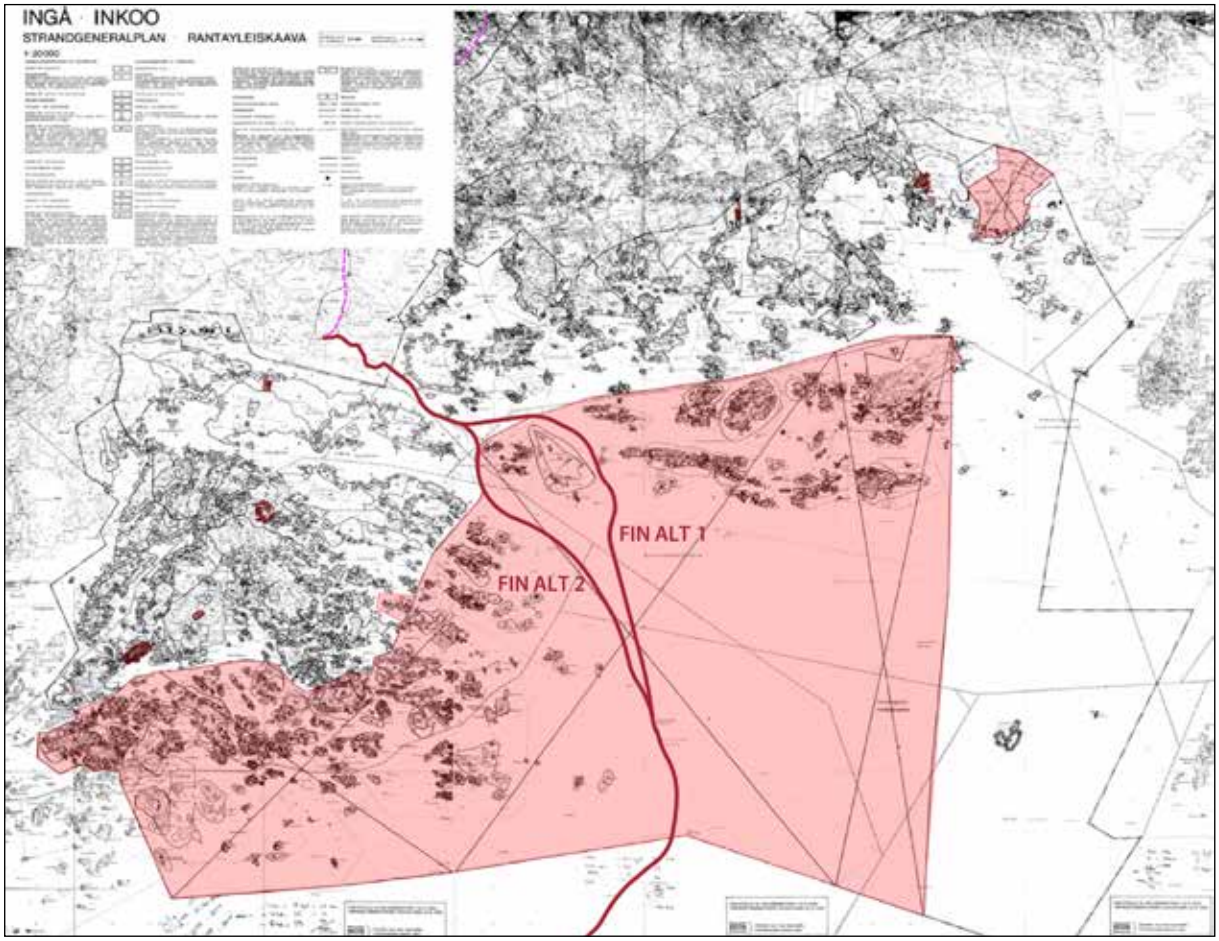

Figure 4.7. Extract from the master plan for the Inkoo inner archipelago (© Inkoo municipality & MML, permit no. 302/MMY/10)

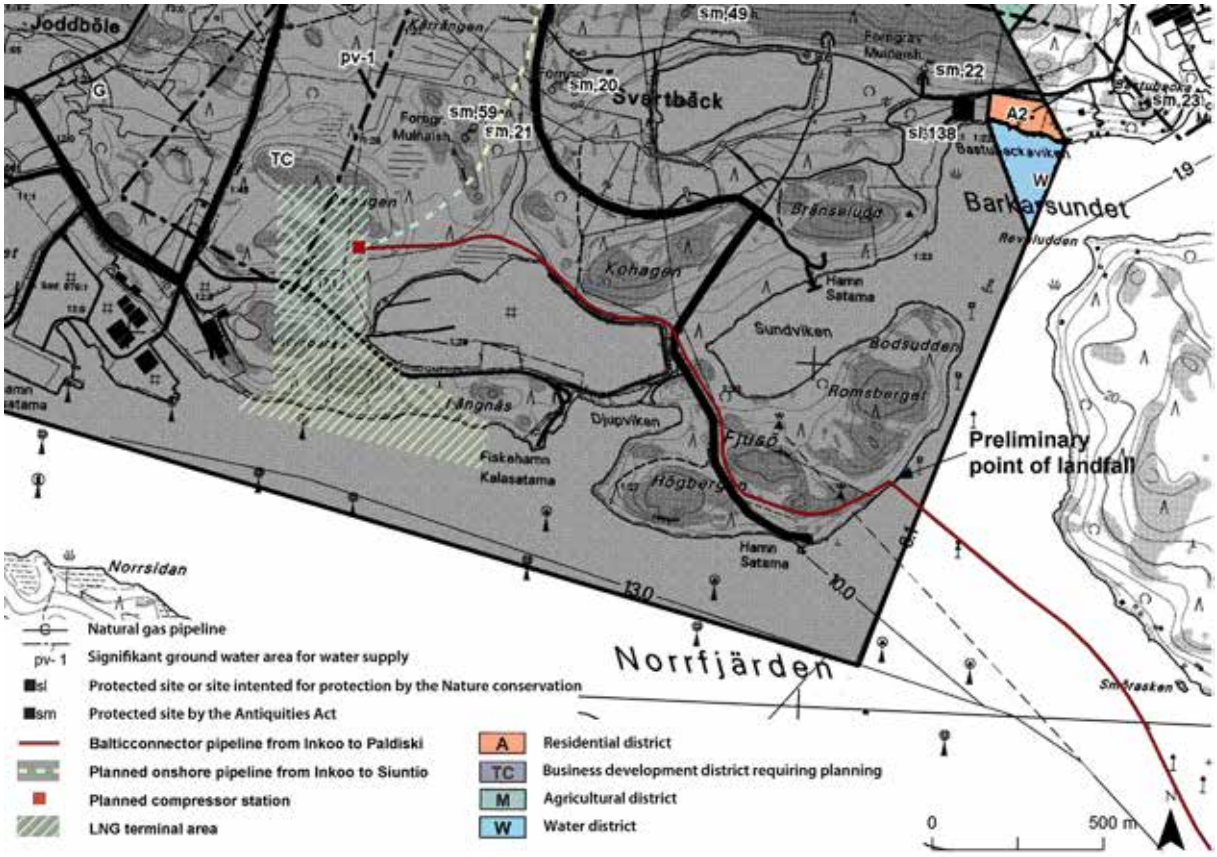

Figure 4.8. Extract from the continental master plan of Inkoo (© Inkoo municipality & MML, permit no. 302/MMY/10)

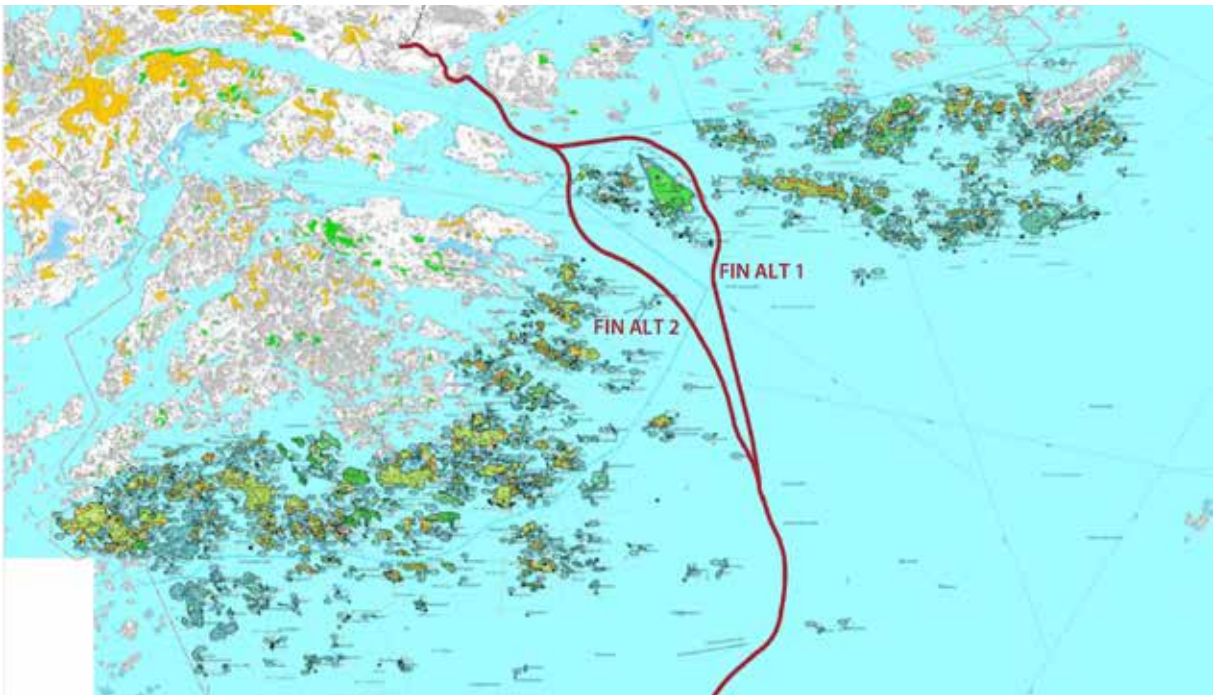

Figure 4.9. Extract from the master plan for the Inkoo outer archipelago (© Inkoo municipality, permit no. 302/MMY/10)

In Inkoo, a detailed land use plan is currently being prepared for the Joddböle area, where the compressor and receiving station and the route alternatives leading to them will be located.

4.4.3 Traffic

Regional road 186 connects the port of Inkoo to the main road network (highway 51). The average daily traffic volume (ADT) on the regional road was 1 031-1 084 vehicles and the share of heavy traffic was 14-15 % in the year 2011. A separate small road connection leads from the regional road to the Inkoo oil port. Traffic volumes on this road were very low (ADT was 25 vehicles including two heavy vehicles) in 2011. During the years 2007–2011, 10 accidents occurred on the regional road section south of highway 51 and none of these accidents caused personal injuries.

The port of Inkoo is located in the study area and it is owned by Inkoo Shipping Ltd. A total of 407 vessels visited the port in 2012 and the total transport volume was 1,54 million tons. The share of foreign vessels visiting the port was about 95 % and the share of domestic vessels was about 5 %. The import cargo volume was about 863 200 tons in 2012. The share of international import transport was about 98 % and the cargo volumes mainly consisted of coal and mineral transport. The export cargo volume was about 675 500 tons in 2012. The share of international export transport was about 87 % primarily consisting of mineral transport. Ship traffic in the Baltic Sea has been described in more detail in chapter 3.5.1 "Ship traffic".

4.4.4 Tourism and recreational use of the areas

Tourism is a significant industry for Inkoo. There is also a high concentration of summer cottages. Most of the tourists are domestic. Leisure tourism is seasonal and is concentrated on the summer holiday months.

The Inkoo archipelago is an especially popular site for tourism and recreation. There are many recreational areas in the Gulf of Finland, including national parks. Regarding the national parks in southern Finland, the Tammisaari Archipelago National Park and the Saaristomeri National Park are located near the project area.

Figure 4.10. Summer cottage in Inkoo (Uusimaa, 2010)

5 Current situation in the Pakri peninsula area

5.1 General overview

The Pakri peninsula is included in the municipality of Paldiski. The peninsula is surrounded by the Lahepere Bay at one side and by the Paldiski Bay at the other side. The 3.6 km wide Lahepere Bay in the area of the planned compressor station in Kersalu is located between the peninsulas of Pakri and Lohusalu. The mouth of the gulf is deep – up to 35 m, but the bottom of the sea descends slowly. There is no sufficient geological data for the construction design of the pipeline. The necessary geotechnical investigations will be carried out before starting the construction of the pipeline. Those investigations will constitute the basis for the design and construction.

The point of landfall at Kersalu (ALT EST 1), section from the point of landfall to the compressor station and the location of the compressor station are determined in thematic plan of the Paldiski municipality comprehensive plan named "D-category natural gas pipeline location on the Paldiski municipality territory", which has been approved by the Paldiski municipality council on 22 December 2011. It is proposed that alternative point of landfall at Pakrineeme (ALT EST 2) and onshore section of the pipeline to the Kersalu compressor station is related to the planned LNG terminal area in Paldiski (comprehensive plan's thematic plan was approved on 27 September 2012). (Paldiski city 2013a)

The low density area suitable for farm buildings and area of summer houses have been preserved in the zone. There are no urban residential areas (except the centre of Paldiski city) in close vicinity.

5.2 Physical and chemical environment

5.2.1 Geology

The following geological description of the Estonian territory is based on the Estonian Land Board geological map application data and on geological exploration in the region (Suuroja et al. 2010).

Sedimentary formation in this area began in second half of Neoproterozoic–Ediacara era, or about 580 million years ago. Neoproterozoic and Paleozoic sediment lies on the crystalline basement rocks that can be seen in Finland. Sediment thickness increases near the Pakri peninsula from north to south about 100 meters to 200 meters (Figure 5.1).

Vendian Complex (V2 Ediacara period) is represented in the Pakri peninsula with on Kotlin Stage Kroodi formation clastic sediments (argillite, silt, sandstone). This formation is in the area around 40–50 meters thick and it thins from NE to SW. The Ediacara period sediment outcrop includes the seabed sediments as shown on Figure 5.1.

Cambrian Complex (Ca) is represented with the Lower Cambrian clastic sediments (clay, silt, sandstone). This outcrop runs as few to dozen kilometres wide along a zone at the foot of the Ordovician Baltic Cliff (made of limestone), both on land and sea in the north of the cliff. This sediment thickness is up to 80–90 meters.

Ordovician Complex (O) is usually represented by carbonate rocks and its outcrop is seen in the Pakri peninsula cliffs. Complex sediment thickness increases from about 20 meters to about 60 meters in the southern peninsula border area.

Cliff bordering the Pakri peninsula (Figure 5.1) is one of the most remarkable cliffs in the North-Estonian Baltic Klint area. The Pakri peninsula limestone plateau rising to north-west is up to 24 meters high in the Pakri Cliff. Limestone plateau increases in the peninsula central area from a few meters to a level up to 30 m above sea level. Starting from Paldiski in the west and Kersalu to the east peninsula is bordered with a 18 km long cliff, that is 2–24 m high. The height increases from SE to NW, largely following the rock base slope. Pakripeninsula has five separated cliffs, which are (moving clockwise around the peninsula) Paldiski, Uuga, Pakri, Leetse and Lahepere cliff (See Figure 5.2). Uuga and Paldiski cliff descriptions are not presented in this work, because they are not affected by the project.

The Pakri (Pakerort) cliff and the plateau bordering it is one of the most attractive sections in the Pakri peninsula and same can be said about the North Estonian Cliff as a whole. A dark-red lighthouse located on the cliff is 54 meter high and it is the highest lighthouse in the Baltic Rim area. The lighthouse has

recently started to compete with newly established 60-meter high colourful maritime surveillance radar tower and with a wind park situated farther away.

The Leetse Cliff begins about 0.5 km from the tip of the cape, where the plateau withdraws about hundred meters from the sea and runs for approximately 8 km to southeast until Meriküla which is located southeast from the Leetse mansion. Cliff forest grows in the narrow area between cliff and sea. Leetse is surrounded by many large boulders and among them there are also gigantic boulders (the largest has a circumference of 55 meters).

The Lahepere Cliff is situated southeast from the Leetse mansion and the cliff lowers here to about 5 meters. Cliff length is less than 1.5 km and three small relatively water-poor waterfalls: Valli, Põllküla and Kersalu cascade down from it. Between Pakri and the Lohusalu peninsula, a cliff plateau has been cut in by the Lahepere gulf, which is more than 12 km long and 6 km wide. There is also a partly buried cliff under the Lahepere gulf, which on the land separates into three branc-

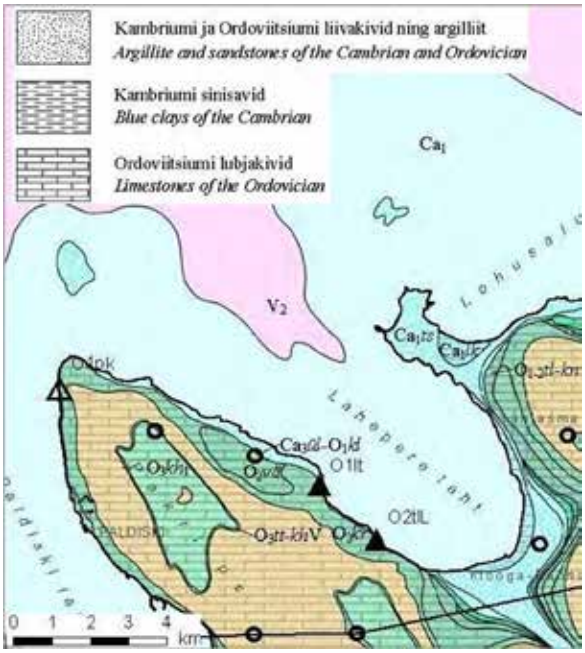

Figure 5.1. The schematic map of bedrock of the Pakri peninsula (Suuroja et al. 2010)

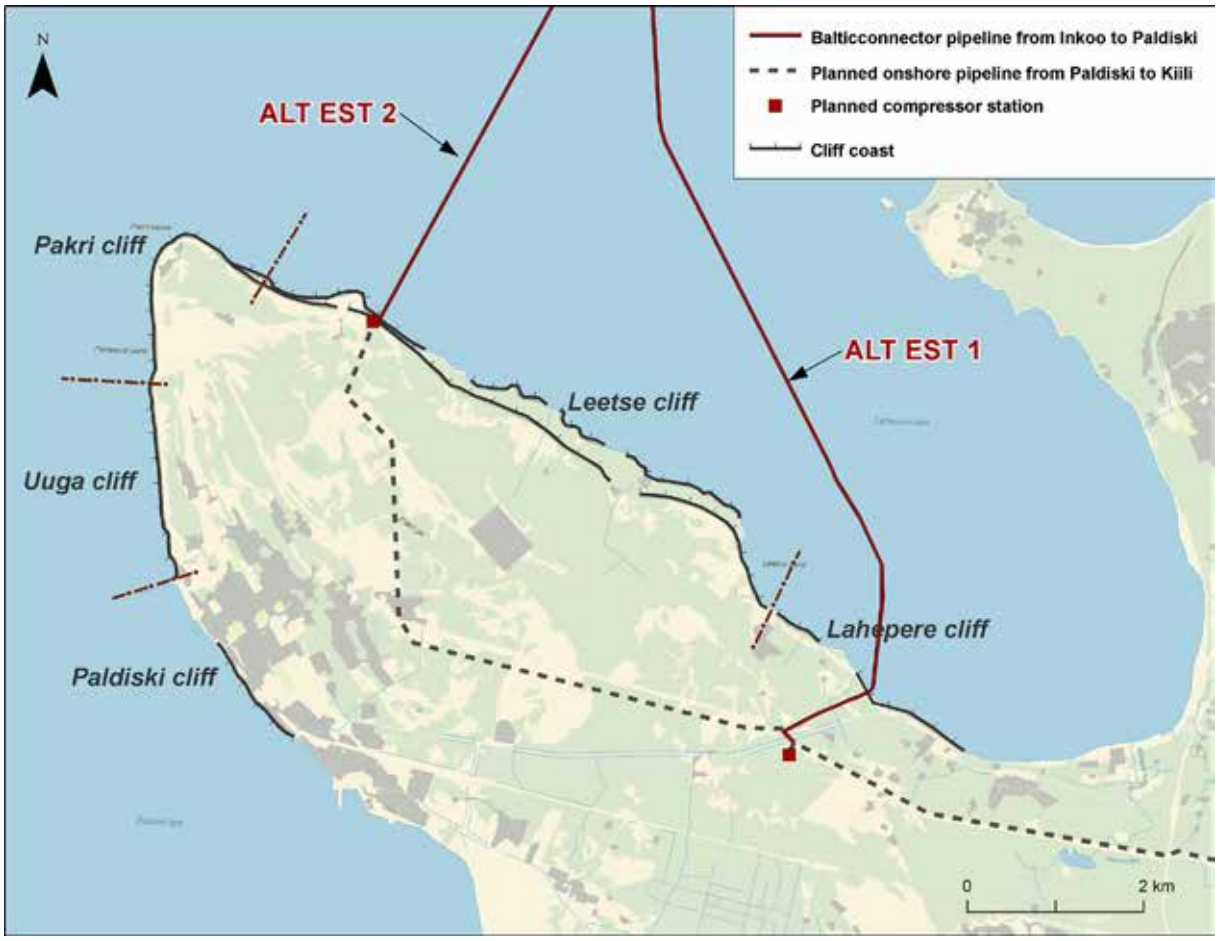

Figure 5.2. Pakri peninsula Cliff coast (Source: Land Board database, 2013)

hes: Klooga, Niitvälja and Treppoja. Treppoja stream descends from the cliff plateau that has around ten terraces and Treppoja cascade with height of approximately 6 meters.

Several places in the Pakri peninsula have sand and limestone suitable for construction. Quarries could be opened here, but these areas have not been registered as official quarry sites. If the pipeline or related facilities are planned in one of these areas, the perspective of potentially good material use has to be analysed.

5.2.2 Hydrogeology

The Pakri peninsula is located in Western Estonia river basin and district Harju sub basin. Hydrogeologically, it is located in northern Baltic artesian basin, where groundwater is in Quaternary cover, bedrock and crystalline basement rock.

Quaternary aquifer groundwater is limited and without significant amount, as the aquifer thickness is relatively small.

The Ordovician aquifer system is spread throughout the area, with the exception of Vääna ancient valley and area before the Clint, embracing all carbonate rock deposits. The aquifer is without pressure virtually everywhere. The carbonate complex has natural fresh water, HCO_3-Ca-Mg-type, mineral TOC (dried residue) mostly 0.2 – 0.5 g/l. Water has typically relatively high iron content. The Ordovician aquifer is a water supply source for many individual houses.

The Ordovician aquifer and the next aquifer is separated from each other by Varangu Formation silts and clays, Türisalu Formation argillite or Dictyonema and traditionally also by the Toila Formation limestone. The area has good water resistant properties in Türisalu Formation, with a thickness of 4 – 5 m.

