NAV08

Wednesday 29th October 2008

Session 9A
Marine Navigation –
Evolving techniques and technology

POADSS

POADSS – latest concept of a PPU

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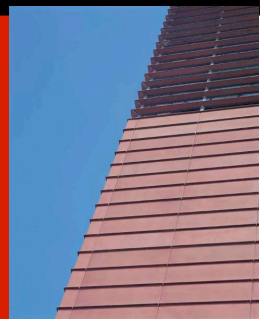


A new concept of a Portable Pilot Unit (PPU)

POADSS

Portable **O**perational **A**pproach and **D**ecision **S**upport **S**ystem

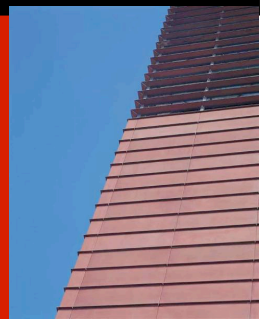
(**POADSS**)

Stages of the project

1. State of the Art PPU's
2. Definition of User Requirements
3. Development of a POADSS
4. Testing
5. End Result/Report

POADSS

MarNIS – Sixth Framework Programme



Evolution of PPU's

Current PPU's–

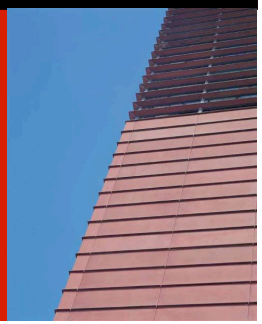
Laptop, Chart Software + GPS = real time position!
+ DGPS = better accuracy
+ RTK = centimetric accuracy (2D - horizontally)
+ AIS = decision support

MarNIS PPU's -

Vertical position - (3D)
Integrate an IMU – dynamic motions - roll, pitch, heave
Broadband – real time info - tide, weather, traffic, WMS
High density bathymetric data – up to date detailed info
Dynamic Under Keel Clearance software (DUKC)

= POADSS

POADSS



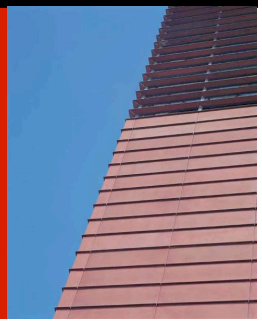
POADSS

In the next decade an increase in traffic is expected in European Ports, which will result in:

- complex traffic patterns within ports, fairways and their approaches
- ever larger ships using the same infrastructure

These expectations require the latest information technology aboard and ashore to improve:

- the overall safety and efficiency of all vessel movements
- better decision support (both ways between the ship and shore)



Objectives

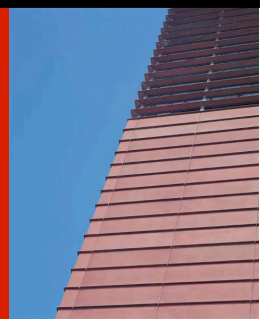
- Make better use of the fairway

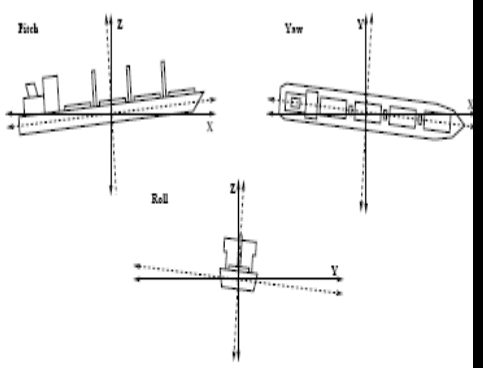
- Engage the Bridge team with the Dynamic Passage Plan, as well as the VTM

- As well as a Dynamic Passage Plan, also with real time data.

The MarNIS project has addressed these challenges through the development of the POADSS.

POADSS

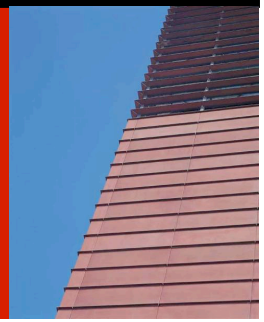




POADSS

- Integration of an Inertial Measurement Unit (IMU) with Global Navigation Satellite Systems (GNSS) to determine all dynamic movement of the vessel
- Wireless broadband to exchange information in real time (WMS)
- Presentation of dynamic high density bathymetric data displayed on an electronic chart (dynamic safety contour)
- Dynamic Under Keel Clearance (DUKC) (actual and predicted UKC)

New Applications



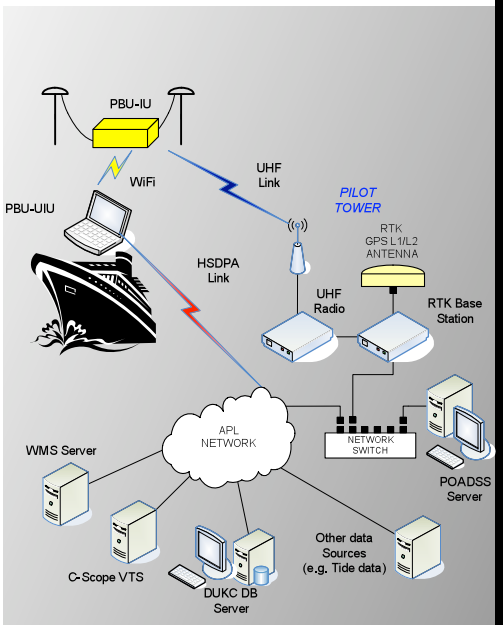
Architecture of POADSS system

- <u>onboard unit</u> – onboard data collection and the User Interface functionalities for the pilot, consisting of :
  - instrument unit (IU)
  - user interface unit (UIU) (laptop)

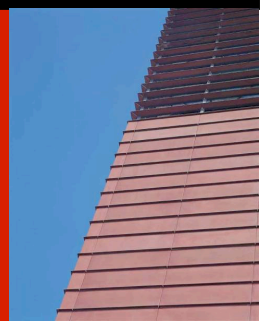
- <u>communication network</u>
  - wireless networks
    - UHF radio band (RTK correction signal)
    - HSDPA (commercial broadband)
    - WiFi (between laptop and Instrument Unit)

- <u>shore server</u> – provides the centralised data base and information channel management functions

- <u>shore front-end</u> – UIU functionalities for the management of the system acting as client of the server



POADSS



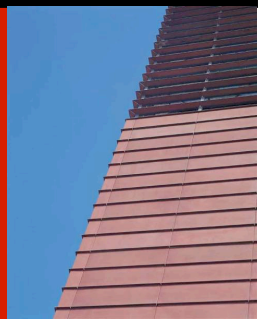
POADSS onboard unit

- **<u>instrument unit</u> (IU)**
  integrated GPS receiver/ inertial measurement unit
  (Coda Octopus F185+ with NovAtel antennae)
  RTK receiver, AIS receiver
  Motherboard, battery pack

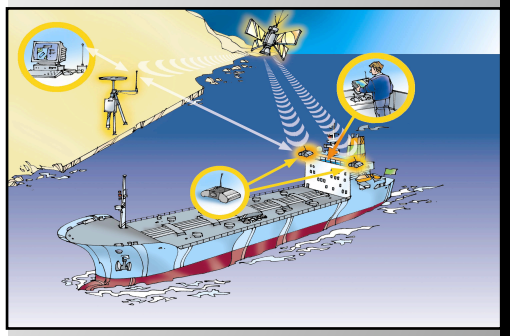
- **<u>user interface unit</u> (UIU) - (Laptop)**
  compaq 2710 P
  windows XP
  dedicated POADSS software

- **connection between IU and the UIU by LAN (WiFi)**
- **onboard unit has battery capacity for 6 hours and a connecton for an external power supply**

POADSS

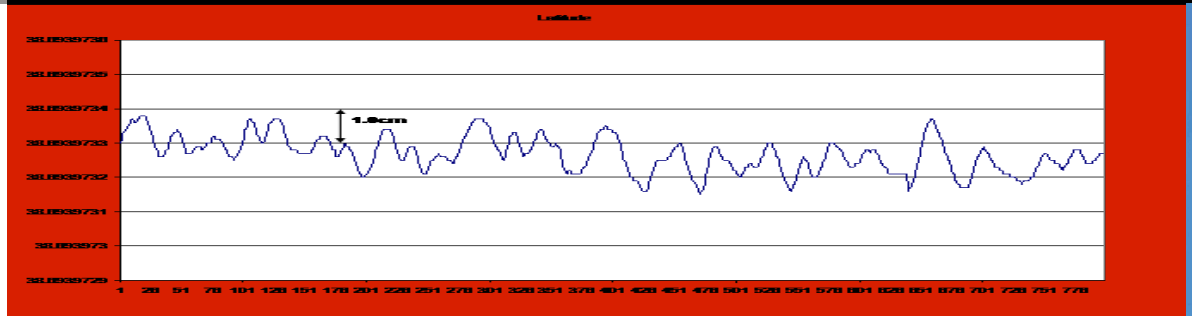


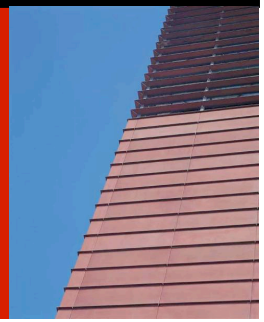
Accuracy



position:	50 cm horizontal stand alone (EGNOS) 2 cm horizontal (RTK) 5 cm vertical (RTK)
speed:	0.03 cm/s
roll/pitch:	< 0.025 deg
Heading:	0.025 deg (antenna distance 4m apart)
heave:	< 5 cm

POADSS

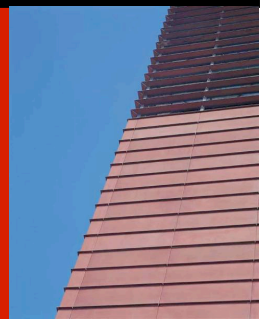




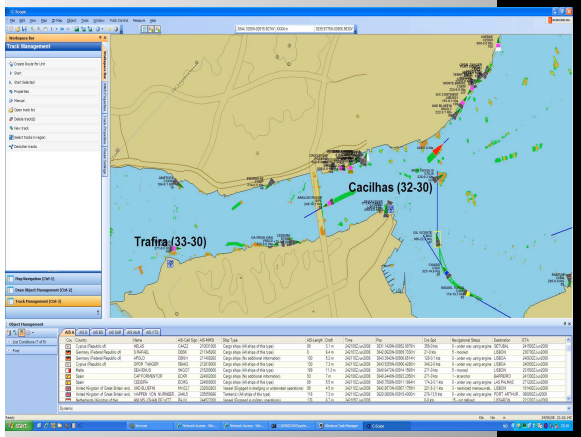
POADSS software modes

1. information mode
2. planning mode
3. navigation mode
4. docking mode

POADSS



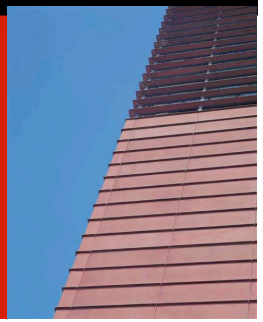
Web Map Services (WMS)



1. Tactical Traffic Image from VTS (AIS, Pseudo AIS/ Radar tracks, Radar video)
2. Wind - direction and speed
3. Current - direction and speed
4. Wave - significant height, direction and period
5. Meteorological/hydrographical warnings
6. Berth/Terminal information
7. Temporary/restricted/closed areas etc.

