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MONITORING DREDGING IN REAL TIME USING 3D VISUALISATION

18/10/2021

Aziah North, KONGSBERG



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**200+ years of
technology**

*From deep sea
to outer space*



Est.
1814





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KONGSBERG's Business areas





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KONGSBERG Maritime

**Broad portfolio
of products for
the maritime
industry**

**PROPULSION &
ENGINES**



**INTEGRATED
SOLUTIONS**



DECK MACHINERY



**SENSORS &
ROBOTICS**



SHIP DESIGN



MARINE CIVIL ENGINEERING projects

- Dams, Hydro Power Stations, Offshore windfarms
- Marine construction & Inspection
- Bridges, Culverts, Tunnels
- Ports, Harbours & Marine terminals
- Hydrographic surveys & Dredging
- River/stream monitoring



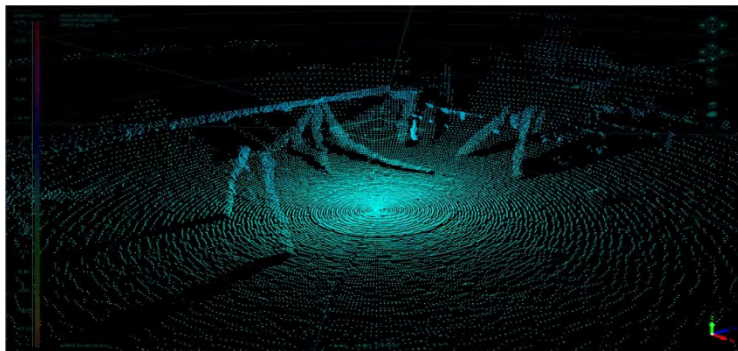


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Using Sonars for Underwater Imaging



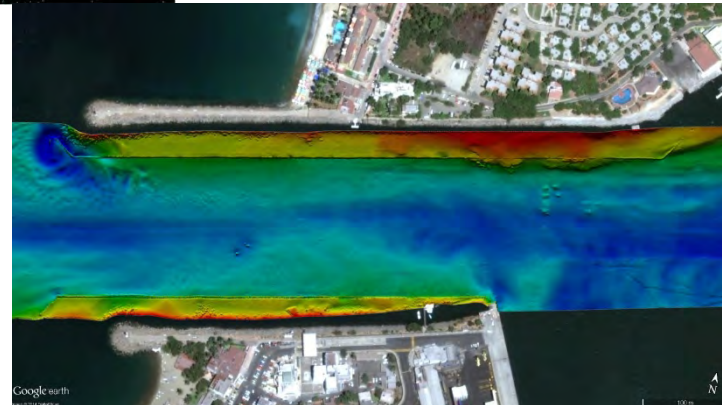
Dual Axis
Scanning
Sonar
(DAS)



M3
Multibeam
Sonar



High- Resolution
Imaging Scanning
Sonar





‘Underwater Inspection of Bridge Substructures Using Imaging Technology’ - FHWA
US Dept of Transportation Report
June 14, 2018

‘Hydrographic Surveying’ USACE - Best practices guide Manual EM 1110-2-1003
November 30, 2013

‘IHO Standards S-44 -

Dual-Axis Scanning (DAS) Sonar

-designed for long-term immersion in harshest conditions

Features

- Rugged design, no moving parts
- Rapid deployment
- Provides digital records, customised scanning
- 3D point cloud data, easy to detect
- Cost-effective system

Monitoring Applications

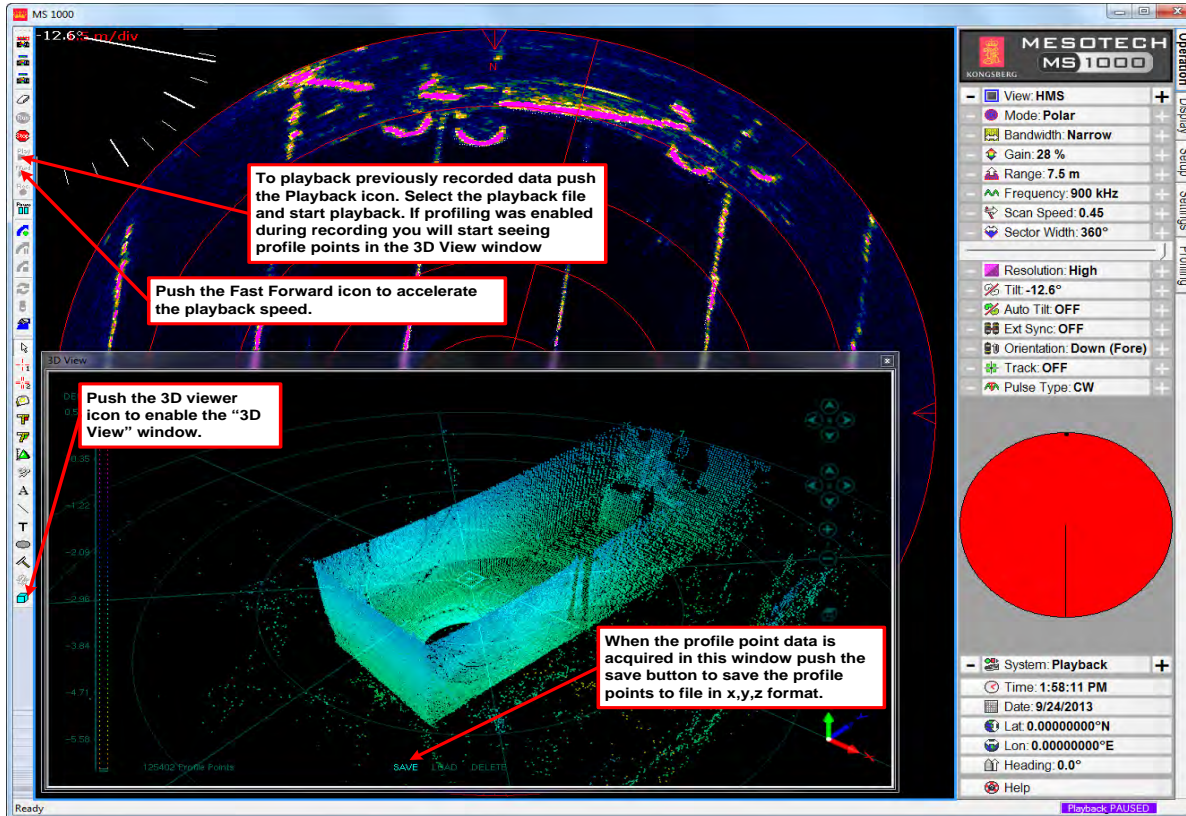
- Wind turbine scour
- Bridge inspection
- Port inspection
- Inspection of dams and intakes





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Dual-Axis Scanning (DAS) Sonar -with MS1000 software