The Cambrian – Ordovician aquifer system (O-Ca) has spread in the majority of the area, near the Cliff area. In buried valleys it is the first bedrock groundwater. The Kallavere and Maardu Formation (Ordovician) and the Tiskre Formation (Cambrian) consist of sandstone and silt with a thickness of 20 – 25 m. Regional aquifer is an infiltration area in Pandivere. Local water infiltration occurs in high limestone area and is carried through the Ordovician aquitard limestone fractures. Water levels are mostly 10 - 20 m below the surface. The aquifer is pressurized, pressure decreases near the Cliff outcrop and in the immediate vicinity. Most of the wells are drilled into this aquifer area.

The Lükati – Lontova regional aquitard is spread all over the area, and it is represented by above mentioned formations clays that is similar to argillite (in Lontova Sämi Formation, about 30 m thick lower part, has sandstone in multiple layers and this interval belongs to the Cambrian – Vendian aquifer system). Aquitard forming the Lontova Kestla Stage Formation (15 – 20 m thick), Tammneeme Formation (10 – 15 m thick) and Lükati Formation, with a thickness of 10 – 15 m in the area. Thus, the aquitard thickness is up to 50 m and it has a very high insulation capability.

The Cambrian – Vendian aquifer system (Ca-V) is represented by deposits of sandstone and silt. The Pakri peninsula has a single Cambrian-Vendian aquifer system, which is not divided and separate as Gdov and Voronka formations. The aquifer is the main water source for the Keila and Paldiski municipalities.

5.2.3 Climate and air quality

As the project area is located near the sea, winter temperatures are higher and summer temperatures lower than the Estonian average[4]. In general, permanent ice cover is formed in the end of January, in rare cases ice can sometimes be found also in December (occurred 3 times). There have been 14 ice-free winters during the period of 1958 – 2008, however most of them occurred in 1990 – 2008. In case when the ice has formed or sailed to the area from north, the sea is free from ice in the beginning of April. On one occasion this occurred as late as on 5th of May. The average ice thickness is usually 25 – 30 cm, reaching up to 60 cm in very cold winters. The period when the sea is covered with ice varies from ice-free winters to 3.5 months, the average is 2 months.

According to the SEA report, the main environmental impacts of the compressor station are noise and air pollution. Therefore, it is more favourable to bring the station to Pakri peninsula instead of the proposed location, as there are no residential areas or social sites that could be affected.[5]

Constant measurements are conducted in Alexela station located near the southern harbour of Paldiski. Non-methane hydrocarbons, benzene, toluene, xy-

4 www.paldiski.ee/index.php?id=12761

5 SEA report of Paldiski LNG terminal thematic plan. OÜ E-Konsult, 2012

lene, hydrogen sulphide as well as meteorological parameters are surveyed within company's self-monitoring program.

Real-time measurements of the Paldiski monitoring station are observable from the website of the Estonian Environmental Research Centre: www.klab.ee/seire/airviro/paldiski.html.

5.2.4 Noise

Planned onshore pipeline in Kersalu (ALT EST 1) crosses the Tallinn–Paldiski road. In the vicinity of the point of landfall in Pakrineeme (ALT EST 2) there are no roads with heavy traffic at the moment and the area is quite peaceful.

Planned compressor station location in Kersalu will be about 350–500 meters from the nearest residential houses (see Figure 5.3).

Figure 5.3. Nearest residential areas in the vicinity of the planned compressor station location in Kersalu (Source: Land-board database)

5.3 Biotic environment

5.3.1 Vegetation

Vegetation types, character and distribution in the Pakri peninsula are related to specific geological conditions and land use history of the area. The secondary forest formed on former agricultural lands, mostly abandoned unmanaged pastures and also military wastelands dominate in the peninsula. Most of the valuable plant communities (cliff forests, dry meadows, alvars) are situated along north-eastern and northern coasts of the peninsula. The Kersalu project area in the vicinity of the planned pipeline (ALT EST1) is dominated by forests and former agricultural lands. At the location of the compressor station, there is an over-grown meadow on a relatively dry soil due to discontinuing traditional activities. It is dominated by pine and alder (Figure 5.4).

Here is a land with a limestone subsoil with a relatively plain relief covered by wooded meadow with a thin soil layer. The areas with deeper soil layer are covered by forest stands. The area is dominated by alder and common alder.

The Pakrineeme alternative point of landfall (EST ALT2) is dominated by relatively valuable meadows. Broad-leaved cliff forest is also represented in the area. Part of the area is covered by secondary forest formed on ancient meadows.

5.3.2 Valuable habitat types

Several protected (listed on Annex I of Council directive 92/43/EEC) habitat types are represented in the Pakri peninsula and coastal sea areas.

Sandbanks, which are slightly covered by sea water all the time (1110). Habitat involves the shallow coastal zone of the Lahepere Bay. Planned pipeline crosses the habitat along 700 m section.

Semi-natural dry grasslands and scrubland facies on calcareous substrates(Festuco-Brometalia) (6210* important orchid sites). Dry grasslands are located in the area of the Kersalu point of landfall and in the vicinity of the Pakrineeme alternative site.

Nordic alvar and precambrian calcareous flatrocks (6280). Alvars are located in vicinity of the Pakrineeme project area.

Vegetated sea cliffs of the Atlantic and Baltic coasts (1230) and **Tilio-Acerion forests of slopes, screes and ravines** (9180) are presented in the Pakrineeme area.

5.3.3 Green network and valuable landscape

The Green Network is the network of ecologically compensating areas. Estonia has joined the Pan-European Biological and Landscape Diversity Strategy, which obligates signatories to participate in the

Figure 5.4. Location of the compressor station – over-grown meadow

development of the Pan-European Ecological Network. The plan Environmental conditions for guiding settlement and land use was initiated in all 15 counties of Estonia in 1999. Two subtopics of this plan are the "Green Network" and the "Valuable Landscapes". The Green Network of Estonia is supposed to complement the network of protected areas, combining them into a unified system of natural areas (Raet et al. 2010). The Green Network is composed of joint elements: core areas and corridors.

Two small core areas of the Green Network are located in the northern and north-eastern parts of the Pakri peninsula. Connecting corridor of these areas is located in the Pakrineeme point of landfall. No elements of the Green Network are located in the Kersalu point of landfall and its vicinity (see Figure 5.5).

The Valuable Landscapes are areas with high natural, cultural- historical, aesthetical, identical or recreational value. On the coastal part of the Pakri peninsula, where the Baltic Klint is represented, the valuable landscape area "Pakri coastal cliff" is determined. This valuable landscape covers the Pakrineeme point of landfall and continues along the coast up to the border of the Kersalu point of landfall (see Figure 5.5).

5.3.4 Protected areas and species in Pakri Peninsula

The most important and the most attractive protected natural feature in the area is the **limestone bluff of Pakri** (pankrannik) – one part of Baltic Klint extending from the island of Öland until Ladoga Lake. It has been presented as a candidate for the list of natural and cultural heritage of UNESCO. The limestone bluff of Pakri is circa 25 m high and it is in an active stage of formation, i.e. it diffracts quite frequently. The Klint area on the shore of the Gulf of Lahepere is called Leetse terrace. Leetse terrace is smooth and it has two levels on the planned location of the gas pipeline route.

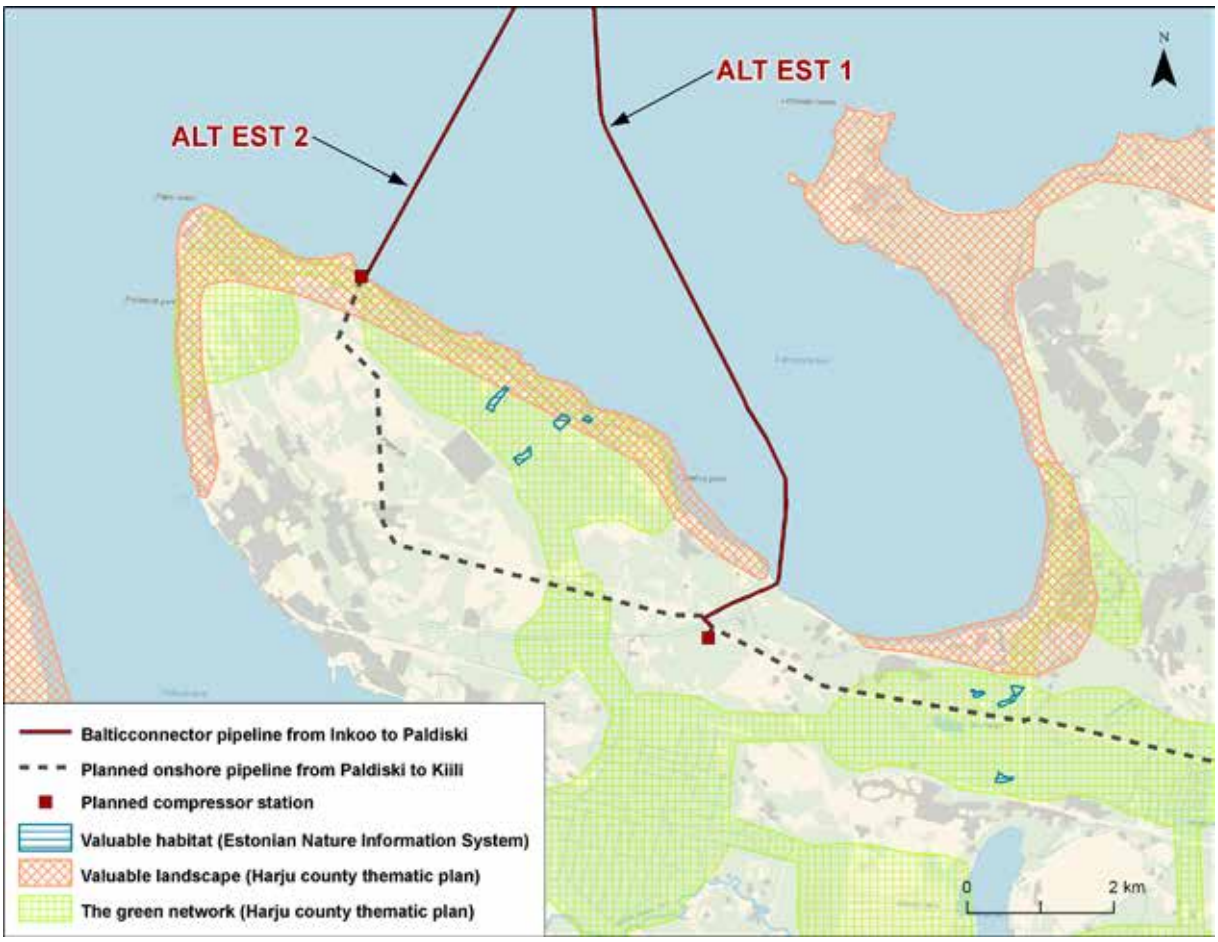

Figure 5.5. The Green Network and the Valuable Landscapes in the project area in Estonia

The Pakri landscape reserve (maastikukaitseala, see Figure 5.6) is taken under protection by the Protection of the nature reserve of Leigri and nature park of Pakri, and confirmation of protection regulations and descriptions of external borders in 1998 by the Government of the Republic for the protection of rare and scientifically valuable geological objects (outcrops of bedrock, beach ridges, glacial boulders) and of biomes of living nature. The surface area of the nature reserve is 1,450 ha. The Kersalu point of landfall of the gas pipeline is not included in the Pakri landscape reserve, but the Pakrineeme alternative point of landfall is partly overlapping with the landscape reserve.

Planned Pakri nature protection area

The extension of the Pakri protection area (4,537 ha) is in process, which includes the area of the Pakri landscape reserve and several unprotected coastal areas of the Pakri peninsula. Both the Kersalu and Pakrineeme points of landfall will be in the new protection area. The proposal to extend the Pakri nature protection area was made in 2010 with a purpose to preserve the Baltic Klint, several natural habitat types and a number of protected species in the area.

Pakri special conservation area

The sea area surrounding the whole Pakri peninsula (except the aquatoria of harbours of Paldiski) is included in the special conservation area (hoiuala) of the Pakri Natura 2000, which also involves a part of the coastal areas of the peninsula (Figure 5.6). The Nature Protection Act provides that the special conservation area intact by human activities or applied according to special requirements, where the nature is preserved, protected, restored, researched or introduced. The special conservation area of Pakri Natura 2000 is taken under protection by the Protection of special conservation areas in Harju County in 2005. The purpose of protection of the special conservation area is applicable to the habitat types specified in An-

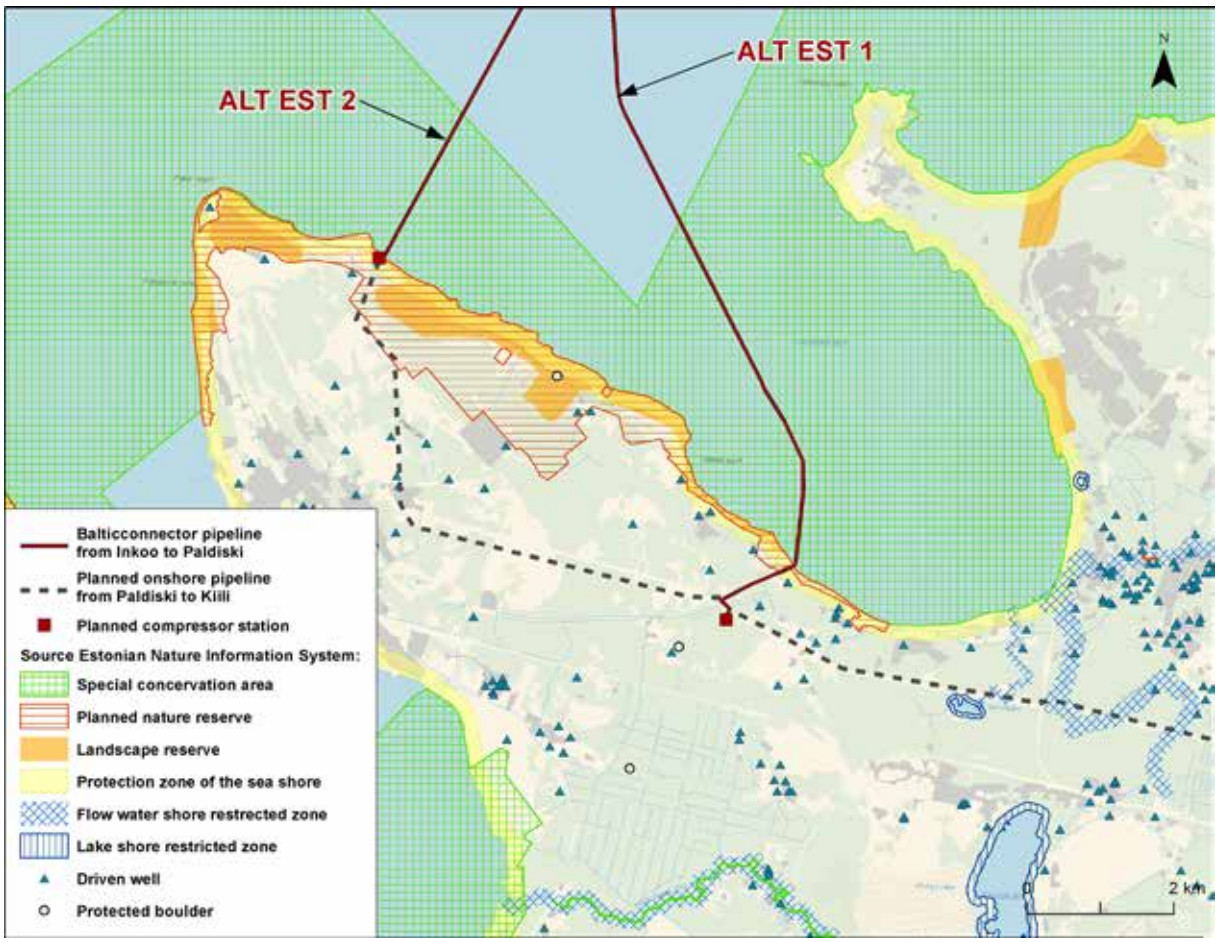

Figure 5.6. Pakri landscape reserve, planned Pakri nature reserve, Pakri special conservation area and protected boulders in the Pakri peninsula

nex 1 of the directive 92/43/EEC of the Council of the European Union.

Boulders

Several protected erratic boulders are presented in the Pakri peninsula: Neosti erratic boulders (rändrahnud, Figure 5.6) (located 0.6 km south from the Pakrineeme alternative point of landfall), Põllküla erratic boulder (1.4 km south-west from the Kersalu point of landfall), Leetse great boulders (2.7 km south-east from Pakrineeme site).

Protected plants

Habitats of several protected plant species are located in the Pakri peninsula (Figure 5.7). The Large Pink (Dianthus superbus) (protection category II) is represented in several calcareous grassland sites around the Pakri peninsula and it is the only protected plant species that grows in the vicinity of the planned Kersalu pipeline point of landfall. Several more protected plant species are found in Pakrineeme alternative point of landfall: Small Pasque Flower (Pulsatilla pratensis), Sand Pink (Dianthus arenarius), Military Orchid (Orchis militaris) and Early Marsh Orchid (Dactylorhiza incarnata) (all protection category III).

Protected mammals

The Brown Long-eared Bat (Plecotus auritus), protected species (cat. II), habitat is located in the north-eastern part of the Pakri peninsula 4 km away from the planned Kersalu pipeline point of landfall.

Protected birds

Protected bird species (cat. II) Black Guillemot (Cepphus grylle) is breeding in the northern part of the Pakri peninsula cliff. The Pakri cliff is the only habitat of the species in Estonia. This habitat is located 1 km west from the Pakrineeme project area. Breeding place of the Common Buzzard (Buteo buteo) is located near the north-eastern coast of the peninsula, 4 km away

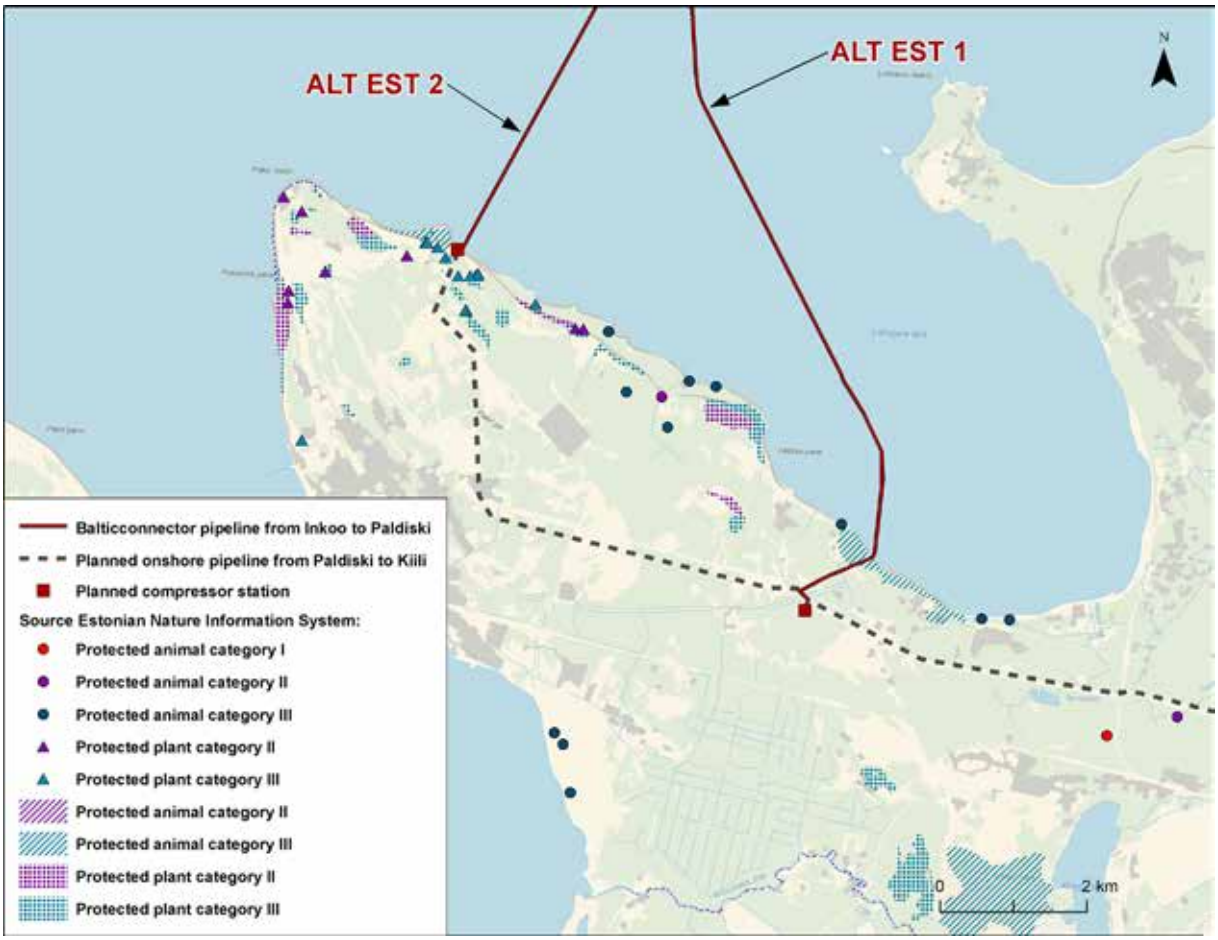

Figure 5.7. Protected species in the project area

from the planned Kersalu pipeline point of landfall. Many protected bird species are related with sea and coastal areas and set target of the Pakri Natura bird area (see Figure 5.7).

Protected insects

Three protected butterfly species (Phragmatobia luctifera, Chersotis andereggi, Lycaena dispar) have been observed in the area of the Pakri peninsula. Habitats of the Large Copper (Lycaena dispar) are situated on the meadows of the Kersalu project area.

5.3.5 Natura 2000 areas in the Estonian sea area

The Pakri Natura 2000 area is located in the vicinity of Paldiski on the coast of Estonia (Figure 5.8). The protected area is 20,472 ha and consists of the Pakri special protection area (SPA) and the Pakri site of community importance (SCI). The Natura area of Pakri holds several habitats and species considered valuable. It is e.g. a significant bird area and valuable landscape area. The Pakri Peninsula and islands have high coasts with limestone cliff (up to 25 m high). Rain water soaks through the cracks in limestone and is therefore rich in lime. Limestone bedrock is covered by shallow calcareous soils that enable numerous rare plants to grow. Species-rich alvar vegetation (calcareous meadows), alvar forests and klint forest are the most valuable types of terrestrial vegetation. Most of the Pakri Natura area consists of different sea-area habitats. Below are listed bird species and types of habitats that are supported by the conservation of the Pakri Natura area.

The Pakri SPA has been designated under EU's Bird Directive 2009/147/EC. The site supports protection of following species:
Eurasian Wigeon (Anas penelope), Mallard (Anas platyrhynchos), Greater Scaup (Aythya marila), Eurasian Bittern (Botaurus stellaris), Common Goldeneye (Bucephala clangula), Black Guillemot (Cepphus grylle), Long-tailed Duck (Clangula hyemalis), Bewick's Swan (Cygnus columbianus bewickii), Whooper Swan (Cygnus cygnus), Mute Swan (Cygnus olor), White-tailed Eagle (Haliaeetus albicilla), Common Gull (Larus canus), Velvet Scoter (Melanitta fusca), Common Merganser (Mergus merganser), Ruff (Philomachus pugnax), Great Crested Grebe (Podiceps cristatus), Common Eider (Somateria mollissima) and Red shank (Tringa totanus).