WMS

New Applications



Selected Standards

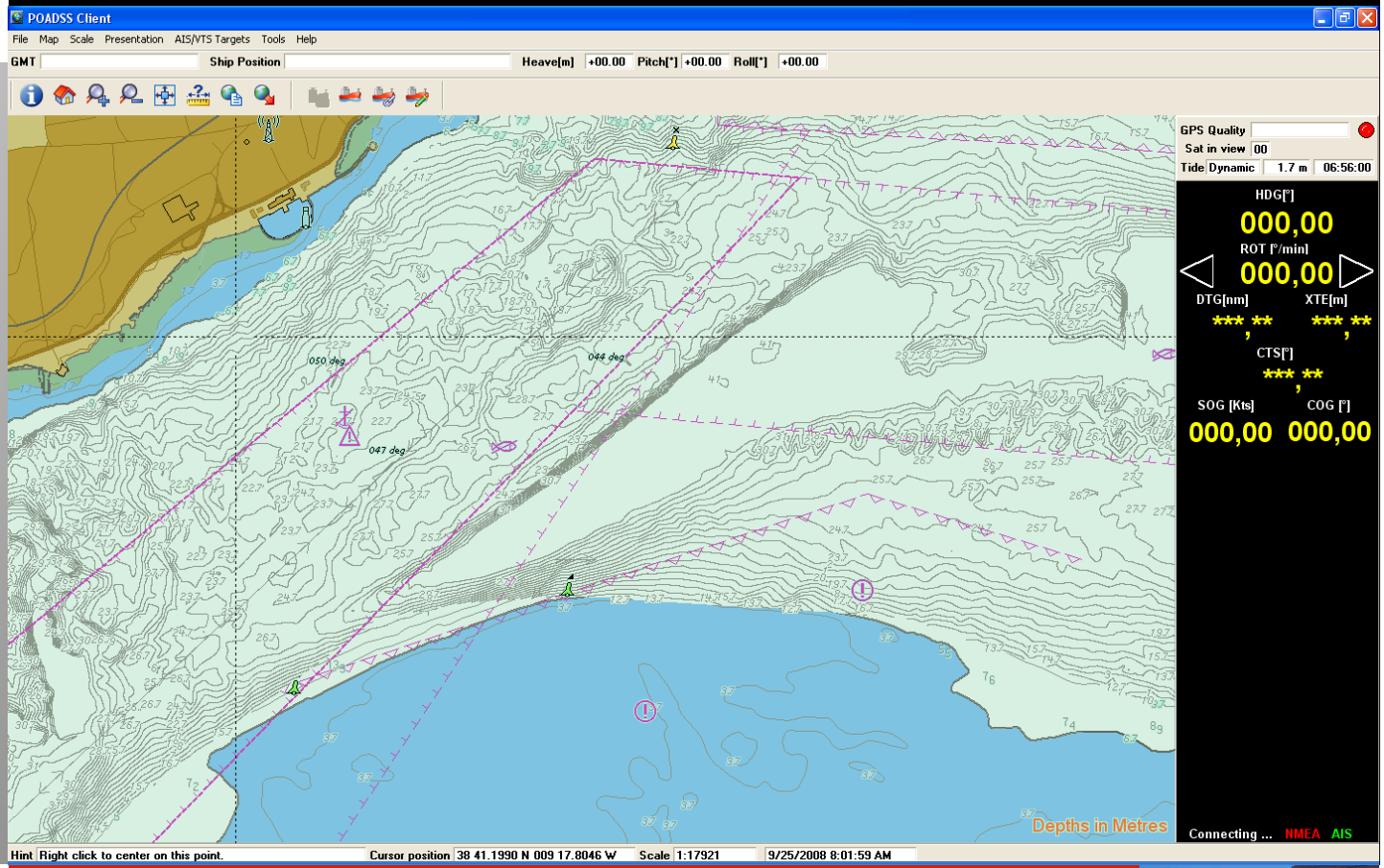
WMS – Web Map Service

- Widely used in the world of GIS – Geographical Information Systems
- Established by OGC – Open Geospatial Consortium
- Consists of 3 requests/responses: GetCapabilities, GetMap and GetFeatureInfo
- Based on HTTP, i.e. the World Wide Web protocol

WMS

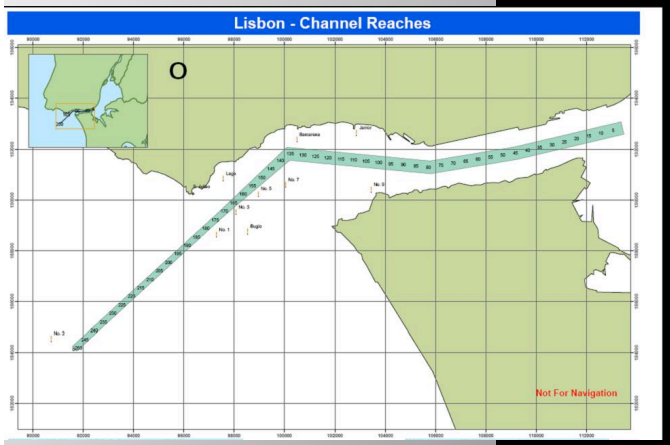
Sharing VTS Information

High Density Charts

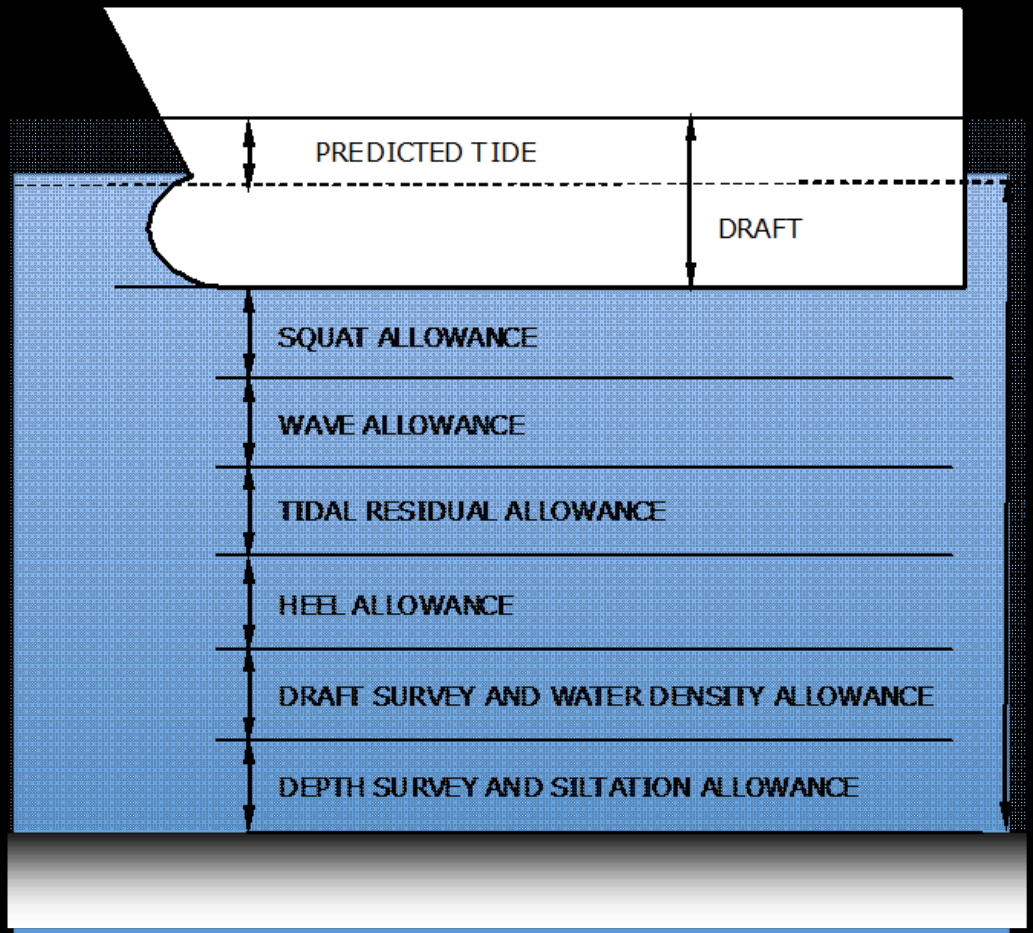


POADSS

Dynamic Charts with Tide input


Lisbon - Channel Reaches
Not For Navigation

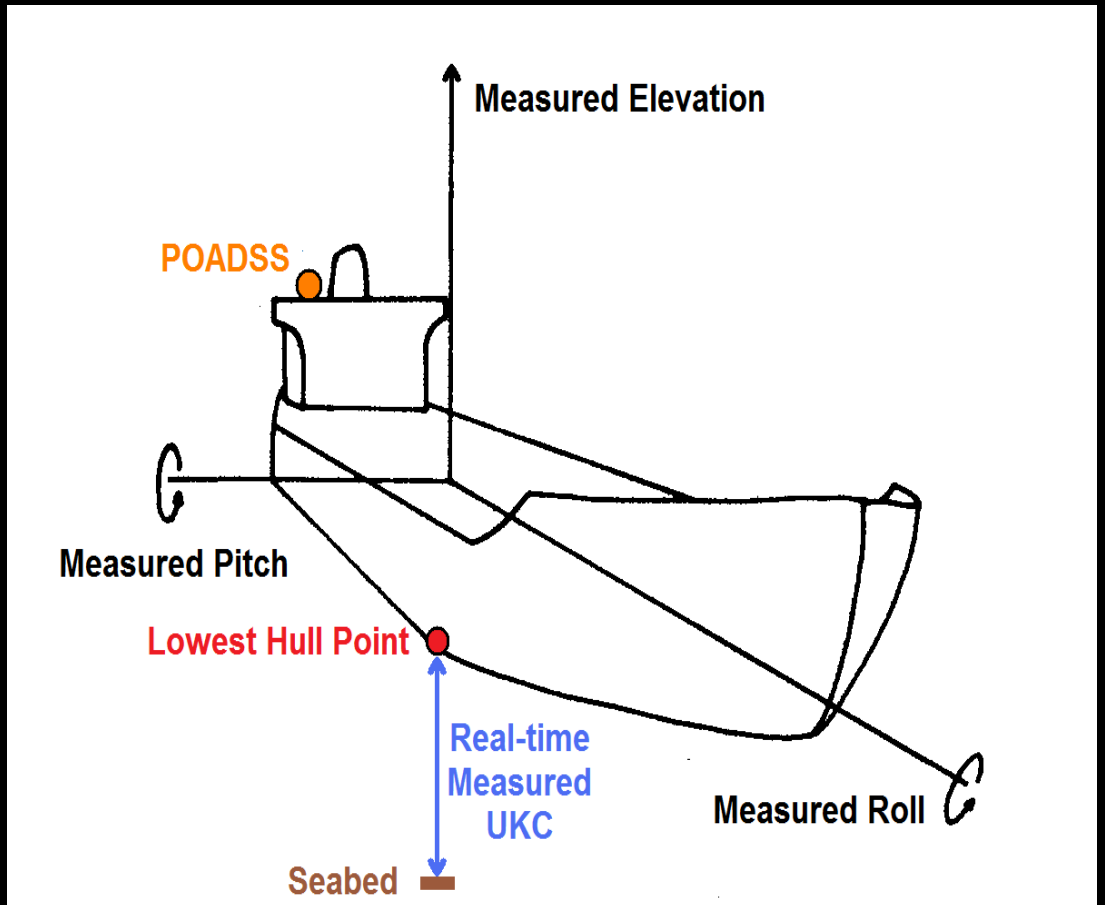
DUKC

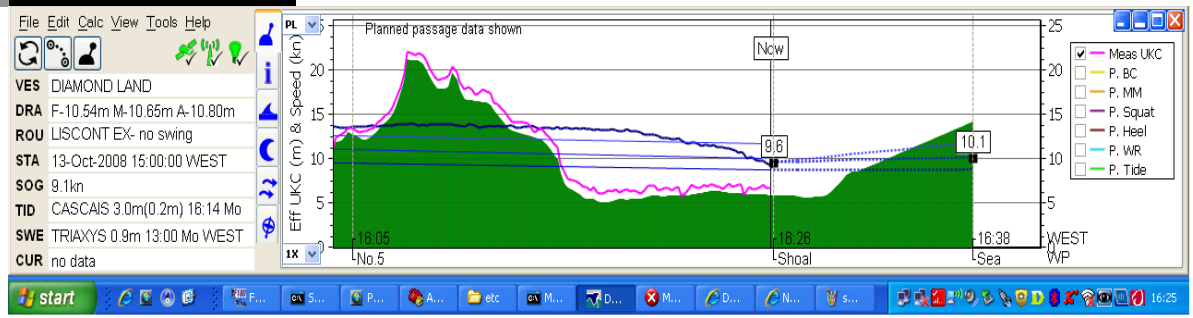

PREDICTED TIDE
DRAFT
SQUAT ALLOWANCE
WAVE ALLOWANCE
TIDAL RESIDUAL ALLOWANCE
HEEL ALLOWANCE
DRAFT SURVEY AND WATER DENSITY ALLOWANCE
DEPTH SURVEY AND SILTATION ALLOWANCE