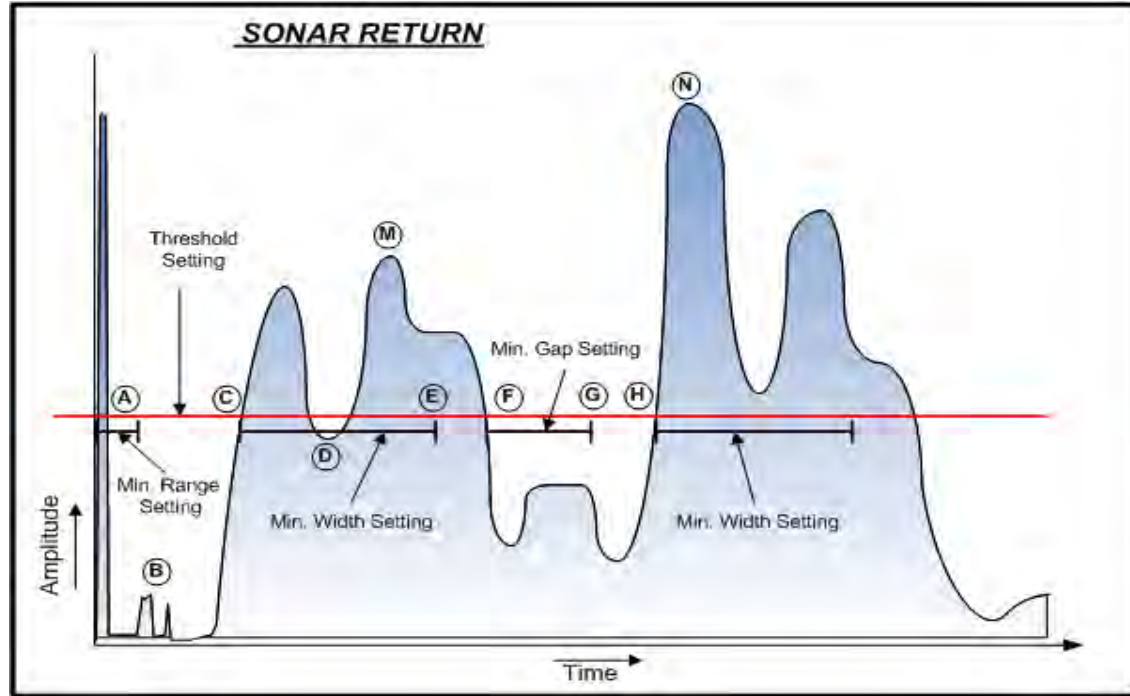




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Sonar Profile Point Detection Algorithm

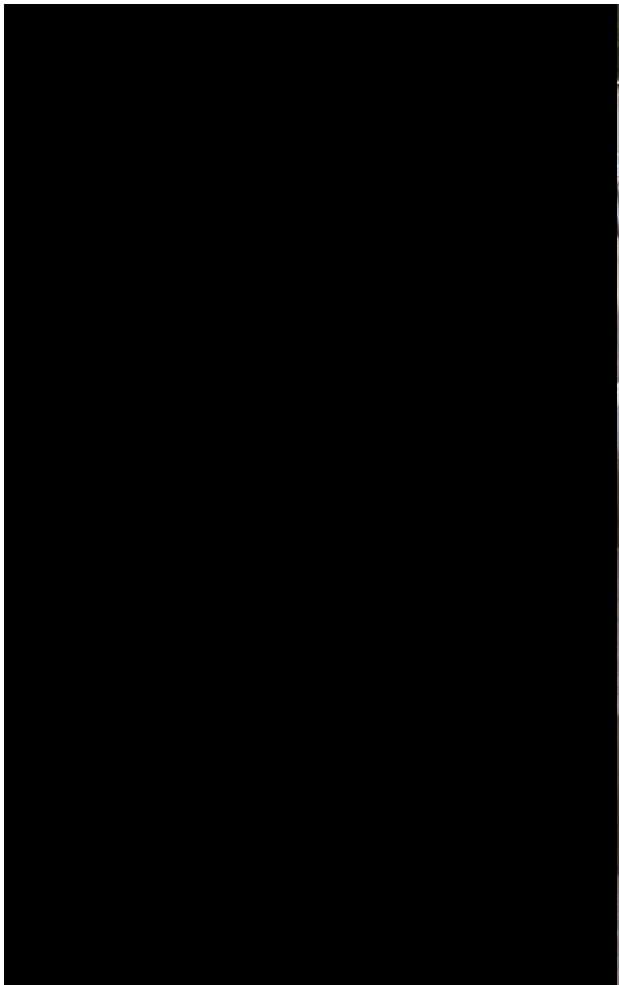
Typical shape for the amplitude of the sonar return signal







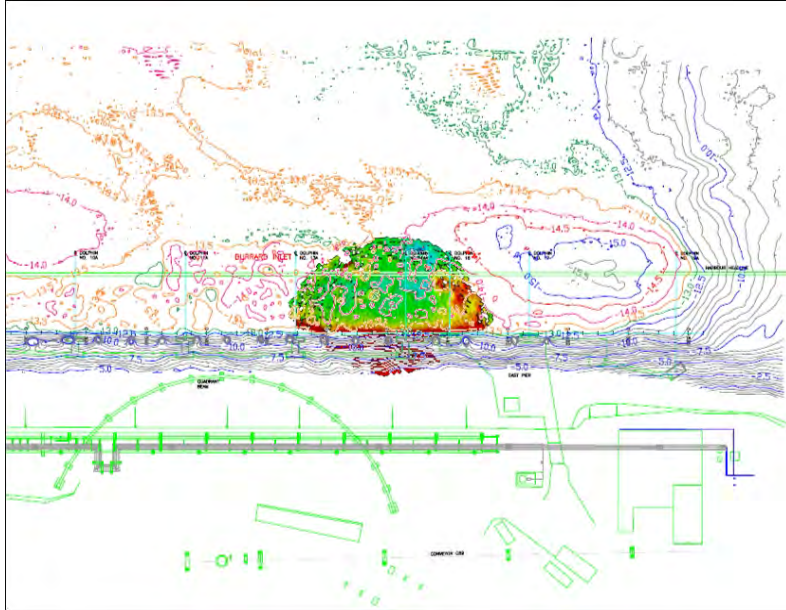
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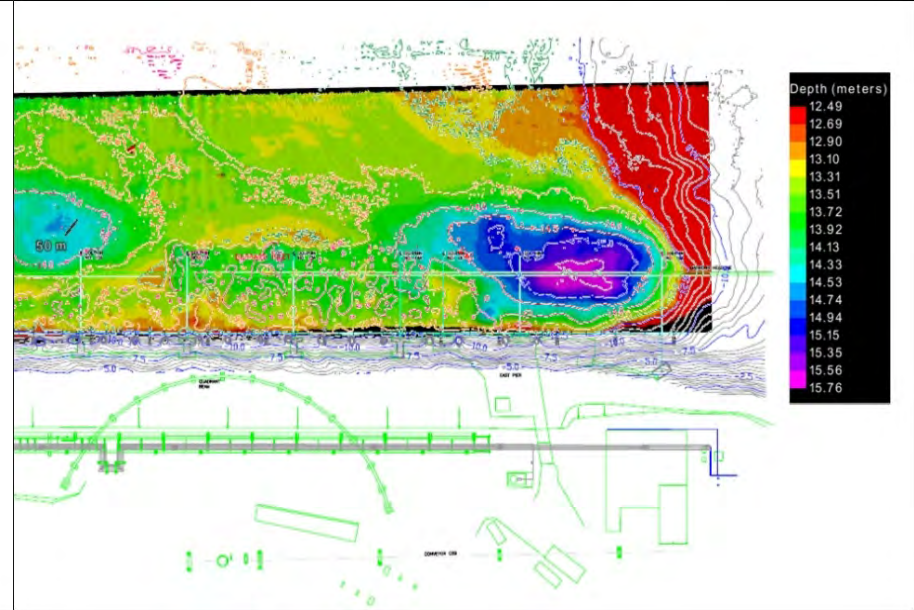