The Pakri SCI has been designated under the EU's Habitat Directive 92/43/EEC. According to Annex I, the conservation objectives are:

sandbanks which are slightly covered by sea water all the time (1110), estuaries (1130), coastal lagoons (*1150), large shallow inlets and bays (1160), reefs (1170), annual vegetation of drift lines (1210), perennial vegetation of stony banks (1220), vegetated sea cliffs of the Atlantic and Baltic Coasts (1230), boreal Baltic islets and small islands (1620), boreal Baltic coastal meadows (*1630), fixed coastal dunes with herbaceous vegetation (*2130), hard oligo-mesotrophic waters with benthic vegetation of Chara spp. (3140), water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260), juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites) (6210), nordic alvar and precambrian calcareous flatrocks (*6280), fennoscandian wooded meadows (*6530), fennoscandian mineral-rich springs and springfens (7160), alkaline fens (7230), fennoscandian hemiboreal natural old broad-leaved deciduous forests (Quercus, Tilia, Acer, Fraxinus or Ulmus) rich in epiphytes (*9020), fennoscandian deciduous swamp woods (9080) and Tilio-Acerion forests of slopes, screes and ravines (*9180).

Species under protection of the Habitat Directive Annex II are Marsh Angelica (Angelica palustris), Sand Pink (Dianthus arenarius subsp. arenarius), Fen Orchid (Liparis loeselii), Tortella Moss and Scarce Fritillary (Euphydryas maturna).

5.3.6 Natura 2000 "shadow" list areas

There are two onshore Natura "shadow" list areas (Figure 5.8) in the Pakri peninsula registered by environmental organisations, which can be designated as Natura areas in the future and therefore must be assessed equally to official Natura areas:

The Pakri potential Natura "shadow" list area (160 ha) is situated on top of the Pakri peninsula and includes the Pakrineeme point of landfall. The area is important for following habitat types:
Large shallow inlets and bays (1160), Annual vegetation of drift lines (1210), Boreal baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (6210), Nordic alvar and precambrian calcareous flatrocks (*6280), Alkaline fens (7230), Fennoscandian hemiboreal natural old broad-leaved deciduous forests (Quercus, Tilia, Acer, Fraxinus or Ulmus) rich in epiphytes (*9020), Fennoscandian deciduous swamp woods (*9080).

The Kersalu Natura "shadow" list area (60 ha) is situated in southeastern part of the Pakri peninsula 1 km west from the Kersalu point of landfall and borders the onshore planned pipeline rout near the kompressor station location. The area is important for the habitat of Nordic alvar and precambrian calcareous flatrocks (*6280).

Possible effects to the areas will be analysed during the EIA.

5.3.7 Other protected areas

Important Bird Areas (IBA)

The European Important Bird Area (IBA) Programme aims to identify, monitor and protect key sites for birds all over the continent through joint efforts of staff and volunteers at local, national and international level. The Important Bird Areas are sites particularly important for bird conservation, because they regularly hold significant populations of one or more globally or regionally threatened endemic or congregatory bird species or highly representative bird assemblages.

The Pakri Important Bird Area (210 km^2) is covered also by the Pakri Natura 2000 area and the Pakri SPA. The planned gas pipeline route goes through the Pakri IBA on the 5.1 km section in Lahepere Bay. The qualifying species are the Tundra Swan (Cygnus columbianus), Whooper Swan (Cygnus cygnus), Greater Scaup (Aythya marila), Long-tailed Duck (Clangula hyemalis) and Common Goldeneye (Bucephala clangula).

UNESCO Biosphere Reserves

There are four UNESCO biosphere areas (Biosphere Reserves) in the Baltic Sea area. Biosphere Reserves are an essential part of the Man and Biosphere (MAB) programme of the UN's scientific and cultural organisation, UNESCO. Its goal is to keep the environment suitable as well for human as for flora and fauna. One of the areas, the Archipelago Sea Biosphere Reserve, is located in Finland. The surface of the area is about 420,000 hectares. The Archipelago Sea National Park

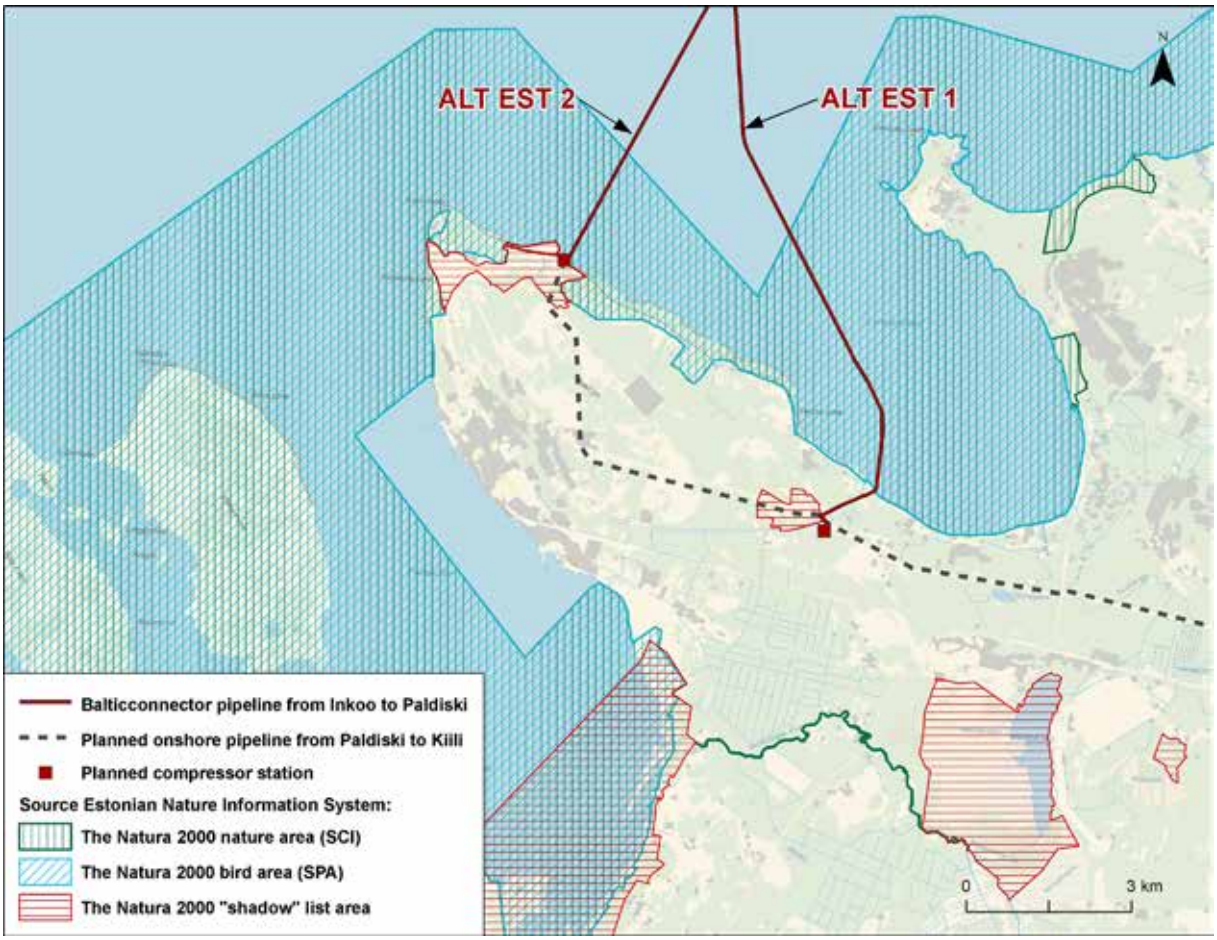

Figure 5.8. The Natura 2000 areas and Natura 2000 "shadow" list areas in the vicinity of the point of landfall in the area of Pakri.

forms the core area of this Biosphere Reserve. The Archipelago Sea Natura 2000 area covers almost the whole national park. Biosphere areas are subject to national legislation.

5.4 Socioeconomic conditions

5.4.1 Settlement

Paldiski is a small municipality 50 kilometres away from the capital Tallinn. There are 4,184 inhabitants (as of 01/03/2012) in Paldiski. Taken into account the area of the city (102 km^2), it is the second largest city in Estonia, as its territory covers the Pakri peninsula, Suur-Pakri and Väike-Pakri islands. The area is very sparsely populated (Paldiski city 2013b). The main living area is the Paldiski municipality centre on the western coast of the Pakri peninsula. There are mainly apartment buildings and less private houses. The population outside of the town centre is very scattered and they mainly reside in private houses.

One-third of the population is Estonian and two-thirds are citizens, who speak another language (mainly Russian). The city has both an Estonian and Russian secondary school as well as two kindergartens. There are an active music school for children, children's activity centre, library and town museum. The pearl of the cultural life is the famous sculptor's Amandus Adamson's Studio Museum in the centre of Paldiski.

The Pakri peninsula is suitable for wind power production. The first wind turbine was connected to the grid on 15 December 2004. The wind park has grown during the years and at the moment there are over 20 active wind generators.

5.4.2 Land use plans

In the territory of Paldiski town, a comprehensive plan (www.paldiski.ee/index.php?id=12761) has been adopted in 2005. The location of the point of landfall of planned gas pipeline and compressor station in Kersalu has been determined by a thematic plan of the comprehensive plan as well as the area for LNG terminal (optional point of landfall and compressor station alternative). For further developments detailed plans are in progress both in Kersalu and in Pakrineeme, see chapter 6.3.

According to the thematic plan's (planned Paldiski gas pipeline and LNG terminal) explanatory reports:

- Kersalu landfall and compressor station site: some lands are owned by private persons and some are unreformed state lands. According to the thematic plan, the acquisition of the necessary land (near the Tallinn-Paldiski road and to the extent of gas pipeline protection zone) from the land owners.
- Pakrineeme point of landfall (LNG terminal area, 43 ha): 3 land areas are owned by Pakrineeme Sadama OÜ and 1 land area is owned by the state.

5.4.3 Traffic

Neighbouring municipalities of Paldiski city are: Keila, Padise and Vasalemma commune. Paldiski has good road and railway connection. Paldiski has two harbours (South and North Harbour) in the west of Pakri peninsula. Both harbours are ice-free all year round and deal with different products. There is a ferry connection to Finland and Sweden from Paldiski South Harbour.

5.4.4 Tourism, cultural heritage and recreational use of the areas

The most important and most attractive natural object, which is under protection, is the Pakri cliff. The Pakri cliff is part the Baltic Klint, which starts from the island of Öland and reaches up to Lake Ladoga. It has also been nominated to be a candidate for the UNESCO list of Cultural and Natural Heritage objects (Paldiski city 2013c).

The cliff is one of the largest tourist attractions in Paldiski. The cliff surrounds the peninsula from Uuga to Kersalu, and the length of the cliff is 12 km.

The Pakri peninsula area is not a very popular summer cottage area due to its harsh military background.

In the summer of 1999, Harju hiking club opened an international coastal track E-9 section through the Pakri peninsula. White-blue-white stripe indicated track is marked on trees, columns and stones. The whole length of the track is 26 km and it takes about 6-7 hours to pass the track. The track begins at the Paldiski fortress.

There are 7 historical and 15 architectural heritage monuments in Paldiski. The most imposing of them all is the Paldiski Peter Fortress (Peetri kindlus). Other important objects are the Paldiski Nikolai Church and the Georgi Orthodox Church, cemeteries in the town and on the islands, etc. There are still a lot of other objects in Paldiski, which would be worthy of being taken under protection, like defence fortifications from the World War I. On the tip of the Pakri peninsula, there is an old Pakri lighthouse, which is also a cultural heritage object. On the eastern coast of the Pakri peninsula closest to cultural heritage object is the old Leetse-Lepiku cemetery.

6 Other related projects

6.1 Related projects and relevant development in the Gulf of Finland

6.1.1 Nord Stream gas pipeline

Nord Stream (Figure 6.1) is a 1,224 kilometer-long offshore natural gas pipeline system across the Baltic Sea, from Portovaya, Russia to Greifswalder Bodden in Germany. The route passes through the Exclusive Economic Zones of Russia, Finland, Sweden, Denmark and Germany, and through the territorial waters of Russia, Denmark and Germany. The pipeline system was constructed and is operated by Nord Stream AG. Nord Stream, which was constructed during 2009–2012, consists of two pipelines, each with a transmission capacity of 27.5 billion cubic meters per year. The first pipeline was brought into operation in November 2011, and the second in October 2012. The Nord Stream pipelines will intersect with Balticconnector.

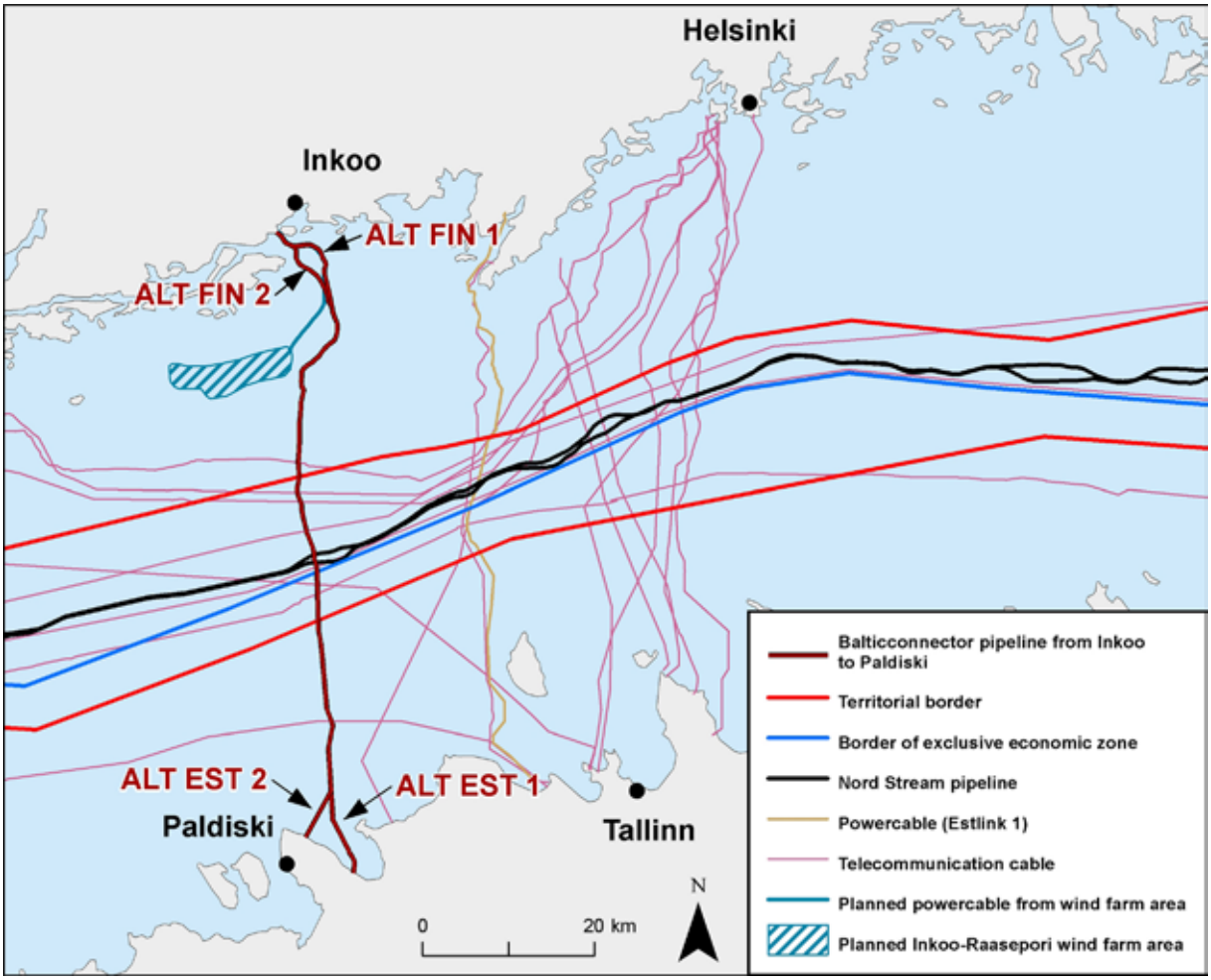

Figure 6.1. Existing and planned main cables and pipes in the project area.

6.1.2 Nord Stream gas pipeline Extension

Nord Stream Extension is a project for up to two offshore natural gas pipelines from Russia to Germany through the Baltic Sea. Route options run from the point of landfall in Russia through Finnish, Swedish and Danish waters to the point of 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 of the order of 1,250 km. The Finnish EIA procedure of the project started in March 2013 and the Coordinating Authority has issued its statement on the EIA Programme on 4 July, 2013.

6.1.3 Cables

Several telecommunication cables run in the Gulf of Finland. Preliminary studies have shown that many identified telecommunication cables cross the planned natural gas pipeline, as does a group of unidentified cables. They consist of both cables that are in use and cables that have been taken out of use. Crossings are to be agreed upon with the owners of the cables.

The Estlink 350 MW high-voltage cable (HVDC, High-Voltage Direct Current Cables) runs in the Gulf of Finland (74 km on the seabed) from Harku, Estonia to Espoo, Finland (point of landfall in Kirkkonummi). Owner of the cable is AS Nordic Energy Link (shareholders: Eesti Energia 39.9 %, Latvenergo 25 %, Lietuvos Energija 25 % and Pohjolan Voima and Helsingin Energia 10.1 %). The cable was put in operation on 4 December 2006.[6] This cable does not cross the planned Balticconnector gas pipeline route.

The Estonian and Finnish transmission system operators AS Elering and Fingrid Oyj (both 50 %) have laid 650 MW submarine cable (145 km on the seabed) connection, Estlink 2, at the bottom of the sea from Püssi substation in Estonia to Anttila substation in Finland. Connection will be commenced in autumn 2013.[7] Estlink 2 does not cross the Balticconnector gas pipeline route.

6.1.4 Inkoo–Raasepori wind farm project

Suomen Merituuli Oy is planning an Inkoo–Raasepori wind farm area on the western side of the Balticconnector pipeline. Possible needs of the area, such as electricity transfer cables, will be taken into consideration in planning the natural gas pipeline.

6.2 Related projects and relevant development in Inkoo

6.2.1 The planned LNG import terminal in Inkoo

The concept includes a full-scale land-based LNG import facility, which is located in Joddböle, Inkoo, approximately 4 km south-west from the Inkoo centre. There are several property owners at the planned terminal location (Figure 6.2).

The area required for the combined facilities would be of the order of approximately 500 x 600 metres; although once site investigations have been performed, the required area may be reduced to half.

The proposed LNG import terminal consists of a) LNG offloading facilities, b) a LNG storage and c) a LNG vaporization and gas conditioning unit that connects with the onshore gas grid.

LNG is transported by sea in a specialized LNG Carrier (LNGC). These are essentially large thermos flasks, with double hulls for safety. LNG is planned to be imported to proposed Inkoo LNG-terminal by 'Q-flex' type ships, the capacity of which varies between 140,000 – 170,000 m^3, length between 250 – 280 m, and width between 40 – 45 m.

If a conventional terminal concept is adopted, the facilities will allow the berthing of one LNGC at a time. The annual frequency of vessels calling at the proposed LNG-terminal is estimated to be 16–21. Other ships, not related to the movement of LNGCs, must remain out of the fairway or berthed, while the LNGC is in transit. Once the vessel is moored against the quay, other ships may pass at a distance of approximately 100 m. The LNGCs need a turning radius of approximately twice of the vessel length. Vessels are usually turned to head outwards before berthing in order to enable quick evacuation in the case of an emergency.

Ships will arrive with a full load. During offloading the ships are re-ballasted with water, which is contained in the double walled ship hull. The whole offloading and re-ballasting operation is completed within 12 – 16 hours.

6 Nordic Energy Link website: www.nordicenergylink.com/index.php?id=23 (29.11.2013)

7 Estlink 2 project website: http://estlink2.elering.ee/projektist/ (29.11.2013)

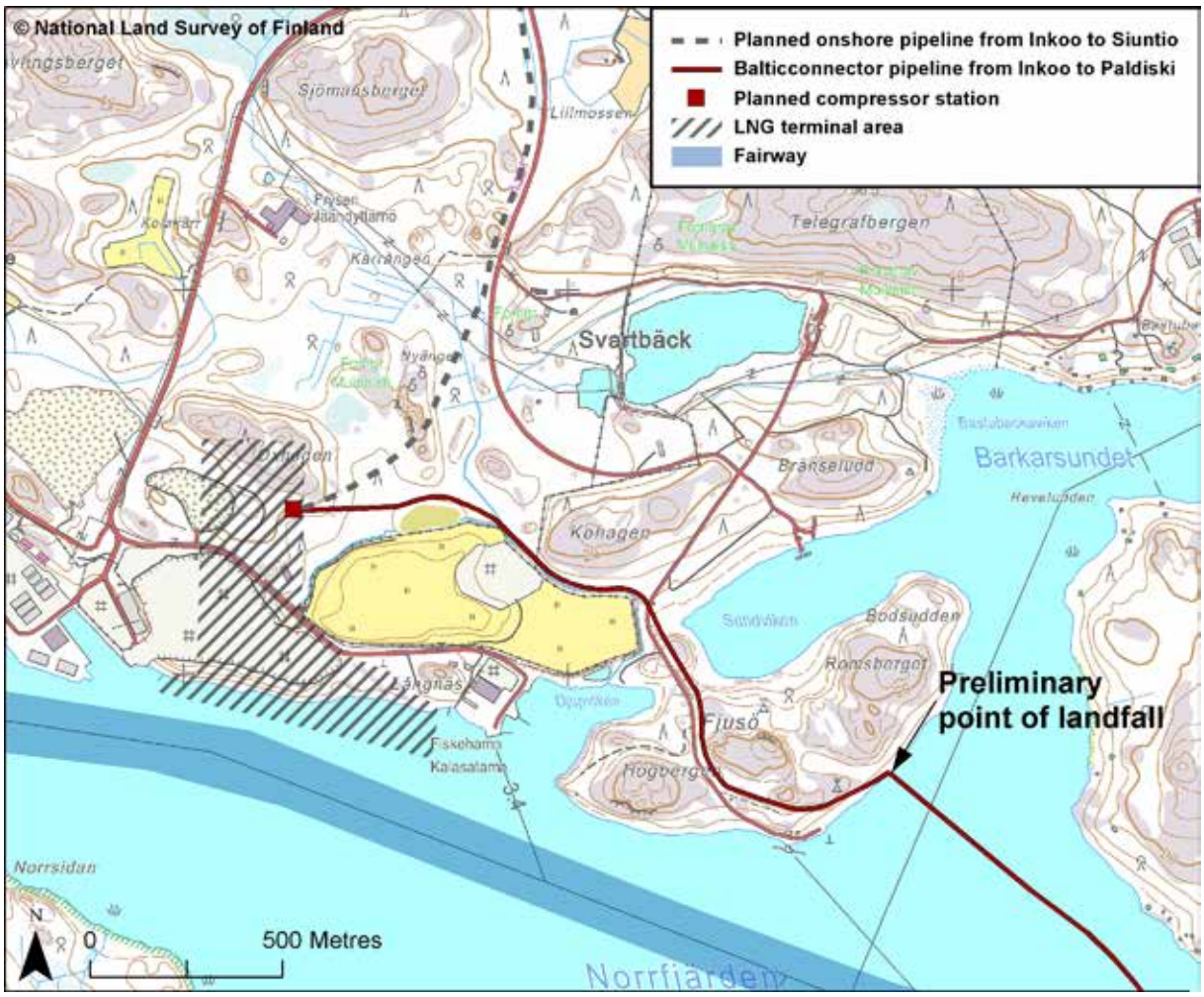

Figure 6.2. Gas pipeline preliminary point of landfall in Inkoo, connection to the Inkoo-Siuntio gas pipeline, the proposed LNG terminal alternative 2 and location of the compressor station

Upon arrival at the proposed terminal, LNG is offloaded, stored and re-gasified. The total output of the facility is expected to be approximately 2 billion m^3 per year. Terminal maximum on-land storage capacity consists of three storage tanks, each of 165,000 m^3. The process of liquefying the natural gas and delivering it to the consumers is visualised in Figure 6.3 below.

