Arab Academy
for Science , Technology and Maritime Transport

MARLOG 13 2024

The International Maritime Transport and Logistics Conference

"MARLOG 13"

Towards Smart Green Blue Infrastructure

3-5 March 2024 - Alexandria, Egypt

Dr. Hisham Elsafti

Senior Consultant
Ports & Terminals
DHI Group

NCOS ONLINE and the Future of Port Operations: Insights from The Digital Integration at The Port of Hamburg, Germany

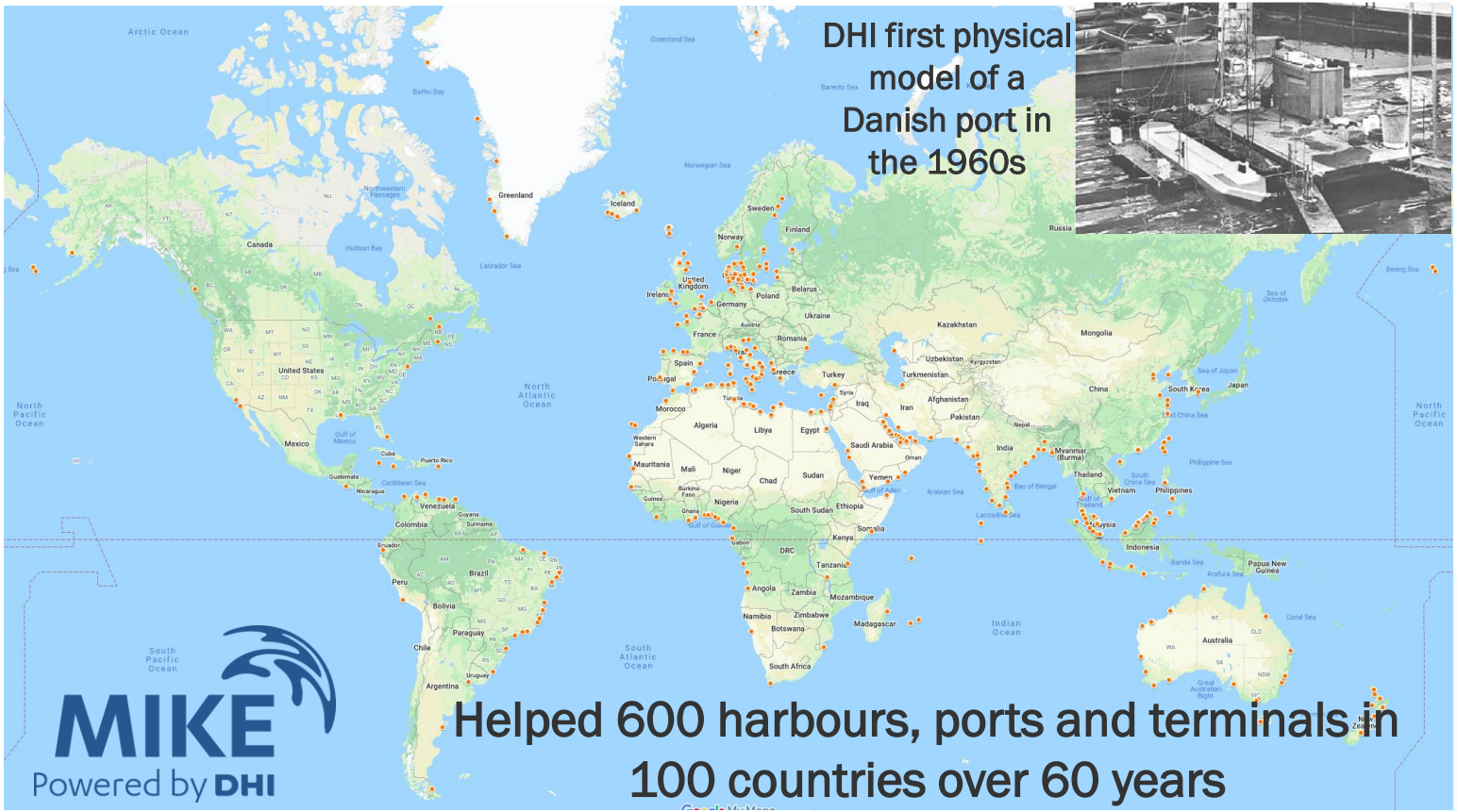
Hisham Elsafti, Stefan Leschka, Prema S. Bhautoo, and Christian Heitmann

Outline

- DHI at a glance
- NCOS ONLINE port operating system from DHI
- Digital support/advisory to modern ports & terminals
- Dynamic Mooring Analysis (DMA)
- Mooring Program for The Port of Hamburg
- Concluding remarks

DHI at a Glance

DHI at a glance



Our services

Consulting

- Engineering consultancy and advisory services (e.g., consultant to the HPA)
- Efficient and goal-oriented numerical and physical modelling, remote sensing, field surveys/monitoring
- Participation/leading research projects

Software

- World leader in providing integrated numerical modelling software for engineering in water environments
- Providing professional support and training tailored to your projects

MIKE Powered by DHI

THE ACADEMY by DHI

Operational platforms

- Digital twin of your facility/asset running 24/7 and on demand
- Intuitive and customer-specific user interface
- Professional training
- 24/7 professional support

HCOS ONLINE

DHI Profile

- Fields of services:
  - Ports & Terminals
  - Coast & marine
  - Energy: e.g., offshore wind, wave, etc.
  - Climate change
  - Aquaculture & agriculture
  - Surface & groundwater
  - Urban water
  - Environment & ecosystems
  - Ballast water
  - Product safety & environmental risk

- Present in more than 29 countries worldwide
- Non-for-profit: we reinvest in R&D
- DHI is:
  - Collaborating Centre for the World Health Organisation (WHO) and the United Nations Environmental Programme (UNEP).
  - An Advisory Centre for the Global Water Partnership (GWP).