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PCT BerthWatch Demo



Check – DAS scan vs PCT chart



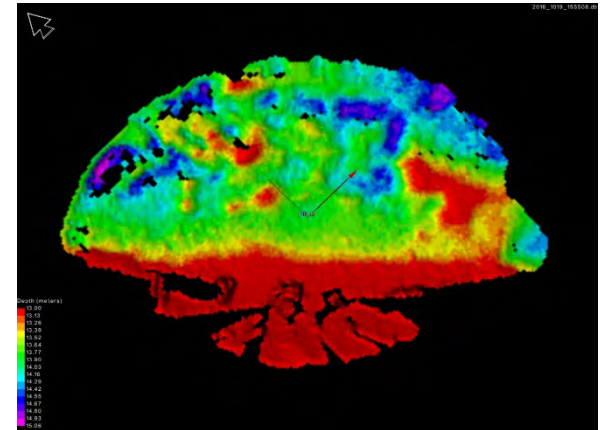
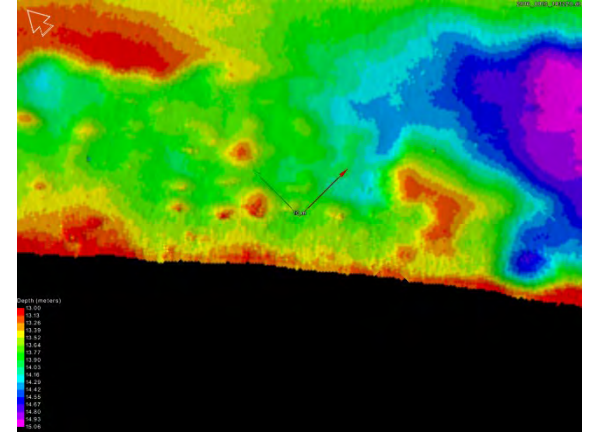
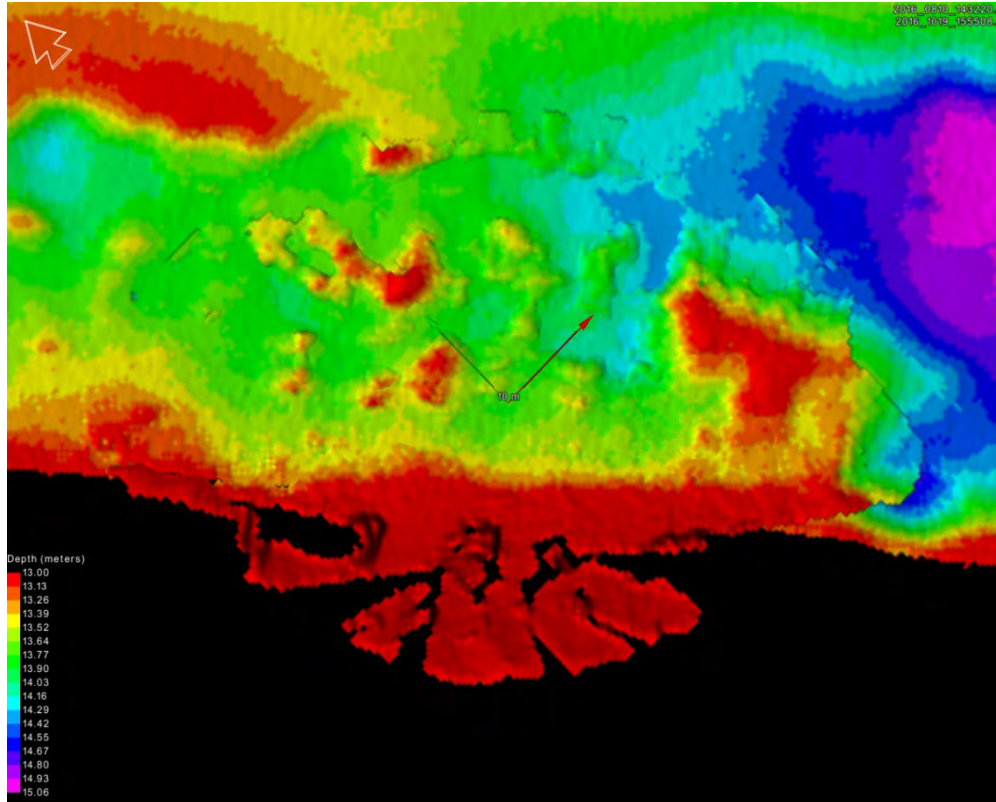
Check – M3 Sonar Survey vs PCT chart



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PCT BerthWatch Demo – Depth Measurements

DAS Scan and M3 Bathy Survey overlay (good match)



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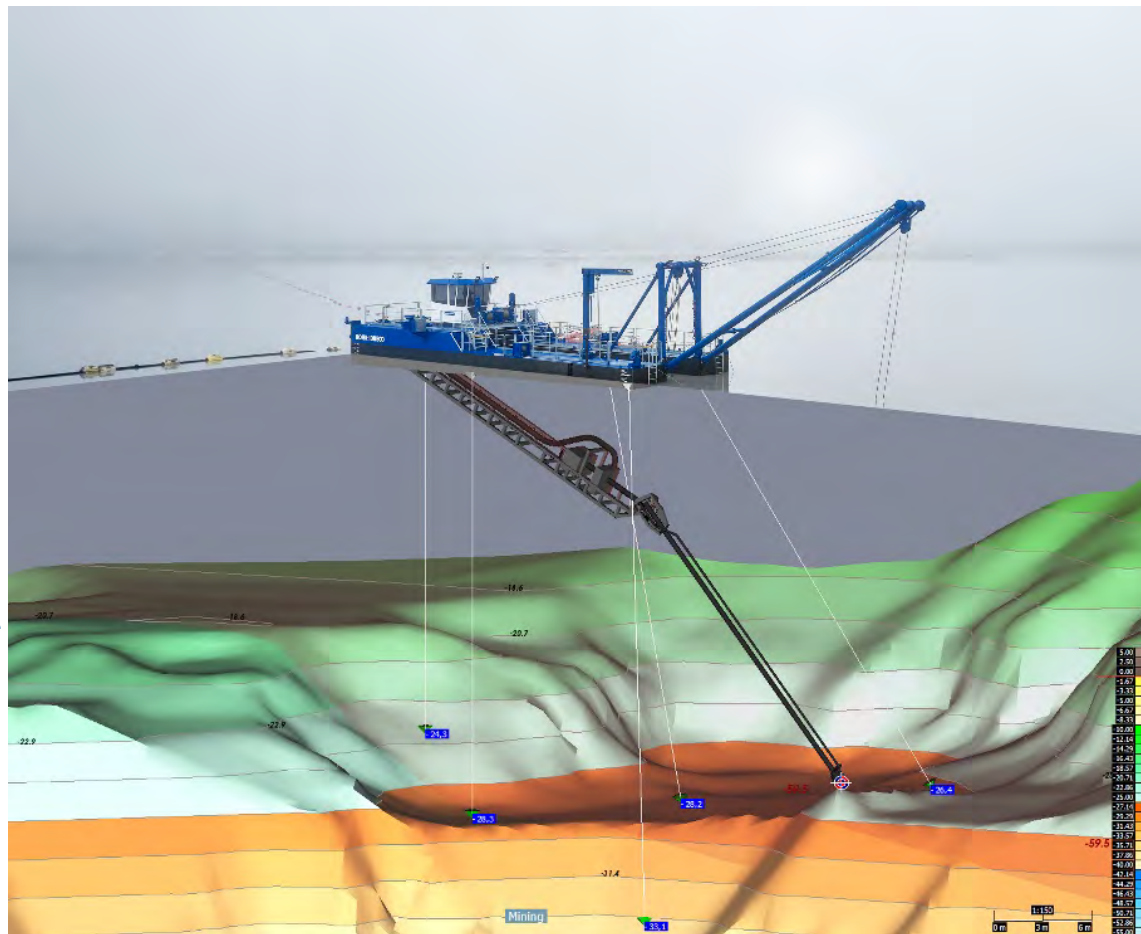