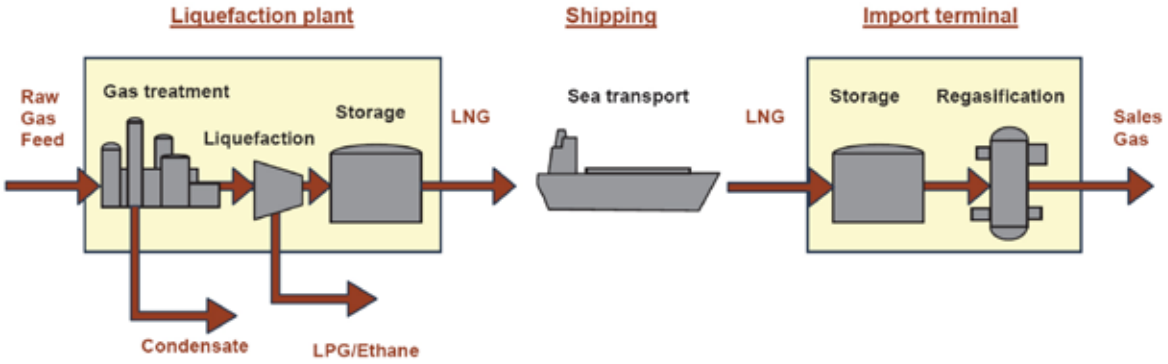

Figure 6.3. The main components of the LNG value chain (Bureau de Veritas 2009)

6.3 Related projects and relevant development in Estonia

6.3.1 Planned onshore pipeline from Paldiski to Kiili

The onshore route of the planned onshore gas pipeline from Kiili to Paldiski in Estonia concerns six municipalities: Kiili, Saku, Saue and Keila commune, Keila and Paldiski town.

At the starting point (in Kiili) of the planned gas pipeline, where block valve station and pigging station are planned, the detailed plan is adopted by Kiili commune council`s decision on 09 April 2009.

The location of the planned onshore gas pipeline is included in the comprehensive plan of the Saku commune.

To determine the onshore route in Saue and Keila commune and in Keila and Paldiski town, a thematic plan needed to be compiled separately in each municipality. Therefore, these plans were initiated in 2006. The following table gives an overview about the municipalities, where the location of the pipeline needed to be determined by a separate thematic plan (Table 6.1).

Table 6.1. Planned onshore pipeline related municipalities and status of pipeline thematic plans and SEA reports (19 April 2013)

Municipality	Date of adoption of thematic plan	Date of approval of SEA report
Saue commune	20 December 2012	10 December 2012
Keila city	18 December 2012	10 December 2012
Keila commune	27 March 2013	10 December 2012
Paldiski city	22 December 2011	4 September 2007

Thematic plans were compiled by K-Projekt AS. The SEA report for the Paldiski thematic plan was compiled by OÜ E-Konsult, others by OÜ Hendrikson & Ko. The developer was AS Eesti Gaas.

The following Figure 6.4 shows the preliminary onshore pipeline route from Paldiski to Kiili.

In the Paldiski thematic plan, a place for compressor station and a point of landfall (in Kersalu) of the Balticconnector project was chosen. Thematic plan is not determining the solution for natural gas consumers in Paldiski municipality (this needs another plan for B-category distribution pipeline). Thematic plan is adopted with a supplementary note: "If the location of the regional LNG terminal will be in Paldiski, in this case the point of landfall of the off-shore pipeline and the location of the compressor station is foreseen on the territory of Paldiski LNG terminal".

Onshore pipeline projects (from compressor station up to Kiili gas network and the compressor station in Kersalu) will be implemented by an Estonian developer and is not covered by the Balticconnector project. The status of other projects is the following:[8]

- A detailed plan of the compressor station has been initiated on 23 May 2012 by the Paldiski town. The developer is AS EG Võrguteenus. At the moment, the detailed plan is ready and is waiting to be addressed for its' publication and public meeting by the council of Paldiski town;
- Keila town government issued a building permit for building D-category pipeline on its administrative territory on 31 May 2013;
- Kiili parish government issued a building permit for building D-category pipeline on its administrative territory on 08 January 2013;
- Keila, Saue and Saku parish governments have issued design criteria for designing a construction project of D-category pipelines in their administrative territory.

8 According to the information received from AS EG Võrguteenus on 26 August 2013.

Figure 6.4. Preliminary onshore pipeline route according to thematic plans

6.3.2 The planned LNG terminal in Pakri peninsula

Thematic plan of the Paldiski comprehensive plan concerning the LNG terminal in Pakri peninsula has been compiled during 2010–2012 and adopted by Paldiski municipality[9] on 27 September 2012. Preparing a thematic plan was needed to determine the location of the object (LNG terminal) with significant spatial impacts (ORMO – olulise ruumilise mõjuga objekt). Thematic plan was compiled by SWECO Projekt AS and the SEA report by OÜ E-Konsult. The SEA report was approved on 19 July 2012 by the Environmental Board. The developer of the planned activity was Balti Gaas OÜ.

The area of the thematic plan is 230 ha. Terminal will be built for:

- receiving the liquefied natural gas (LNG) from tankers;
- storage and distribution of LNG;
- vaporisation of LNG.

In the first construction phase of the LNG terminal, the annual turnover will be 3 million tons and following port facilities, objects and communications will be built:

- quay, with the loading equipment for liquefied natural gas tankers;
- 2 liquefied gas containers (both up to 160,000 m^3);
- LNG vaporisation complex (500,000 Nm^3/h);
- heat and power plant, the first stage;
- nitrogen and compressed air complex;
- metering station;
- pipeline to natural gas network – compressor station;
- power substations;
- fire fighting equipment;
- artesian well;
- administration buildings;
- warehouse complex;
- gas flaring device;
- reversal compressor station.

9 Decision to adopt the plan was disputed by environmental NGOs (Estonian Ornithological Society)

If the gas consumption will increase in the future, the expansion of the terminal complex is possible.

The maximum radius of the danger zone of the terminal is 750 meters.

Thematic plan also foresees the onshore pipeline route from the LNG terminal to compressor station in Kersalu. The planned pipeline route runs mainly parallel to the existing high voltage power lines and planned wind park area (at the end of LNG terminal). A medium pressure gas pipeline is planned for supplying natural gas for Paldiski Municipality.

Materials of LNG terminal thematic plan are published at the website of Paldiski Municipality (Paldiski 2013a).

The preparation of detailed plans for onshore terminal (43 ha) and terminal quay (0.9 ha) has been initiated on 1 October 2012 by the Paldiski Municipality (explanatory reports and schemes are available: www.paldiski.ee/index.php?id=10604).

An EIA for the permit of special use of water (construction of quay) has been initiated on 23 January 2013. Developer is Pakrineeme Sadama OÜ and the EIA is carried out by OÜ Hendrikson & Ko. According to the published EIA programme, the quay will be approximately 1 km long (from coast). One leveller (laadimissild) will be 320 meters long at a depth of 14 meters and another 625–800 meters from the shoreline and approx 175 meters long at a depth of 9.5 meters (Figure 6.5 and Figure 6.6). EIA programme was approved by the Environmental Board on 3 June 2013.

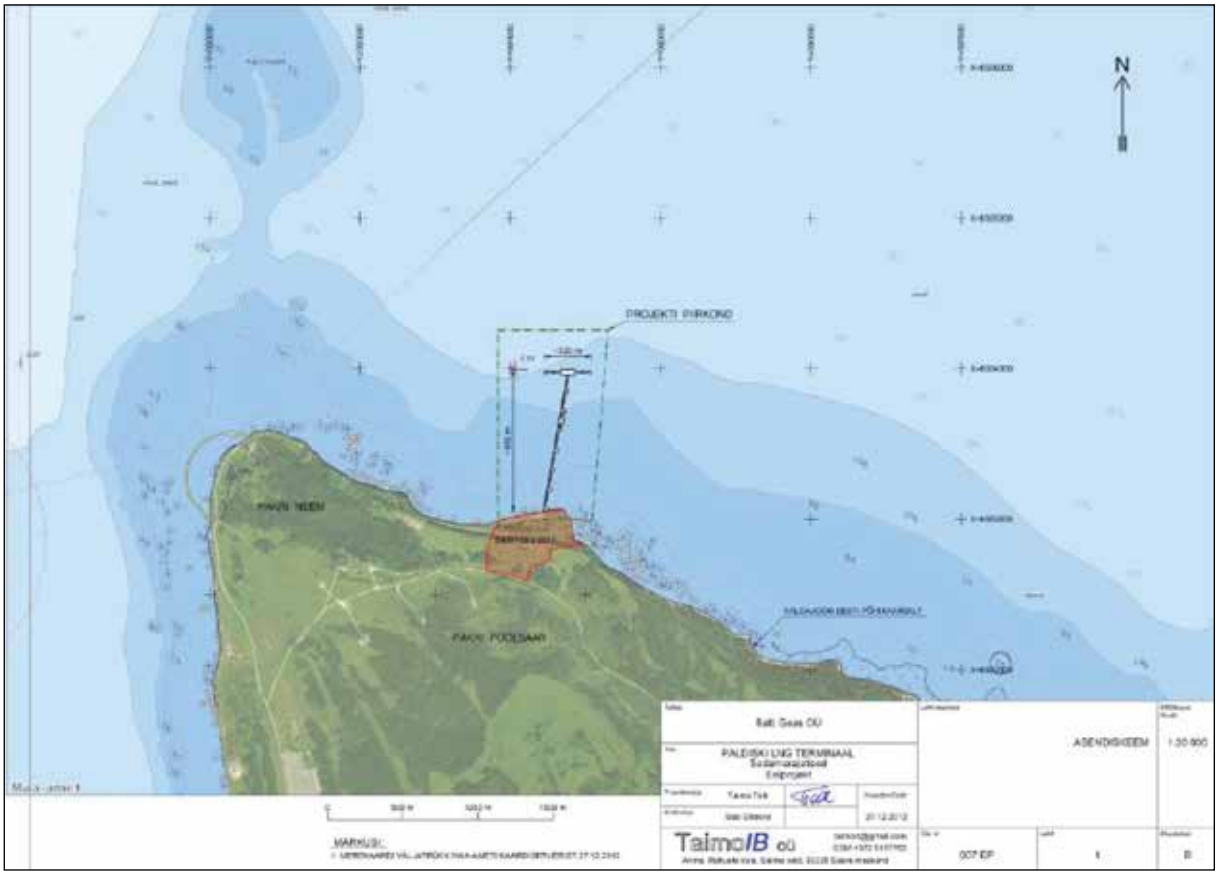

Figure 6.5. Location scheme of the quay of the LNG terminal (EIA programme, OÜ Hendrikson&Ko, 2013)

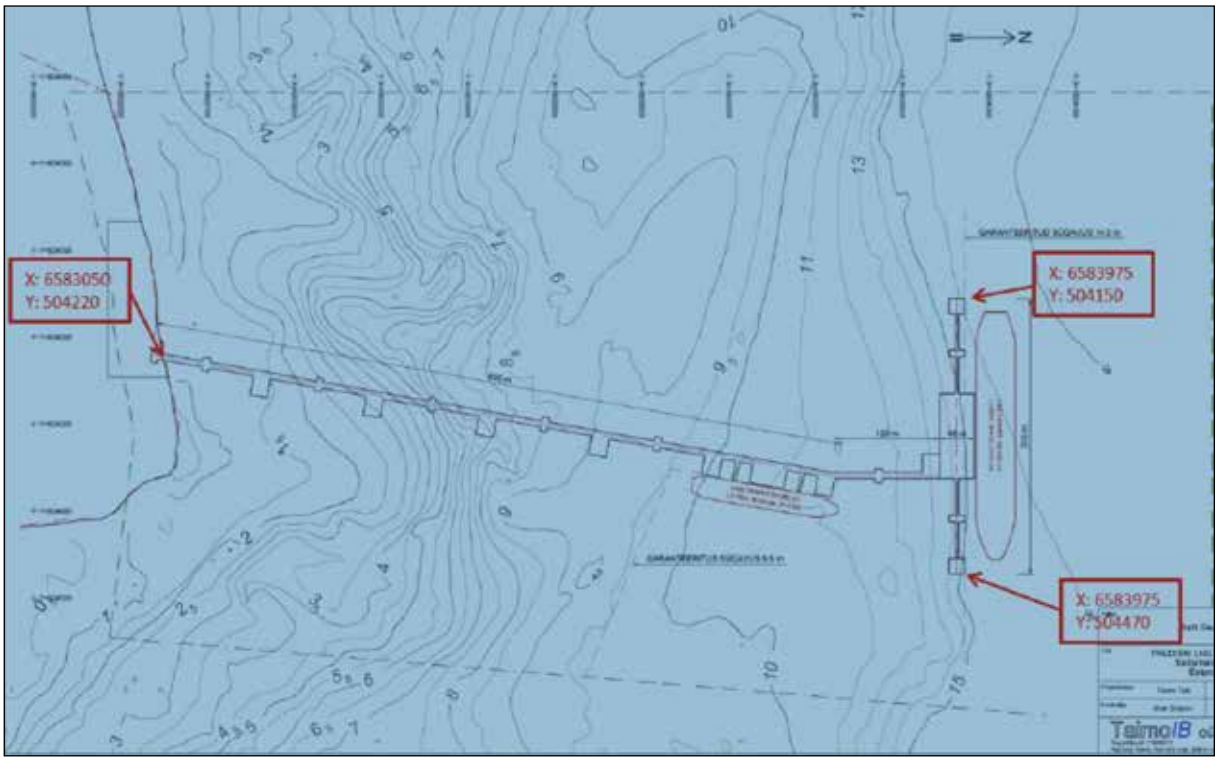

Figure 6.6. Plan of the quay of the LNG terminal (EIA programme, OÜ Hendrikson&Ko, 2013)

7 Alternatives of the project

7.1 Alternatives to be examined in the EIA procedure

The EIA legislation requires that various alternatives should be considered as well as alternative 0 (project is not implemented) in the environmental impact assessment.

In the EIA of Balticconnector, the following alternatives are to be assessed (Figure 7.1):

- **ALT 0:** Non-implementation of the Balticconnector pipeline. The natural gas pipeline from Paldiski to Inkoo will not be constructed.
- **ALT FIN 1:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia to Inkoo, Finland, route north of Stora Fagerön.
- **ALT FIN 2:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia to Inkoo, Finland, route south of Stora Fagerön.
- **ALT EST 1:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia to Inkoo, Finland, point of landfall in Kersalu in Estonia.
- **ALT EST 2:** Construction of the Balticconnector natural gas pipeline across the Gulf of Finland from Paldiski, Estonia to Inkoo, Finland, point of landfall in Pakrineeme in Estonia.

The planned preliminary point of landfall in Finland is located in the Fjusö Peninsula, about two kilometres

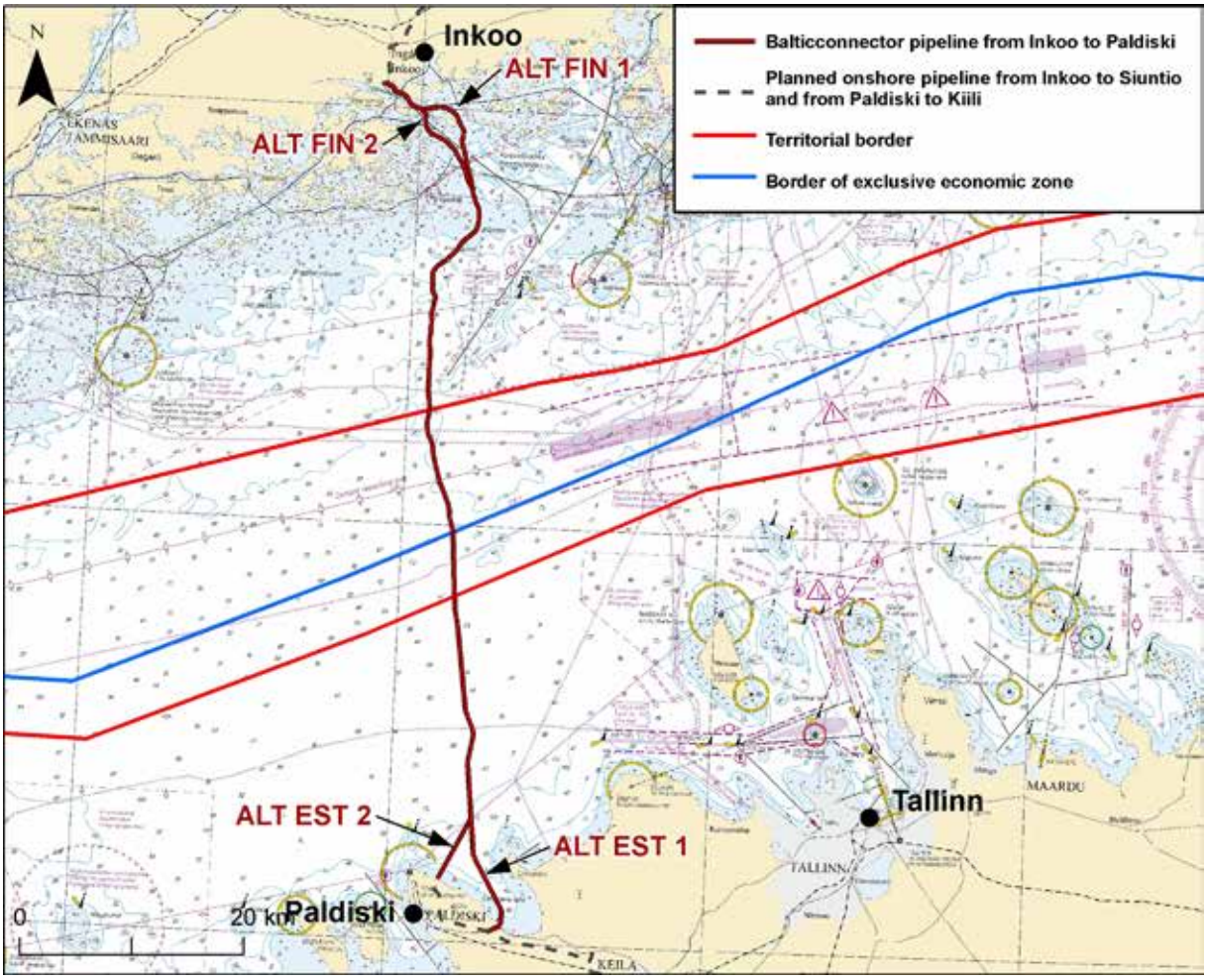

Figure 7.1. Alternatives of the Balticconnector offshore pipeline

east of the Inkoo harbour. In the Inkoo archipelago, two alternatives routes for the pipeline have been examined: north (ALT FIN1) and south (ALT FIN2) of the island Stora Fagerön.

In Estonia, there are two possible points of landfall (Kersalu ALT EST1 and Pakrineeme ALT EST2) on the shore of the Pakri Peninsula in the territory of the Paldiski municipality. The point of landfall in Kersalu (Estonia) has been determined by the relevant land use plan. The optional point of landfall in Parkineeme will be considered related to the proposed LNG terminal site in Paldiski.

The planned offshore routes were decided on the basis of previous studies, route comparisons, and the sea bottom studies made in the summer of 2006. The route will be optimised in a later planning phase for an area of two kilometres wide, which has been the study width in the sea bottom measurements. During 2013 Gasum will organise relevant environmental surveys, which are necessary for the assessment of impacts caused by the project as well as for comparison of the route alternatives (see chapter 8.2.1).

7.2 Previously studied Balticconnector route alternatives

In the initial planning phase, Gasum and Eesti Gaas studied two different route alternatives for the offshore pipeline. These alternatives were directed from Paldiski to Inkoo and from Paldiski to Vuosaari, Helsinki. Routes are shown in Figure 7.2.

According to the original goal of the Balticconnector project, the central task of the offshore pipeline connection is to improve the reliability of natural gas supply by creating a possibility to import gas through the Baltic countries to Finland and at the same time to create a possibility of exploiting the natural gas storage located in Latvia.

