



Nord Stream 2 Natural Gas Pipeline construction and operation in the Finnish EEZ Environmental and Technical Monitoring Quarterly Report Q2 2019

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Summary

The report presents results and preliminary findings of the environmental and technical monitoring for construction activities of the Nord Stream 2 Gas Pipeline in the Finnish EEZ for the second quarter of 2019. Monitoring is based on the Nord Stream 2 Environmental Monitoring Programme, Finland. The programme was approved on April 12, 2018 within the water permit decision (Nro 53/2018/2, Dnro ESAVI/9101/2017).

Sitowise Oy prepared this report based on data and reports provided by Nord Stream 2 AG and its' monitoring and technical contractors. All findings are preliminary and final conclusions will be reported in the annual report 2019 to be published in May 2020.

The construction activities during the second quarter of 2019 were rock placement and pipelay of Line A and B. By the end of Q2, the total number of finalized berms was 231 and the total volume of rock installed was 762,300 m³. Pipelay of Line A in Finnish EEZ was finished on April 30, 2019. Pipelay of Line B in Finnish EEZ started on May 18, 2019 and was completed in August 2019.

Environmental monitoring continued during Q2 and the monitoring equipment was serviced, and data collected at all sites (Control 1, Control 2 and Sandkallan) in May 2019. During the winter and spring period (December 2018 – May 2019), no impacts on water quality that could be related to NSP2 construction activities were detected at the long-term monitoring stations. Natural episodes of strong currents and high wave action, later in spring also sedimentation of the spring bloom algae, induced elevated levels of water turbidity. Oxygen conditions were good at Control stations 1 and 2 until May, when the Control 2 suffered from near-bottom hypoxia. At the Sandkallan site, the shallow station had high oxygen conditions throughout the study period, whereas the deeper stations often experienced oxygen deficiency.

The Finnish authorities were notified of two new pipe supply vessels that started operating in the Finnish EEZ. There were no incidents to be notified to the Finnish authorities during the reporting period.

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1 Introduction

The report presents results and preliminary findings of the environmental and technical monitoring for the construction activities of the Nord Stream 2 Gas Pipeline in the Finnish EEZ for the second quarter (Q2) of 2019.

Nord Stream 2 AG has started construction activities for a new two-pipeline offshore natural gas system from Russia to Germany through the Baltic Sea (Figure 1). The length of the corridor is approximately 1,200 km. Parallel pipelines pass through the territorial waters and/or Exclusive Economic Zones (EEZ) of Russia, Finland, Sweden, Denmark and Germany. In the Finnish EEZ the route follows the existing Nord Stream pipeline route. The length of the route in the Finnish sector is approximately 374 km.

Pipelay of Line A started on September 5, 2018 and was finished in the Finnish EEZ on April 30, 2019 /1/. Pipelay of Line B in the Finnish EEZ started on May 18, 2019 /2/ and was completed in August 2019 /3/.

All construction works are scheduled to be completed during 2019, after which the pipelines are planned to be taken into operation.

