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Environmental Monitoring to Support the Dredging Operation in the Nord Stream Pipeline Project in Northern Germany

Hydro 2010 Rostock Germany

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Introduction

The Nord Stream pipeline project

Dredging

Environmental Monitoring

Technical:

- Buoys
- Sensors
- Telemetry

Conclusions



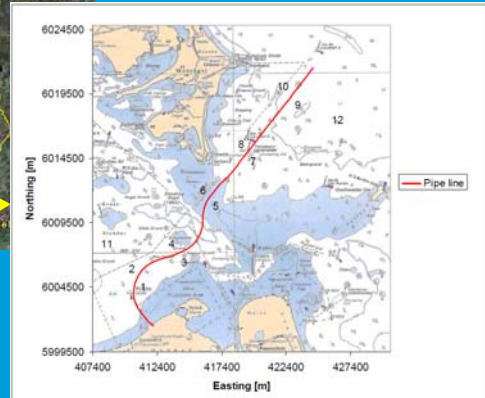
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NORD STREAM



Nordstream pipeline project



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NORD STREAM



Dredging activities in Nord Stream

- Trench dredging in Landfall area
- Dump & temporary storage locations
- Trench backfilling after pipelay
- Survey & Environmental monitoring



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Environmental Monitoring

Contractual requirements:

- Dredging transportation and backfilling operations shall not increase the background Turbidity value by more than 50 mg/l. measured as running average.
- Peak values are limited to 100 mg/l. above background.
- To be measured 500 m from pipeline route and dredging, transportation and backfilling units.



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Environmental Monitoring

Monitoring Requirement :

- Online on 12 sites offshore continuously
- Vessel mounted ADCP and turbidity

Continous monitoring of :

- Current (speed & direction)
- Waves
- Turbidity

Occasionally: pH and DO

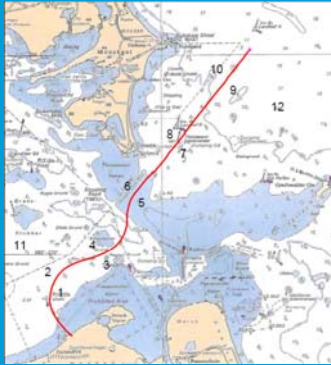


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Environmental Monitoring

Contractual requirements:

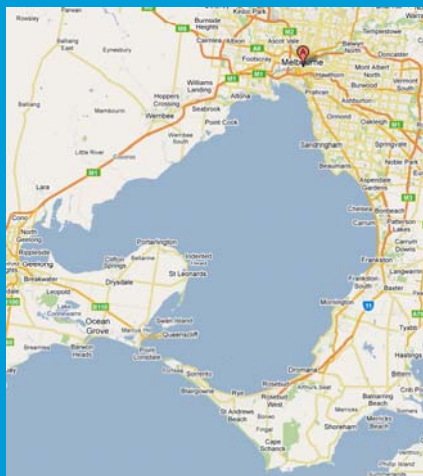


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History monitoring projects

- 1. Port Phillip Bay – Melbourne Australia – 12 buoys





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History monitoring projects

2. Khalifa Port development – Abu Dhabi, UAE - 14 buoys/tripods



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History monitoring projects

3. Devonport – UK – long term study 1 buoy

Ongoing development and climbing learning curve

- Physical design and shape of buoy (platform)
- Telemetry (GPRS) and it's associated problems





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Norstream Technical info



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Monitoring Buoys

1.9 m diameter

Material PE and Aluminium

Mounted:

- Solar panel
- Radar reflector
- Navigation light





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NORTEK AW



SMIT

Data collection unit

Campbell CR 1000 collector

GPS sensor attached for position and timing

Built-in GPRS modem

Externally attached Integra data radio



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NORTEK AW



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Instruments

Nortek AWAC 1 Mhz

- Current profile
- Waves
- Internal processor
- on the seabed in a gimbaled frame



YSI

- Temperature, Salinity, Turbidity (wiped)
- Mounted in / below the buoy → picture





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Telemetry Protocol

Every 15 minutes

Radio

GSM / GPRS internet

Open ASCII protocol – NMEA type of messages

```
$BEGGA,<ID>,<SeqNr>,<Date>,<Time>,<Latitude>,  
<[N[S]>,<Longitude>,<[E[W]>,<Quality>,<NrOfSatellites>,  
<HDOP>,<AntennaAltitude>,M,<GeodSeparation>,  
<DifferentialAge>,<DifferentialRefID>,*hh<CR><LF>
```



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Telemetry Protocol

Other messages used :

\$BEAWC - General AWAC Wave data

\$BEAWA - General AWAC / AquaDopp sensor data

\$BEAWS - Specific wave energy data

\$BECUR - Current Velocity information, from AWAC or AquaDopp

\$BEWTR - Weather information

\$BEWTQ - Water Quality Parameters – Main Probe

\$BEWTP - Water Quality Parameters - Probe 2

\$BEDST – Datalogger status message

Full message details available on request



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Why ?

Consequential damage of system failure.

- financial risk of insufficient data return many times larger than cost (value) of data (system) itself.
- Control over all segments of monitoring system to enable action in case of problems.



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NORTH SEA



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Thank you for your attention

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Sjoerd van den Brom