During the project, based on capacity investigation of the natural gas networks, it was noted that the capa-

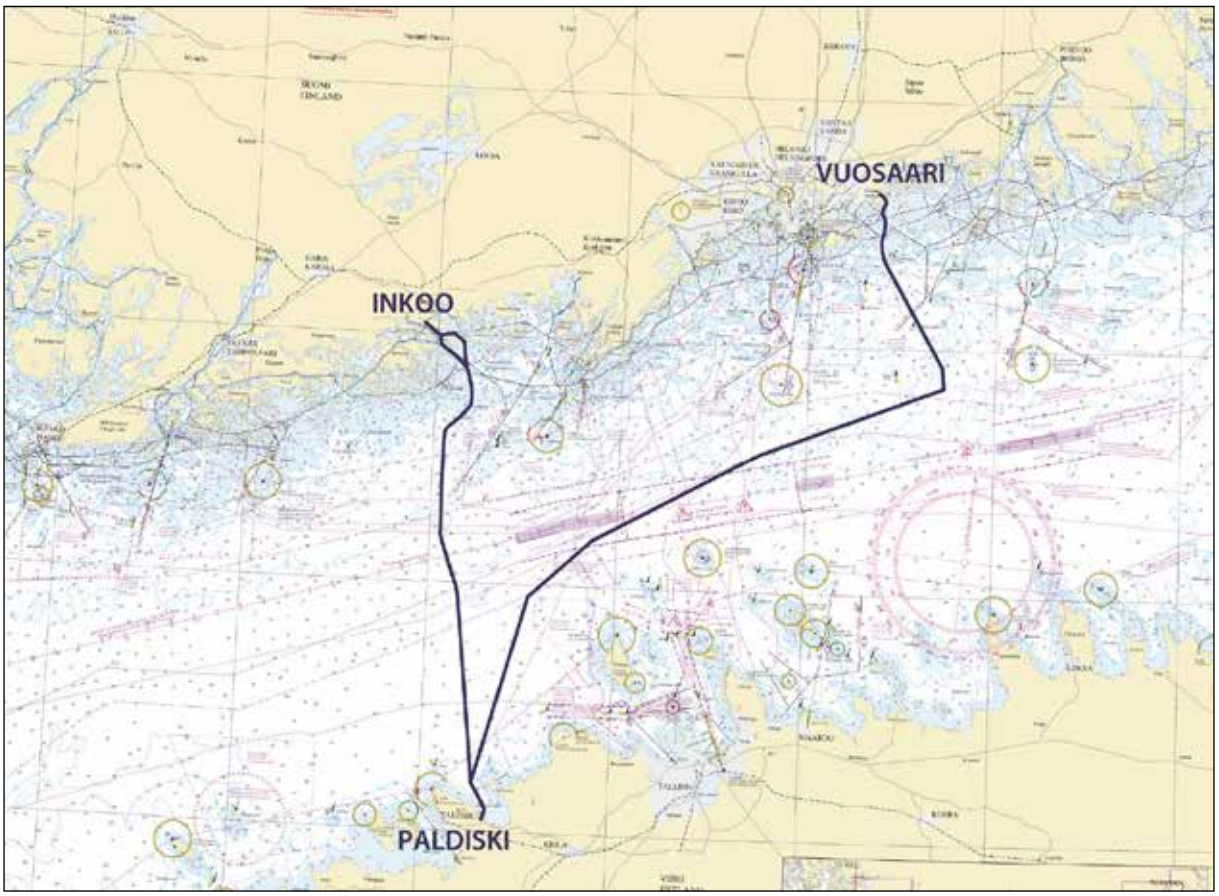

Figure 7.2. Preliminary route alternatives for the Balticconnector offshore pipeline

city of the natural gas pipelines extending from Western Russia through the Baltic countries to Finland is mostly in use. Free capacity for the needs of Finland can only be used from time to time. Similarly, capacity shortages have also occurred in meeting Estonia's own needs for natural gas. For this reason, investigations were started to clarify the possibility, in which gas would be transferred through Finland to Estonia and possibly elsewhere in the Baltic countries. In this phase of the project, it could be stated that a two-directional transfer possibility for natural gas is a basic requirement for implementing the project. This means that the point of landfall and the connection to Finland's natural gas network must be planned in such a way that the required capacity for two-directional transfer is also available in the Finnish side. Based on the investigations, it could be noted, that this is not the case in the Vuosaari alternative. For this reason, the previous Vuosaari alternative for a point of landfall and a pipeline route will not be studied as realistic alternative in this EIA procedure.

AS Eesti Gaas has planned to expand the current gas pipeline network in Estonia to the western side of Tallinn all the way to the city of Paldiski. The gas pipeline route from Kiili to Paldiski from the southern side of Tallinn has been assessed in connection with the strategic environmental impact assessment (SEA) included in the zoning process. The impacts of the compressor and receiving stations to be constructed in Paldiski (Kersalu) have also been evaluated in connection with the same strategic environmental assessment. The assessment report has been approved by the Harju regional office of the Ministry of the Environment and it is being considered by the Paldiski Municipality.

In Finland, Gasum Oy decided to invest in a new gas pipeline between Mäntsälä and Siuntio in 2007 after Fortum Oy made an investment decision on a remote heat power plant using natural gas in Suomenoja, Espoo. The current capacity of the Helsinki branch would otherwise not be sufficient to serve the additional gas use in the area. The additional gas pipeline capacity would primarily meet the increasing need for gas consumption by the Suomenoja power plant, but also significantly improve the reliability of natural gas delivery of the whole capital city region. Gas import to new areas of western Uusimaa would also become possible when the Mäntsälä – Siuntio pipeline is completed. This investment decision by Gasum Oy also supports the decision to concentrate on developing the Balticconnector project only on the basis of the Paldiski – Inkoo alternative.

8 Impact assessment and methods

8.1 Impacts to be studied

In this project, environmental impacts mean impacts caused by the natural gas pipeline (ALT FIN1 and 2, ALT EST1 and 2). For this reason, the environmental impact assessment will concentrate on the impacts of implementation alternatives. The environmental impact assessment phase will be carried out nationally both in Finland and in Estonia.

In this project, the main impacts to be assessed are impacts by the offshore pipeline. Impacts to be studied include (offshore and onshore):

- impacts on the seabed and water quality
- impacts on natural organisms, such as animals, fish and plants
- impacts on protected areas and values and Natura 2000
- impacts on ship traffic and boating
- impacts on land use and land use planning
- impacts on human living conditions, fishing and safety
- impacts on landscape and cultural heritage
- impacts on tourism and recreational use of the areas
- impacts on utilization of natural resources
- impacts on air quality
- noise
- impacts on scientific heritage.

Implementation of the project can cause impacts in the following phases: construction, operation and decommissioning of the pipeline. In the assessment, direct and indirect impacts will be assessed during construction, operation and decommissioning. Additionally, cumulative impacts of other related projects (i.e. Nord Stream natural gas pipelines, planned LNG terminal in Inkoo and Paldiski and the planned onshore pipeline from Paldiski to Kiili) will be taken into account in the assessment.

EIA report will include a separate chapter about transboundary impacts (i.e. impacts on ship traffic) (see chapter 8.7).

The most significant impacts will probably be caused by the pipeline installation operations, such as dredging, blasting, filling and rock placement to even the seabed under the pipeline structures and prevent free-spans. In the operation phase, impacts caused by the project will probably be quite minor mainly including impacts on fishery and ship traffic. Impacts of decommissioning can be assessed after the methods for decommissioning are defined during the planning process. Current situation in the Gulf of Finland and in the project area is described in the EIA programme and it will be supplemented in the EIA report.

8.2 Assessment methods to be used

The following methods are used to assess environmental impacts:

- analysis of existing data
- studying the results of existing geotechnical and physical studies
- new field studies (surveys) made along the pipeline corridor and around the points of landfall
- consultations with authorities and institutions
- modelling the distribution of environmental impacts
- expert opinions

In the assessment, direct and indirect impacts will be assessed during construction, operation and decommissioning. Impacts will be assessed:

- by characterisation (quality, type, reversibility and importance of impacts),
- by impact magnitude (extent and duration) and
- by significance in general.

Combined impacts with other projects and plans and uncertainty factors of the project will be assessed, as well. The environmental impact assessment will mainly be performed as an expert assessment.

After the seabed conditions of the planned pipeline are clarified and the pipe design is made more accurate, it will be possible to define the locations of the needed seabed intervention works in more detail and their impacts on the environment.

According to the Estonian EIA act, well known methods have to be used while compiling an EIA report. Assessment methods will be determined by the EIA

consultant compiling the report, taking into account the national requirements for assessment methods.

8.2.1 Environmental surveys

The offshore pipeline route has been studied and extensive marine surveys have been conducted in 2006. Environmental surveys here mean field works and desk studies, which are carried out during autumn 2013. These surveys will constitute the baseline information in the EIA report.

The geotechnical and acoustical surveys, which have been conducted in 2006, include:

- Bathymetric survey, for measuring the topography of sea bottom.
- Side scan sonar (SSS) survey, to detect seabed features and objects on the seabed.
- Sub-bottom profiler, for profiling layers under seabed.
- Geotechnical sampling, to achieve more information on geotechnical conditions of the seabed.

The environmental surveys, which are carried out during 2013 – 2014, include:

- Sediment studies
- Soft bottom macrozoobenthos
- Benthic flora and fauna on hard bottoms, by scuba diving
- Acoustic surveys, remote operated vehicle (ROV) and magnetometric surveys
- Nature studies on onshore pipeline areas
- Test fishing with nets in coastal area
- Fish breeding area study
- Bird study
- Survey of commercial and professional fishery near shore and offshore
- Marine mammals study.

8.3 Timing and duration of the impacts

The fact that different impacts occur in different ways and time spans will be taken into consideration in the impact assessment of offshore gas pipelines. Some of the most important effects are limited to the construction period and some of the impacts are permanent. The nature of each impact regarding time and place will be described in the environmental impact assessment report.

8.4 Impact assessment of the offshore gas pipeline

8.4.1 Impacts on water quality and the seabed

During construction works, shaping the seabed will cause sediment spreading and increasing water turbidity. Shaping can include, for example, dredging, trenching, blasting and covering of the seabed. If the concentration of organic matter and nutrients in spreading sediments is high, the released nutrients (like nitrogen, N and phosphorus, P) can increase eutrophication in the impact area. Spreading sediment can also contain inorganic and organic contaminants that can partly be released into surrounding water. In soft sediments, which contain a large amount of organic matter, heavy metals (for example cadmium and lead) and various harmful organic substances (including PCB) can appear. Also tributyltin (TBT) can be found in the contaminated bottom areas. Potentially, negatively affected areas especially include shoals and shallow areas, where the living nature is most abundant When the pipeline is installed directly on the seabed without shaping, the impacts will be lower. The installation technique also has significance considering sediment spreading. The optional pipeline installation barges are anchoring and dynamically positioning lay-barge. Anchoring affects directly on the seabed and disturbs sediments in the anchoring corridor. Anchoring lay-barge needs tug boats to handle the anchors. Dynamically positioning (DP) lay-barge uses powerful thrusters. Thrusters' flows can disturb softer seabed especially in shallow areas.

If munitions are found in the close vicinity of the pipeline area or in the anchoring corridor, they need to be cleared for safety precaution. The usual way is to blast them. Blasting also disturbs sediments. It creates a crater (size depending on explosive charge) and destroys benthos from the crater area. Explosives contain hazardous substances. Blasting causes sediment and contaminant spreading. If containers, like barrels are found in the pipeline area or anchoring corridor, they must be inspected in case of a hazardous content.

Impacts on water quality and the seabed will be assessed by experts. In the environmental impact assessment (EIA), the volume of sediments to be moved, sediments spreading in the water column and released nutrients and contaminants will be assessed. Mathematical modelling will be used to model sediment spreading, re-sedimentation of the released sediments and impacts of the seabed shaping on the currents of the area. The Finnish Environment Centre has

modelled currents in the Gulf of Finland in the Finnish water areas. During the EIA procedure, the applicability of existing model will be verified. Otherwise, new models will be produced to assess currents and the spreading of different sediments and contaminants and their impact areas. Estimated duration of these impacts will be assessed, as well.

The impact assessment will be based on existing data on water quality and sediments, further investigations like data obtained from modelling and experience gained from similar projects. In the future, the additional investigations will be concentrated especially on the areas, where seabed will be shaped or disturbed. The quality and quantity of additional investigations will be negotiated with the environmental authorities.

Seabed bathymetry, such as the location, height and steepness of precipices, will be studied more accurately as the planning proceeds. The seabed geology will be studied in the pipeline area with i.e. multi-beam echo sounding, side-scan sonar (gives a silhouette of the sea bottom, e.g. wrecks, munitions and cables can be seen), sub-bottom profiler and magnetometer (for seeking underwater metal accumulations). Environmental and geotechnical samplings will be carried out along the pipeline for investigating sediment quality and the composition and grain size of sediments. The organic substances and, when needed, contaminants in sediments will be analysed.

Figure 8.1. A typical cone penetration rig. Among other sampling, the seabed survey will include cone penetration testing to study the geotechnical features of the seabed.

The possible impacts during the operation time will be considered, as well. These derive, for example, from noise and visual disturbance and disturbance from monitoring and maintenance. The environmental impacts of the pipeline materials and materials used to cover them will be assessed. The aim is to use materials that have no substantial impacts. Thus, no harmful materials will dissolve in the surrounding water. The impacts of dissolving materials from sacrificial anodes will be considered in the assessment.

8.4.2 Impacts on living environment

The possible impacts of the project can be divided into impacts during the construction phase and impacts during operation and maintenance.

The living environment is most dense and diverse in shallow areas. Due to this, the most significant impacts of the project on living environment also occur in shallow areas. Bottom shaping (dredging, blasting, filling and rock placement to even the seabed under pipeline structures and prevent free-spans), can cause disturbance to organisms living on the bottom and in the water. Generally, benthic flora and fauna recover within a couple of years, depending on type of community and species. Sediment spreading, due to bottom shaping activities, cause temporary increase in turbidity. Spreading sediment can contain harmful inorganic or organic substances that might enter the food chain when partly dissolving to the surrounding water column. When settling and re-sedimenting in the new sedimentation area, spreading sediment can shade, cover and disturb communities living on the seabed.

According to preliminary assessments, impacts on flora will be minor, as there are few macrophytes at the bottom of the deep open sea area. Significant flora exists at the coasts in euphotic areas, where light penetrates the water column all the way to the bottom and makes photosynthesis possible.

Impacts on flora and fauna will be assessed by experts. Existing data, collected research results and results of possible further investigations will be utilised. The surface area and diversity of living communities located in the pipeline area and the significance of their possible disappearance will be examined. The significance of impacts will be considered in accordance with the guide Nature Investigations and Nature Impact Assessment (Söderman 2003) and i.e. the requirements for nature conservation set by the Nature Conservation Act and the EU's Birds and Habitats Directives will be considered. Impacts on communities living on the seabed

Figure 8.2. Baltic Sea landscape in the Inkoo archipelago (Ramboll 2011)

will especially be studied. In addition, possible disturbance of marine mammals, birds and fish will be studied. Possible impacts on species and their important breeding, feeding and resting areas are considered. Also, possible impacts of the project on planctonic environment (e.g. due to increasing turbidity) will be considered. Mitigation methods to reduce harmful impacts on valuable areas and species will be proposed.

Impacts during the construction phase include, for example, disturbance of seabed and sediment spreading, increasing water turbidity, noise and visual disturbance and pressure waves due to possible munitions clearance. Noise impacts will be mathematically modelled. Changes in ship traffic have impacts on emissions and seabed disturbing in the area. Species and their abundance in the impact area will be assessed in the EIA.

The impacts of the pipeline during operation and maintenance are mostly due to the permanent impact on the seabed structure. The communities under the actual pipeline will be permanently destroyed. Pipeline can also create new reef areas that favour fish and hard bottom species that are new in the area. The permanent impacts on seabed structures, noise and currents in the pipeline area will be assessed in the EIA. Also, impacts deriving from materials possibly dissolving from the pipeline structures will be assessed.

In addition to the above-mentioned impacts, the accident risk is related to the construction period and operation time of the project. For example, the risk of collisions, possible oil leaks and their impacts on living environment will be studied. The risk factors will be assessed by means of mathematical modelling and proper mitigation measures will be suggested.

8.4.3 Impact chains

Impact chains connected with the project will also be taken into consideration in assessing possible impacts on living environment. Impacts can often indirectly affect the whole ecosystem. For example, increasing water turbidity can affect the reproduction of mussels and consequently on eiders' food and their possibilities for reproduction in the protected areas in the vicinity of the gas pipeline. The significant impacts will be described and their significance will be assessed by experts.

8.4.4 Impacts on protected areas

The impacts on nature conservation areas caused by the project in the affected area around the planned pipeline area will be studied in the environmental impact assessment. The Natura 2000 areas, national parks, the BSPAs (Baltic Sea Protection Areas), the UNESCO biosphere areas, the RAMSAR wet-

land protection areas (which are all also Natura 2000 areas) and seal protection areas will be considered in the assessment. The natural gas pipeline route is partly located in the Inkoo archipelago Natura area and the Pakri Natura area. These areas are valuable in conservation of the archipelagic nature and birds.

In assessing the impacts on protected areas, the possible impacts on protection values of the areas will be assessed. The significance of assessed impacts depends on its effect to protected values (e.g. biotopes or species), which constitute the base for the founding of the conservation area. Direct and indirect impacts will be considered. Also, the impacts on communities, that are significant in conserving the biodiversity, will be assessed. The significance of the possible impacts on habitats and species defined valuable according to the EU's Habitats and Birds Directives (SPA, SCI Natura areas) will be studied. The impacts will be categorised and illustrated on maps according to their importance.

8.4.5 Natura assessment

Under the article 65 of the Finnish Nature Conservation Act (1996/ 1096) and article 3 of Estonian EIA act, a full Natura 2000 assessment must be undertaken, if the screening of impacts indicates that the project will have impacts that extend into a Natura 2000 area and which are likely to have a significant adverse effects on the ecolo-gical values of the area. This means impacts on natural habitats or on the habitats of species that are protected in the Natura 2000 network. Authorities cannot grant a permit to implement a project, if the above-mentioned assessment indicates that the project will deteriorate the protected values of a Natura area.

The screening study of the impacts on the Natura 2000 areas in Finland will be accomplished during the EIA procedure. It can already be stated, that a full Natura assessment (appropriate assessment according to EU guidelines) has to be made in Estonia. The report of this assessment will be attached to/be part of the EIA report.

8.4.6 Impacts on ship traffic and boating

The impacts on ship traffic and the risks possibly caused to traffic will be assessed by an expert assessment. Harm may be caused to ship traffic by, for example, safe areas during construction and traffic connected with pipeline installation. The impact of the construction of the pipeline on the traffic separation scheme (TSS) in the Gulf of Finland will be estimated. In assessing the impacts, the planned announcements and contacts with ship traffic guidance will be examined during the work of installing the pipeline. From the viewpoint of ship traffic guidance, it must be investigated, what kind of vessels will be used to install the pipeline and how much space the installation vessels require around themselves. The routes and quantities of possible supply and maintenance traffic will be estimated.

To assess the impacts on ship traffic, the volumes and routes of ship traffic are to be investigated, for example, with the aid of AIS (Automatic Identification System) or the Gulf of Finland Reporting (GOFREP) system. The GOFREP is a required vessel reporting system that has been in use since 2004.

During operation, the pipeline route may limit anchorages and cause risks of gas leaks or in the form of vessels coming into contact with the bottom. Impacts during the operation of the pipeline will be assessed from the viewpoint of both current and estimated future traffic. Both freight and passenger traffic is estimated to increase further in the Gulf of Finland.

Small boat traffic on the coast of Finland is extremely heavy in the project area. Pipeline construction will cause disturbances by limiting ship traffic at dredging and filling points on the pipeline route and at the point, where the pipeline is being laid. However, the disturbance will be short-term and temporary. The impacts will be assessed as expert estimates. Data about boat traffic will be collected from boat clubs and small boat harbours in the area.

8.4.7 Impacts on human living conditions, safety and recreation

The project may have indirect impacts on human living conditions and safety. The following impacts will be assessed in the impact assessment: impacts on human safety and comfort, possibilities for outdoor activities and recreational use of the environment, impacts on health and well-being and how people feel the project may impact their lives. Impacts on settlements will also be assessed.

Impacts may be caused, for example, by noise and traffic disturbances during construction, as well as munitions clearance or the risk of accidents connected with munitions and toxic substances on the seabed. People's expectations on the project and its impacts will be assessed based on the opinions expressed in statements and during participation. The assessment of health impacts will be handled in connection with noise during construction and risk assessment. In ad-

dition, impacts derived from the spreading of contaminants will be assessed, if needed.

In identifying and assessing social impacts, all social groups that will be affected, such as residents in the area and fishermen, will be identified. Experience-based, subjective data analysis and expert assessment are combined in the assessment of social impacts. Efforts will be made to obtain the views of local interest groups and other parties about the social impacts. Statistical materials, written source materials and feedback received during the work will be analysed, just as observations made during public meetings. Feedback on the project in newspapers will also form an important source of information.

In the risk analysis of the project, the risk to third parties will be assessed, for example, to ship passengers or people located in the vicinity of the point of landfall of the pipeline. In the risk analysis, the probability of an incident of damage to the pipe and the impacts caused by the damage will be assessed. Damage to the pipe can be caused, for example, by anchors being dragged, sinking vessels or the effect of ice. The assessment of impacts caused by damage contains estimates of the amount of gas leaking from a broken pipe and spreading in water and in air above the sea surface. The impact assessment of risks for ship passengers and people in the vicinity of the point of landfall place will be based on the volume of ship traffic, the density of residences at points of landfall and information about spreading of gas in air.

8.4.8 Impacts on tourism and economic life

Impacts on fishery

In the construction phase of the project, a safety zone to be established on both sides of the gas pipeline route may cause restrictions on fishery. During the installation phase, the spreading of sediments may, for example, disturb fish spawning areas. Covering the pipeline with rock materials may also have a positive effect on fish. Especially, in coastal areas and shoals, the operation will create reefs favourable to fish.

Impacts of the pipeline on fishery will be assessed in the environmental impact assessment. Use will be made of the possible source materials from the International Council for the Exploration of the Sea (ICES), The Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM) and the Finnish Game and Fisheries Research Institute.

Impacts on the Estonian and Finnish fishery will be assessed by the help of fishing rights in the EC, bilateral and national level, current vessels, fishermen, catch quotas, catches, species, free spans, fish occurrence, oxygen status in project area, the number of fishing days in the EC log books etc. Impacts on fishing will also be estimated with the help of using the coordinates of VMS satellite data, which is based on remote sensing methods in the Regulation (EC) No 1966/2006. In future, both the location and the depth of trawl haul must be reported on-line to the register. Crossing points can be screened by the help of the speed of vessels.

Figure 8.3. Inkoo archipelago (Ramboll 2011)

All features and extensions of the LNG facilities and the pipeline will be specified in the assessment procedure. However, the assessment of fishery impacts in prevailing fishing conditions should be directed to the bottom-close mid- water trawling, since there should be neither bottom trawling nor other forms of fishing that could be affected in theory.

Impacts on tourism and recreational use of areas

Possible impacts on tourism and recreational use of areas in the Gulf of Finland will be assessed in the environmental impact assessment. In the assessment, among other things, possible impacts of suspension and spreading of sediments in the water during construction on nearby archipelago areas and possible impacts on cruise ships and leisure boating will be assessed. Areas important to tourism and seasonal leisure homes and residents in the vicinity of the project area will be investigated in the assessment. Efforts will be made to obtain the views of local interest groups and other parties about impacts on economic life.

The most significant impacts on tourism and recreational use of areas are concentrated near the points of landfall in Finland and Estonia, and during the construction phase on islands located near the pipeline. The main impacts to be assessed include noise and disturbances to traffic. Risks to tourism will also be assessed, such as possible impacts of a pipe leak on recreational use of nearby islands and shores.

8.4.9 Impacts on landscape and cultural heritage

The geological and physical characteristics of the pipeline route will be studied by, among other things, echolocation methods, with the aid of photographs and magnetometry. For example, areas, in which munitions are suspected, will be studied in detail by methods suitable for the conditions. Even small objects, a few centimetres in diameter, can be located, if they are not buried too deep in the sediment layer. Larger metallic objects can be located at a depth of about 1–2 metres on the sea bottom sediment. Chemical deviations from munitions can be detected from water above the sea bottom.