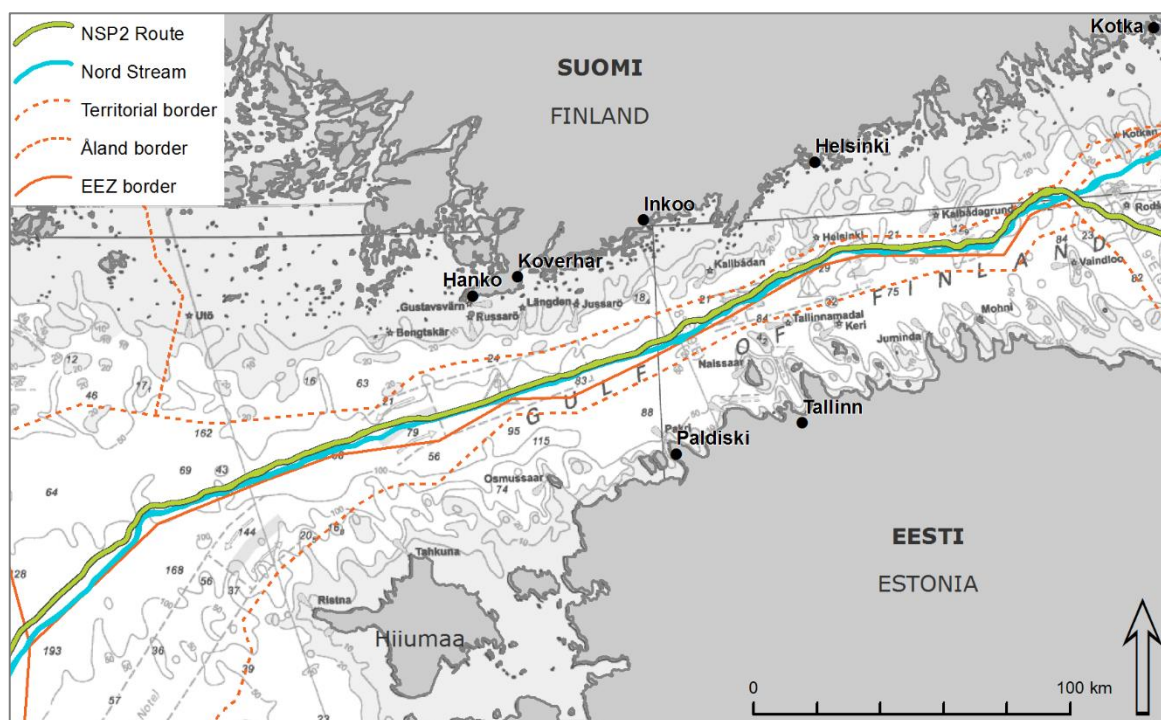


Figure 1. The Nord Stream 2 route passes through the Finnish EEZ. It is situated north of the existing Nord Stream pipelines with an exception of a short section in the east, close to Russian waters.

Nord Stream 2 AG is responsible for environmental monitoring and reporting during construction and operation of the pipelines. The scope of monitoring activities is presented in the Environmental Monitoring Programme, Finland /4/. The programme has been approved within the water permit decision on April 12, 2018 (N:o 53/2018/2, Dnro ESAVI/9101/2017). Monitoring is most intensive during the construction phase (Table 1).

Table 1. General schedule for monitoring activities during 2018–2023 in the Finnish EEZ (based on /4/, modified).

Monitoring target	Construction		Operation			
	2018	2019	2020	2021	2022	2023
Underwater noise	X					
Water quality and currents	X	X				
Commercial fishery					X	
Cultural heritage	X		X			

The supervisory authorities for monitoring of underwater noise, currents and water quality are the Southeast Finland, Uusimaa and Southwest Finland ELY Centres (The Centres for Economic Development, Transport and the Environment). For fishery monitoring, the supervisory authority is the Southwest Finland ELY Centre. For cultural heritage, the supervisory authority is the Finnish Heritage Agency (former National Board of Antiquities).

Quarterly reports will be provided three months after the end of each quarter during the construction period, and annual reports by the end of May of the following year during construction and operation.

Quarterly reporting aims at presenting the main results from technical and environmental monitoring to the authorities. For this reason, they are concise and focused on results. Annual reports will include further data analysis, comparisons to the impact assessments presented in the EIA Report and the permit application and more thorough discussion on the observed impacts.

2 Environmental conditions during the second quarter

April 2019 was warm and dry. According to the statistics of the Finnish Meteorological Institute, the average temperature in Finland was 2–3.5 degrees higher than the long-term average (1981–2010) for April, and several observation station temperature records were broken. For example, at the Utö island, northern Baltic Sea, the highest measured temperature in April, 15.9°C, exceeded the previous record by 1.4°C. The island also received the lowest rainfall (1.8 mm), but the month was dry in the whole country, stoking wildfires especially in southern Finland /5/. May, on the contrary, was unusually rainy throughout the country. The average temperature for the month was very close to the long-term averages /6/. In June the weather was, again, warm and dry, with the average temperature in the southern parts of the country exceeding the long-term averages by 3°C, which happens approximately once in a decade. Precipitation was exceptionally low, about 25 % of the long-term average, which only takes place about every 30 years /7/.

According to the Finnish Meteorological Institute's open data /8/, during the period of April 1 to June 30, 2019, significant wave height in the open Gulf of Finland varied between 0.1 and 2.3 m (Figure 2) and the wind speed (from April 25 to June 30) between 0.5 and 15.6 m/s /8/. The wave observation data was collected from an open sea wave buoy located in the Gulf of Finland (see Annex 1) approximately six kilometres north of GKP 185, and the wind speed data from a weather station located in the middle of the Gulf of Finland, the Helsinki lighthouse (see Annex 1).

The warm weather of April accelerated ice melting, and the Finnish Meteorological Institute reported that the whole Gulf of Finland was free of ice by the last week of April /9/.