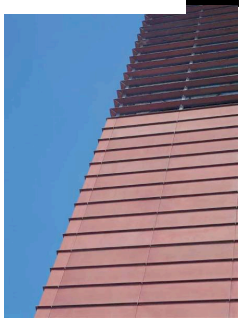

DUKC PPU
Vessel Passage View Calculate Reports Tools Help Exit
zoom 1X
Ship CHLOE
Draft F-12.00m M-12.00m A-12.00m
Trans FIC to B16 (LOWER)
Start 17-Feb-2006 09:05:00 AEDT
SOG 10.1kn
Tide 4.1m/0.06m 09:00 Fri AEDT
Swell 0.2m/14s 09:00 Fri AEDT
WCur 0.2kn/292.0° 09:00 Fri AEDT
Planned passage data shown
UKC (m) and Speed (kn)
Now
9.5
9.6
9.8
09:25 10:00 10:18 10:35 10:52 11:23 11:58 AEDT
FIC B38 B30 B24 B16 B12 B8 B4 B2 WP
P. Eff BC
P. Eff MM
P. Squat
P. Heel
P. Wav Res
P. Tide Hgt

DUKC - Actual

DUKC



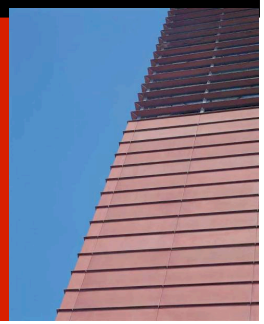




Software easy to use

- In Europe, most PPU's have ship 'type tested' software, slightly modified for a Pilot to use
- POADSS has Port specific software
- Lisbon Pilots have determined the POADSS laptop presentation, specific for their needs

POADSS



POADSS Training

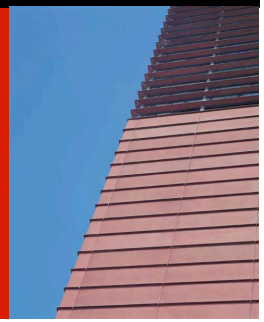
POADSS

Proposed PPU Training Standards

ECDIS IMO Model Course 1.27
AIS IMO Model Course 1.34
Manufacturers Type specific training
Familiarization trips accompanying another Pilot
Assessment

Meets IMO A960 requirements (23) 6.2

Apart from ‘assessment’ – Lisbon Pilots received the above



‘Lisbon Live’

via Port of Lisbon VPN

to POADSS Server in VTS

WMS

POADSS

Broadband WMS

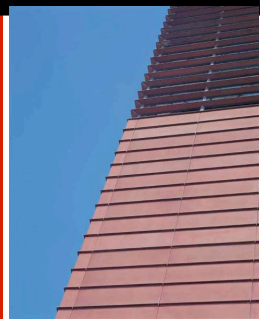
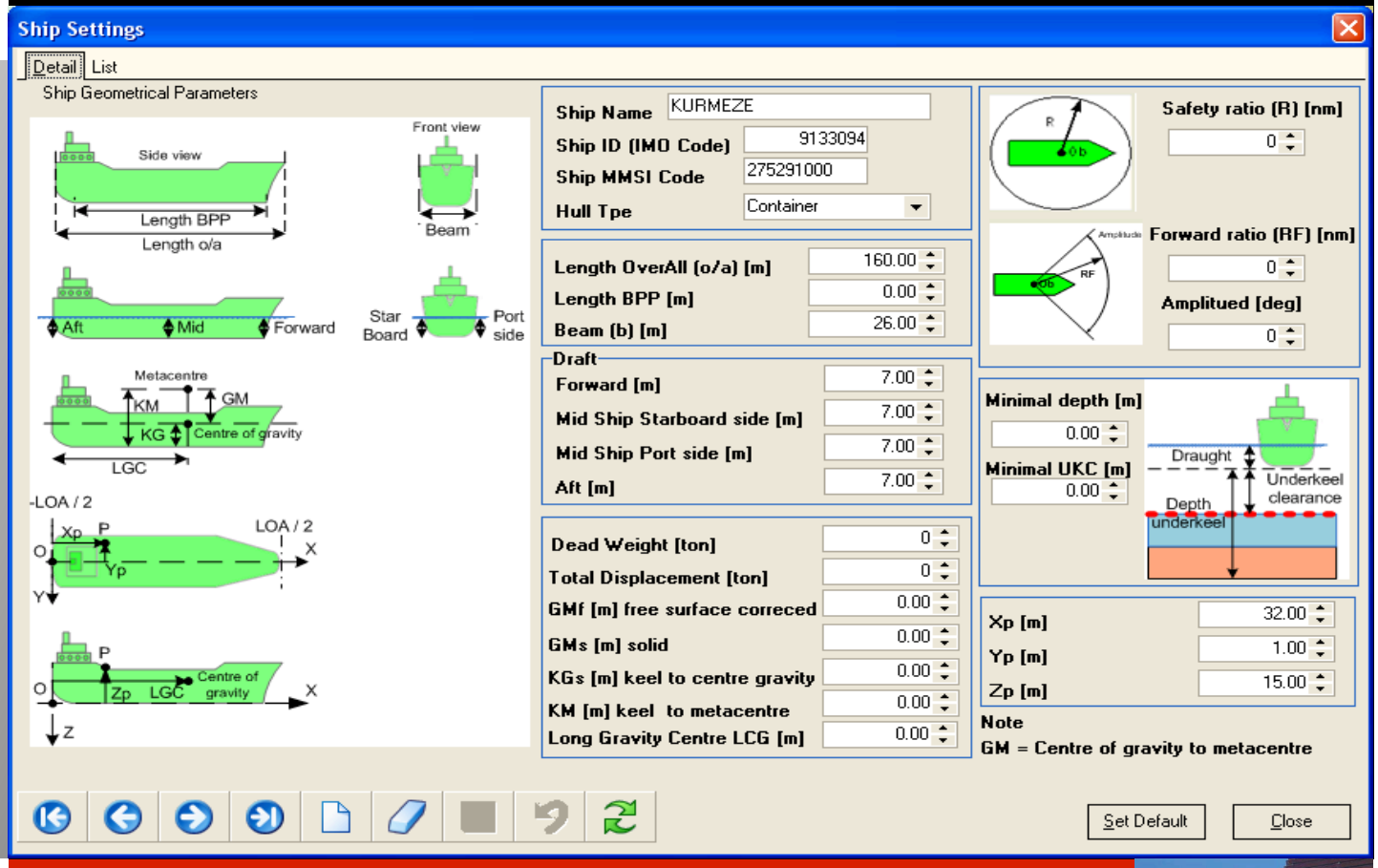