NCOS ONLINE port operating system from DHI

NCOS ONLINE

Climate Change Mitigation
High Accuracy Weather Forecast
Safe Vessel Transit Scheduling
Capital & Maintenance Dredging
Maneuverability & Towage
Safety and Efficiency at Berth
Safety and Efficiency of the Yard
The Worlds Most Accurate Science Based Decision Support System For Ports
NCOS ONLINE
SeaportOPX
DHI

Planning & Operational modes

Strategic Planning (One-Off)

- Input design vessel and select berth configuration
- Specify design environmental conditions (waves, winds, tides)
- One-off mooring assessments
- Specify operational thresholds

Operational Mode (24/7 Planning & Ops System)

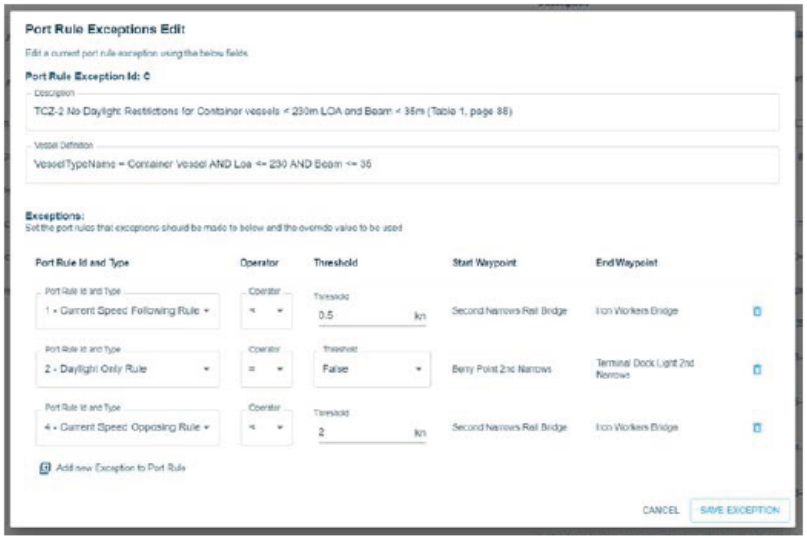
- Input berth plan for inbound vessel
- Environmental conditions from 7-day forecast
- Issue mooring advisory to vessel master
- Update actual mooring configurations
- Issue warnings if required

Digital support/advisory to modern ports & terminals

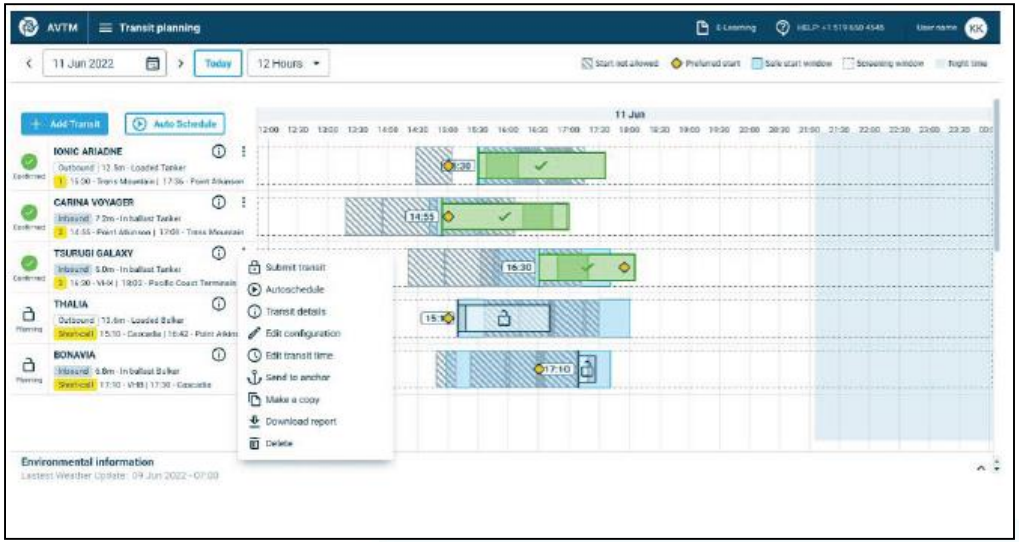
(Selected Cases)