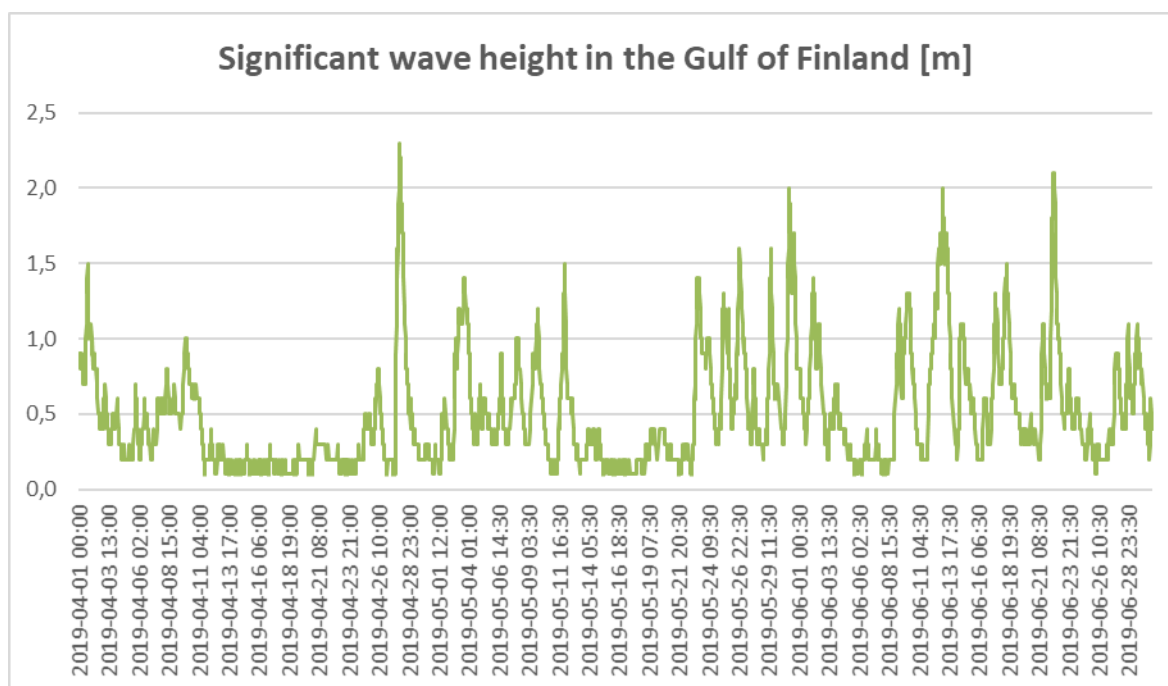


Figure 2. Significant wave height in the Gulf of Finland during the period from April 1 to June 30, 2019 /8/. The data was collected from an open sea wave buoy located in the Gulf of Finland (see Annex 1) and consists of measurements conducted every half an hour.

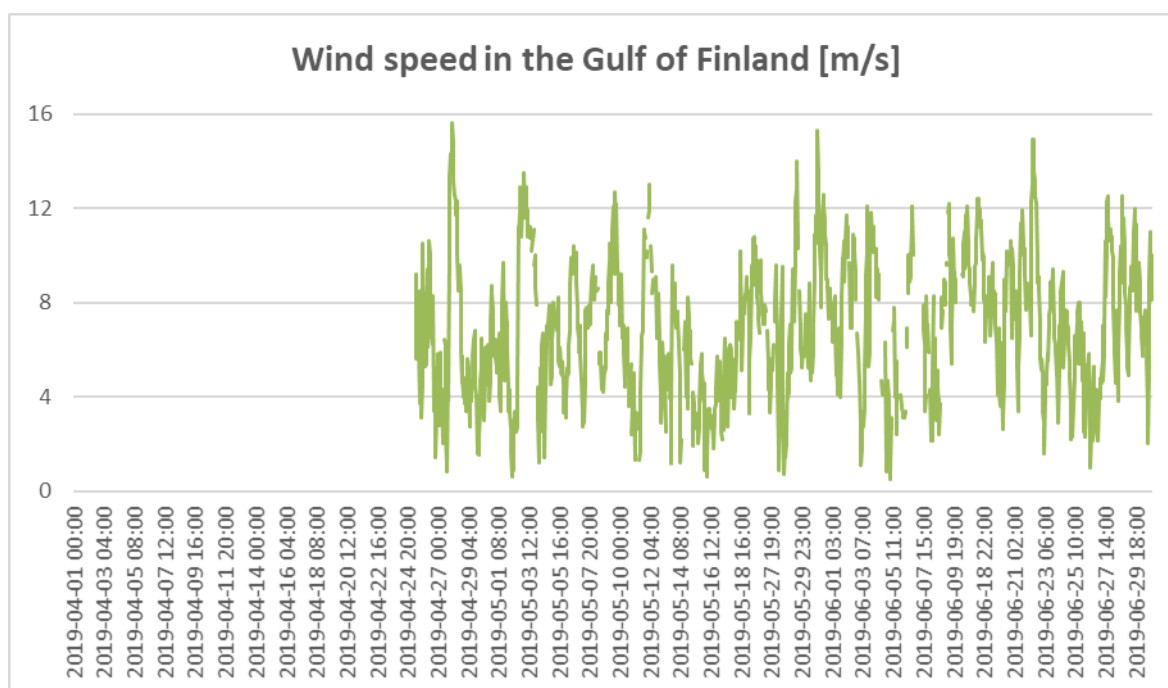


Figure 3. Wind speed in the Gulf of Finland during period from April 1 to June 30, 2019 /8/. The data was collected from a Helsinki lighthouse weather station located in the middle of Gulf of Finland (see Annex 1) and consists of measurements conducted once an hour. Data not available for the period from April 1 to April 24, 2019.

3 Construction activities during the second quarter

3.1 Schedule

The construction activities during the second quarter included rock placement and pipelay of Line A and B (Table 2).

Table 2. Construction activities during Q2 2019.

2019 Q2	April					May					June				
Week	14	15	16	17	18	19	20	21	22	23	24	25	26		
Rock placement															
Pipelay Line A															
Pipelay Line B															Continues

3.2 Activities during the period

Rock placement

Rock placement was conducted by the vessel Bravenes from April 1, 2019 until April 7, 2019. There was a pause in rock placement from April 8 until May 21, 2019 during which operations were transferred to Swedish Waters. The work was continued by the vessel Seahorse from May 22, 2019 to June 17, 2019 /10/. Rock placement contractors were Boskalis Offshore Contracting B.V. and Van Oord Offshore B.V. (BoVO). Contractors report the proceedings of the rock placement works in an as-built register /11/, which is summarized in the quarterly reports.