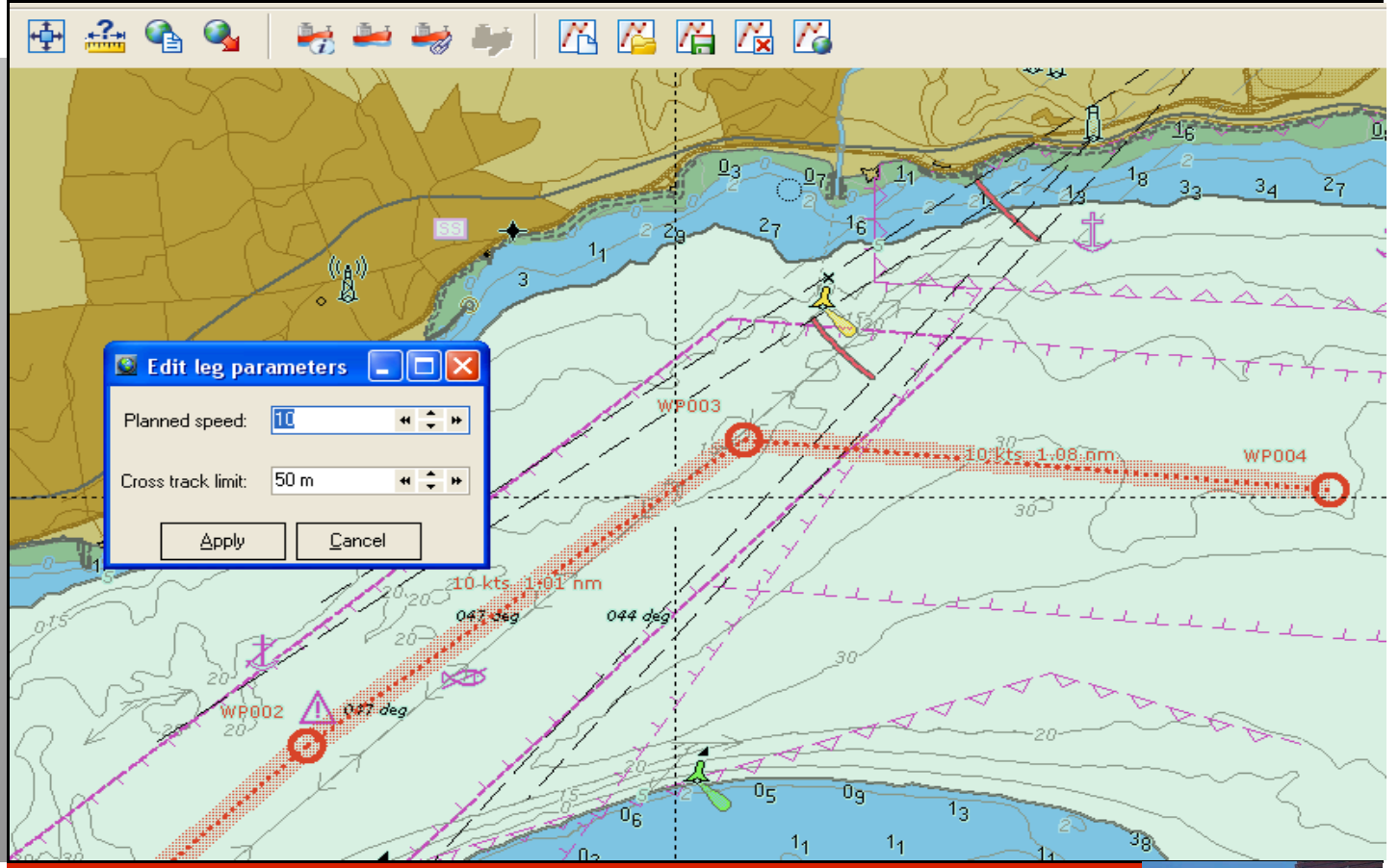
Image of Planning Mode

POADSS



Ship data settings

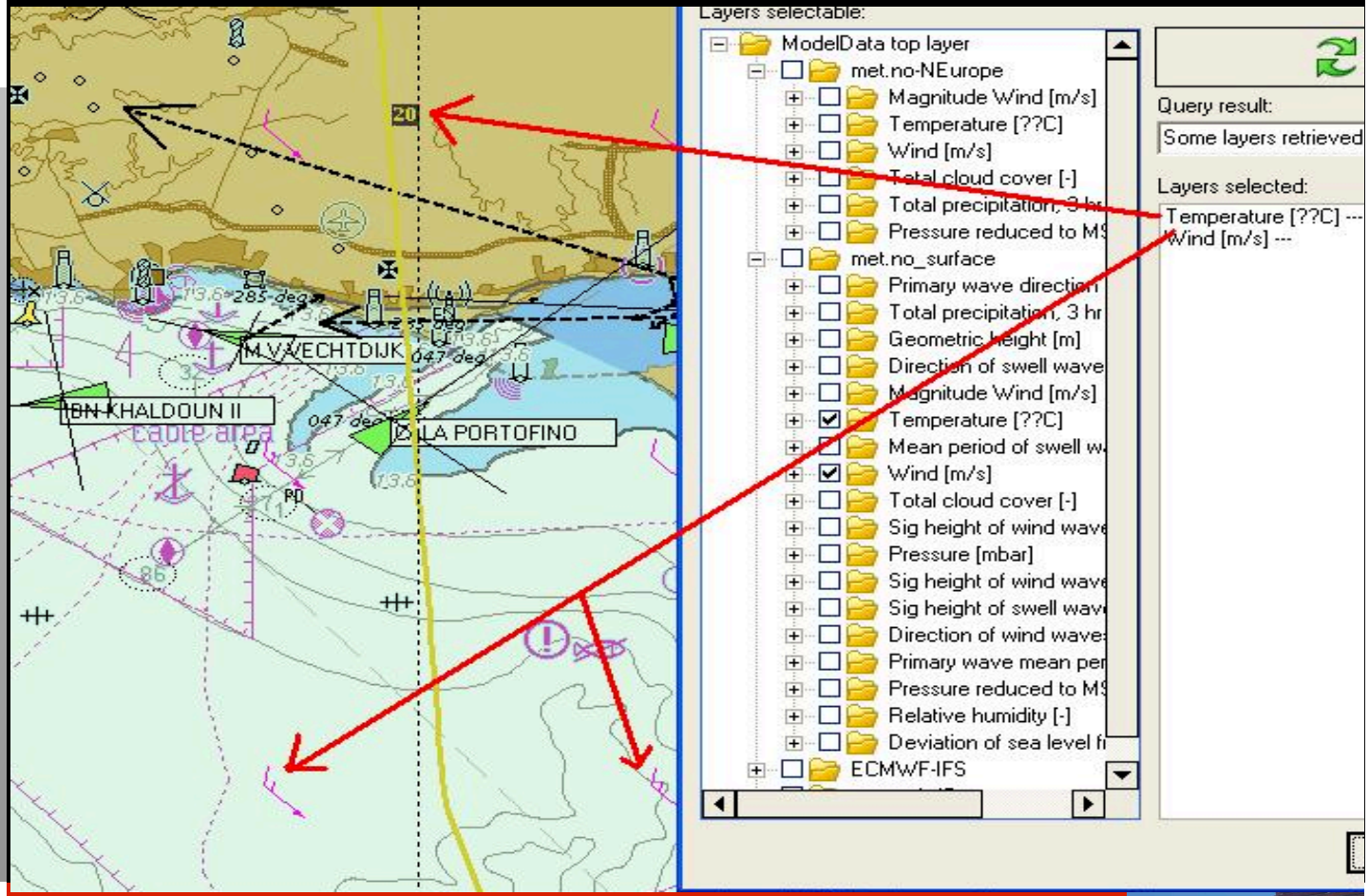
Image of Planning Mode



POADSS

Route selection/edit

Image of Information Mode

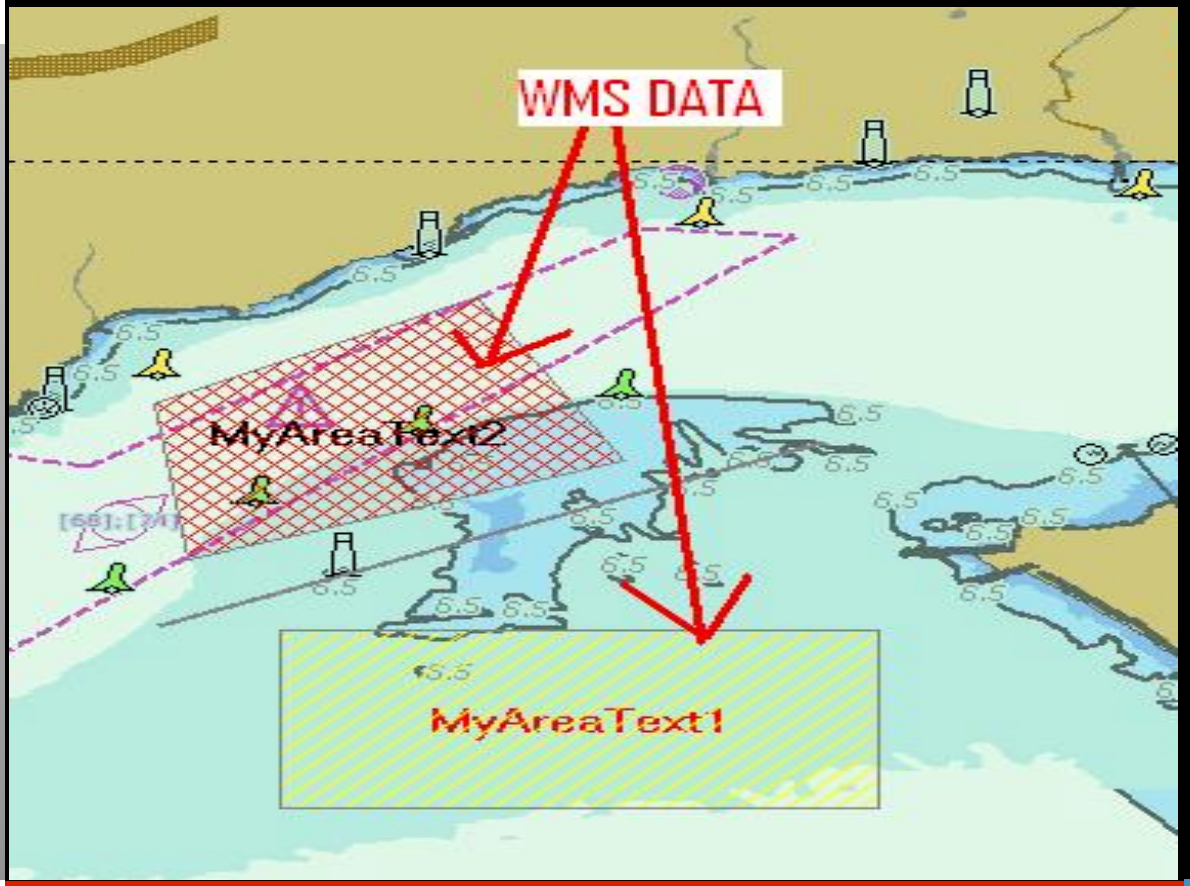


WMS

POADSS

Wind and Temperature

Image of Information Mode

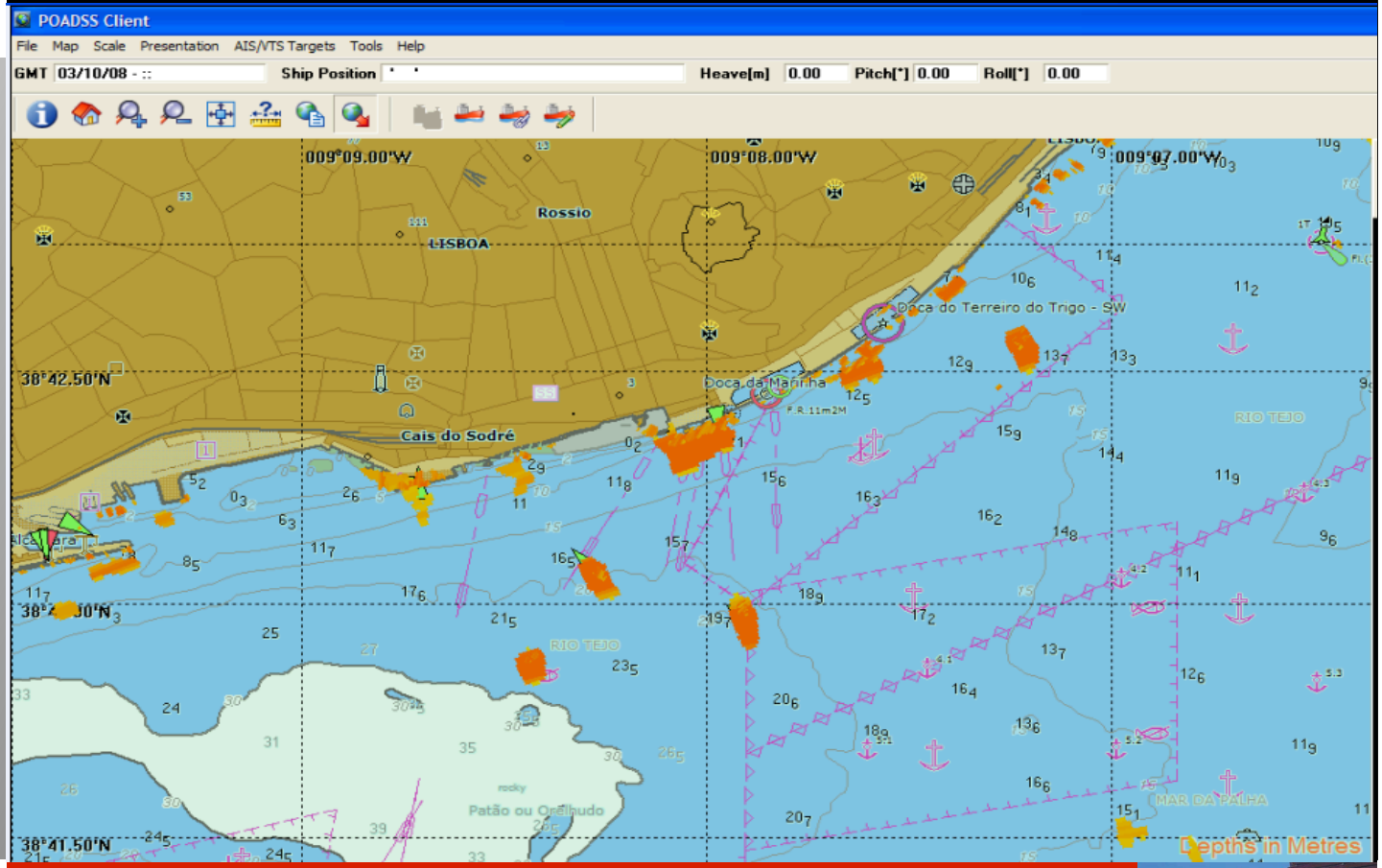


WMS

POADSS

Special Areas - regatta

Image of Information Mode

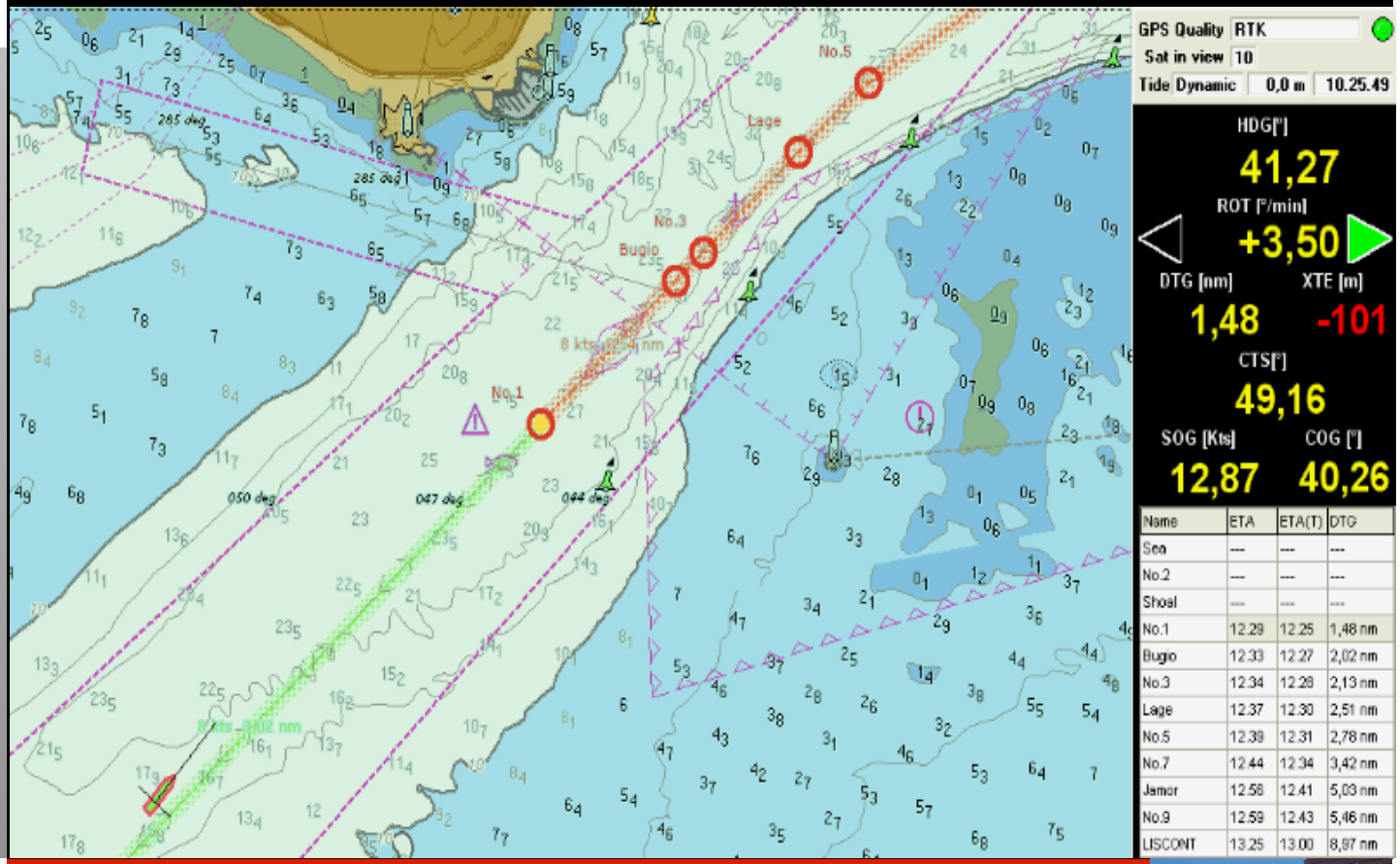