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Dredge Monitoring System

MARPO_DGPS
Marine Position DGPS



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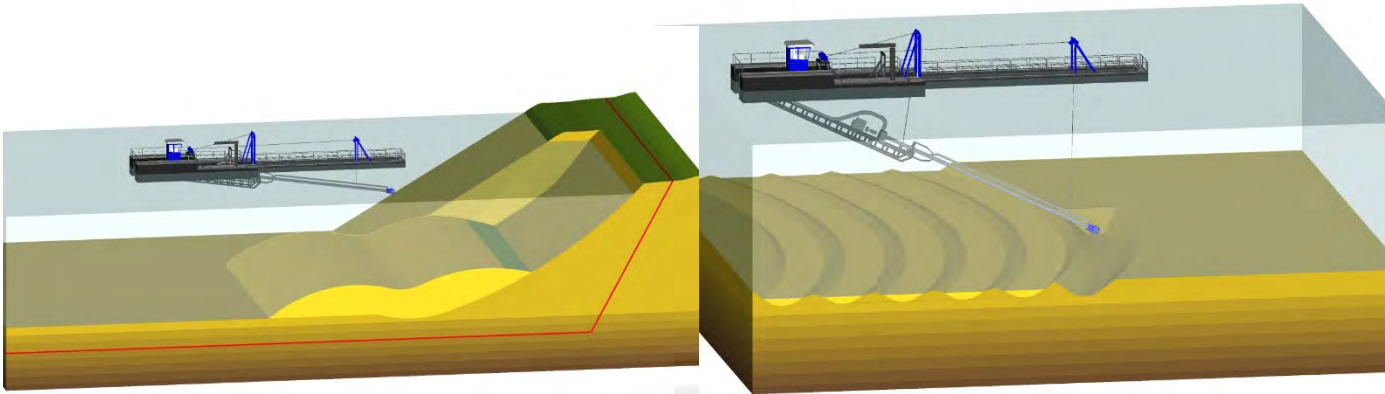
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Dredging losses

- Slope failures, slip back material undetected
- Equipment performance
- Dredging limits not defined – overdredging or underdredging
- Existing data





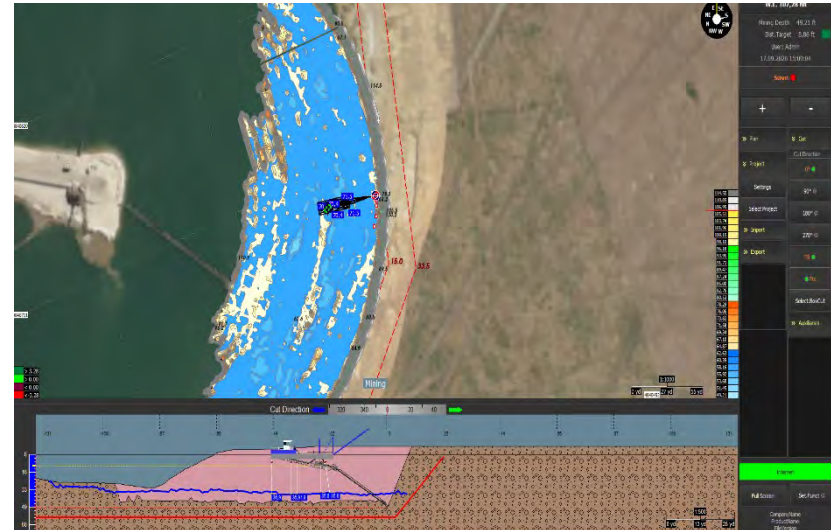
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The MARPO_Dredger software



Purpose

- Dredging can be done systematically within predefined limits and approval guidelines, minimise overdredging
- To avoid exceedance of dredging limits in critical slope areas , minimise slope failures
- Detect slipped back material and can be dredged selectively
- Positions and depths of dredgings are recorded and can be provided for reporting
- Results are visualised on monitor screens as plans and profiles.

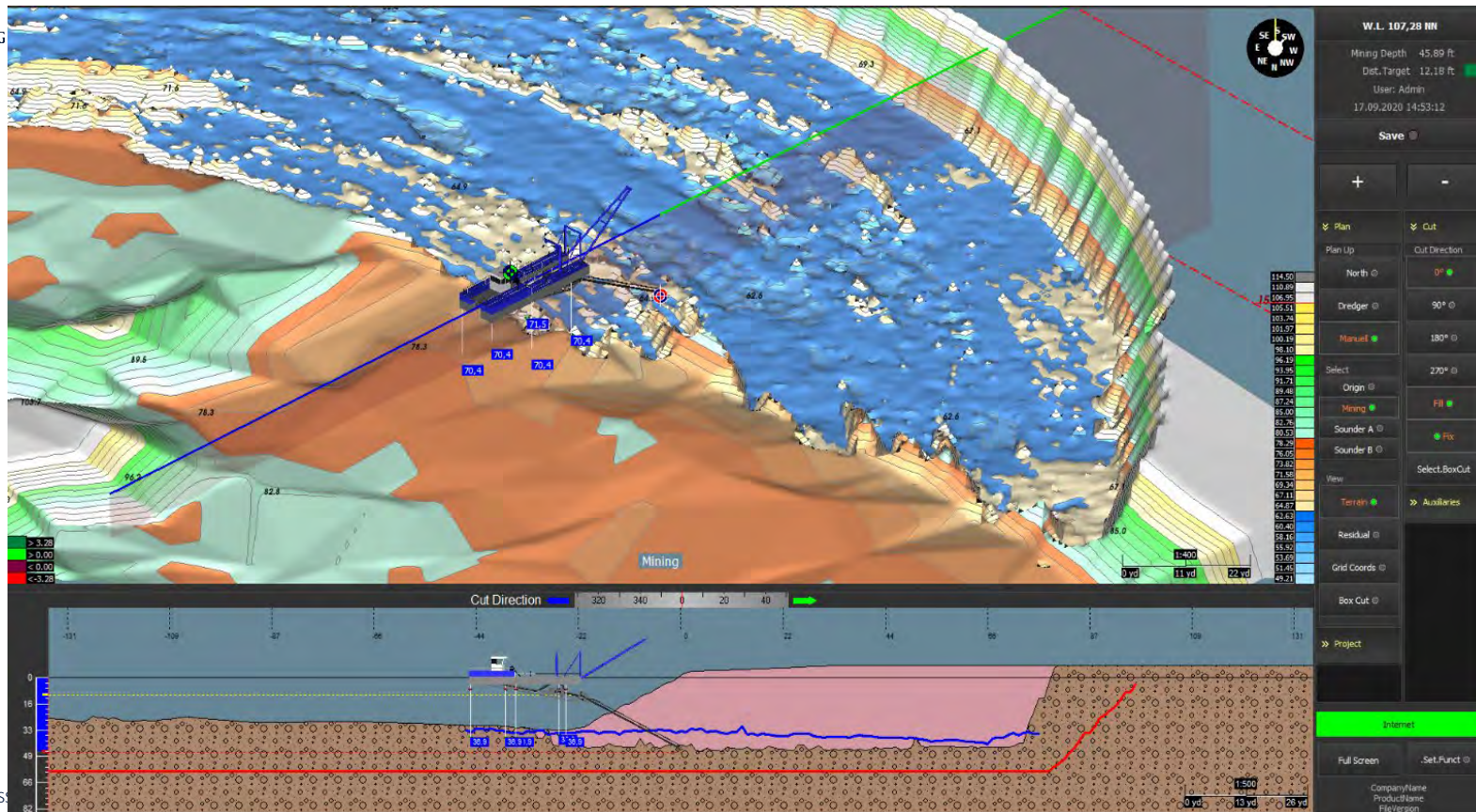




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Eg MARPO_Dredger views

Split view of 2D/3D map, Profile/Section cut and menu.