The rock placement during Q2 took place between GKP 245 and GKP 410 (Figure 4). In addition, Line B crossing with Nord Stream gas pipeline was constructed at GKP 114. During the Q2 period altogether 24 berms were finalized: two pre-lay berms for Line B and 22 post-lay berms for Line A (Table 3). The additional pre-lay berms for Line B were related to the construction of the Balticconnector gas pipeline, which is proceeding concurrently. Post-lay berms were installed on the pipeline in order to support and cover the pipeline as well as increase its stability.

In total 4 of the 24 berms were stress/freespan correction berms (Table 3). In addition, 15 in-service buckling mitigation berms were designed and installed for additional protection along the route (to avoid excessive movement due to hydrodynamic loading and/or fatigue caused by current action of freespans in sections of uneven seabed). Furthermore, five berms were constructed to support crossings with other pipelines: 2 pre-lay berms for Balticconnector crossing with line Line B and 3 post-lay berms for Nord Stream gas pipeline crossing with Line A. The total number of finalized berms was 231 at the end of Q2 2019.

The volume of rock used during Q2 was 78,500 m³. Of this, 19 % was pre-lay and 79 % post-lay rock placement. Only Finnish rock material was used. By the end of Q2, the total cumulative volume of rock used in the Finnish EEZ was 762,300 m³.

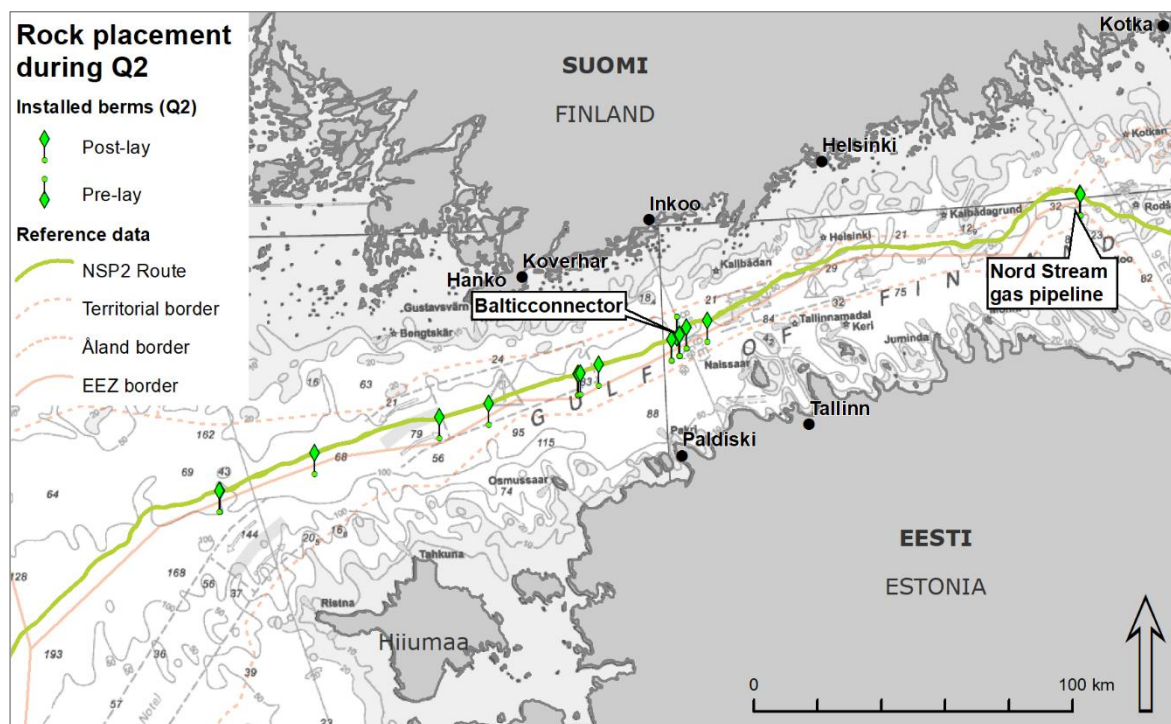


Figure 4. Rock placement activities during Q2.

Table 3. Rock placement during Q2, 2019. Data summarized from /11/.

Berm type	Installed volume Q2/2019*	Number of berms
Stress/freespan correction (post-lay)	29,300 m ³	4
In-service buckling mitigation, lateral stability (post-lay)	15,500 m ³	15
Crossings	33,700 m ³	5
Pre-lay	15,300 m ³	2
Post-lay	18,300 m ³	3
Total	78,500 m³	24
* Installed volume was notified to Nord Stream 2 by contractors as tonnes (t), which was converted to cubic meters using factor 1/1.5625.		