WMS

POADSS

Raw Radar

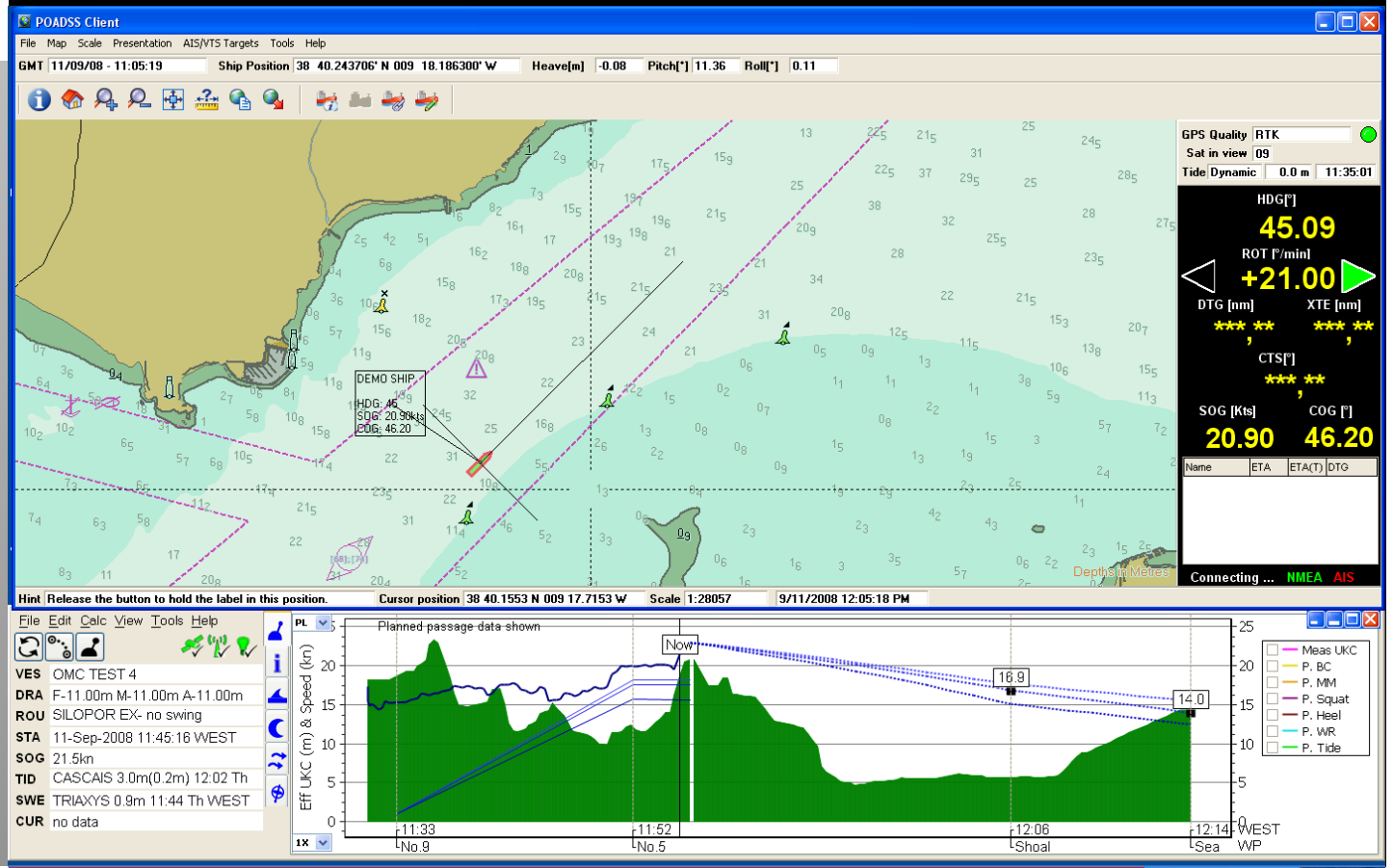
Image of Navigation Mode



POADSS

Routes

Image of Navigation Mode

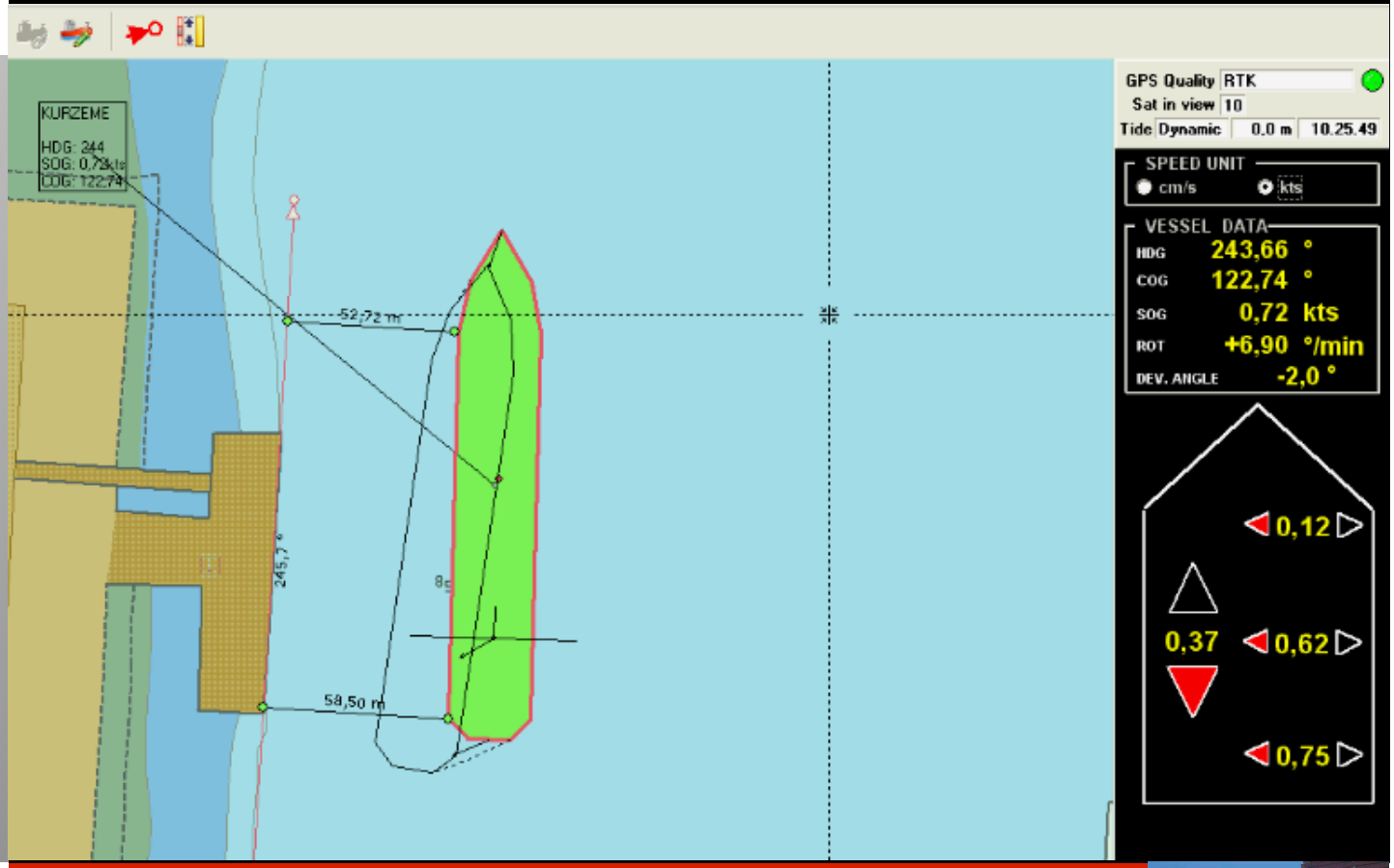


POADSS

DUKC Panel

Image of Docking Mode

POADSS

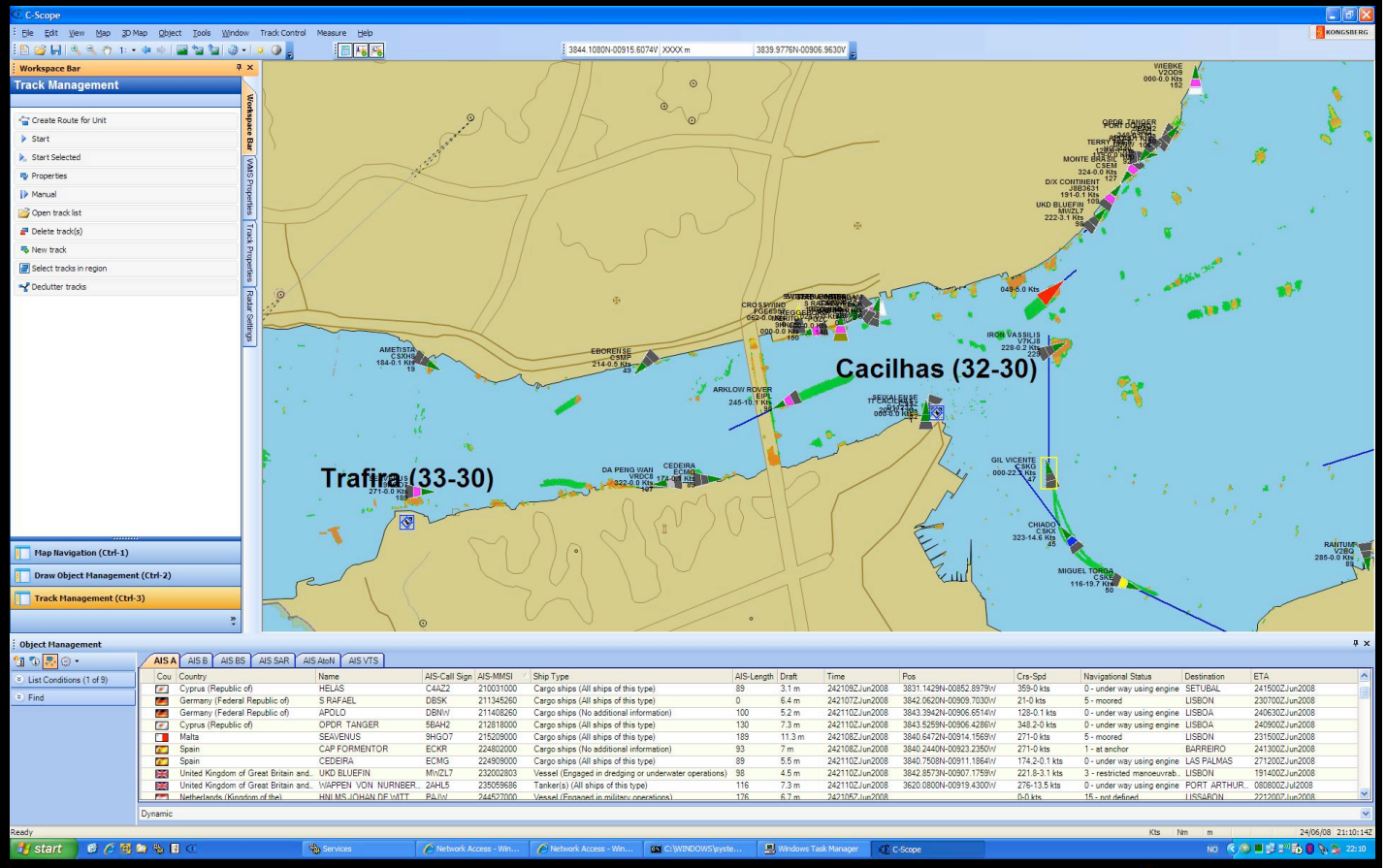


Berthing Line/Distance off Prediction

Radar video, radar/AIS tracks

AIS

WMS

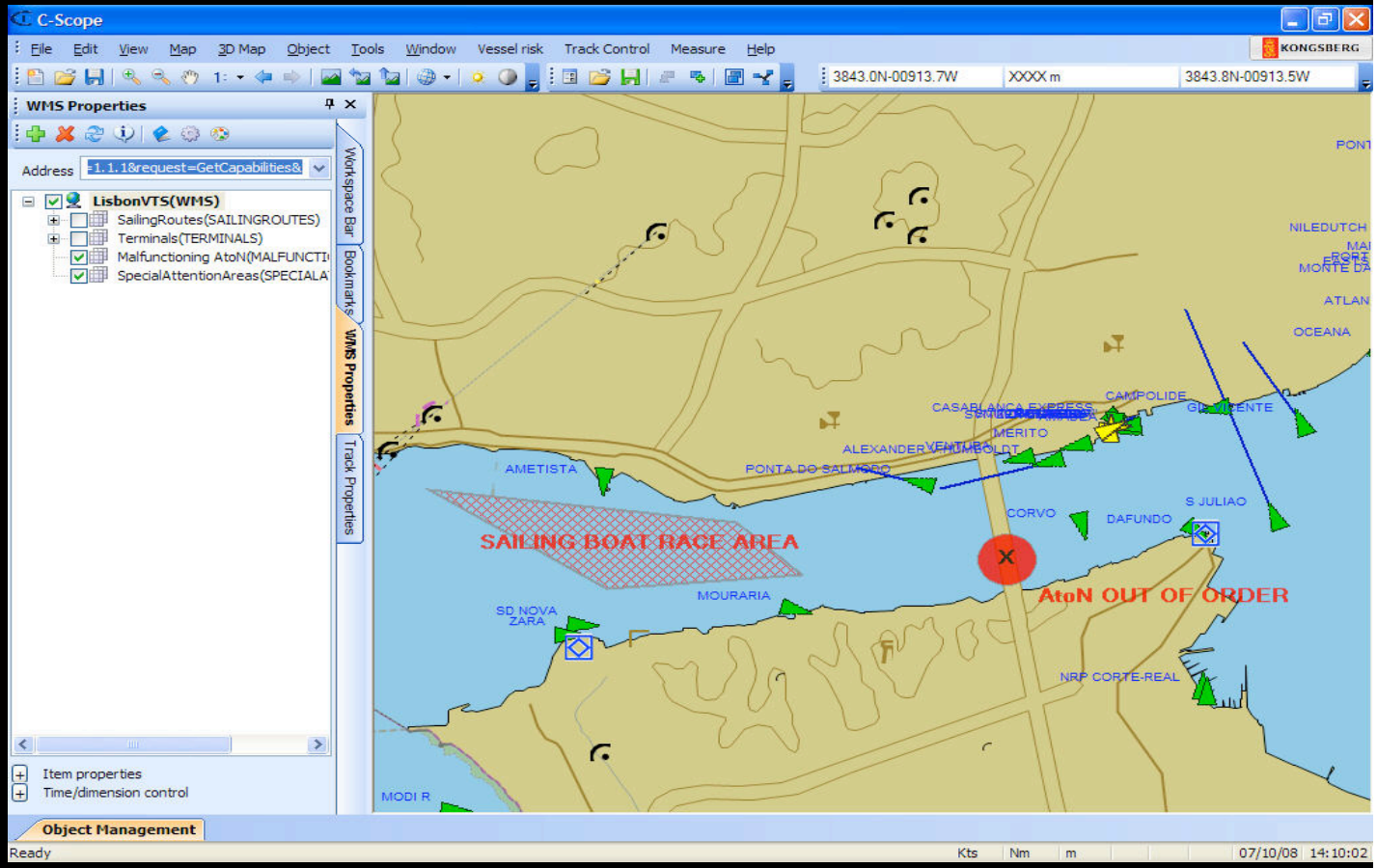


Sharing VTS Information

Attention Areas / Points

AIS

WMS