Port Traffic Scheduling

Port of Vancouver, Canada



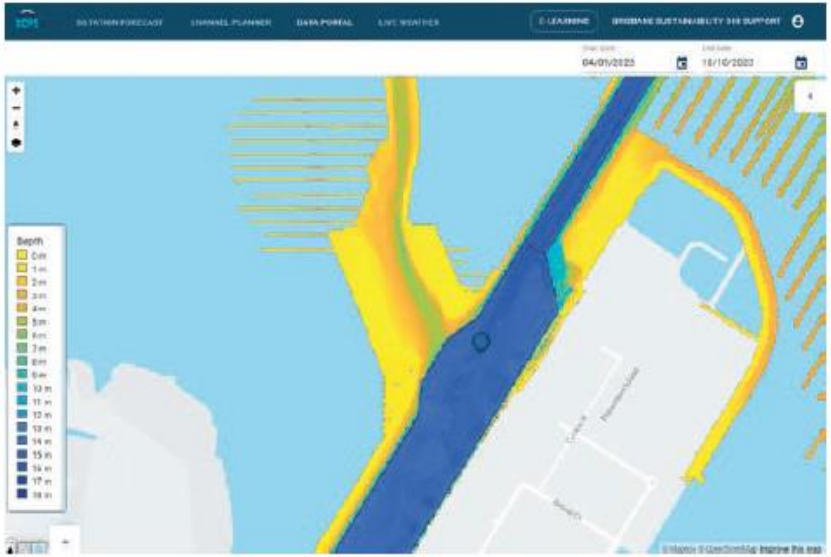
Digital Port Rule Management



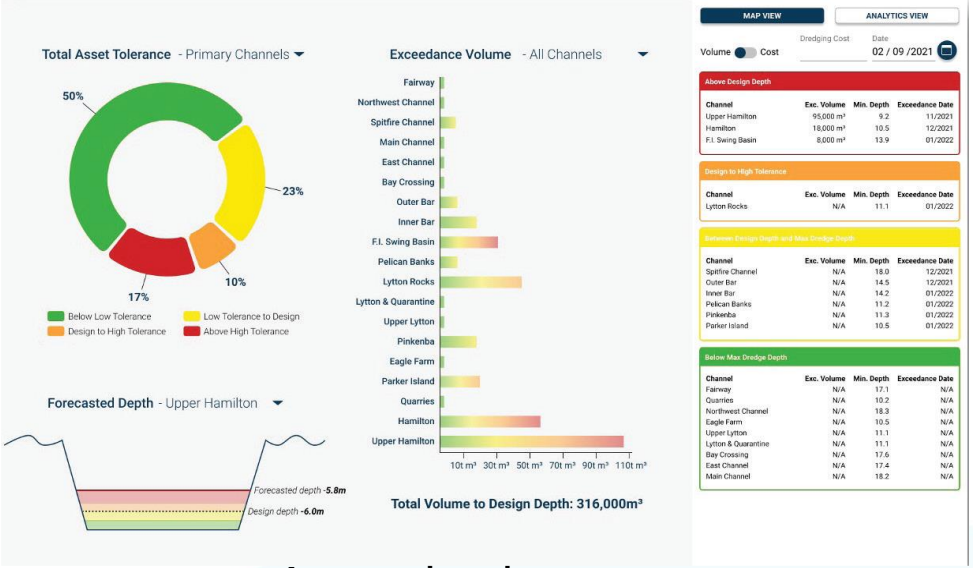
Integrated Scheduling Environment

Larger Vessels & Optimize Dredging

Port of Brisbane, Australia



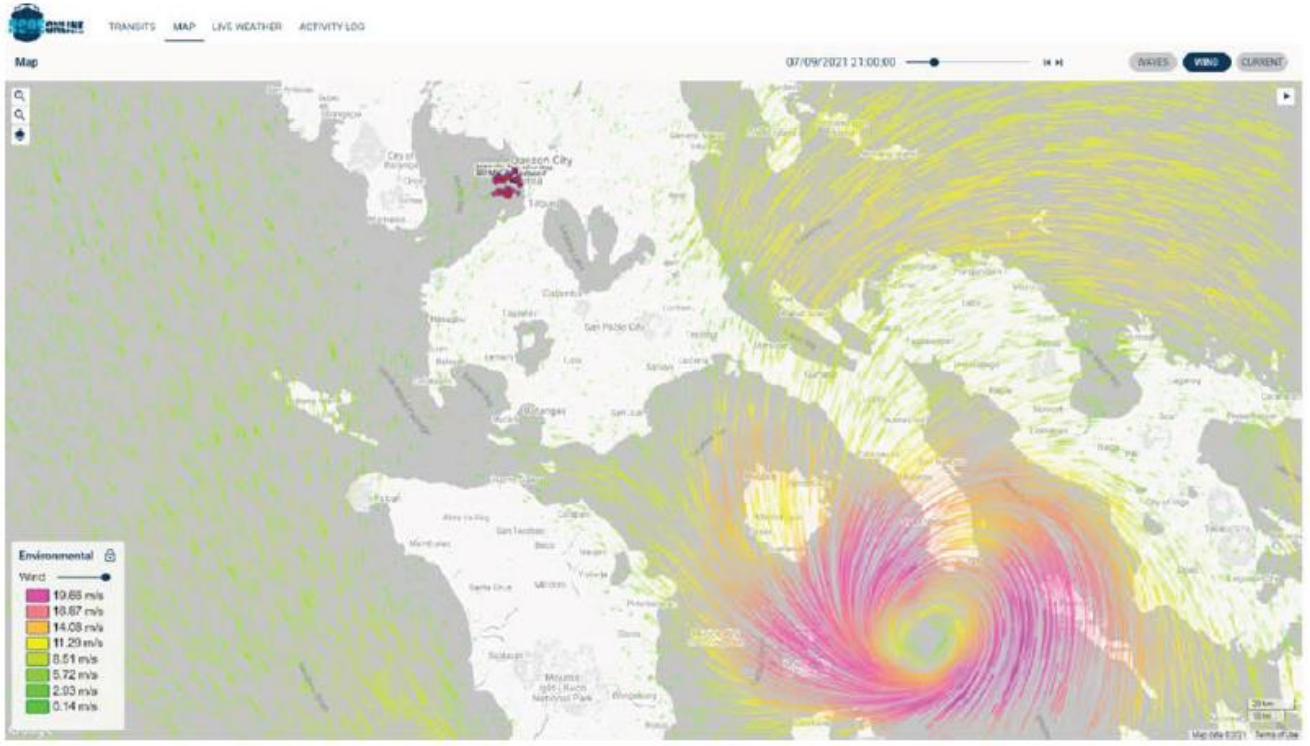
Instantaneous water depth



Asset depth manager

Safe Navigation & Weather Warning

Manila International Container Terminal (MICT) in the Philippines

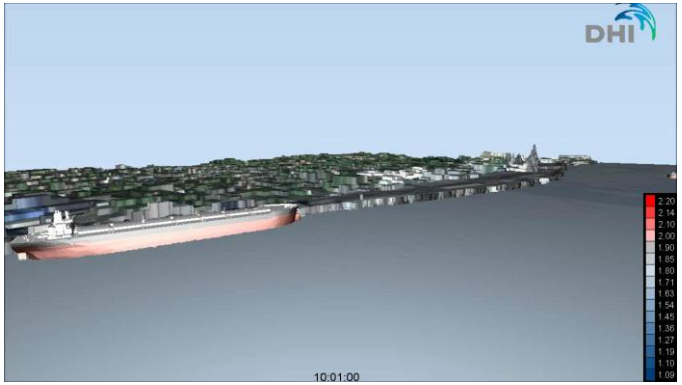


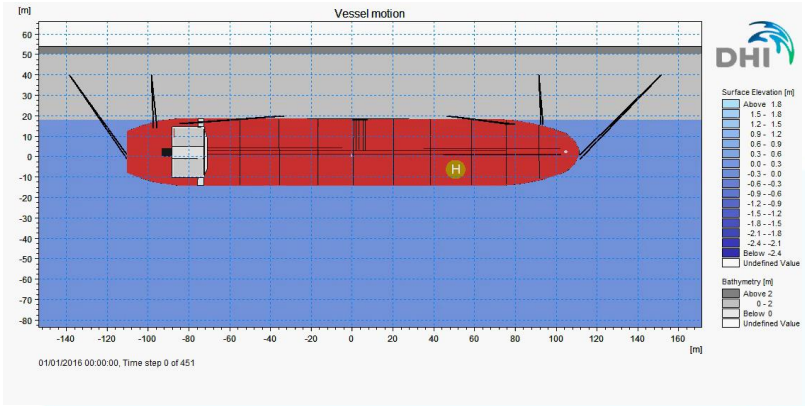
A typhoon weather system as viewed on NCOS dashboard

Dynamic Mooring Analysis (DMA)

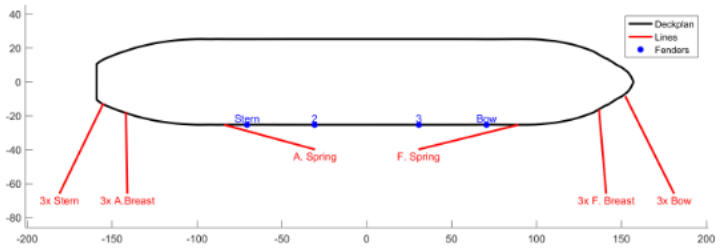