Pipelay

During the second quarter 2019 pipelay of Line A and B was conducted in the Finnish EEZ by the pipelay vessels Solitaire and Pioneering Spirit. The OCV Oceanic, OCV Fortitude and PLSV Calamity Jane provided ROV survey support to the pipelay vessels. This included Touch Down Monitoring (TDM), A&R operations of the pipeline and support at cable crossing locations. The survey support vessels also performed pre- and post-lay surveys /1, 2, 10, 13, 14, 15, 16/.

The pipelay vessel Solitaire commenced the pipelay of the last, about 3 km long section of Line A from GKP 117 to GKP 114 in the Finnish EEZ, close to the Russian border, on April 29 /10/. Pipelay of Line A in the Finnish EEZ was finished on April 30, whereupon Solitaire left the Finnish EEZ to continue pipelay in Russian waters /1/.

The pipelay vessel Pioneering Spirit arrived in the Finnish EEZ on May 18, 2019 and started pipelay of Line B /2/ at GKP 488. Pioneering Spirit continued pipelay until June 4, 2019 /13/. when it departed for work on another project. When Solitaire reached the end of its scope of pipelay of Line A in Russia, Solitaire returned to Finland, took over pipelay of Line B on June 5, 2019 /14/ and continued until June 27, 2019 when it departed to Sweden /15/. Pioneering Spirit returned and commenced pipelay of Line B in the Finnish EEZ on June 28, 2019 /16/, continuing eastward. By the end of the Q2 it had reached GKP 320.

There were no interruptions in pipelay due to weather conditions during Q2 2019.

Efficiency of pipelay during Q2 is presented below:

- approximately 171 kilometres of pipelay
- 46 effective days of pipelay
- pipelay at 8 cable crossings and at two Nord Stream pipeline crossings
- highest daily speed in Q2 was approximately 5.4 km/day for Pioneering Spirit and 4.1 km/day for Solitaire
- average daily speed in Q2 was approximately 3.7 km/day (effective days)

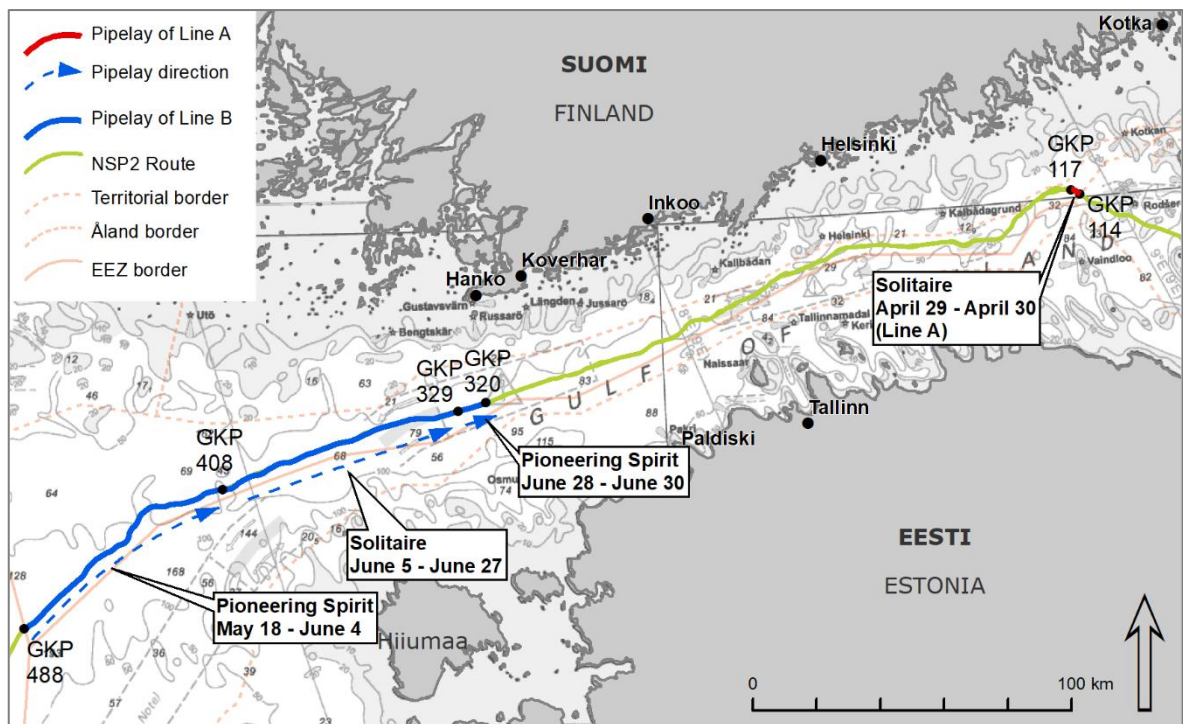


Figure 5. Pipelay during Q2 2019.

4 Water quality and currents

4.1 Monitoring activities

Water quality and current velocity is monitored at three sites by Luode Consulting, according to the approved Environmental Monitoring Programme Finland /4/ (Table 4 and Figure 6).

During the winter and spring period (December 2018–May 2019), water quality measurements continued at Control stations located in the Western (Control 1) and Eastern Gulf of Finland (Control 2). The same two control stations were used during the Nord Stream project. They represent relatively shallow coastal waters. The water depth at both stations is between 40–50 meters. Water quality monitoring includes turbidity, oxygen concentration, salinity and temperature measurements in three depth layers near the seabed.