In connection with the studies in question, information will also be obtained about ship wrecks and iron-containing accumulations that may possibly be on the sea bottom, such as old objects. In addition, existing information about valuable sites in the Gulf of Finland will also be used. When cultural heritage sites in the vicinity of the gas pipeline route have been investigated, impacts during installation and use of the gas pipeline will be assessed and the possible risk of accidents to the particular objects will be assessed. The assessment will be made in cooperation with museum officials.

8.4.10 Impacts on land use and land use planning

The pipeline will be located in the area of a master plan confirmed for the entire municipality of Inkoo. Impacts of the pipeline will be assessed as needs for changing the plan in the sea area. The impacts will be assessed as expert work together with land use planners of Inkoo. The locations of fairways are also shown in the master plan, which should be taken into consideration in assessing the impacts.

8.4.11 Impact on marine areas and marine area planning

Information about the present situation of Marine Management Plans (MMP's) and strategies in the Gulf of Finland will be compiled. According the Marine Strategy Framework Directive (MSFD) of EU, the Member States have to plan and implement their strategies to reach the goals stated in directive. The first part of the MMP includes a preliminary assessment of the status of sea areas, specification of what is meant by good environmental status and how to measure it. The monitoring programme will be launched by 2014 and the programme of measures latest by 2016. The MMP's will have influence on the commitments of authorities but not on the commitments of operators and private persons. Balticconnector project will be analyzed as single pressure factor possibly having effect on achieving good environmental status.

Maritime transport development, trends and strategies of Baltic Sea countries will be collected and described. Also the phase of development of marine spatial planning (MSP) in the Gulf of Finland will be presented. Two organisations, HELCOM and VASAB, have in 2010 established a MSP working group for the cooperation in the Baltic Sea area.

8.4.12 Impacts on the exploitation of natural resources

The impacts of the project on the exploitation of natural resources will probably be small. On the other hand, what and how much material will be needed to cover the pipeline and how much material will have to be moved in the sea bottom will be investigated. The amounts of masses to be moved and needed will

be investigated and their impacts on the exploitation of natural resources in the Gulf of Finland will be assessed.

8.4.13 Impacts on air quality

According to the project made by K-Projekt AS "Maagaasi D-Kategooria torustiku paiknemine Paldiski linna territooriumil" the needed gas turbines power in compressor station is 13 to 18 MW, depending on the locations of compressor station and other establishments. This means that the total amount of input power must be 39 to 54 MW (thermal power) and the gas flow volume in this case is 2.8 t/h to 3.9 t/h. Calculated CO_2 emissions into the air in this case are 7,900 to 10,800 kg/h, the total NO_x emission would be 12 to 17 kg/h. Over the past year, the capacity of gas turbines has increased and new technologies are developed to reduce NO_x emissions. Therefore, we can assume that new, low NO_x emission gas turbines will be used with appropriate NO_x emissions reducing equipment.

Exhaust gases from gas turbines potentially also contain carbon monoxide (CO), unburned hydrocarbons, sulphur oxides (SO_2 and SO_3) and particulate matter. However, they are considered to be insignificant for natural gas combustion. Leaking methane (CH_4) is not restricted.

In Finland, regulation number 1017/2002 states the requirements for gas turbines installations thermal input that exceed 50 MW. However, local authorities and local governments often impose equivalent restrictions for smaller installations. The Finnish regulation imposes restrictions on SO_x, NO_x and fine particulate matter emissions. When using natural gas, all other gases than NO_x are insignificant. The maximum permitted NO_x emission level is 50 mg/m^3 [measured under standard conditions (15 % O_2 content in the exhaust gas, OC, 1 bar)]. This will result in the amount of NO_x in the overall exhaust gas 28.5 ppm to 8.1 kg/h (13 MW compressor), or 11.2 kg/h (18 MW compressor). At the same time, the regulation of Finland gives an opportunity to develop maximum NO_x emission level of 75 mg/m^3 for gas turbines that run the mechanical drive units. In this case, the amount of NO_x in the overall exhaust gas can be 28.5 ppm to 8.1 kg/h.

8.4.14 Noise

Noise on the sea will be emitted mainly during the construction time of the pipeline. Noise impact in the construction phase is caused by pipeline installation, such as dredging, blasting, filling and rock placement to even the seabed under the pipeline structures and prevent free-spans. Also, the construction of the LNG terminal requires dredging of the seabed. However, the duration of these impacts is short. There are no specific acoustic measurements of background noise in the project area, as well as there are no known published measurements of airborne noise in the open sea in the Estonian project area. It can be assumed, that most of the background noise in the Baltic Sea, both in-air and underwater, in general is generated by ship traffic. Ship traffic in this area mainly consists of cargo and tanker vessels. (Ramboll 2011). Gas flowing through the pipeline generates some noise during operation.

Three different situations must be taking into account in noise assessment:
- noise situation during construction;
- noise situation during operation;
- cumulative noise (with other existing and planned noise sources in the area).

The following planned activities will cause noise during construction and operation:
- stationary noise sources - compressor station (internal and external devices);
- construction noise - construction equipment, machinery, heavy vehicles, ships at sea;
- unloading tankers – tankers' engines (as cumulative impacts).

Noise impacts will be mathematically modelled. The impacts on the biological environment will be assessed as an expert opinion.

8.4.15 Impacts on scientific heritage

There are long-term environmental monitoring stations in the Gulf of Finland managed by several countries around the Baltic Sea. Two of these are located within 1–4 km distance from the planned pipeline. Possible impacts on these stations will be assessed in the EIA.

8.5 Impact assessment of the onshore pipeline and compressor station

8.5.1 Impacts on living environment

Impacts on flora and fauna will be assessed by experts. Existing data, collected research results and results of possible further investigations will be utilised. The land area and diversity of living communities located in the pipeline area and the significance of their possible disappearance will be examined. The significance of impacts will be considered in accordance with the guide Nature Investigations and Nature Impact Assessment (Söderman 2003) and i.e. the requirements for nature conservation set by

the Nature Conservation Act and the EU's Birds and Habitats Directives will be considered. Impacts on communities and the green network will especially be studied. In addition, possible disturbance to birds and mammals will be studied (See Figure 4.3). Possible impacts on species and their important breeding, feeding and resting areas are considered. Mitigation methods to reduce harmful impacts on valuable areas and species will be proposed.

The possible impacts of the project can be divided into impacts during **the construction phase** and impacts during **operation and maintenance**. Impacts during the construction phase include, for example, logging, excavation and building of the pipeline and compressor station, noise and visual disturbance. Species and their abundance in the impact area will be assessed in the EIA.

The impacts of the onshore pipeline during operation and maintenance are small. The communities under the actual onshore pipeline will be permanently destroyed. Also, impacts deriving from materials possibly dissolving from the pipeline structures will be assessed.

In addition to the above-mentioned impacts, the accident risk is related to the construction period and operation time of the project. For example, the risk of accidents due to another construction work and their impacts on living environment will be studied. The risk factors will be assessed by means of mathematical modelling and proper mitigation measures will be suggested.

8.5.2 Impacts on protected areas

The impacts on nature conservation areas caused by the project in the affected area around the planned pipeline area will be studied in the environmental impact assessment. The Natura 2000 areas and other protection areas will be considered in the assessment.

In assessing the impacts on protected areas, possible impacts on protection values of the area will be assessed. The significance of assessed impacts depend on the effect to protected values (e.g. biotopes or species), that constitute the base for founding of the conservation area. The direct and indirect impacts will be considered. Also, the impacts on communities that are significant in conserving the biodiversity will be assessed. The significance of the possible impacts on habitats and species defined valuable according to the EU's Habitats and Birds Directives (SPA, SCI Natura areas) will be studied. The impacts will be categorised and illustrated on maps according to their importance.

8.5.3 Impacts on landscape and cultural heritage

Map data, prepared studies on landscape and cultural heritage as well as other prepared plans in the area, aerial photo material and register information from authorities (for example relic and cultural environmental register by the National Board of Antiquities, OIVA-environmental information system and wreck register by the Environmental Administration, database of the national registry of cultural monuments in Estonia) are used as background information in the impact assessment regarding landscape and cultural heritage.

An analysis of landscape and cultural environment is prepared for the assessment. These are used for identifying the most sensitive areas regarding landscape. The impact area of changing landscape will be defined and the nature and significance of this change on current values of landscape and cultural heritage is specified. For example, field trips, maps, historical material and diagonal photos are used as support material in the assessment.

The locations and values of cultural environments and relics in the vicinity of project area, which are valuable regarding cultural history, are clarified in cooperation with the museum authorities. The impacts of the construction of onshore gas pipeline on these objects are evaluated. This evaluation will be done by using an expert analysis.

The valuable objects regarding cultural history, such as locations of old buildings, building complexes, cultural environments and relics are included in the environmental impact assessment and this information will be compiled in thematic maps.

8.5.4 Impacts on ground and surface water, mineral resources and cliffs

Impacts on ground and surface water in the Pakri peninsula will be assessed, as well as impacts on the North-Estonian limestone cliffs. Technical and visual analysis has to be performed concerning the North-Estonian limestone cliffs.

Excavation of an onshore pipeline may have impacts on ground and surface water. These possible impacts will be measured and assessed by water experts.

Impacts on onshore mineral resoures will be assessed based on official databases and existing data as expert opinion.

8.5.5 Impacts on local people, residents in the area

The project may have direct and indirect impacts on human living conditions and safety. The following impacts will be assessed in the impact assessment: impacts on human safety and comfort, possibilities for outdoor activities and recreational use of environment, impacts on health and well-being and how people feel the project may impact their lives. Impacts on settlements will also be assessed.

Impacts may be caused, for example, by noise and traffic disturbances during construction, as well as clearance of forests along the onshore pipeline. People's expectations on the project and its impacts will be assessed based on the opinions expressed in statements and during participation. The assessment of health impacts will be handled in connection with noise during construction and risk assessment.

In identifying and assessing social impacts, all social groups that will be affected, such as residents and vacationers in the area, will be identified. Experience-based, subjective data analysis and expert assessment are combined in the assessment of social impacts. Efforts will be made to obtain the views of local interest groups and other parties about the social impacts. Statistical materials, written source materials and feedback received during the work will be analysed, just as observations made during public meetings. Feedback on the project in newspapers will also form an important source of information.

Risks to third parties will be assessed, for example, people located in the vicinity of the point of landfall of the onshore pipeline. In the risk analysis, the probability of the incident of damage to the pipe and the impacts caused by the damage will be assessed. Damage to the pipe can be caused, for example, by excavation of soil in another construction project. The assessment of impacts caused by damage contains estimates of the amount of gas leaking from a broken pipe and spreading in the air. The impact assessment of risks for people in the vicinity of the point of landfall will be based on the number and density of residences at points of landfall and information about spreading of gas in the air.

8.5.6 Impacts on land use and land use planning

The pipeline will be located in the area of a master plan confirmed for the entire municipality of Inkoo. Impacts of the pipeline will be assessed as needs for changing the plan in the sea area. The impacts will be assessed as expert work together with land use planners of Inkoo. The locations of an onshore pipeline are not shown in the master plan, which should be taken into consideration in assessing the impacts.

8.5.7 Noise

Construction activities and the operation of the compressor station will result in atmospheric noise. The main activities that may emit noise are as follows:

- Gas turbines: noise occurs both when entering and exiting gas, the noise level depends on the pressure, and the exhaust system noise is usually slightly larger than the entering gas;
- Cooling and ventilation system: noise occurs due to the rotation of the ventilator blades and air turbulence occurs;
- Compressors: the noise level depends on the capacity, type of compressor, gas compression capacity;
- The valve controllers: the noise is caused by adjusting the pressure, this is not a constant source of noise.

According to the regulation, residential areas near the compressor station are assigned as second category. For this reason, the second category limit of noise level shall be applied: the equivalent level of noise of industrial companies in new planned areas in the daytime is adopted as 55 dBA and as 40 dBA at night. The noise may not exceed the levels specified in the regulation outdoors in the installation or management of noisy plants. When selecting the location of compressor station, the descriptions of the best available technique must be taken as a basis in order to guarantee the minimum emissions of noise by the plants.

Typical maximum A-weighted sound power levels (LwA - describes the maximum noise emission generated by the device) of equipment used in compressor stations are as follows:

- Exhaust system (without a muffler) – 125 to 135 dB;
- Exhaust systems (muffled) – 105 to 110 dB;
- Compressors – 100 to 110 dB;
- Cooling system – 100 to 105 dB;
- Release of gas after pressure adjusting – 125 to 135 dB.

Noise impacts will be mathematically modelled. The impacts on the biological environment will be assessed as an expert opinion. In the EIA also likely cumulative effects from the road traffic (Tallinn – Paldiski road) have to be considered.

8.6 Cumulative impacts

Cumulative impacts of at least the following projects must be taken into consideration in the assessment:

Nord Stream natural gas pipelines from Russia to Germany crosses the Balticconnector pipeline in the Gulf of Finland (existing)

- LNG-terminal in Inkoo, where the pipeline will be connected (planned).
- Compressor stations in Estonia (planned).
- Onshore pipeline from Paldiski to Kiili (planned).
- Other planned and existing activities that may have cumulative impacts with the Balticconnector pipeline.

8.7 Transboundary impacts

The EIA report will include a separate chapter about transboundary impacts (i.e. impacts on ship traffic). In that chapter probable significant transboundary impacts, which might extend to Russia or Baltic Sea region countries, will be described. Information of the project and initiation of EIA process will be sent to all Baltic Sea countries.

8.8 Proposed impact area to be studied

The planned route of the offshore pipeline runs from Inkoo to Paldiski. The project also consists of receiving stations at both ends and compressor station in Inkoo. The impacts from the project will mainly be limited to the construction area (Figure 8.4). Some impacts may extend more widely, for example, during the time of construction. Therefore, the extent of the impact area of indirect impacts will probably extend a little farther than to the close vicinity of the pipeline.

The extent and significance of environmental impacts vary depending on the nature of the impact and environmental conditions. Direct impacts, such as possible extinction of bottom organisms, mainly extend to the vicinity of the offshore pipeline. Possible direct seabed intervention works will be made in a corridor of about 15 metres wide on the seabed. Indirect impacts, such as temporary turbidity of sea water, will spread more widely depending, among other things, on the location of the dredging site and water currents. Solid matter falls rapidly back to the seabed as sediment. Fine-grained or dissolving matter can remain in the water more easily and spread more widely. According to the preliminary estimate, seabed intervention works will be made along a distance of about 20 kilometres. The seabed and the environment will mainly be studied in a corridor of two kilometres wide around the pipeline corridor.

The assessed impact area will be extended in the vicinity of coastal areas, shallow water areas and sensitive areas, such as in the vicinity of residences and the Natura-areas. The assessed impact area will also be extended at sites, in which, for example, seabed intervention works cause widespread impacts. In addition, necessary transport routes leading to the construction and maintenance sites and their surroundings will be included in the impact area under assessment.

The international environmental impact assessment procedure (the Espoo Convention) requires that impacts will also be examined for areas, where impacts extend to offshore areas or economic zones of neighbouring countries. Finland and Estonia have a bilateral agreement (SopS 51/2002) on assessing environmental impacts, in which the principles for applying the Espoo Convention are made more precise. Finland has to ensure that Estonia receives the necessary information for applying the environmental impact assessment for the project and vice versa.

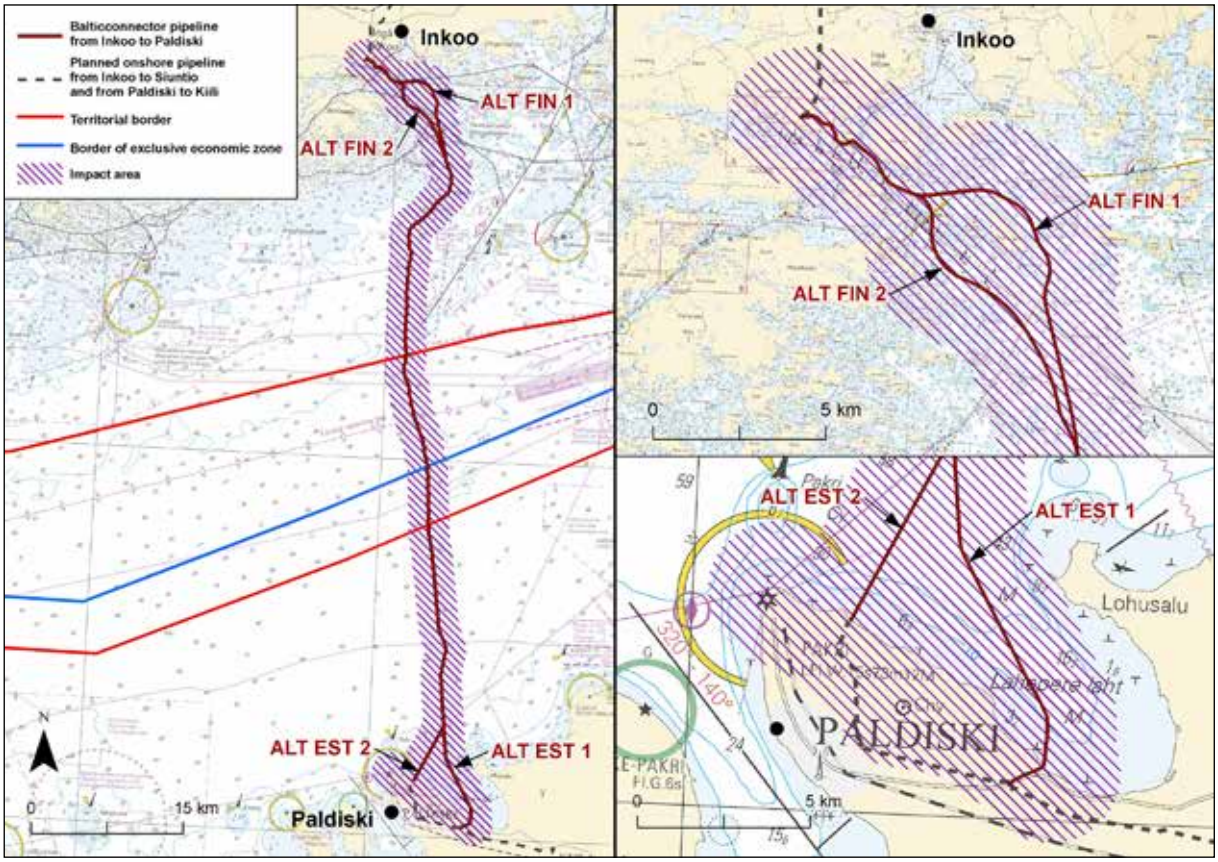

Figure 8.4. Proposed impact area to be studied

9 Permits and decisions needed

Below (Table 9.1) is a summary of licences and permits required in both countries regarding the alignment of the route, construction, operation and chemical and gas safety as well as the safety storage and use of the LNG facilities related to the project.

Table 9.1. Permits needed for routing, construction, operation and safety use of the Balticconnector pipeline in Finland and Estonia

Activity	Permits in Estonia	Permits in Finland
Pipeline construction and pre-operational testing activities in territorial waters and EEZ	Special water usage permit according to Water Act §8 section 2 points 1,7 and 9 from the Ministry of the Environment (MoE)	Water permit from the Southern Finland Regional State Administrative Agency, ESAVI (construction and use, Water Act)
Environmental surveys concerning pipeline route location	Consent from the Estonian Government, permission granted from the Ministry of Foreign Affairs (MFA) to conduct surveys in the Estonian territorial waters and EEZ until 30.12.2013.	Consent from the Council of State via Ministry of Employment and the Economy (EEZ Act)
Pipeline route in EEZ's (right to use)	EEZ consent from the Estonian Government via MFA (EEZ Act); Superficies licence according to Water act §22[5] from the Estonian Government (permit to burden Estonian sea area with a pipeline)	EEZ consent of the Council of State via Ministry of Employment and the Economy (EEZ Act)
Import and transmission of gas in Estonian territory	Activity permit and 'gas market' permit from the Estonian Competition Authority (ECA) (Natural Gas Act §27, 29 and 47)	-
The construction of the cross-border natural gas transmission pipeline	Permission from the Estonian Government (Natural Gas Act §18[1])	Project license from the Ministry of Employment and the Economy (Natural Gas Market Act, 'gas market' permit)
Gaseous fuel safety in Estonian territory	Protection zone of the gas equipment determined by Estonian Government and registration by Estonian Technical Surveillance Authority (Gaseous Fuel Safety Act §10 section 3 and §19 section 2)	-
Operating as service provider	Permission from the Estonian Competition Authority	-
On-shore pipeline section from the point of landfall to the compressor station	Technical requirements for next steps and other relevant permits(e.g construction permit, etc) from the local municipality (Paldiski municipal government)	-
Safe construction of the pipelines in Finnish territory (onshore, offshore)	-	Construction licence from the Safety Technology Authority (Tukes) according to the Chemical Security Act and the Decree on the Safety Processing of Natural Gas

Activity	Permits in Estonia	Permits in Finland
The storage of natural gas in Finnish territory (onshore, offshore)	-	Construction licence from Tukes, the Chemical Security Act and the Decree on the Safety Processing of Natural Gas
Safe storage of gas in liquid form in Finnish territory	-	Construction licence from Tukes, Chemical Security Act and Dangerous Chemical Decree
State technical inspections	Estonian Technical Surveillance Authority(Gaseous Fuel Safety Act)	Private certified bodies (the Decree on the Safety Processing of Natural Gas Pressure Equipment Act)

9.1 Permits and decisions needed in Finland

The environmental impact assessment procedure will be conducted before initiating any permit procedures. Construction of the Balticconnector natural gas pipeline requires the following permits and decisions in Finland:

- Consent of the Council of State according to the Finnish Act on Exclusive Economic Zone (1058/2004, 6 §), which is to be applied from the Government. The application is to be submitted to the Ministry of Employment and the Economy (MEE).
- Water permit according to the Water Act for construction and operation of installations in water and shore areas. The permit is to be applied from the Southern Finland Regional State Administrative Agency (ESAVI).
- Construction licence and operating licence for the pipelines pursuant to the Government Decree on the Safety Processing of Natural Gas (551/2009) and the so called Chemical Security Act (390/2005, 37–40 and 53 §), which are to be applied from the Safety Technology Authority (TUKES).
- The so-called project licence for the cross-border high pressure transit pipeline according to the Natural Gas Market Act (508/2000), which is to be applied from the Ministry of Employment and the Economy.
- Expropriation permit for the high-pressure pipeline pursuant to the Act on the Redemption of Immoveable Property and Special Rights (603/77, "the Expropriation Act"), which is to be applied from the Ministry of Employment and Economy and granted by the Council of State.
- Building permit for the compressor station according to the Land Use and Building Act (132/99) and Decree (895/99), which is to be applied and granted by the local building control authorities.

9.1.1 Water permit for the pipeline

A water permit is required for laying the submarine pipeline through the Finnish territorial waters and the Finnish exclusive economic zone (3 § of the Water Act).