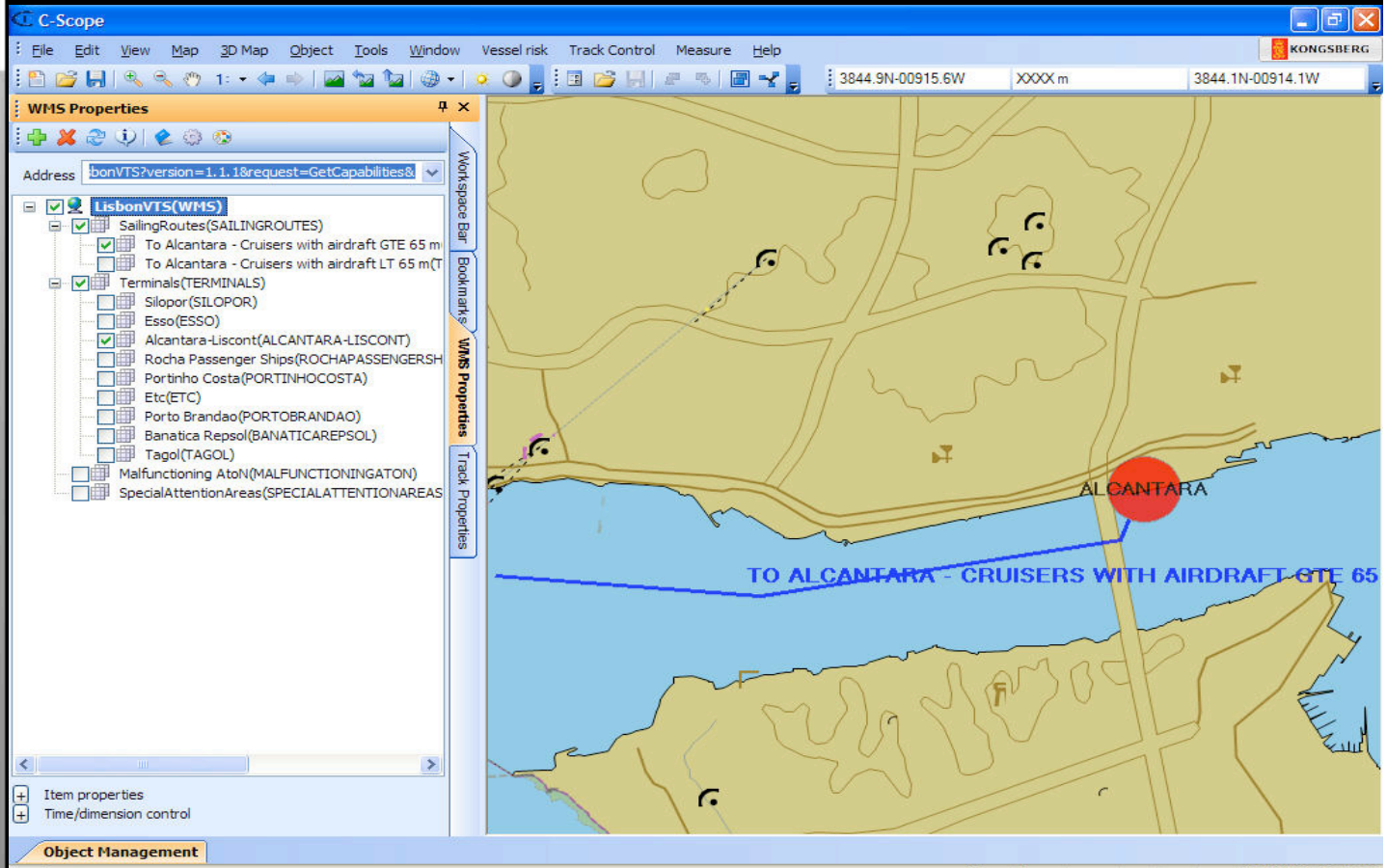


Sharing VTS Information

Proposed Approach Route

AIS

WMS

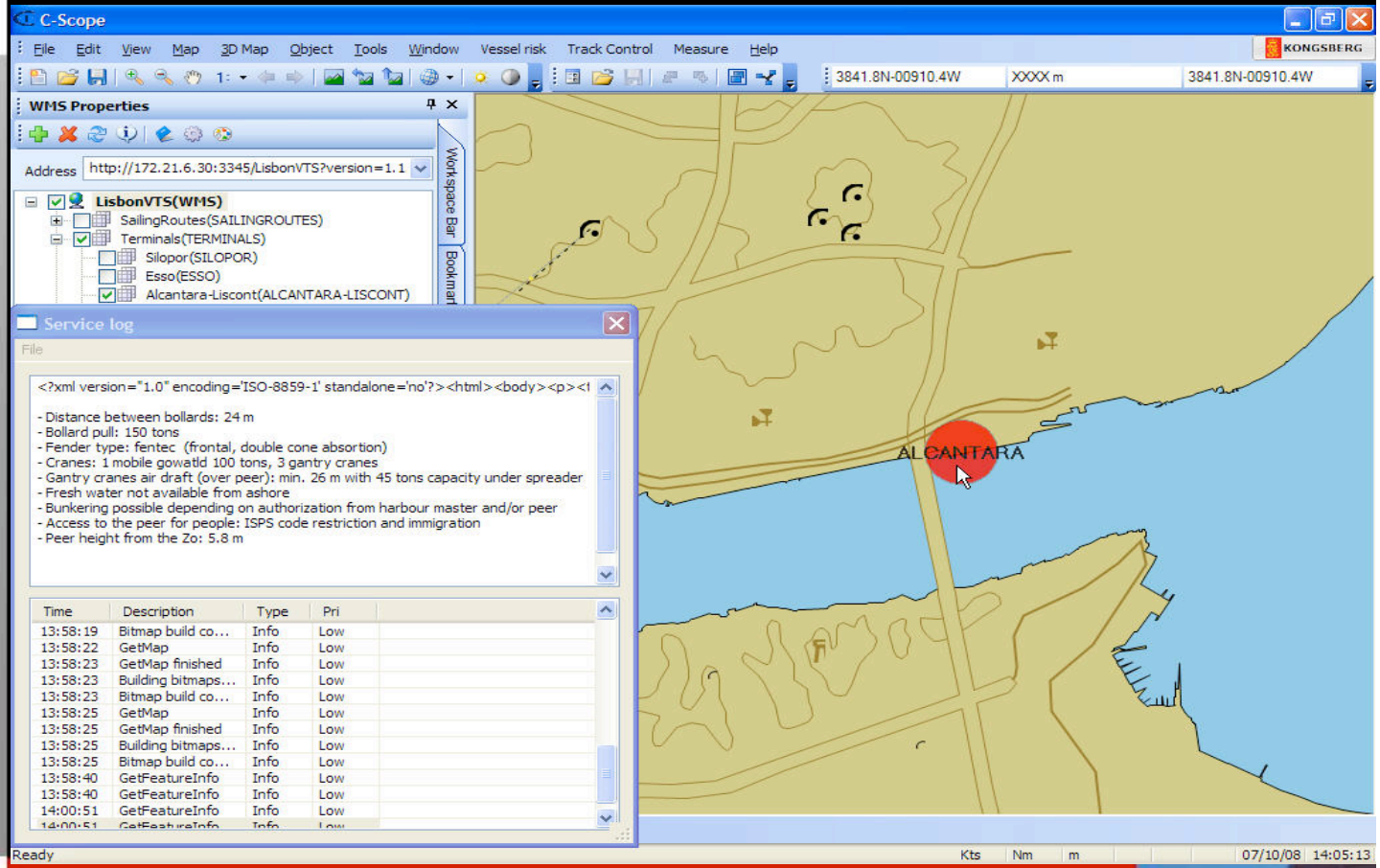


Sharing VTS Information

Terminal Information

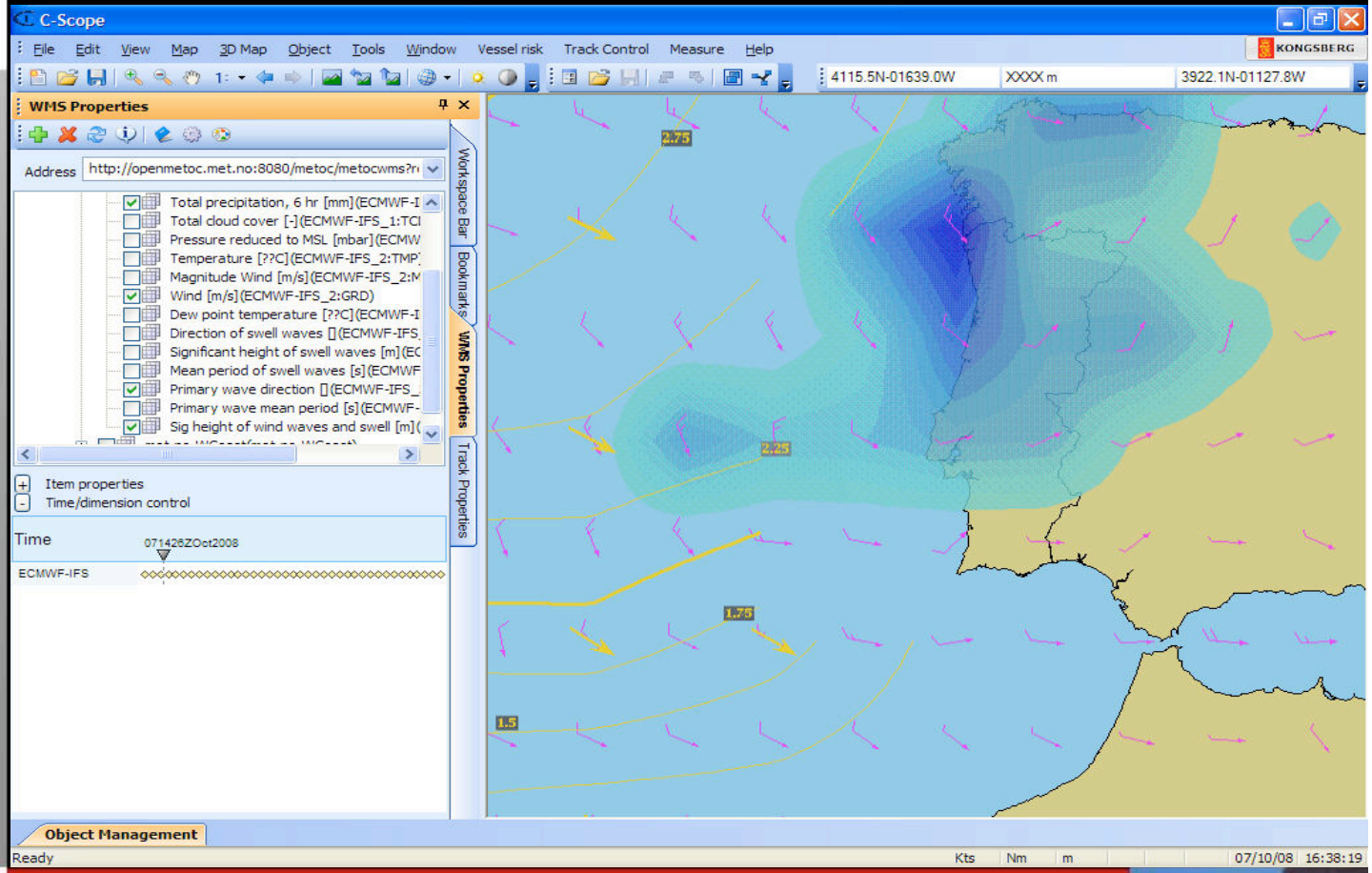
AIS

WMS



Sharing VTS Information

Weather information
Meteo/Hydro Forecasts



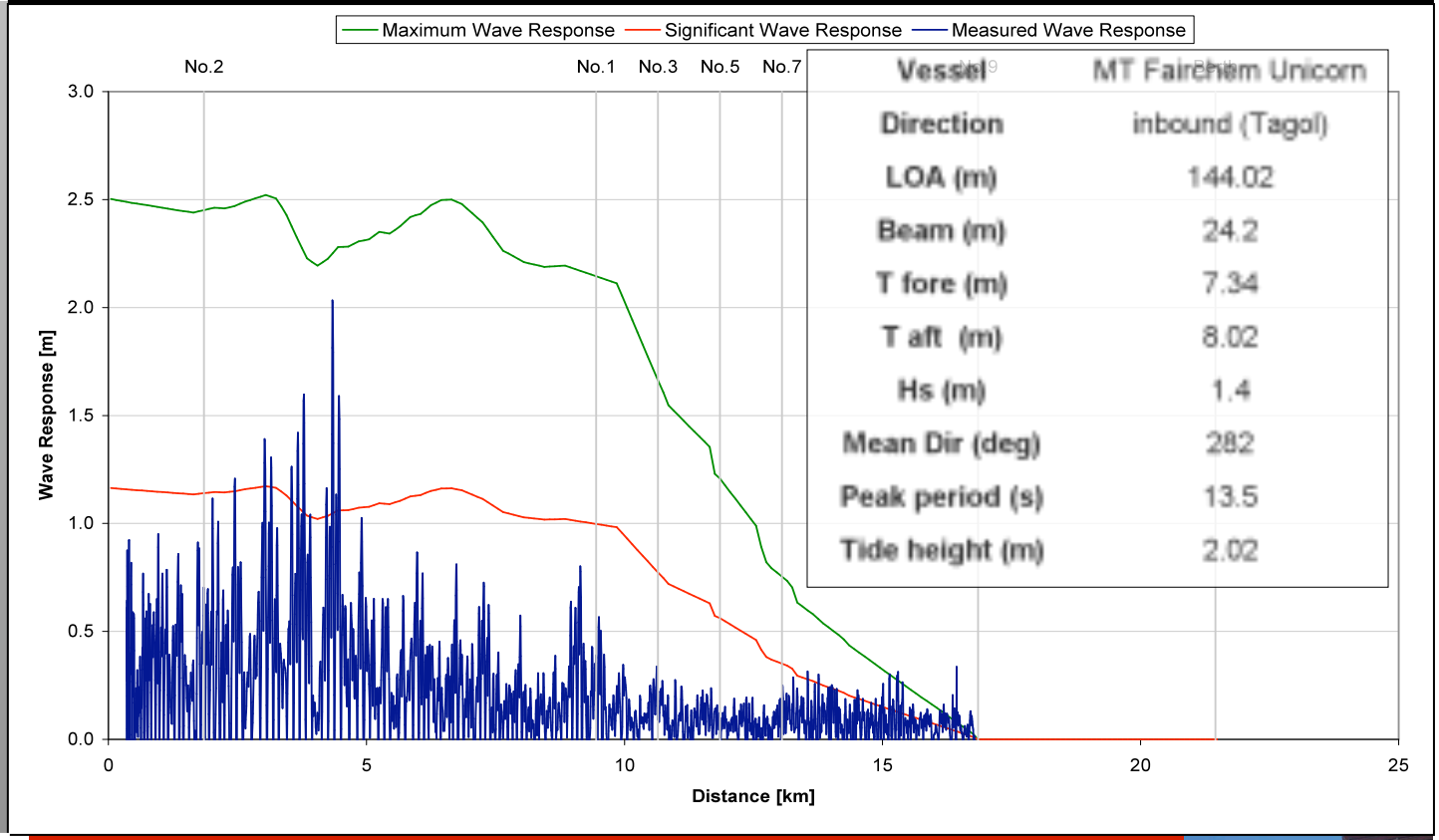
AIS

WMS

Sharing VTS Information

Wave Response

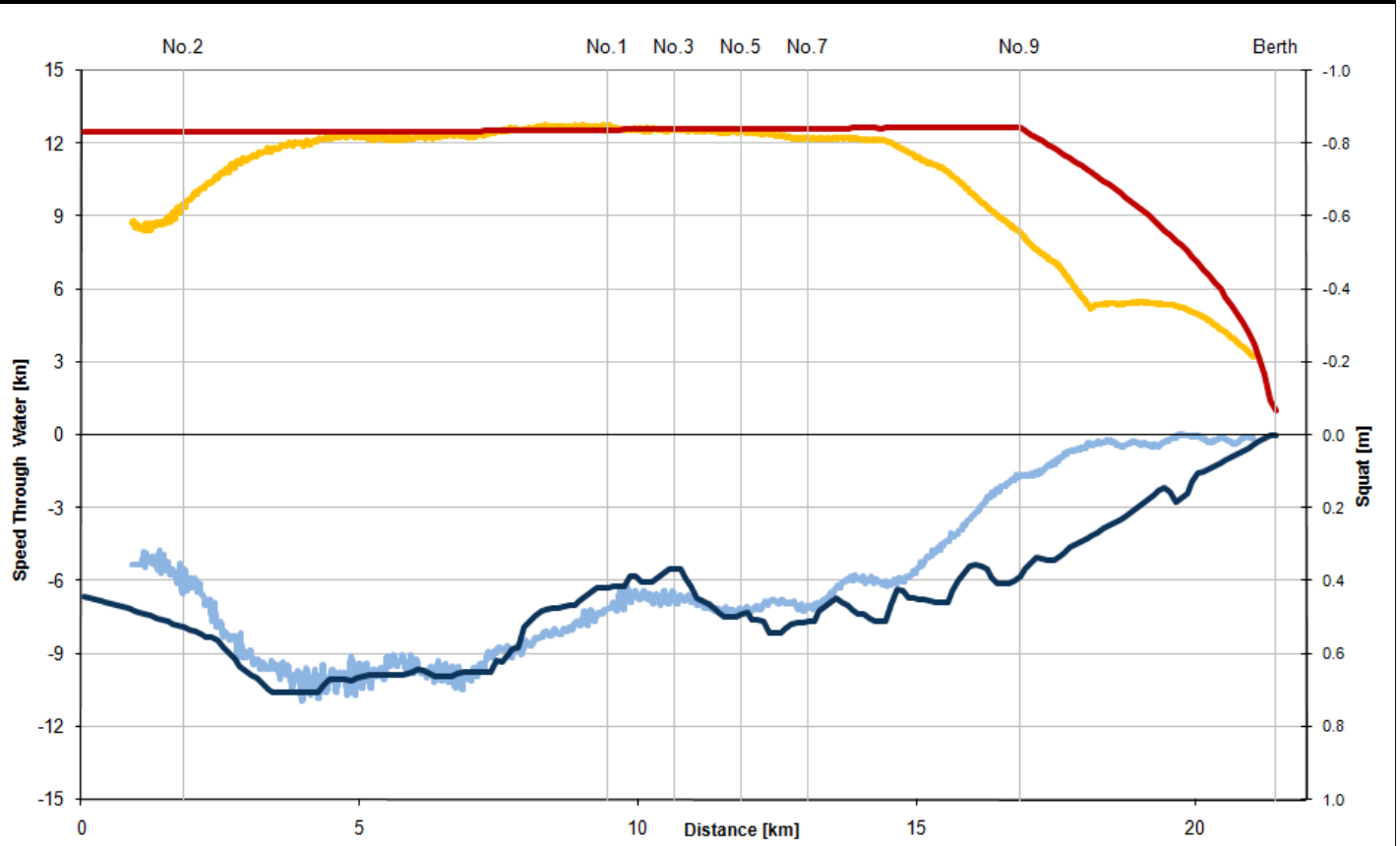
DUKC



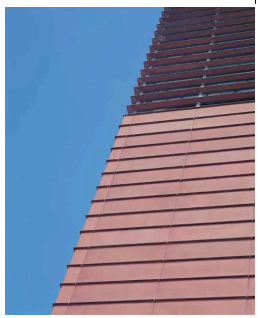