In addition, water quality was also measured at Sandkallan monitoring site. Sandkallan site consists of three separate water quality stations. One of them is equipped with profiling current meter measuring flow speeds and directions in separate depth layers covering the whole depth range from the bottom to the surface /17/. The Sandkallan stations represent deeper waters than the two control stations. The water depth at the stations varies between 49 and 67 meters.

Table 4. Installation, last and next service and data recovery of water quality and current monitoring sites.

	Installed	Last service	Next service
Control 1	17.4.2018	16.5.2019	Q3
Control 2	18.4.2018	24.5.2019	Q3
Sandkallan	18.4.2018	28.5.2019	Q3

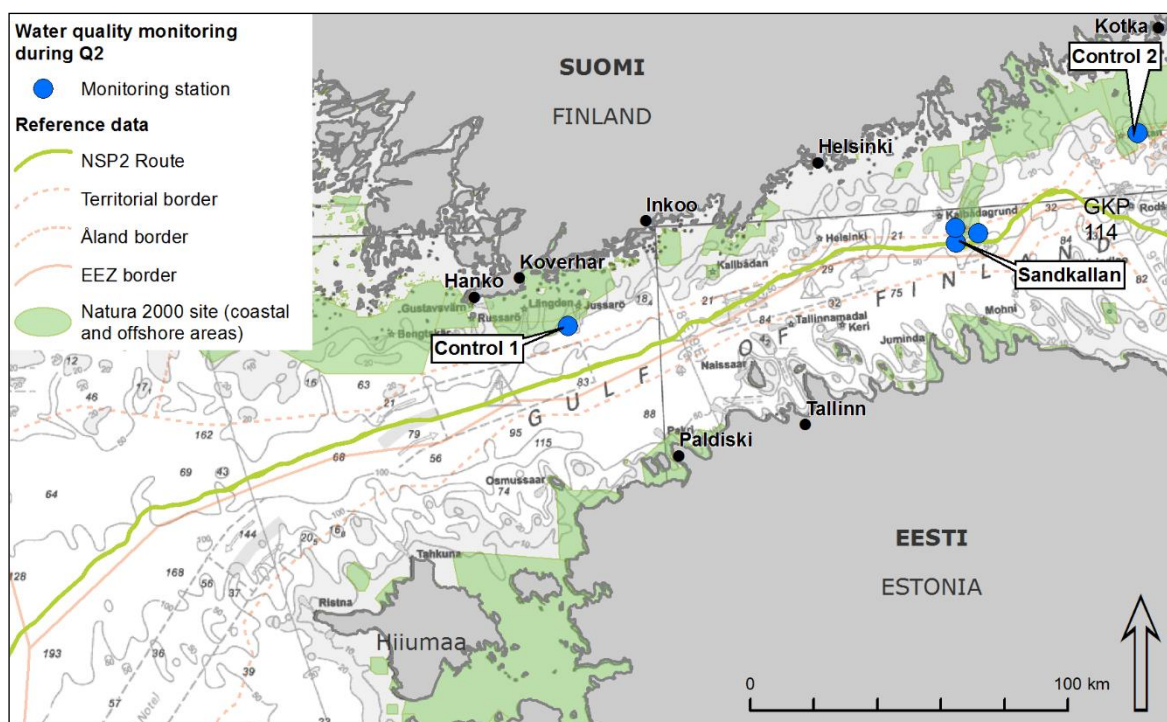


Figure 6. Water quality and current monitoring sites during Q2 2019.

4.2 Results

The results cover the period between December 2018 and May 2019, as it was not possible to access the equipment during the winter due to occasional ice cover. Monitoring results for June 2019 will be presented in the third quarter report (Q3). No impacts from construction activities were detected in water quality at long-term monitoring sites Control 1, Control 2 and Sandkallan during the monitoring period /18/.

Stormy periods with strong currents and high wave action (wave data not available for the winter months due to occasional presence of ice) induced elevated levels of water turbidity with peak values close to 10 turbidity units [FNU] (Figure 7). The reason for the phenomenon was resuspension of sediment on the relatively shallow bottoms. It was observed most clearly at the relatively shallow sites of Control 1 and Control 2. Slightly increased turbidity was also observed at the deeper monitoring stations of the Sandkallan site in late May. It was caused by sedimentation of the phytoplankton spring bloom.

There was high variation in the oxygen concentration at the monitoring sites (Figure 7). At Control 1, Western Gulf of Finland, oxygen concentration was high during the winter and spring. It remained above 10 mg/l most of the time. At Control 2, Eastern Gulf of Finland, oxygen concentration stayed at around 8 mg/l over the winter period, but relatively low concentrations, down to 3 mg/l, were measured in May close to the bottom. At Sandkallan site, the deepest measurement stations suffered regular oxygen deficiency. On the contrary, the shallowest station of Sandkallan showed good oxygen conditions throughout the whole winter and spring period.

