Channel Risk & Optimisation Project

Forum for Operational Oceanography, Melbourne 2019

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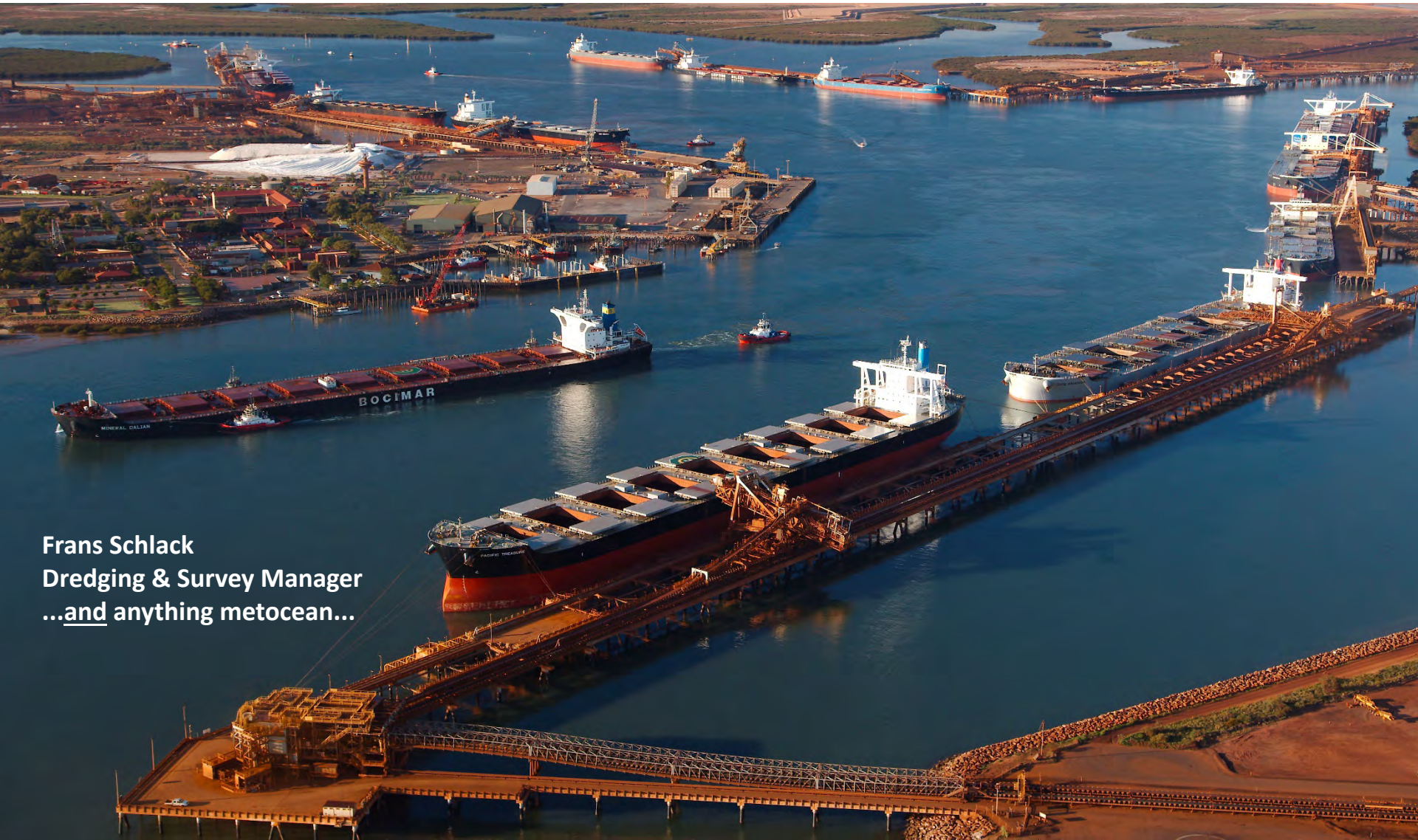
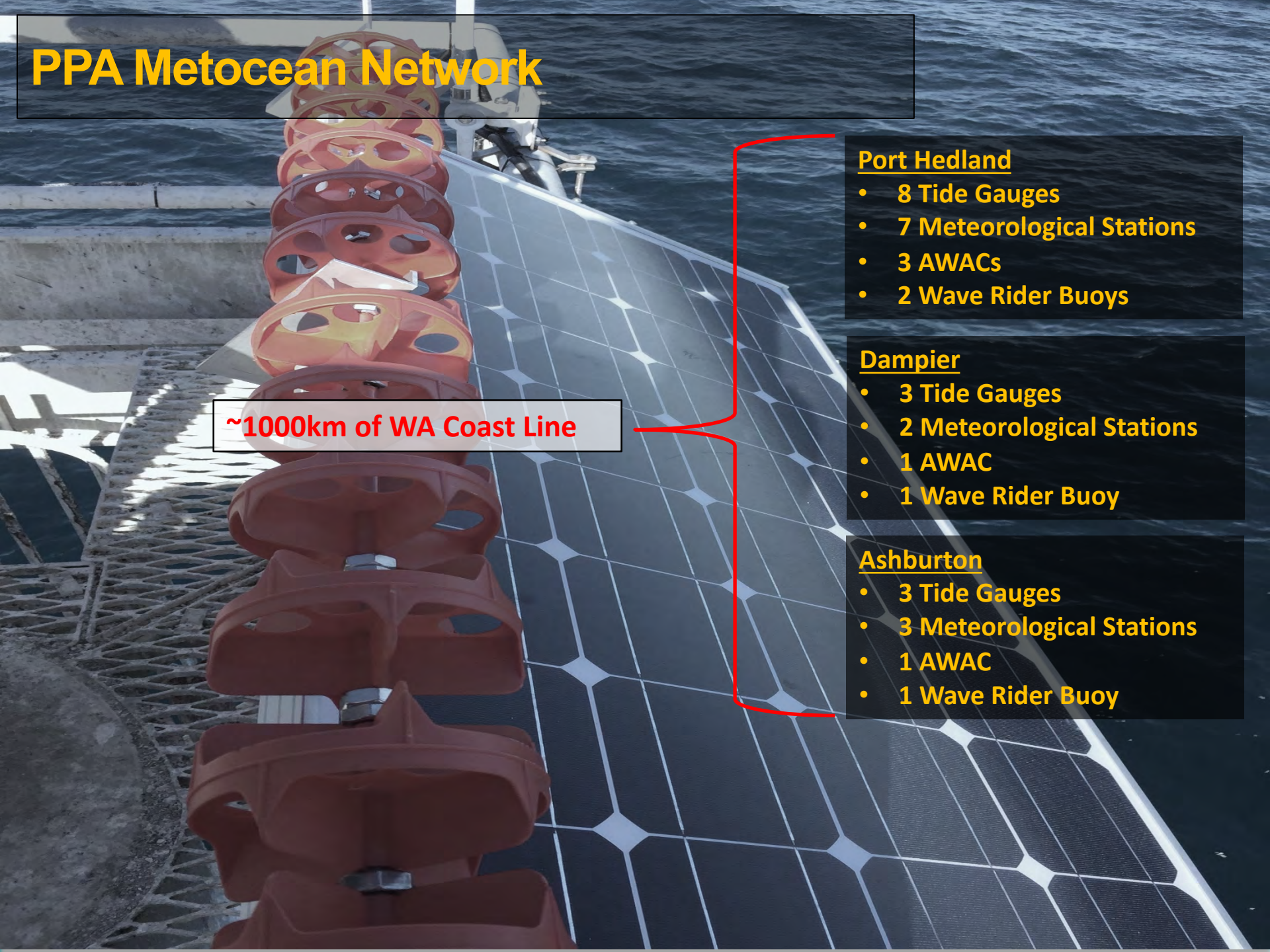