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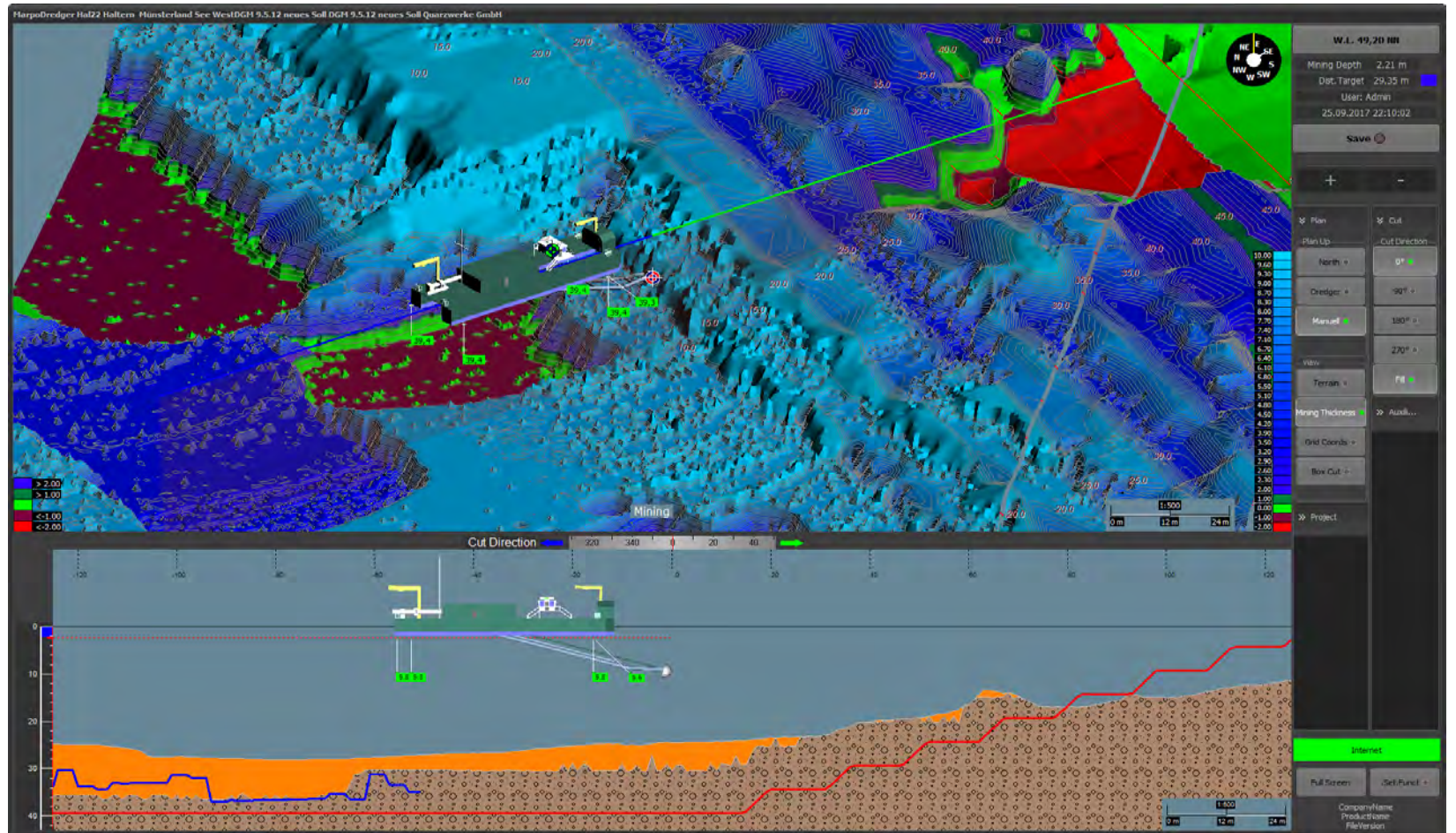
Dredged material can be shown on map

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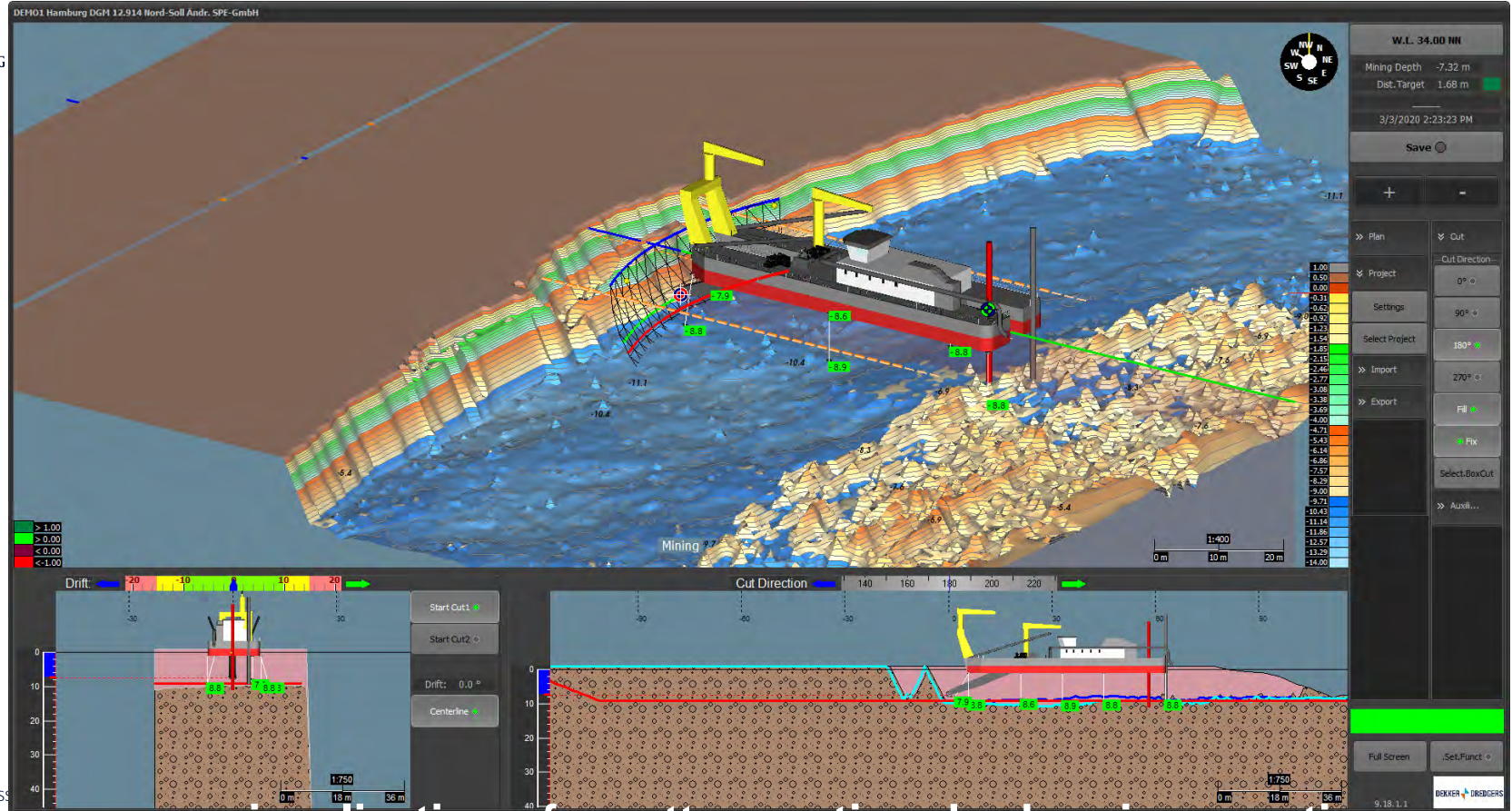
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Cutter Suction Dredger in operation