Measured vs Modelled at Lisbon

Squat

DUKC



Measured vs Modelled at Lisbon

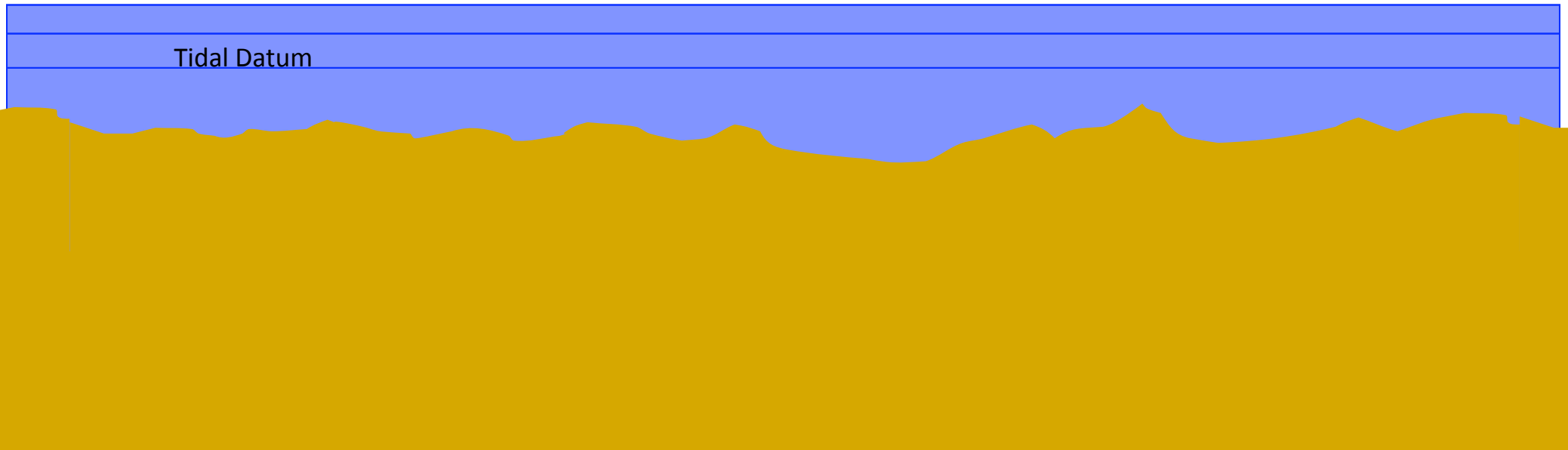


Underkeel Clearance =

+ sounded depth
- survey tolerance
- siltation

Underkeel Clearance =

+ sounded depth
- survey tolerance
- siltation
+ astronomical tide
+ tidal residual



Underkeel Clearance =

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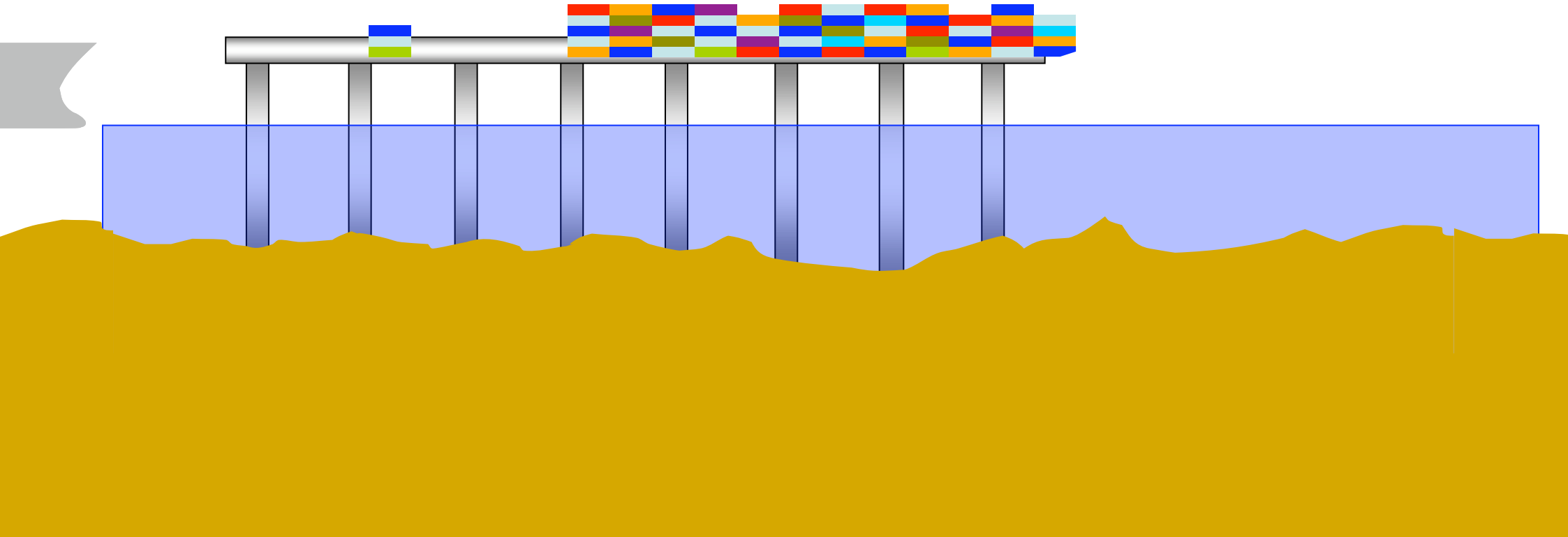
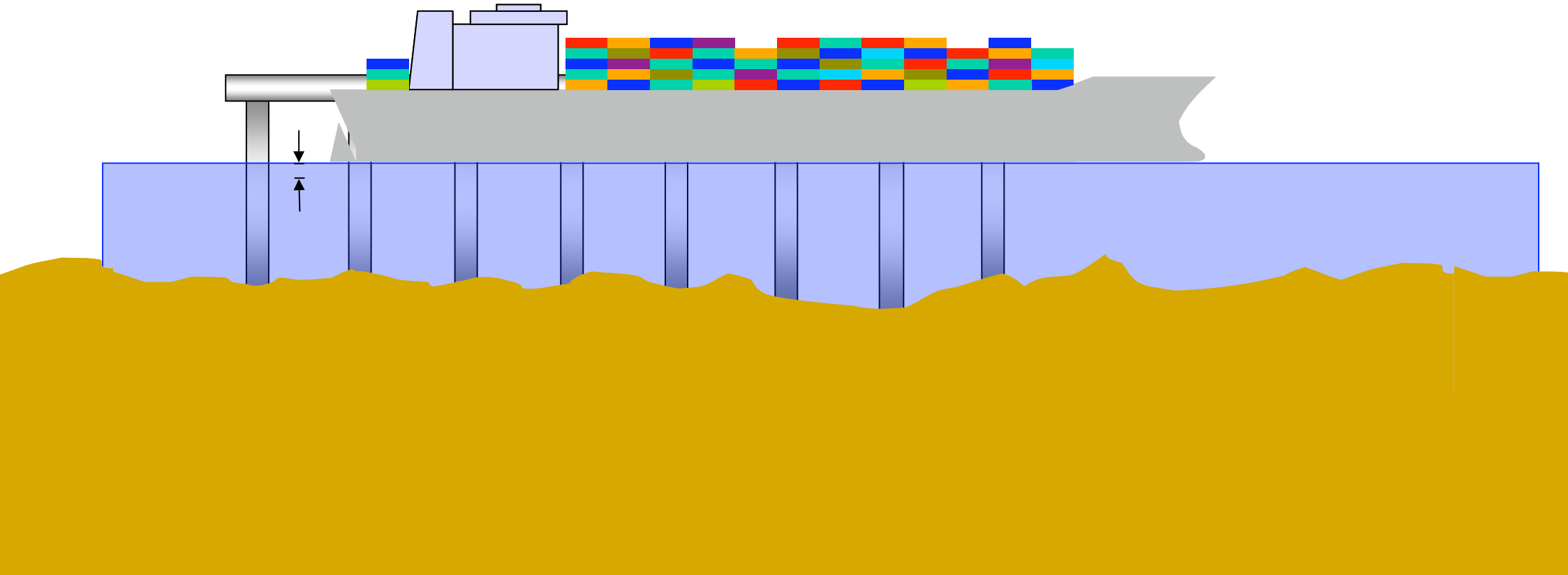