Frans Schlack
Dredging & Survey Manager
...and anything metocean...

PPA Metocean Network



~1000km of WA Coast Line

Port Hedland
- 8 Tide Gauges
- 7 Meteorological Stations
- 3 AWACs
- 2 Wave Rider Buoys

Dampier
- 3 Tide Gauges
- 2 Meteorological Stations
- 1 AWAC
- 1 Wave Rider Buoy

Ashburton
- 3 Tide Gauges
- 3 Meteorological Stations
- 1 AWAC
- 1 Wave Rider Buoy

Channel Risk & Optimisation Project

Port of Port Hedland, Western Australia

Inner Harbour with Swing Basin

Berths:

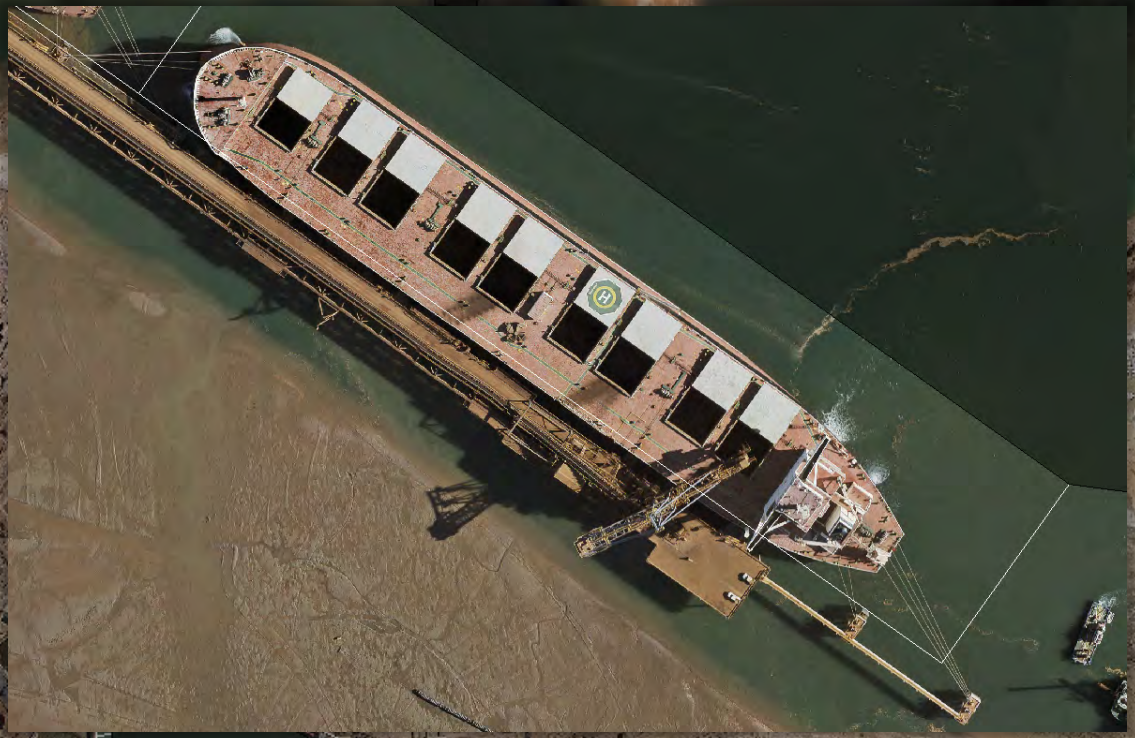
- 16 Cape Size
- 1 Panamax Size
- 2 General Cargo

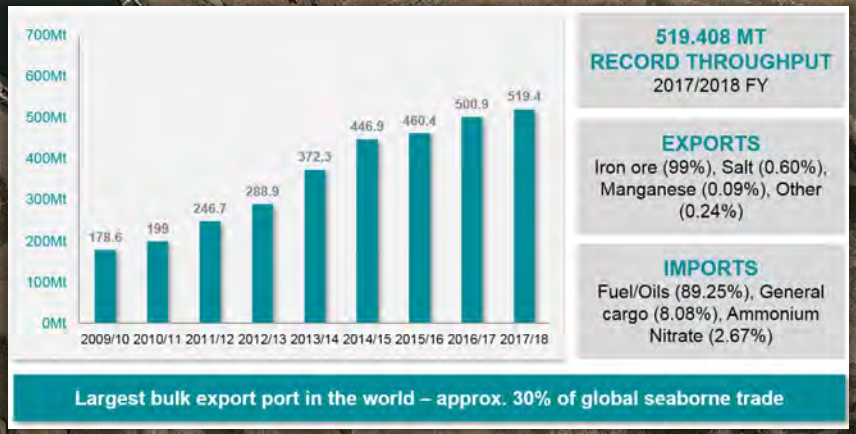
Single Entry & Exit Tidal restricted 42km Channel