The activities (ammunition clearing, dredging, rock filling and other pre-lay works, construction, laying, run-up, post-lay works, use and maintenance) are subject to a water permit pursuant to the Water Act (587/2011) chapter 1 § 4 and 5, chapter 2 § 12, chapter 3 § 2, § 3 and § 16. The content of an application is regulated in Chapter 11 § 2 and § 3. The environmental impact assessment report and the statement given by the contact authority should be included to the permit application. An application has to contain necessary clarifications and sufficient plans of the activity and intended constructions, and the application also has to contain information of the project impacts of the intended activity (Decree on Water Management Matters 1560/2011, § 1, 2, 11, 12, 15, 16, 20). Also, appropriate rules of the Environmental Protection Act and the Nature Conservation Act (1096/96) have to be taken into account, as well as planning situation of the area of the activity (3:6 of the Water Act). Water resources management plan and marine resources management plan according to the Act on Water and Marine Resources Management (1299/2004) will be also taken into account in permit consideration (3:6 of the Water Act).

9.1.2 Government consent for the pipeline

Implementation of the project in the Finnish exclusive economic zone also requires consent from the Finnish Government pursuant to the Finnish Act on Exclusive Economic Zone (1058/2004, the EEZ Act), the Government's Code of Practice (262/2003, § 4 (7)) and the UNCLOS (United Nations Convention on the Law of the Seas, article 79 (2-4)).

Pursuant to 6 § of the Finnish EEZ Act, the government may upon application grant an approval to perform activities within EEZ aiming at financial exploitation of the zone (exploitation right). The content of an application is stipulated in 2 § of the Government's decree (1073/2004). Based on the interpretation of the UNCLOS, laying cables is not regarded as construction according to 7 § of the Finnish EEZ Act and therefore a permit is required only for exploitation of the EEZ according to 6 § of the EEZ Act.

Even though the rules for the content of the application are of a general nature, a more detailed application may be necessary to assess prerequisites for the consent. Provisions of the Nature Protection Act (1096/96) have to be taken into account in the consideration. Information on project impacts is mainly presented in the EIA report enclosed with the application and will be taken into account before the Government may grant its approval. The application has to be submitted at least six months before the estimated commencement date of the activity to the Ministry of Employment and the Economy, which is the presenting official for the decision-making process of the Finnish government.

9.1.3 Security permits and standards

The Finnish Act on Exclusive Economic Zone (1058/2004) defines the other acts to be applied within the Finnish EEZ (3 § - 5 §). The Pressure Equipment Act (869/99), the Natural Gas Decree (1058/93), the Chemical Security Act (390/ 2005) and Dangerous Chemical Decree (59/99, under amending process) shall not apply within the Finnish EEZ. However, all of them have to be followed in Finland, e.g. in Finnish territorial waters and onshore.

Unlike the Seveso Directive 96/82/EC (as amended) that shall not apply to the transport of dangerous substances in pipelines, including pumping stations outside of establishments covered by the Seveso Directive, the Finnish Chemical Security Act (390/2005) shall also apply to the transport of gas (37 § - 52 § and 100 § - 104 §). However, pursuant to 5 § of the Chemical Security Act, the Pressure Equipment Act shall be applied to danger arising from pressure equipment.

According to the Government Decree on the Safe Processing of Natural Gas (551/2009), a construction licence for over 0,5 bar and with a diameter of more than DN 25 pipelines is required for the onshore areas and in the territorial waters of Finland (5 §). The operating licence has to be granted before the commissioning of such devices (7 §). The storage of natural gas is subject to a separate construction licence pursuant to 9 §. If the amount of gas is at least 50 tons, also the SEVESO requirements, as appropriate, through the so called Chemical Security Act (390/2005) and the decree 855/2012 will be followed.

Installation and maintenance of the pipeline may only be carried out by the approved body (Chapter 3). The decree 551/2009 contains rules on inspections before commissioning and during operation (Chapter 4). Rules for operation are in Chapter 6, the prevention of explosion in Chapter 7. Specifications for license procedures and technical requirements are in annexes.

Structural requirements of pipelines and installations are contained in the Pressure Equipment Act. The Pressure Equipment Act (869/99) shall in the Finnish territory apply to gas pipelines, which are classified as pressure equipment. Anybody placing pressure equipment on the market, must be able to verify that the pressure equipment and its design and manufacture are in compliance with the technical requirements of the act (6 §). Pressure equipment that may cause a significant hazard must be registered and is subject to an inspection at specific intervals (periodic inspection) and, if necessary, to a modification inspection so as to ensure that, when properly operated, the pressure equipment does not endanger anybody's health, safety or property. However, according to Pressure Equipment Act no permit is needed.

Furthermore, appropriate ISO standards and SFS standards shall be followed. Chemical security legislation and standards give reference information on good construction practice, service, maintenance, equipment, use, inspections, surveillance procedures, decommissioning etc. Finally, also regional planning, local master planning and local detailed planning pursuant to the Land Use and Building Act (132/99) require chemical security to be taken into account in onshore areas and in offshore areas constituting internal territorial waters.

9.1.4 Natural Gas Markets

The construction of the cross-border natural gas transmission pipeline is subject to a project licence pursuant to Chapter 6, 5 § of the Natural Gas Market Act (508/2000). The route for the pipelines will not be determined in the context of licensing. The precondition for granting a license crossing the national border is that the construction is regarded to be appropriate for the development of natural gas markets. The EIA report must be enclosed to the application

before decision-making. The content of an application is described in 8 § of the Natural Gas Market Decree (622/2000). The Ministry of Employment and the Economy shall have the right to order the construction to be suspended or to ban its use, if the construction work has already commenced without a project license subject to the Natural Gas Market Act.

9.1.5 Land acquisition and expropriation

Land acquisition will be executed primarily via voluntary agreements. In state of necessity, for the onshore range, advance seizure and expropriation licence for the high-pressure pipeline are needed and to be applied from and granted by the Finnish Government pursuant to the Act on the Redemption of Immoveable Property and Special Rights (603/77, "the Expropriation Act"). The application will be submitted to the Ministry of Employment and the Economy (MEE) as the presenting authority. The construction of the low-pressure land pipeline is subject to a permit according to the Land Use and Building Act (132/99, §161). This is being applied from local building supervision authorities of Inkoo, Lohja and Siuntio. The right of use of the offshore areas will be given in the water permit. There is no need for separate expropriation procedure for the offshore sections.

9.1.6 Building permit

Compressor station, which can be classified as a building, is subject to a building permit pursuant to the Land Use and Building Act (§125). An action permit is required for to install or locate a structure or installation that is not considered a building (§126, in more detail in §62 of the Land Use and Building Decree (895/99)). Both permits are granted by the local building supervision authority.

9.2 Permits and decisions needed in Estonia

In Estonia, implementation of the project requires at least the following permits:

- Permit for a special use of water according to the Water Act, which is being applied from the Ministry of the Environment.
- Consent from the Estonian Government, application shall be submitted to the Ministry of Foreign Affairs (Välisministeerium).
- Superficies licence from the Estonian Government to burden public sea area according to Water act §22^5.
- Gaseous safety inspections (Estonian Technical Surveillance Authority).

Earth's crust (soil) has to be handled according to the Earth Crust Act (Maapõueseadus) §59 which deals with the use of earth's crust not related to extraction of mineral resources. According to §59, the owner of an immovable or a person with the right to use an immovable has the right to use the earth's crust without a permit for geological investigation, an exploration permit or an extraction permit.

9.2.1 The consent from Estonian Government and need for superficies licence

Pursuant to 7§ of the Estonian Maritime Boundaries Act (Merealapiiride seadus) and 1 and 3§ of the Estonian Act on the Exclusive Economic Zone (Majandusvööndi seadus), the exclusive economic zone is the marine area outside the territorial water , which is adjacent to the latter and the external boundary of which is determined with the approval of neighbouring states and is situated outside the territorial water, while adjacent thereto where the State exercises its sovereign rights and jurisdiction in accordance with generally recognised terms of international maritime law and treaties concluded by the Republic of Estonia. Annex 3 of the Maritime Boundaries Act includes the coordinates for the boundary of the exclusive economic zone.

Survey works in the Estonian EEZ are regulated in 7–10§, installation, use, and removal of structures and equipment are regulated in 11§ and the protection of marine environment in 12 and 13 §. It is not stated in the Act, who will issue the permit decision and to which authority a permit application should be submitted. However, an application can be submitted to the Ministry of Foreign Affairs (Välisministeerium) and the Government will decide on giving consent.

To burden public body of water with a facility (pipeline, offshore wind park, artificial island, etc), the developer needs permission and licence from the State. According to the Water Act §22^5, this permit is called superficies licence (Hoonestusluba) and its maximum duration is 50 years.

The superficies licence application has to have information about the following parameters of the activity:

- Intended use of the facility and description of operation;
- External dimensions of the facility, type of foundation and other essential technical data;

- Coordinates of the proposed burdened area of a public body of water and size of the proposed burdened area in square meters;
- Description of the studies, which will be done before superficies licence is granted;
- Requested duration of the superficies licence.

The EIA will be initiated after the application for a superficies licence is submitted to the Ministry of the Economic Affairs and Communications. Through the superficies licence procedure, the Government decides, whether to allow the project, and initiates the EIA procedure (Water Act §22[7]). After the EIA procedure has ended, the superficies licence procedures continue and the Government makes a decision about the licence application.

9.2.2 Permit for the special use of water for the pipeline

An integrated environmental permit for surveys or for the construction of the pipeline is not required pursuant to the Industrial Emissions Act (Tööstusheite seadus, Approved 24 April 2013, entered into force 1 June 2013), hence operations are not listed in categories of activities in 19 §. However, construction operations are subject to a permit for the special use of water. The aim of the Estonian Water Act is to guarantee the purity of inland and transboundary water bodies and ecological balance in water bodies and insofar as the protection of water is concerned, the provisions of the Water Act also apply to the exclusive economic zone (1 §).

The provisions regarding open proceedings apply to proceedings of application for and issue of permits for the special use of water, taking account of the specifications provided for in the Water Act. Pursuant to 6 (3) § of the Water Act, the special use of water is the use of water with technical equipment, constructions or substances, which could affect the condition of a water body or aquifer, in accordance with 8 § of the Water Act. According to 8 § (2) a permit for the special use of water is necessary, if more than 30 cubic meters of water in one day (24 h) is taken from the body of water (point 1); a water body is dredged or soil is disposed of on the bottom of the water body (point 7); if the physical or chemical characteristics of water or the biological characteristics of a water body change upon water use (point 9).

According to points 1 and 9 a permit for special use of water is needed due to pre-commissioning activities (An oxygen scavenger is added to the sea water and then it is used for pressure tests), point 7 is related to the construction works and seabed intervention works. Right for special use of water is valid as long as the superficies license is valid (Water Act § 9 (1) pint 5).

The Ministry of the Environment shall issue permits for special use of water at sea (9 §). Pursuant to 9 (7) § of the Water Act, an applicant shall submit a written application for a permit for special use of water to the issuer of permits for special use of water and the issuer shall decide to initiate or refuse to initiate EIA on the basis of the application. Pursuant to 23 (6) § of the Water Act, the Ministry of the Environment as a supervisor of the EIA has the right to determine environmental requirements to avoid polluting water.

A permit for special use of water shall be refused, if the special use of water directly endangers human health or the environment, if the state of a recipient or aquifer is deteriorated to an extent, which makes them unusable, if the activities applied for are not in accordance with legislation, and if inaccurate information was submitted upon application for the permit. The permit can also be amended or revoked. The regulation of the Ministry of the Environment (26 March 2002 number 18) establishes the procedure for the issue, amendment and revocation of permits for special use of water or temporary permits for special use of water, the list of documents required for application for permits and the format of permits.

9.2.3 Natural Gas Act

The Natural Gas Act regulates about import, transmission, distribution and sale of gas. It includes regulation of the security of supply of the gas system, but not technical security standards. The Estonian Competition Authority under the Ministry of Economic Affairs and Communications (MEAC) is the responsible supervision authority regarding fuel and energy areas.

According to §18[1], cross-border gas pipeline is only allowed with the permission of the Estonian Government. Application must include following information:

- applicant's name and address;
- information about the pipeline location;
- technical information of the pipeline (pressure, capacity, diameter, length etc.);
- planned construction period;
- expected construction cost;
- justification for the need of the pipeline;
- results of the environmental impact assessment.

The Estonian Competition Authority is giving, according to § 27, a permit for operating within following activity areas:

- gas import;
- gas selling;
- providing gas transmission service;
- providing gas distribution service.

Chapter 4 of the Act is describing the grounds for operation.

9.2.4 Gaseous fuel safety

The Gaseous Fuel Safety Act is applied for gaseous [fuel] installations, which are fixed operational assemblies of gaseous fuel pipelines, containers and construction works connected thereto. Gas works include the repair or maintenance of gas appliances, fittings and gas installations, the storage of gaseous fuels, the installation or demounting of gas appliances and fittings, and the filling of containers of liquid gas.

The requirements for gas appliances and fittings and for the provision of information and attachment of conformity marks thereto and the procedure for the assessment and attestation of the conformity of gas appliances and fittings are established by the Ministry of Economic Affairs and Communications. An accredited notified body (AB) as a designated body conducts the conformity assessment procedures.

The provisions of the Product Conformity Attestation Act apply to the procedure prescribed in the Gaseous Fuel Safety Act for the conformity assessment and attestation of gas appliances and fittings of gas appliances with the specifications arising from the Gaseous Fuel Safety Act. A gas installation with a working pressure exceeding 16 bar belongs to category D.

Government regulation (02.07.2002 number 212) "The gas installation protection zone and category D gas installation maintenance zone range" is specifying the protection zone for the category D gas installations, which is 10 meters on land. If the category D gas installation is located underwater, the protection zone is 20 meters. Maintenance zone for the category D gas installation is 6 meters.

The supervisor of gas installations is any competent person able to organise or ensure, that the gas installation and connected gas appliances are used according to the Gaseous Fuel Safety Act. Requirements for the construction of gas installations and gas works are in chapter 5 of the Gaseous Fuel Safety Act. This includes technical inspections carried out by a technical inspection body, which is a state company.

State supervision about implementation of the Gaseous Fuel Safety Act is the responsibility of The Estonian Technical Surveillance Authority (ETSA). The ETSA is subordinate organisation of the MEAC.

AS Eesti Gaas is a system operator and a network operator, which possesses a distribution system and owns metering systems on the border of the state of Estonia. It is responsible to ensure the security of supply for the gas system, to plan and supervise the supply of gas and to ensure co-operation with the gas systems of neighbouring states taking into account the technical limitations of such systems in real time.

9.2.5 Building permit for offshore pipeline

The design specifications for building in a public water body a construction work that does not have a permanent connection to the shore (avalikku veekogusse kaldaga püsivalt ühendamata ehitis) shall be prepared and issued by the Estonian Technical Surveillance Authority (TSA). The design specifications shall be issued to the person, who holds the superficies licence (hoonestusluba) as defined in section 22^5 (1) of the Water Act.

A building permit for building in a public water body a construction work that does not have a permanent connection to the shore shall be issued and, where necessary, revoked, by the TSA. A building permit shall be issued to the person who holds the superficies licence defined in section 225(1) of the Water Act.

9.2.6 Land acquisition and expropriation

Land acquisition will be executed primarily via voluntary agreements. Furthermore, there is legislation to be followed for enforced land acquisitions within the Estonian territory. Expropriation right shall be granted pursuant to the Immovables Expropriation Act.

10 Uncertainly factors

Uncertainty factors are part of the environmental impact assessment and will be taken into account in the assessment work. All facts connected to the assessment are not known in sufficient detail. This causes uncertainty in predicting impacts. In addition, not all impacts can be measured nor are they unambiguous, which cause additional uncertainty to the assessment. In addition to quantitative assessment techniques, expert assumptions are needed.

Uncertainty factors include, for example:

- time schedule of the project, that has not been determined yet;
- other physical conditions (i.e. salinity) in the Gulf of Finland vary in time, and the impacts from operations, like dredging differ depending on the conditions at the time of the operation;
- survey and modelling techniques - although using the best available techniques in the assessment - can develop from the time of the assessment;
- technical design of the project, that can be in a process of being finalised at the time of the assessment.

Uncertainty factors will be described and presented in more detail in the assessment report.

A 'safety principle' will be applied throughout the assessment, meaning that the risk estimates represent the worst-case scenarios.

11 Comparison of alternatives

In the environmental impact assessment report, the developer is required to provide a description of reasonable alternatives as well as the alternative of taking no action, commonly known as the zero alternative. The nature of the project means that it can be broken down into parts:

- Balticconnector offshore pipeline from Inkoo to Paldiski;
- Receiving stations (both Finland and Estonia);
- Onshore pipelines from point of landfall in Finland to compressor station in Inkoo and from point of landfall in Estonia to receiving station in Paldiski Kersalu;
- Compressor station in Inkoo.

When investigating alternatives, it is a common practice to consider environmental, socio-economic and technical criteria.

- environmental criteria aim to reduce the environmental impact of the proposed project in terms of site location, avoiding environmentally sensitive or protected areas;
- socio-economic criteria aim to reduce any adverse effects of the proposed project on marine activities in the Gulf of Finland (commercially, militarily or recreation) for the offshore section.
- technical criteria aim to identify the optimal technical solution for the proposed project and can include pipeline installation techniques, design of the pipeline to ensure pipeline integrity, pre-commissioning etc.

The assessment of alternatives in accordance with the above criteria thereby indicates a preferred project with potential alternatives.

Alternative 0 or non-implementation of the project constitutes the basis for the comparison of alternatives. All alternatives are examined in relation to alternative 0. Impacts of mitigation measures of negative effects are considered in comparison.

In the environmental impact assessment, alternatives are compa-red in relation to their mutual features and significant impacts. Positive and negative factors, possible risks, uncertainties and significant impacts related to different alternatives are presented in the comparison. Impacts are categorized as primarily significant and significant impacts, and the alternatives are compared based on the significance of impacts.

The significance of impacts for different alternatives is compared, for example, based on their permanence, extent and concentration.

The comparison is conducted by using an analytical method so that each alternative is examined from the viewpoint of different impacts. After this, the alternatives are studied in an integrated way so that one criterion of comparison is the achievement of defined goals for different alternatives. The comparison of alternatives is presented as an illustrative summary table in the assessment report. Based on the significance of impacts, the feasibility of implementing alternatives is evaluated.

The following factors will be considered in evaluating the significance of impacts:

- direct and indirect impacts;
- spatial extent of impacts;
- target of impacts and sensitivity to changes;
- reversion or permanence of impacts;
- duration and the magnitude of change of impacts;
- fears, attitudes and uncertainties;
- significance of impacts from different viewpoints (residents, business life, environmental protection);
- probability of impacts.

According to the Estonian EIA act, well-known methods have to be used while compiling an EIA report. Methods for the comparison of alternatives (e.g AHP-method, Saaty 1980 http://123ahp.com/Default.aspx) will be determined by the EIA consultant compiling the report, considering the national requirements.

12 Prevention and mitigation measures

Preventing and mitigating adverse effects is an important part of the plan. Preliminary measures will be defined in connection with the environmental impact assessment, with the help of which the predicted adverse effects can be avoided or limited.

One of the most important mitigation measures is the optimization of the pipeline route. Offshore pipeline needs an even base that preserves its integrity. Erratic route causes tensions in the pipeline and can damage its structures. Avoiding free-spans is also necessary, because they can produce risks for anchoring or bottom trawling vessels. These risks and also environmental impacts due to seabed shaping are mitigated by thorough seabed surveying and route optimization. The best route that needs least seabed shaping, this means avoiding bluffs and depressions, will be identified by means of advanced marine survey techniques.

When optimizing the route, possible objects e.g. munitions, hazardous wastes, wrecks and other existing infrastructure along the pipeline route will also be localized. Encounters with them are avoided as far as possible. If necessary, munitions that can cause risk to pipeline structures or operators and devices during the work phase and pipeline installation will be cleared.

To avoid and mitigate adverse environmental effects, the best and most environmentally friendly techniques available will be selected for all phases of the project. The most environmentally friendly materials will be used in pipeline coating.

The construction time will be minimized in sensitive areas. Also, timing is an important mitigation measure, for example, disturbing activities close to the birds' nesting areas and seal breeding areas will be avoided during their breeding season.

Proper planning and implementation of communication and informing during scheduling and construction, adequate safety zones and risk anticipation are also important in the mitigation of adverse effects. In the operation phase, monitoring of the pipeline structures and its functions is also important for avoiding unwanted incidents.

The assessed possible impacts, which will be presented in the EIA, are used as a basis for planning proper prevention and mitigation measures.

13 Monitoring programme

It will be investigated in the assessment work, whether the project will cause adverse effects considering that the assessment contains so much uncertainty. Areas and sites can be proposed for monitoring, if the duration of the impacts is long-lived or recurring or if the impact mechanism or extent of impacts is unknown. A proposal for a possible impact monitoring programme will be presented in the assessment report.

The primary objective of the monitoring programme is to verify the results of the impact assessment and to reveal possible uncer-tainties therein. In addition, monitoring ensures that the planned mitigation measures act as intended. The need for and timing of the proposed monitoring programme will be based on the results and the reliability of the impact assessment and the nature of the impact object.

Objectives of monitoring

Verification of the realization of assessed impacts
Indicates, whether an impact occurs as anticipated in the impact assessment. Monitoring of water quality, for example, will indicate possible changes in water turbidity in the bottom-close water near rock placement sites.

Efficiency of mitigation measures
Indicates the rate of efficiency of an implemented mitigation measure. In addition, it indicates / ensures that a planned mitigation measure has actually been implemented and it is efficient. For example, it is expected that the chosen rock placement method will result in significantly less turbidity in the bottom-close water than would a dredging operation.

Identification of impacts from unplanned events
If an impact unexpectedly arises, it may possibly be identified by monitoring. For example, monitoring of the suspension of sediments will indicate, if sediment spreading is greater than assessed or modelled.

Monitoring of environmental impacts is proposed to be conducted before, during and after the construction phase.

Timing of monitoring

Prior to construction
Monitoring prior to construction aims to provide baseline information for the planned impacts during construction and operation. For example, monitoring of benthic fauna on the proposed pipeline route.

During construction
Monitoring during construction focuses on verifying planned impacts and identifying unexpected impacts that arise during construction works. If unexpected impacts occur, it will be possible to reduce these impacts by implementing mitigation measures. For example, possible impacts on water turbidity and release of contaminants will be measured and compared with the results of the impact assessment. If the release of contaminants is higher than expected, additional mitigation measures can be considered.

During operation (after construction phase)

Monitoring during operation focuses on the reversion of the impacts (recovery of impact objects) to their pre-impact state. In addition, this monitoring verifies assessed impacts during operation, e.g., the pipeline acting as a substrate for hard-bottom fauna.

14 List of sources

Allseas.com (2013). <www.allseas.com/uk/33/company/activities/pipeline-installation.html>
Kuva poimittu 31.5.2013.

Arvokkaat maisema-alueet, Maisema-aluetyöryhmän mietintö, Osa 2. (1993). 203 p. Ympäristöministeriö [Ministry of the Environment], Ympäristönsuojeluosasto, Helsinki.

Bartnicki et.al. (2009). Atmospheric supply of nitrogen, lead, cadmium, mercury and dioxins/furans to the Baltic Sea in 2007. EMEP Centres Joint Report for HELCOM EMEP/MSC-W TECHNICAL REPORT 2/2009.