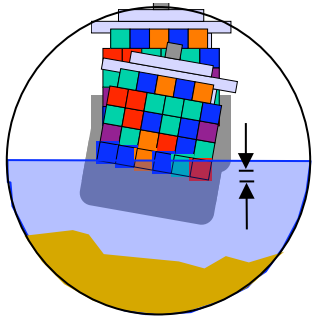
Underkeel Clearance =

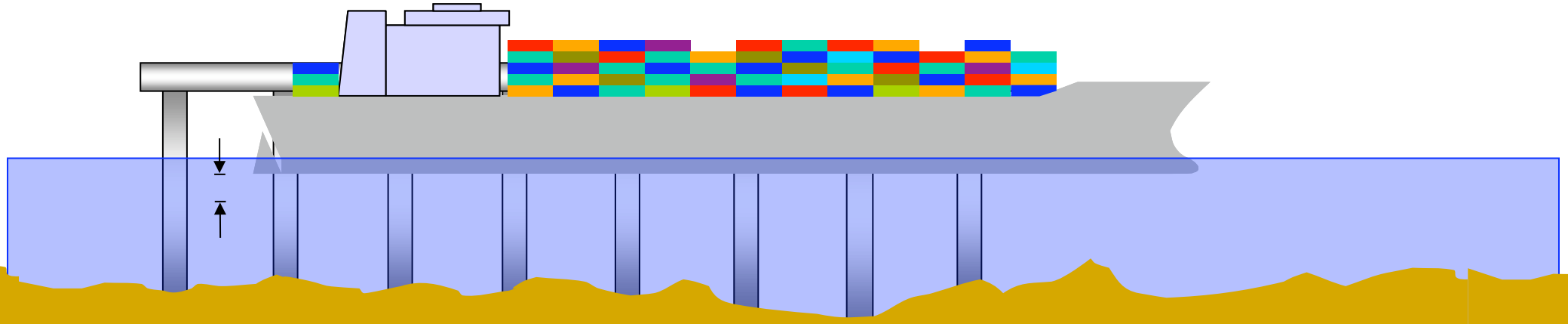
+ sounded depth
- survey tolerance
- siltation
+ astronomical tide
+ tidal residual
- draft



Underkeel Clearance =

+ sounded depth
- survey tolerance
- siltation
+ astronomical tide
+ tidal residual
- draft
- squat
- heel





Underkeel Clearance =

+ sounded depth

- survey tolerance

- siltation

+ astronomical tide

+ tidal residual

- draft

- squat

- heel

- wave response