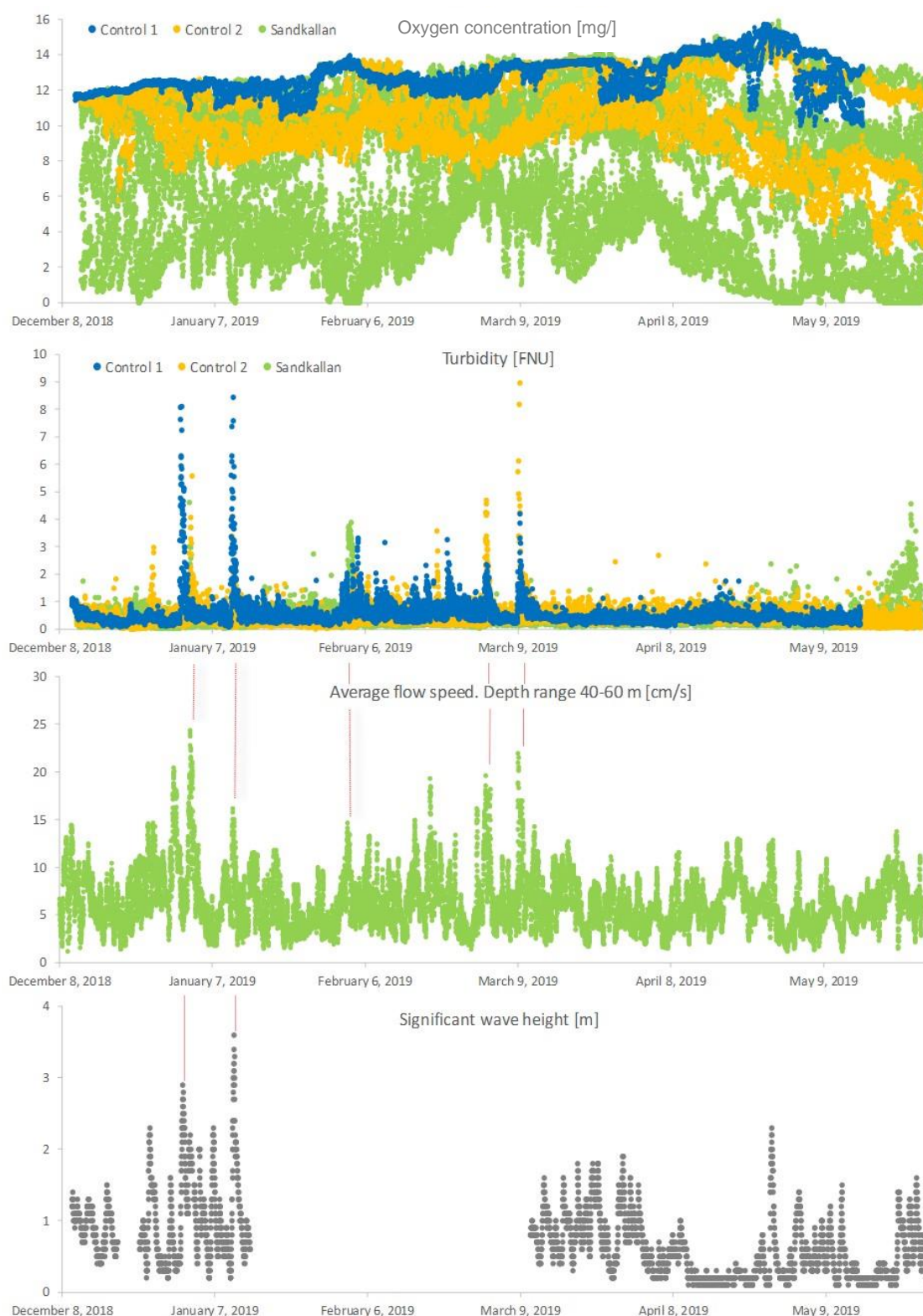


Figure 7. Oxygen concentration, turbidity and flow speed at the monitoring sites Control 1, Control 2 and Sandkallan, and the significant wave height measured by the Finnish Meteorological Institute /8/. Wave data are not available for the winter months due to occasional presence of ice. Wind induced high wave and flow episodes and their connection to increased turbidity are indicated by red hairlines. The images are combinations of all measurements carried out at the monitoring sites.

5 Notifications

Finnish authorities were notified of two new pipe supply vessels, Standard Supporter and Sea Goldcrest, that support pipelay in the Finnish EEZ /19/.

There were no incidents to be notified to the Finnish authorities during the reporting period.

6 Conclusions

Construction activities in the second quarter of 2019 consisted of pre- and post-lay rock placement as well as pipelay of Line A (finished during Q2) and Line B (started during Q2). No pipelay interruptions occurred due to weather conditions. There were also no incidents to report to the ELY Centres. Construction work progressed according to plans.

The water quality monitoring report covers the period between December 2018 – May 2019, as it was not possible to access the equipment during the winter period due to occasional ice cover. The monitoring data indicated no detectable impacts from construction activities at the long-term monitoring sites Control 1, Control 2 and Sandkallan. The increased turbidity values in the bottom layers of these stations are explained by natural phenomena such as strong currents, high wave action and sedimentation of phytoplankton after spring bloom.