MIKE21 MA

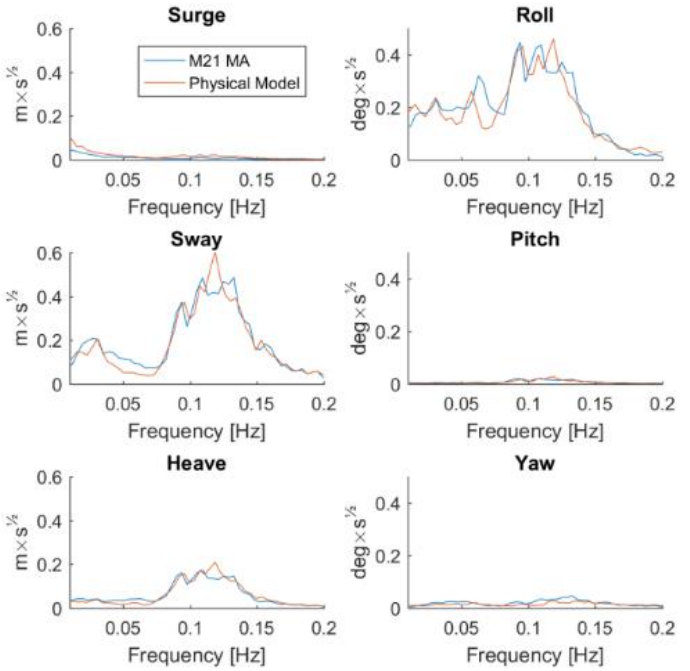
- Part of the MIKE software suite
- 3D vessel-water interaction and 6-DoF dynamic ship response
- Coupled with other MIKE models for accurate site-specific loading: wind, wave and currents
- Accurate definition of mooring elements
- Assess safety of mooring system under extreme conditions
- Define limits of permissible operational conditions





Validation of MIKE21 MA



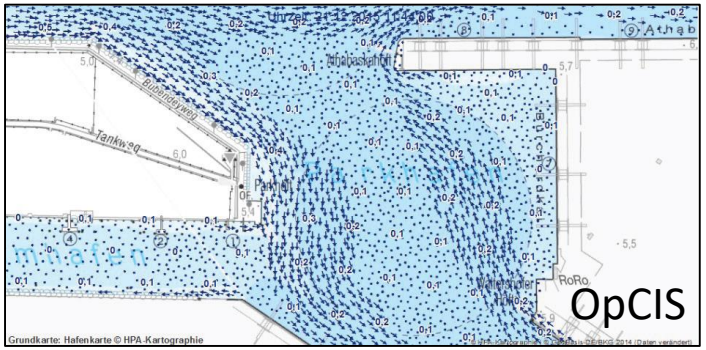


Harkin, A., Mortensen, S.B., Dixen, M. "Validation of Moored Vessel Response Simulator with Physical Model Comparisons." *Coasts & Ports Conference* – Cairns, Australia, 21-23 June 2017