Annually, ~3000 Cape Size Bulk Carriers Departures,

10 Bulk Carriers departures per day

On average > $100M export per day





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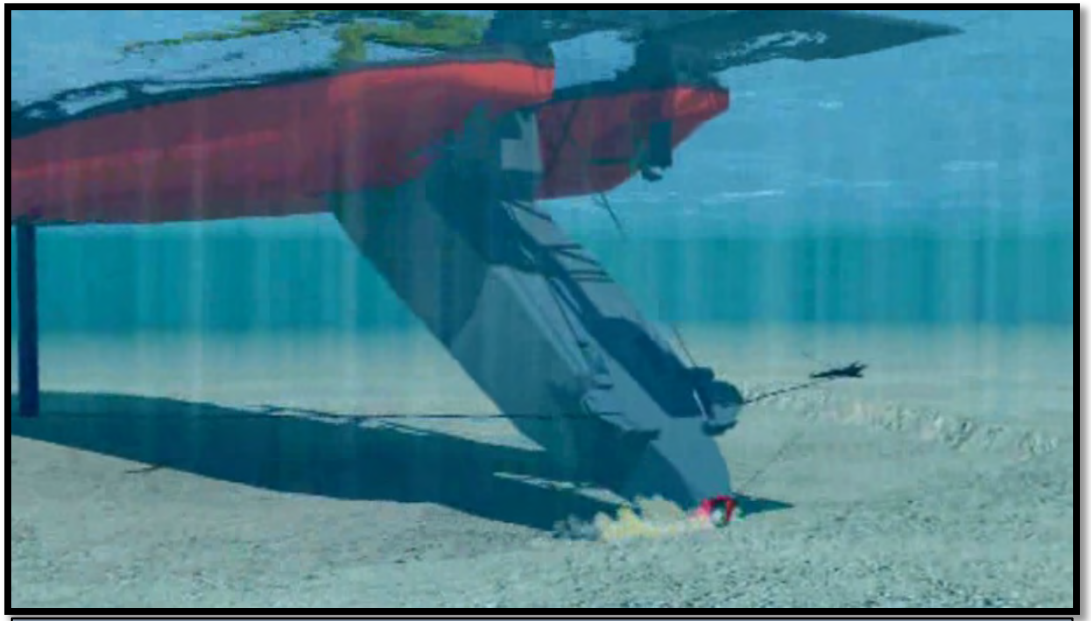
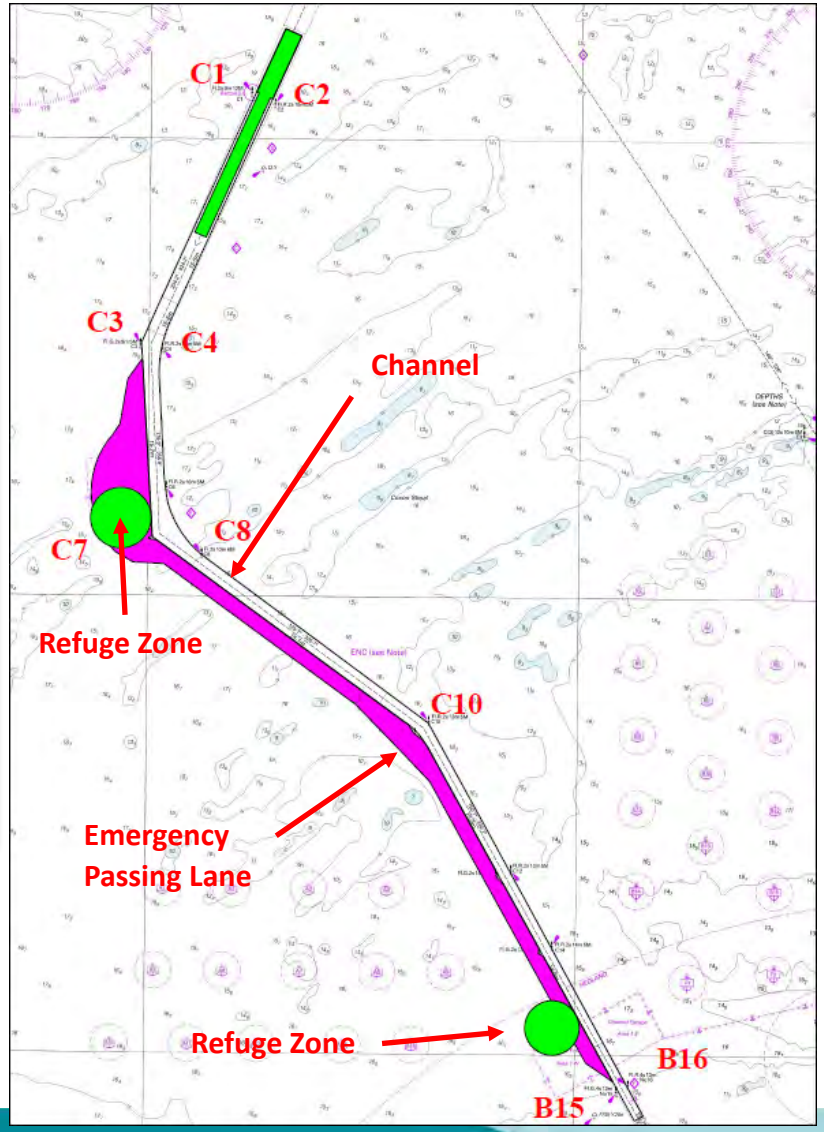
Dredging Methodology