Environmental and technical monitoring has been carried out according to the monitoring programme. The results in this report are preliminary. The final results for the year 2019 will be presented in the annual report 2019.

7 List of references

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Maps and GIS data

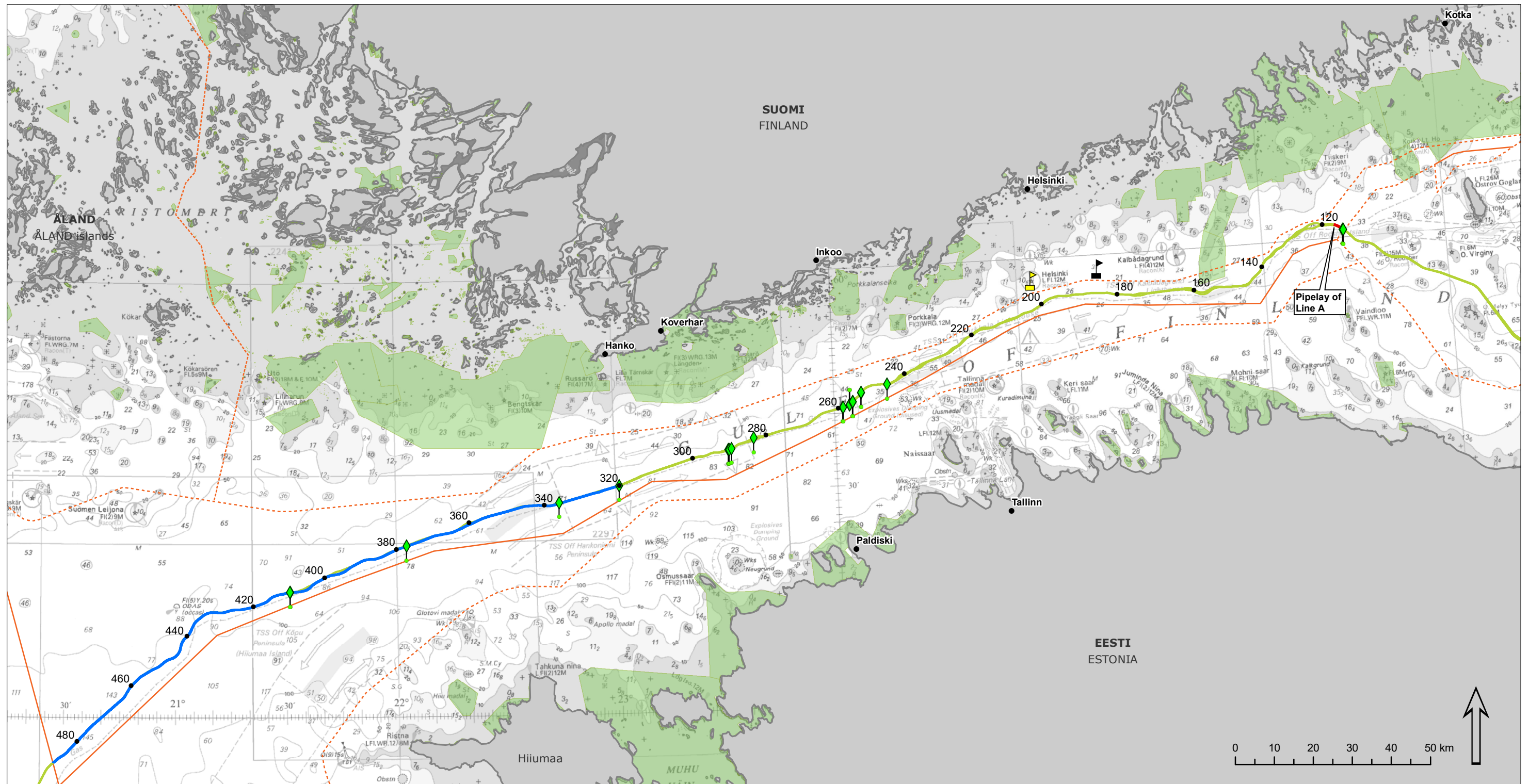
Background admiralty charts, 2018. Charts are not to be used for navigation.

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European Environmental Agency (EEA) 2018. Natura 2000 sites. © Directorate-General for the Environment (DG ENV).

Finnish Environmental Institute (SYKE) 2018. Natura 2000 sites.

International Boundaries Research Unit (IBRU) 2010. Borders of the Exclusive Economic Zones and Territorial Waters.



Nord Stream 2 Construction activities during Q2/2019

Pipelay

- Pipelay of Line B
- Pipelay of Line A

Rock placement

- Post-lay
- Pre-lay

Reference data

- NSP2 Route
- Global Kilometre Point (GKP)
- Wave data
- Wind data

Natura 2000 site (coastal and offshore areas)

- Territorial border
- Åland border
- EEZ border

References:
 - Limits of Exclusive Economic Zones and Territorial Waters: IBRU May 2010
 - Background sea charts are "Not to be used for navigation"
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 - Natura 2000 sites. EEA and SYKE 2018.

Annex 1

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Construction activities during Q2/2019

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