Mooring Program for The Port of Hamburg

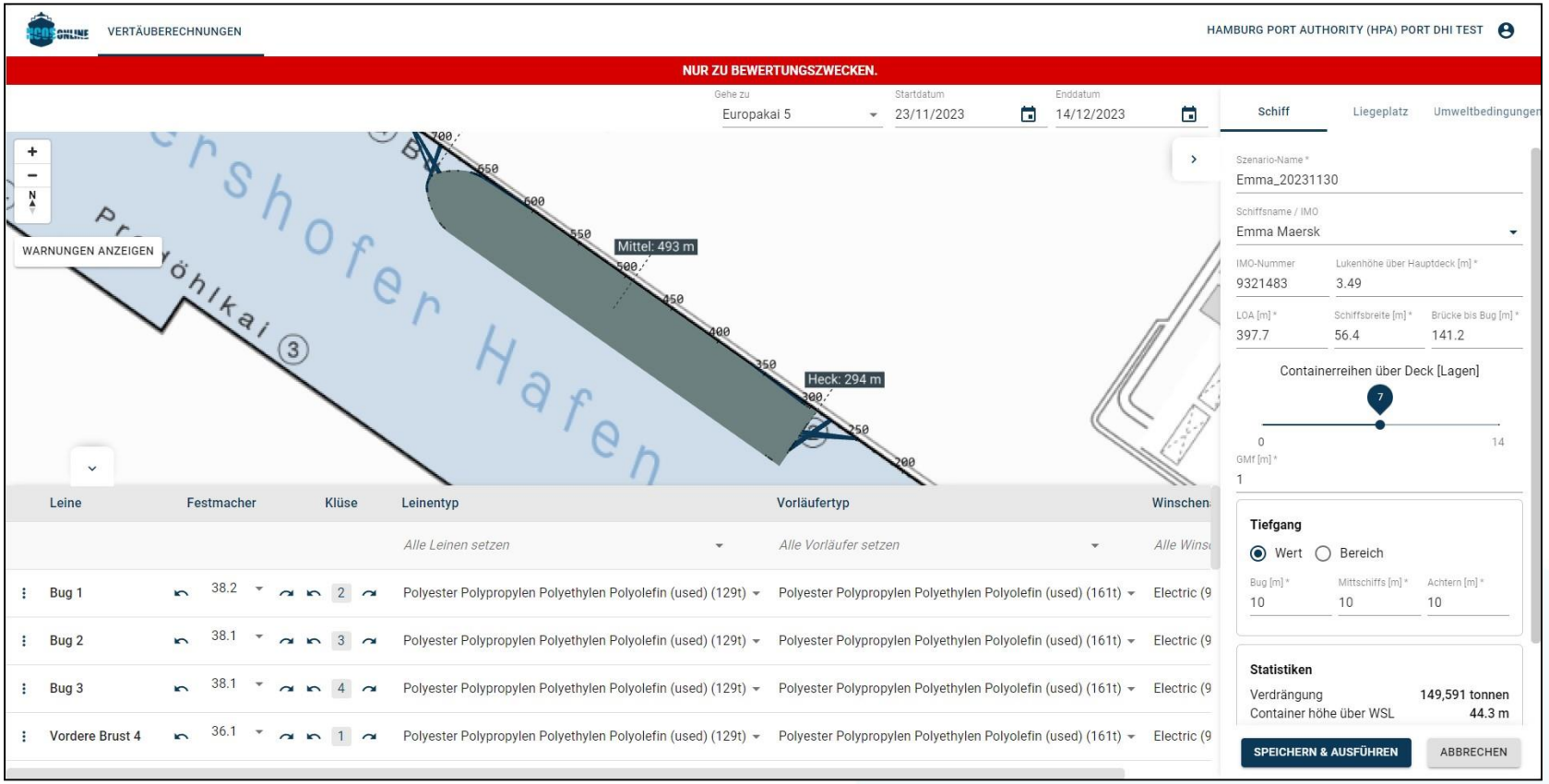
NCOS ONLINE for Hamburg

- Challenges:
  - Development of shipping vessels
  - State of port infrastructure
  - Climate change



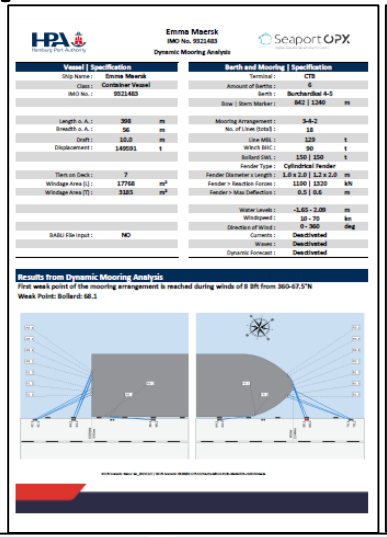
- Operational Current Information System for The Port of Hamburg (OpCIS), 2016
- Adoption of MIKE21 MA exclusively for DMA in the Port of Hamburg, 2017
- NCOS ONLINE MA module: the Mooring Program for the Port of Hamburg (VfHH), 2018