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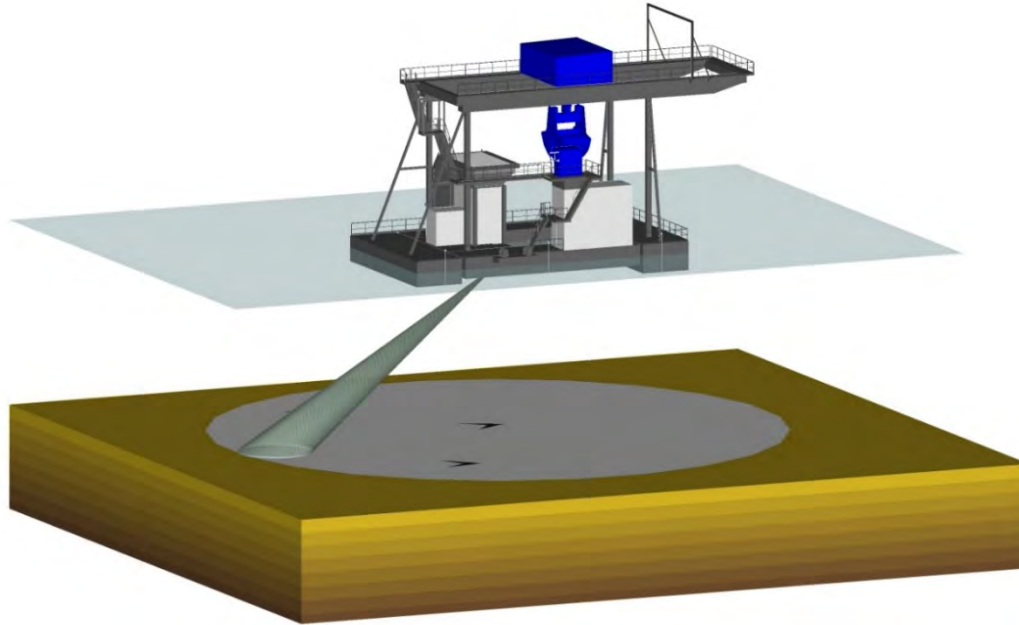
WORLD CLASS



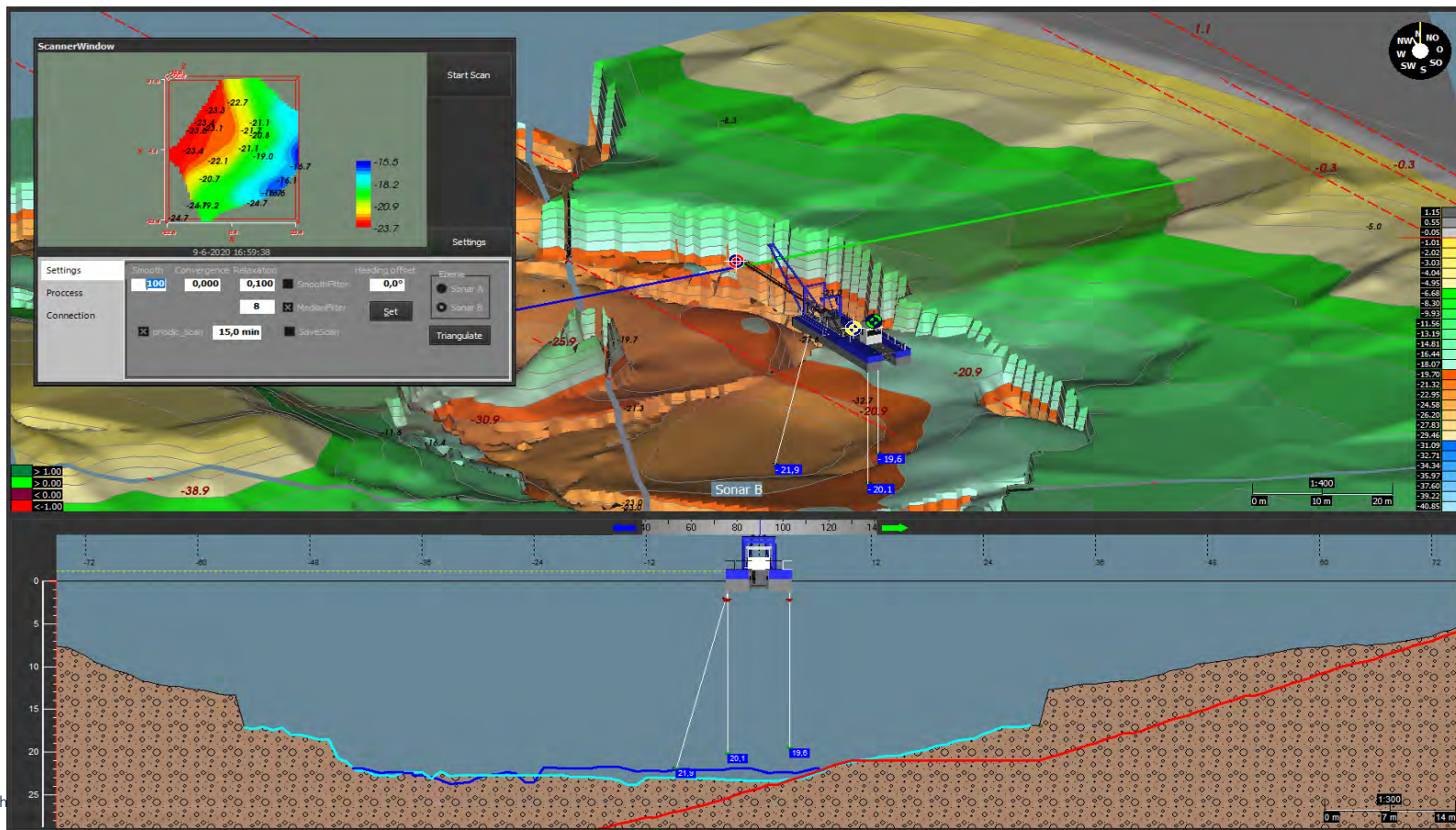
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360° DAS scan

- Scans the bottom of the lake and provides a high-resolution three-dimensional terrain model.