Bird Life Suomi. IBA-areas GIS data. www.birdlife.fi/suojelu/paikat/iba/iba-suomen-tarkeat-lintualueet.shtml

Estonian Environmental Research Centre website: www.klab.ee/seire/airviro/paldiski.html

Eesti Looduse Infosüsteem (EELIS); <http://loodus.keskkonnainfo.ee/webeelis/infoleht.aspx?type=artikkel&id=-164545161>

Estonian national heritage boards database (2013). <http://register.muinas.ee/> (16.05.2013).

EIA programme, OÜ Hendrikson&Ko (2013). Taimo IB OÜ work number 007EP "Paldiski LNG terminal. Port facilities. Pre-design".

European Commission (2007). Interpretation Manual of European Union Habitats, EUR 25. 142 p. <http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf>

FCG Planeko Oy (2008). Joddbölen asemakaavamuutoksen luontoselvitys.

Finnish Environmental Administration (2013). <http://www.itameriportaali.fi/fi/ajankohtaista/itameri-tiedotteet/2012/fi_FI/Itamerentila/>. 24.4.2013.

Finnish Environment Institute, SYKE Marine Research Centre (2012). Monitoring of the HELCOM benthos stations in the Gulf of Finland. Final results of Macrozoobenthic Analyses of the 4th Monitoring Campaign. Fourth Zoobenthic Data Report 9 December 2012, G-PE-EMS-MON-193-SYKEHEL7-A. Ref. Ramboll 2013b

Finnish Institute of Marine Research (2008). <www.ymparisto.fi/download.asp?contentid=83549&lan=fi> 16.6.2010.

Gasum website (2013). <www.gasum.fi>

Gasum Oy (2013). Finngulf LNG. LNG-terminaalin rakentaminen Suomeen. Ympäristövaikutusten arviointiselostus. Pöyry. Huhtikuu 2013.

GeographBot (2010). Wikimedia Commons, File: Black_guillemots,_ Bangor_harbour_(2)_-_geograph.org.uk_-_207287.jpg, 16.6.2010 and Malene, 2006. Wikimedia Commons, File:Havterne.jpg. Kuva poimittu 17.6.2010.

Geological Survey of Finland. Maaperä 1:20 000 digitaalinen kartoitusaineisto.

Gs-press.com (2013). http://gs-press.com.au/images/news_articles/Bredero_Shaw_concrete_weight_coated_pipe_79.jpg Kuva poimittu 31.5.2013.

Harju maakonnaplaneeringu teemaplaneering "Asustust ja maakasutust suunavad keskkonnatingimused" (2003). <http://harju.maavalitsus.ee/et/roheline-vorgustik>

HELCOM (2002). Baltic Sea Environmental Proceedings no. 82B. Environment of the Baltic Sea Area 1994 – 1998. Helsinki Commission. Baltic Marine Environment Protection Commission.

HELCOM (2010). Ecosystem Health of the Baltic Sea. HELCOM Initial Holistic Assessment. Baltic Sea Environment, Proceedings No. 122.

HELCOM (2010). Maritime Activities in the Baltic Sea – An integrated thematic assessment on maritime activities and response to pollution at sea in the Baltic Sea Region. Balt. Sea Environ. Proc. No. 123.

Helsinki Commission (2006). Baltic Marine Environment Protection Commission. <www.helcom.fi/environment2/nature/en_GB/nature/>

Helsinki Commission (2010). Baltic Marine Environment Protection Commission. 17.6.2010. <www.helcom.fi/environment2/nature/en_GB/facts/>

Ichthysproject.com (2013). <www.ichthysproject.com/environment/dredging-progress/dredging-vessels/backhoe-dredger>. Kuva poimittu 31.5.2013.

Jalkanen,J-P., Johansson, L., Stipa,T. 2012, Emissions from Baltic Sea shipping in 2011. HELCOM Baltic Sea Environment Fact Sheet(s) 2012. Online. 27.8.2013, <http://www.helcom.fi/environment2/ifs/en_GB/cover/>.

Kalatalouden keskusliitto [Central Association of the Finnish Industry] (2006). <www.ahven.net>

Keskkonnaministeerium 2005. Natura 2000 alasid oluliselt mõjutavate kavade ja projektide hindamine. Loodusdirektiivi 92/43/EMÜ artikli 6 lõigete 3 ja 4 tõlgendamise metoodilised juhised Euroopa Komisjon (2001).

Keskkonnamõju hindamine (2007). Juhised menetluse läbiviimiseks tegevusloa tasandil. Koostaja K. Peterson. Keskkonnaministeerium.

Keskkonnaregister (2013). <http://register.keskkonnainfo.ee>

Kirkkonummi (2006). <www.kirkkonummi.fi/>

Kujansuu Raimo, Uusinoka Raimo, Herola Erkki ja Sten Carl-Göran (1993). Tammisaaren kartta-alueen maaperä. Suomen geologinen kartta 1:100 000. Maaperäkarttojen selitykset, lehti 2014. Geologian tutkimuskeskus. Espoo.

Kuus, A., Kalamees, A. (eds.) 2003. Important Bird Areas of European Union importance in Estonia. Eesti Ornitoloogiaühing, Tartu. <www.eoy.ee/linnualad/iba2003.pdf> visited 12.04.2013.

Laine, K. (2011). Inkoon sisäsaariston kulttuurimaiseman ominaispiirteet, uhat ja mahdollisuudet. Inkoon strategisen yleiskaavan selvityksiä.

Luode Consulting Oy (2013). Water quality and current monitoring during Nord Stream operations in the Gulf of Finland, November 2009 – December 2012. Antti Lindfors, Luode Consulting Oy, 28.1.2013, G-PE-EMS-MON-175-LUODEL12B-A. Ref. Ramboll 2013b

Maanmittauslaitoksen Maastotietokannan 04/2013 aineisto.

Maa-ameti kaardirakendus. <http://xgis.maaamet.ee/xGIS/XGis> (maainfo teenus, kultuurimälestised, looduskaitse ja Natura 2000, pärandkultuur, kitsenduste kaart, maanteeamet).

Marcusroos (2007). Wikimedia Commons, File: Icebreaker_Fennica.jpg. Kuva poimittu 16.6.2010.

Marin Mätteknik AB (2006). Marine survey report, Balticconnector Marine Survey 2006. Orderer: Gasum.

Merenkulkulaitos [Sea Transportation Institute]. Satamien ulkomaan alusliikenne alustyypeittäin vuonna 2003-tilasto [Foreign vessel Traffic in Harbours by Basic Types, Statistics, 2003].

Merentutkimuslaitos (2006). Itämeriportaali [Baltic Sea Portal]. <www.fimr.fi/fi/itamerikanta.html>

Metsähallitus [Forest Administration] (2006). Metsähallituksen verkkopalvelut [Network Services of the Forest Administration], <http://www.luontoon.fi> sekä <www.metsa.fi>

Museoviraston paikkatietoaineisto 3/2013.

Myrberg, K., Leppäranta, M. & Kuosa, H. (2006). Itämeren fysiikka, tila ja tulevaisuus. Helsinki 2006.

Natura 2000 Viewer. <http://natura2000.eea.europa.eu/#>

Nironen, M. (2008). Information about investigations on natural squirrels and Russian flying squirrels made by Enviro Oy. Oral information.

Nord Stream AG (2007). Offshore Pipeline through the Baltic Sea, Ship traffic crossing the pipeline Ship traffic.

Nord Stream AG (2009). Kartasto, Itämeren poikki kulkeva maakaasuputkilinja, Ympäristövaikutusten arviointi Suomen talousvyöhykkeellä 2009.

OIVA Ympäristö- ja paikkatietopalvelu ammattilaisille. <http://wwwd3.ymparisto.fi/d3/aineistolataus.htm>

Paal, J. (2004) Loodusdirektiivi elupaigatüüpide käsiraamat. Eesti Keskkonnaministeerium, Digimap OÜ, lk 285.

Pakri Island website (2010). 2.6.2010. <http://www.pakrisaared.ee/v2/index.php?89>

Paldiski municipality website (2013a). 8.6.2010. <www.paldiski.ee/index.php?id=12762>

Paldiski municipality website (2013b). 14.5.2013 www.paldiski.ee/index.php?id=15642

Paldiski municipality website (2013c). 14.5.2013 <www.paldiski.ee/failed/arengukava.pdf>

Paldiski gaasiterminali piirkonnas elavad harul-dased liigid. 17.6.2010. <http://uudised.err.ee/index.php?06206158>

Peterson, K. (koost.) (2006). Juhised loodusdirektiivi artikli 6 lõigete 3 ja 4 rakendamiseks Eestis. Säästva Eesti Instituut, 2005, 61 lk; SEI kodulehekülg. <http://www.seit.ee/failid/36.pdf>

Population Register Centre. 31.12.2011.

Raet, J., Sepp, K., Kaasik, A., Kuusemets, V., Külvik, M. (2010). Distribution of the Green Network of Estonia. Metsanduslikud uurimused, 53, 66–74.

Rakennettu kulttuuriympäristö, Valtakunnallisesti merkittävät kulttuurihistorialliset ympäristöt (1993). 278 s. Museoviraston rakennushistorian osaston julkaisuja 16, Helsinki.

Ramboll (2009). Offshore pipelines through the Baltic Sea. Environmental field survey Finland 2009. G-PE-PER-REP-100-03240000-F.

Ramboll (2011). Final Technical Summary Report – Linking the gas networks of Finland and Estonia.

Ramboll (2013a). Nord Stream Extension. Environmental Impact Assessment Programme, Finland. N-PE-EIA-SOW-705-GOFF01EN-A /25.3.2013

Ramboll (2013b). Nord Stream Gas Pipeline Construction and Operation in the Finnish EEZ. Environmental Monitoring 2012, Annual Report. G-PE-EMS-MON-100-0321ENG0-B / 3.7.13

Ramboll, Witteveen+Bos and Luode Consulting Oy. (2012). Current Monitoring Report Finland –Comparison of current modelling and current monitoring results. G-PE-EMS-MON-500-CURMONFI-02. Ref. Ramboll 2013a

RKTL (2012). Ammattikalastus merellä 2011. Riista- ja kalatalous –tilastoja 2/2012. Riista- ja kalatalouden tutkimuslaitos, Helsinki.

RKTL (2013). Ammattikalastus merellä 2012. Riista- ja kalatalous –tilastoja 3/2013. Riista- ja kalatalouden tutkimuslaitos, Helsinki.

Saaty (1980). A method for comparing alternatives (called AHP method, AHP = Analytic Hierarchy Process) used in decision making, http://123ahp.com/Default.aspx

Saipem (2013). <http://www.saipem.com/site/article.jsp?idArticle=5401&instance=2&node=2012&channel=2&ext=template/37DueColonne&int=article/1DefaultArticolo>. Kuva poimittu 31.5.2013.

SEA report of Paldiski LNG terminal thematic plan. OÜ E-Konsult, 2012

Seppänen E, Toivonen A-L, Kurkilahti M ja Moilanen P 2011. Suomi kalastaa 2009 – vapaa-ajankalastuksen saaliit kalastusalueittain. Riista- ja kalatalous, tutkimuksia ja selvityksiä 7/2011. Riista- ja kalatalouden tutkimuslaitos, Helsinki

Soomere T., Myrberg K., Leppäranta M., Nekrasov A. (2008). The progress in knowledge of physical oceanography of the Gulf of Finland: a review for 1997–2007. OCEANOLOGIA 50 (3), 2008. pp. 287–362. Ref. Ramboll 2013a

Suoja-alueet Suomen rannikolla. Puolustusvoimat [The Finnish Defence Forces]. 14.4.2010. www.mil.fi/merivoimat/esikunta/suoja_index.dsp

Suomen Merituuli Oy (2009). Raaseporin – Inkoon edustan merituulivoimapuisto, ympäristövaikutusten arviointiohjelma.

Suuroja, K., Morgen, E., Mardim, T., Otsmaa, M., Kaljuläte, K., Vahtra T., All, T. (2010). The explanatory note to the geological maps of Paldiski (6333) sheet.

Söderman, Tarja (2003). Luontoselvitykset ja luontovaikutusten arviointi – kaavoituksessa, YVA-menettelyssä ja Natura-arvioinnissa [Nature Investigations and Nature-impact Assessment – in mapping, the EIA procedure, and in the Natura assessment]. Ympäristöopas 109. p. 196 Suomen ympäristökeskus [Finnish Environment Centre].

The Baltic Sea Portal website. 8.6.2010. <www.itameriportaali.fi/en/tietoa/jaa/jaatalvi/en_GB/jaatalvi/>

The Ministry of the Environment (2004). Instructions for dredging and depositing dredged materials 19.5.2004. Environmental Guide 117. Helsinki.

Uusimaa (2010) Inkoo. Nettimökki.com. <http://image.nettix.fi/extra/cottageimg/2101_2200/2148_b_ae4b8e6ec9f87561.jpg>. Kuva poimittu 17.6.2010.

Uudenmaan maakuntakaava. Uudenmaan liitto [Helsinki-Uusimaa Region]. 14.4.2010. <www.uudenmaanliitto.fi/index.phtml?s=1006>

Vabariigi Valitsuse 05.08.2004 korraldus nr 615-k. Euroopa Komisjonile esitatav Natura 2000 võrgustiku alade nimekiri.

Vallius, H. & M. Leivuori (1999). The Distribution of Heavy Metals and Arsenic in Recent Sediments in the Gulf of Finland. Boreal Environment Research 4: 19-29.

Vallius, H. & M. Leivuori (2003). Classification of Heavy Metal Contaminated Sediments of the Gulf of Finland. Baltica 16 (2003) 3-12.

Valtion säädöstietopankki [State Regulation Database] Finlex (2006). <www.finlex.fi/fi/>

Valtion ympäristöhallinto. 17.6.2010. <www.ymparisto.fi/default.asp?node=15057&lan=fi>

Website of Estonian Defence Forces: www.mil.ee/et/kaitsevagi/merevagi (29.11.2013)

Website of Nordic Energy Link: www.nordicenergylink.com/index.php?id=23 (29.11.2013)

Website of Paldisky Munisipality: www.paldiski.ee/index.php?id=12761

Verkkoapaja (2010). Riista- ja kalatalouden tutkimuslaitoksen uutiskirje. <http://mmm.multiedition.fi/rktl/uutiskirje/kuvat/avomerikalastusalus.jpg>. Kuva poimittu 17.6.2010.

VTT (2002). Statistical Analyses of the Baltic Maritime Traffic. Finnish Environment Institute, Ministry of Traffic and Communications. VTT research report NO VAL34-012344. 30.9.2002.

Wikipedia (2007). <http://en.wikipedia.org/wiki/File:Allseas%27_Solitaire,_het_grootste_pijplegschip_ter_wereld.JPG>. Kuva poimittu 31.5.2013.

Wikimedia Commons (2006). File:Grey_seals_rhossili_2.jpg. Kuva poimittu 10.6.2010.

Ympäristöhallinto [Environment Administration] (2006). Ympäristöhallinnon verkkopalvelut [Network services of the Environment Administration] <www.ymparisto.fi> and Hertta database.

I ja II kaitsekategooriana kaitse alla võetavate liikide loetelu. Vabariigi Valitsuse 20.05.2004.a määrus nr 195; Elektrooniline Riigi Teataja. <www.riigiteataja.ee/akt/13360504>

15 Glossary

AE	Asphalt enamel
AIS	Automatic identification system (used in Baltic Sea to register ship traffic)
Alvar	Biological environment based on a limestone plain with thin or no soil and, as a result, sparse grassland vegetation
As	Arsenic
Auks	Bird species of the genera Alca, Cepphus, and Uria
Aquifer	A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs
Aquitard	A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer; a leaky confining bed. It does not readily yield water to wells or springs, but may serve as a storage unit for ground water
ALT	Alternative
ALT 0	Alternative 0 in the Finnish EIA procedure (nonimplementation)
ALT 1	Alternative 1 in the Finnish EIA procedure
Automatic identification system (used in Baltic Sea to register ship traffic)	AIS is a system used by ships and Vessel Traffic Services (VTS) principally for identification and locating vessels.
Argillite	A metamorphic rock, intermediate between shale and slate that does not possess true slaty cleavage
Bar	A non-SI unit of pressure
Bathymetry	Depth or topography of the seabed
Bedrock	Unbroken solid rock, overlaid in most places by soil or rock fragments
Benthos	Aquatic organisms living at the seabed
Benthic flora and fauna	Plant and animal species living in or on the seabed
BSPA	Baltic Sea Protected Areas
Calcareous plant species	Plants growing on limestone or in soil impregnated with lime
Catchment area	Area from which water drains to certain receiving water body i.e. lake or sea
Clastic sediments	Clastic sediments are rocks composed predominantly of broken pieces or clasts of older weathered and eroded rocks
Clay	Particles with diameter less than 1/256 mm regardless of mineral composition
Cliff	A significant vertical, or near vertical, rock exposure.
Congregatory species	Species which regularly or seasonally congregates at particular sites, and then usually disperses over a wide area
Contaminant	Impurity, waste
CPT	Cone penetration test
CWC	Concrete weight coating

Cyanobacteria	Algae
Demersal	Fish, lives on or near the seabed
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment
Dispersion	The process is also called oil-in-water emulsion
Divers	Water bird species of the genus Gavia in the Baltic Sea
Drift ice	Floating ice, any ice that has drifted from its place of origin
DP	A pipe lay vessel of dynamically positioned (DP) type
EC Habitats Directive	International treaty protecting areas that contain certain natural environments or house certain organisms (as listed in appendices to the treaty)
EEZ	Exclusive Economic Zone – Seazone in which a state has special rights over the exploration and use of marine resources
EIA	Environmental Impact Assessment
EIA programme	The EIA programme (scoping document) highlights the potential environmental and socioeconomic components that may be impacted upon during a certain timeframe and over a certain distance
Emissions	Airborne compounds emitted from traffic or combustion of fossil fuels
Endemic species	Species whose habitat is restricted to a particular area
Erosion	Removal of solids (sediment, soil, rock and other particles) in the natural environment due to water, wind, mechanical erosion or other factor
Erratic boulder	Piece of rock that differs in composition, shape, etc., from the rock surrounding it, having been transported from its place of origin, especially by glacial action
Espoo Convention	Convention on Environmental Impact Assessment in a Transboundary Context
EU	European Union
Eutrophication	Increase in chemical nutrients - typically compounds containing nitrogen or phosphorus
Fairway	A deep navigable channel for vessels on water (shipping lanes)
FNBA	Finnish National Board of Antiquities
GOFREP	Gulf of Finland Mandatory Ship Reporting System
Habitat	Place or environment where a plant or animal naturally or normally lives and grows
Halocline	A strong, vertical salinity gradient
Haul-out	Place on shore where the seals dwell, breed, moult, etc.
HELCOM	The Helsinki Commission. See "The Helsinki Commission" for more detail
IBA	Important Bird Area
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organization
Indirect impact	Impacts that result from other activities that happen as a consequence of the project
Intervention Works	Sea bottom moulding and changing works
IUCN	International Union for Conservation of Nature and Natural Resources
Limestone	A sedimentary rock consisting of at least 50 % calcium carbonate ($CaCO_2$) by weight
LNG	Liquefied natural gas
Macrophytes	Bigger plants living on the seabed

Munitions	General term for ammunition, explosives and other munitions such as mines, air dropped bombs, depth charges and mine chairs/releasing systems
Natura 2000	Network of areas designated to conserve natural habitats and species of wildlife in the European Community
Natura assessment	Assessment of potential environmental impacts on Natura 2000 network
NDT	Non-destructive testing
Negative impact	An impact that results in an adverse change from the baseline or introduces a new, undesirable factor
NGO	Non-governmental organization
Nm^3/h	Normal cubic meters per hour
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
Oxygen scavenger	A chemical substance added to a mixture in order to remove oxygen
Outcrop	Outcrop is a visible exposure of bedrock or ancient superficial deposits on the surface of the Earth
Pack ice	Large area of floating ice consisting of pieces of ice driven closely together
PCB	Polychlorinated biphenyls
PE	Polyethylene
Pelagic	Species living in the water column that is not near the coast
Photic zone	The depth of water that is exposed to sufficient sunlight for photosynthesis to occur, also called euphotic zone
Phytoplankton	Plant organisms of plankton i.e. algae
Plankton	Aquatic organisms that float passively or exhibit limited locomotive activity in the water column
Plateau	An elevated, comparatively level expanse of land
Post-lay	After the laying of the pipe
PP	Polypropylene
Pre-commissioning	Before taking the pipe in to use
River basin districts	River Basin Districts (RBDs) and/or their subunits (RBDSUs) are the main units for the management of river basins and have been delineated by Member States under Article 3 and updated by reporting to Article 13 of the Water Framework Directive
ROV	Remote Operated Vehicle
S-lay	Refers to the shape the pipe assumes on its passage to the seabed
SCI	Site of Community Importance
scoping	The process of identifying the content and extent of the environmental information to be submitted to the competent authority under the EIA procedure
Sandstone	Sandstone is a clastic sedimentary rock made up mainly of sand-size weathering debris
Seabed	Bottom of the sea
Sea birds	Bird species that regularly spend a substantial part of their life cycle at sea
Sediment	Solid fragments of inorganic or organic material that come from the weathering of rock and are carried and deposited by wind, water, or ice
Sedimentation	Motion in suspensions in response to an external force such as gravity

Semi-submersible crane vessel, SSCV	Vessel that can put much of its bulk underwater
Side-scan sonar	Device used to produce picture-like information from the bottom of the sea
Significant impact	Impact target has high value/sensitivity. The extent can typically be regional and duration long- termed or permanent. The impact is typically partly reversible or irreversible
Silt	A sedimentary material consisting of very fine particles intermediate in size between sand and clay
SPA	Special Protection Area (for birds)
spp.	Short way of saying that something applies to many species within a genus, but do not necessarily all species within that genus
Spreading	After release spreads due to current and wind
Sub-bottom profiler	Powerful low frequency echo-sounder, provides profiles of the upper layers of the ocean bottom
TBT	Tributyltin
TEN-E	Trans-European Energy Network
Terrestrial	Refers to things related to land
Territorial water	Belt of coastal waters extending at most twelve nautical miles from the baseline (usually the mean low-water mark) of a coastal state
Thermocline	A strong, vertical temperature gradient
Till	Non-sorted, non-stratified sediment carried or deposited by glacier
TSS	Traffic Separation Schemes
Tug boat	Boat used for dragging another boat behind
Turbidity	"Cloudy" condition of water due to suspended silt or organic matter
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
Unexpected impacts	Impacts that result from an unplanned or unexpected event
Vegetation	All the plants or plant life of a place, taken as a whole
Waders	Bird species of the order Charadriiformes, e.g. Dunlin (in American called "shorebirds")
Water birds	A generic term for bird species that regularly spend a substantial part of their life cycle at water, e.g. sea birds, waders and gulls
Wide area network, WAN	Wide Area Network (WAN) is a computer network that covers a broad area (i.e., any network whose communications links cross metropolitan, regional, or national boundaries)
Wind park / farm	Area for windmills producing energy
Zooplankton	Animal organisms of plankton