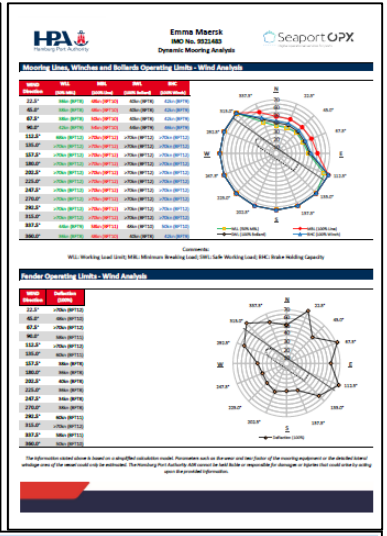
Dashboard for VfHH

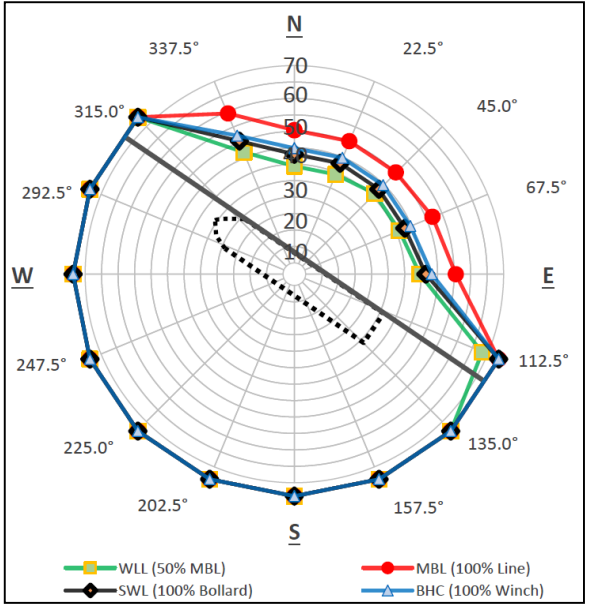


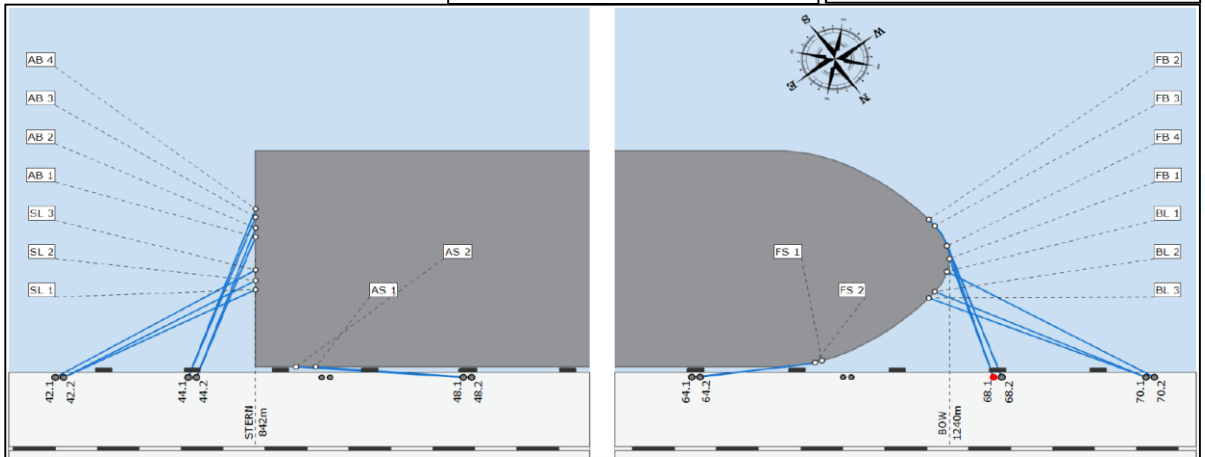
NCOS Report

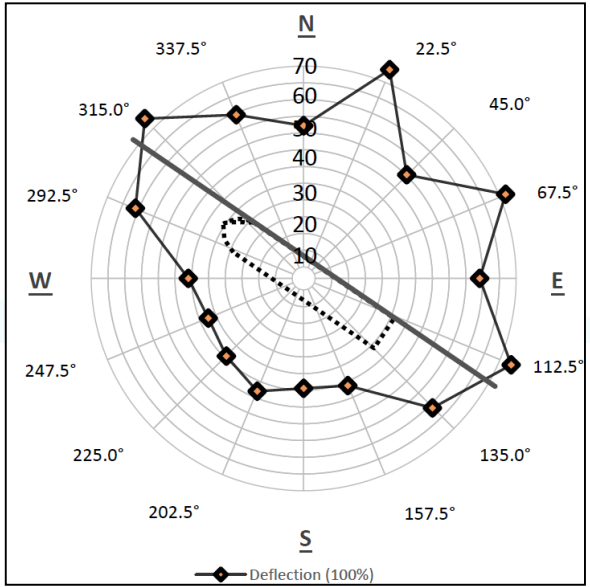
Effortless reporting: streamlined DMA results delivered automatically to Captains











Concluding Remarks

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- NCOS ONLINE is an award-wining operational platform for port operations from DHI
- It assists ports/canals/terminals to increase safety, reduce/manage risks and increase capacity: service larger vessels with minimal/without extra dredging
- Acts as a virtual environment to test new developments and increase efficacy of investments
- We work together with the port/canal authorities and terminal operators to develop the most efficient solution for their needs