Current Scan Window (top left), Display in 3D + profile cut

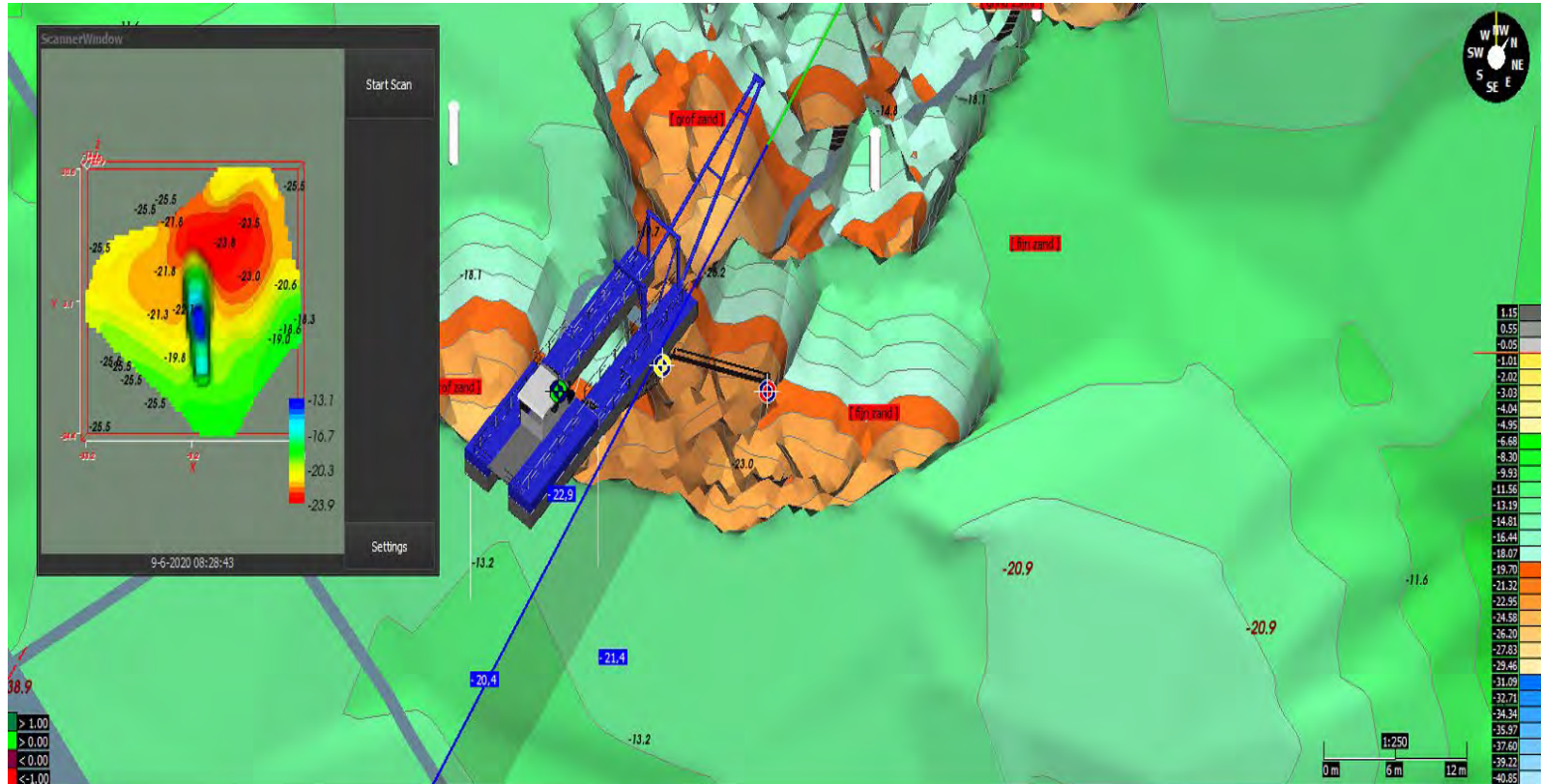




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The 3D map “Mining” is showing the material removed by the loosening tool