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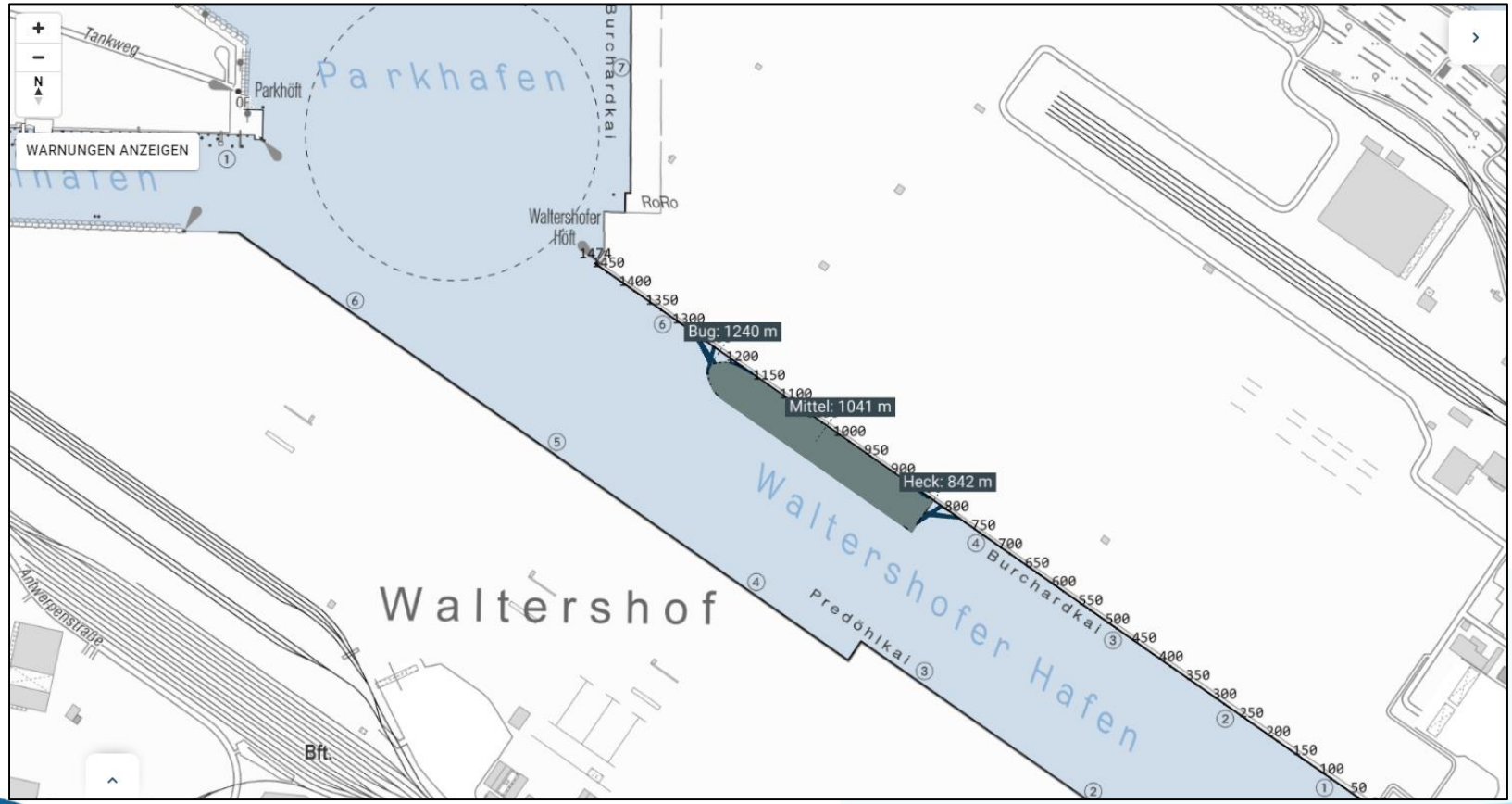
hels@dhigroup.com

Thank You

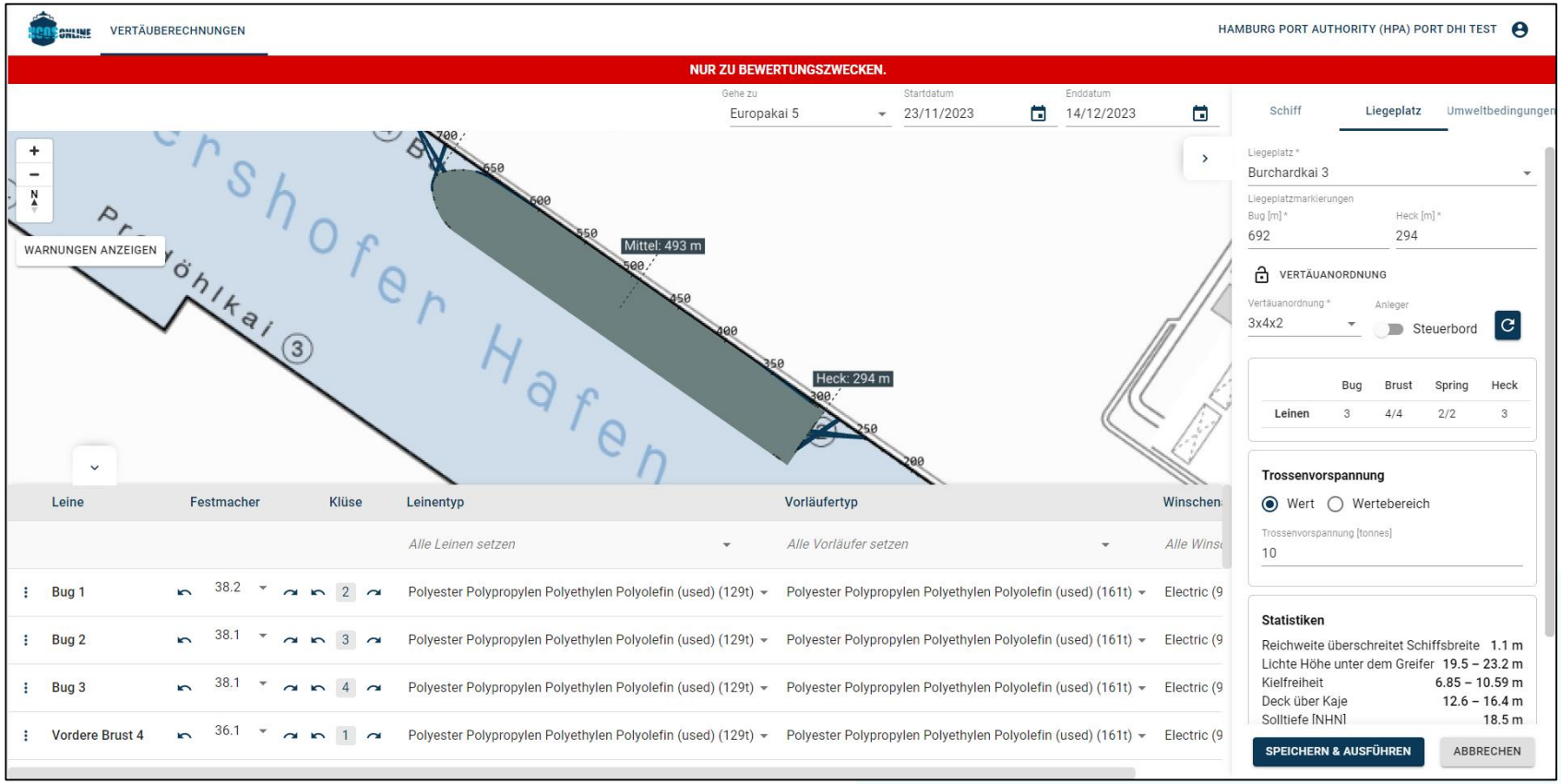
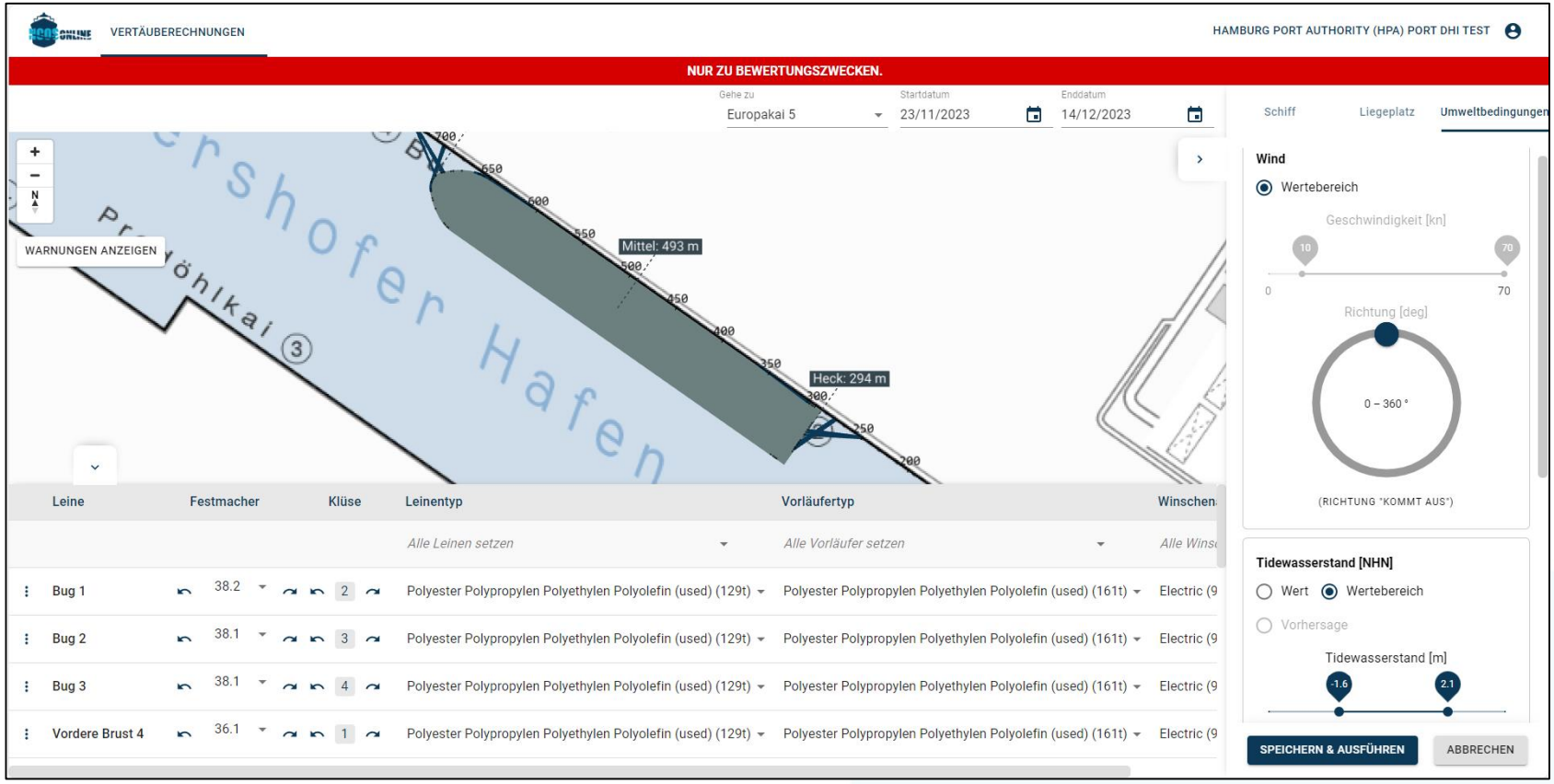
DHI
The expert in WATER ENVIRONMENTS

NCOS ONLINE

GIS system of the Port



Selection of Mooring Arrangements



Selection of Loading Conditions