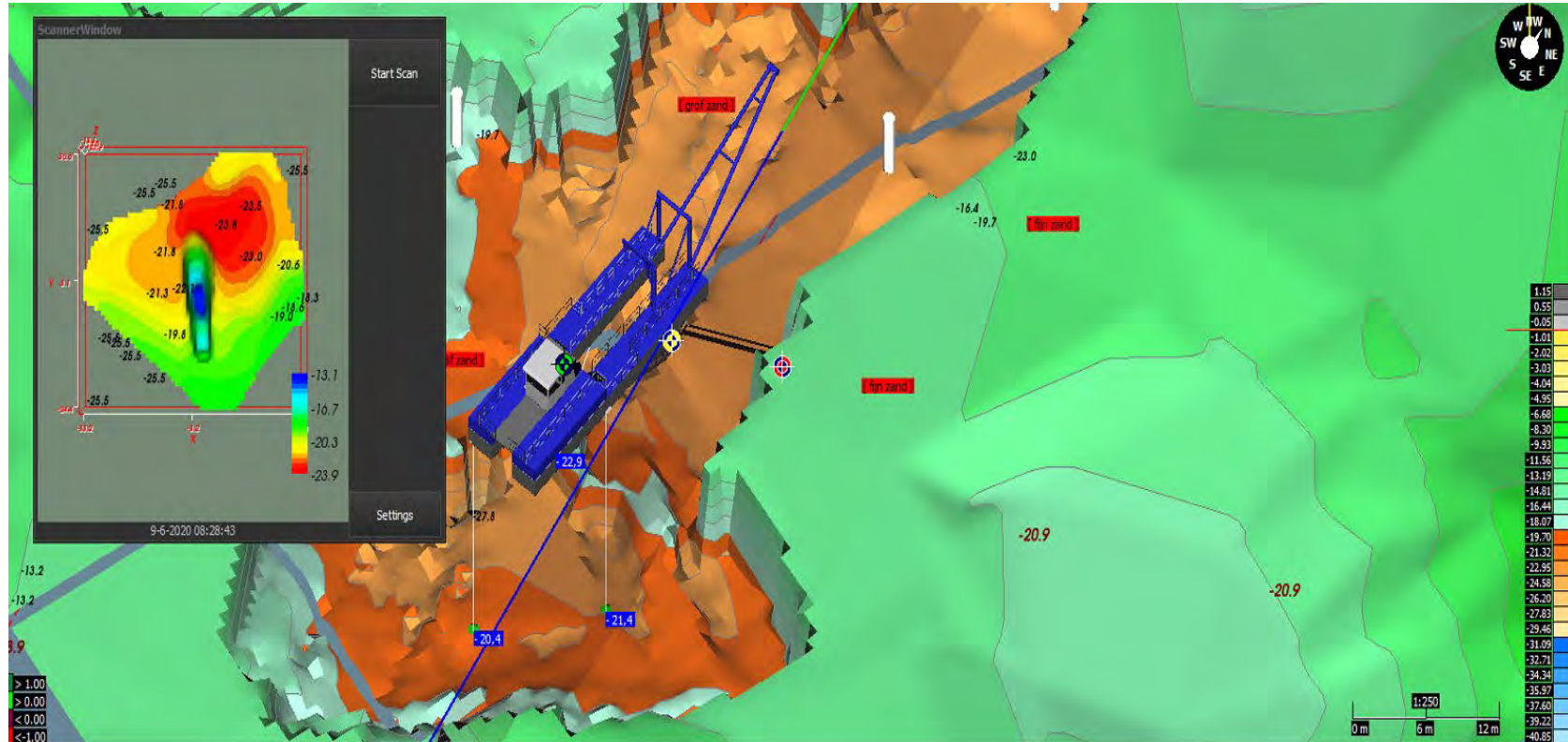


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360° DAS Sonar



“Sonar A” displays the area “seen” by single beam echo sounders



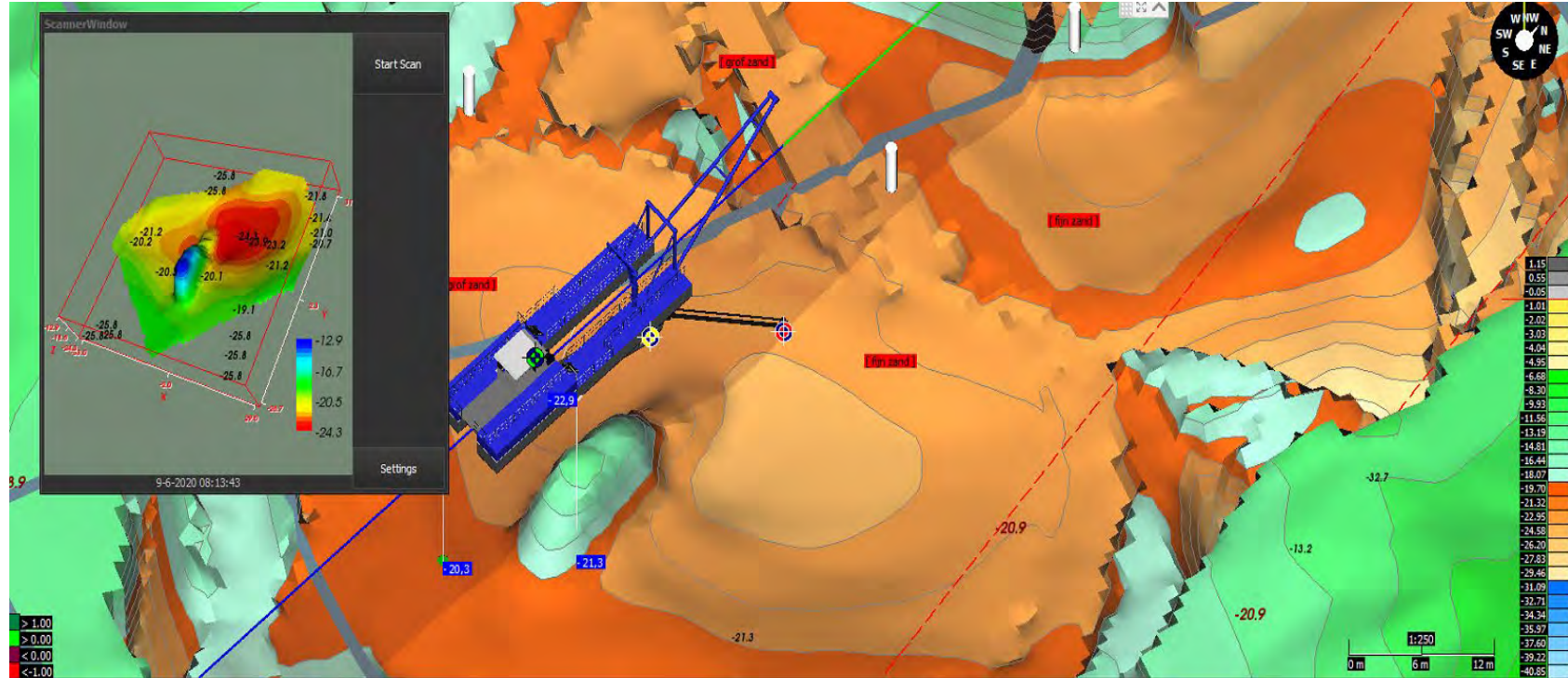


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360° DAS Sonar



Switched to “Sonar B” map reveals the area detected by the 360° DAS sonar



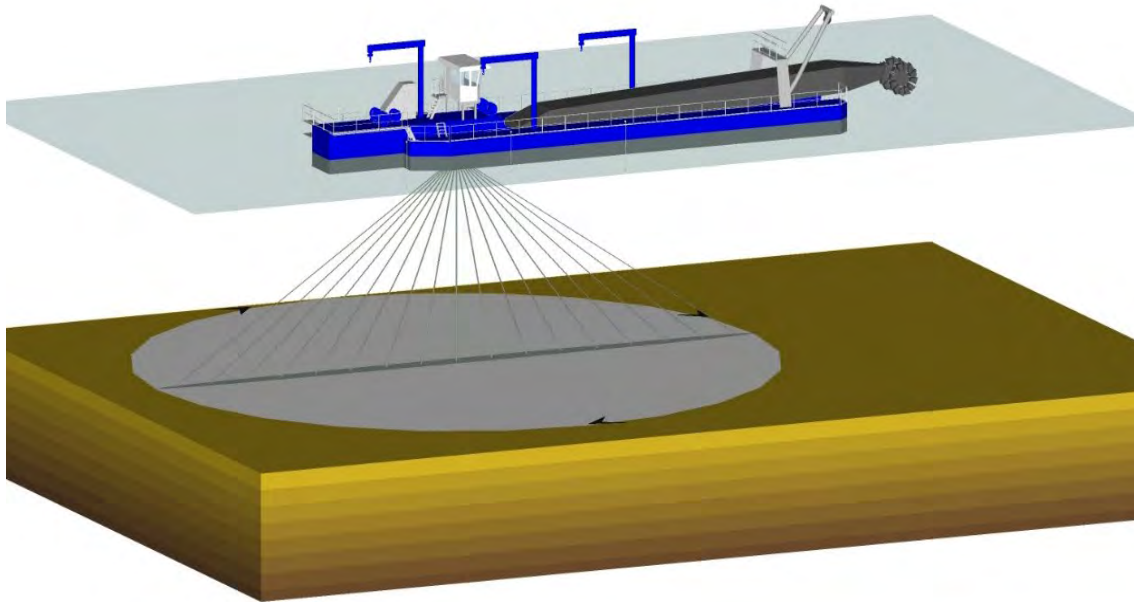


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Multibeam (echo sounder)

Scans the bottom of the lake and provides a high-resolution three-dimensional terrain model.

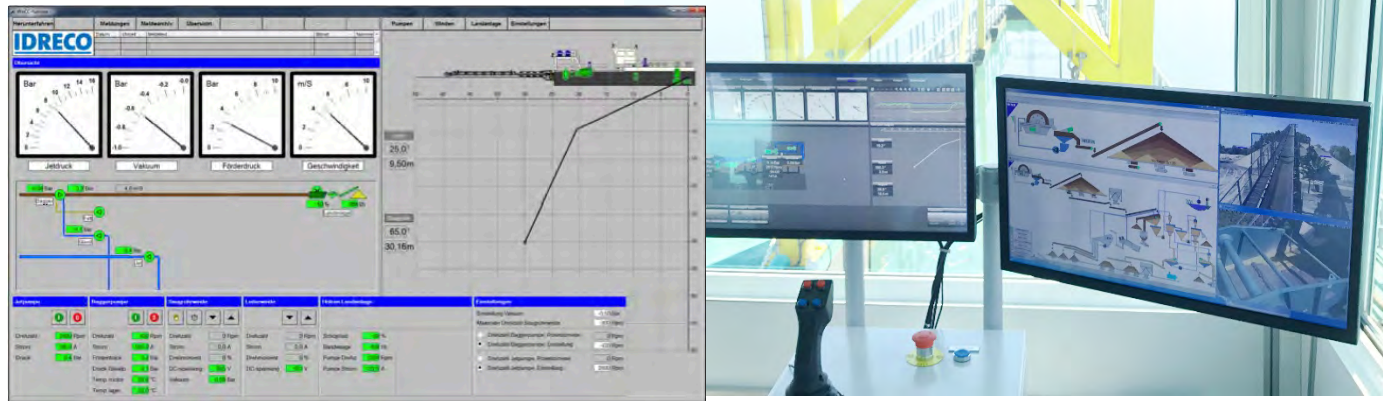




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Visualization of operating states / data and the process chains



Additional options /installations

- Sensors for energy efficiency control or for monitoring density and flow on a suction dredger, etc.
- Video cameras to display strategic points in the process chain.



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Dashboard presentation



Display and storing of operational data

- Current (update rate 10min) and historical view of stored operational data
- Correlation of data to gain additional / new information, like €/t, kWh/a, etc.
- Proof of energy efficiency to authorities by providing stored energy data
- Preventative maintenance alerts to minimize production loss





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Dashboard presentation



Browser based cloud application

- Access to database anytime remotely using a weblink with user account
- Secure transfer and storage of the data by encryption

Access with any desktop or mobile device with internet connection





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SUMMARY

- **3D visualization of dredging boundaries & material for dredging are displayed at any time. Viewing made easy by 3D map or Plan & Profile views**
- **Maps can be switched to display differences (before and during dredging) and allows for real time monitoring of dredging process**
- **Slipped material can be visualized, Avoid re-dredging**
- **Best accuracy – using RTK antennas , 2-10 cm in x,y,z**
- **Intuitive operation – using touch screen monitors**
- **Using the DAS sonar, program to measure customed areas (e.g. avoid measurements when spuds are down or scan selected sector areas to avoid spuds)**



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Additional services by



- Permit/approval planning
- Exploration and soil analysis
- Bathymetrical surveys
- DTM generation/ dredging concept

- Stability calculations
- Dredger optimisation and consulting
- Worldwide installation/commissioning
- Training and instruction

- Service and after-sales service
- Software updates
- Automation
- (Remote) maintenance / repair
- Retrofitting



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Innovative Dredging



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INTELLIGENT | DREDGERS



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Thank you

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