- **Stage 1-0 & 2-1:**
  - Dredging of as much material with a TSHD and disposal in Spoil Grounds



- **Stage 2-2:**
  - Dredging of remaining (hard) materials to achieve design and relocation by Hopper Barges into Spoil Grounds



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Project Execution:
Stage 2-2: April 2019 to August 2019

Project Risks

Stage 2-2:

- Creation of 'High Spots/Obstructions' during dredging works
- Shipping Traffic > Excessive Project Costs
- **Inclement Sea State > Excessive Project Costs**

Cutter Suction Dredge (CSD) 'Niccolò Machiavelli' 7,000KW
Split Hopper Barges , 3500 m^3

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Project Execution:

Stage 2-2 Project Risks

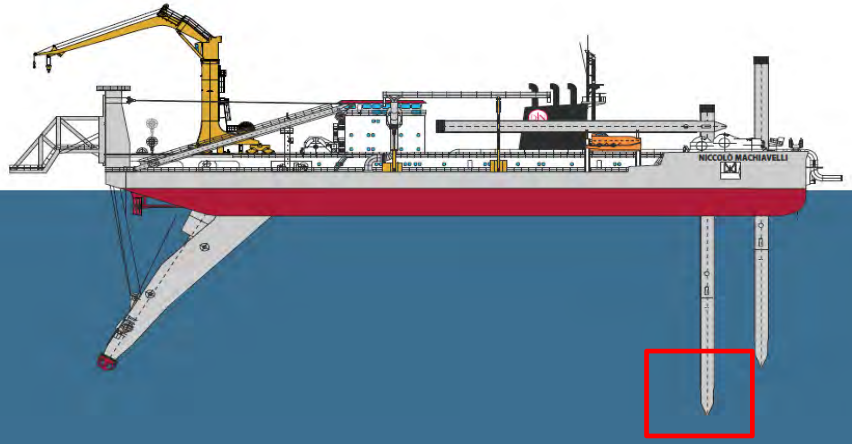
Project Risks (Mitigation)

Stage 2-2:

- Creation of 'High Spots/Obstructions' during dredging works
- **Channel Evacuation by CSD versus Loss of efficiency > Excessive Project Costs**

NICCOLÒ MACHIAVELLI

Length o.a.	138.5 m
Breadth	26.0 m
Draught	5.50 m
Dredging depth	35 m
Suction pipe diameter	900 mm
Discharge pipe diameter	900 mm
Barge loading pipe diameter	900 mm
Submerged pump power	4,250 kW
Inboard pump power	2 x 5,000 kW
Cutter power	7,000 kW
Propulsion power	2 x 3,500 kW
Total installed diesel power	23,520 kW
Speed	13 kn
Accommodation	46
Built in	2011



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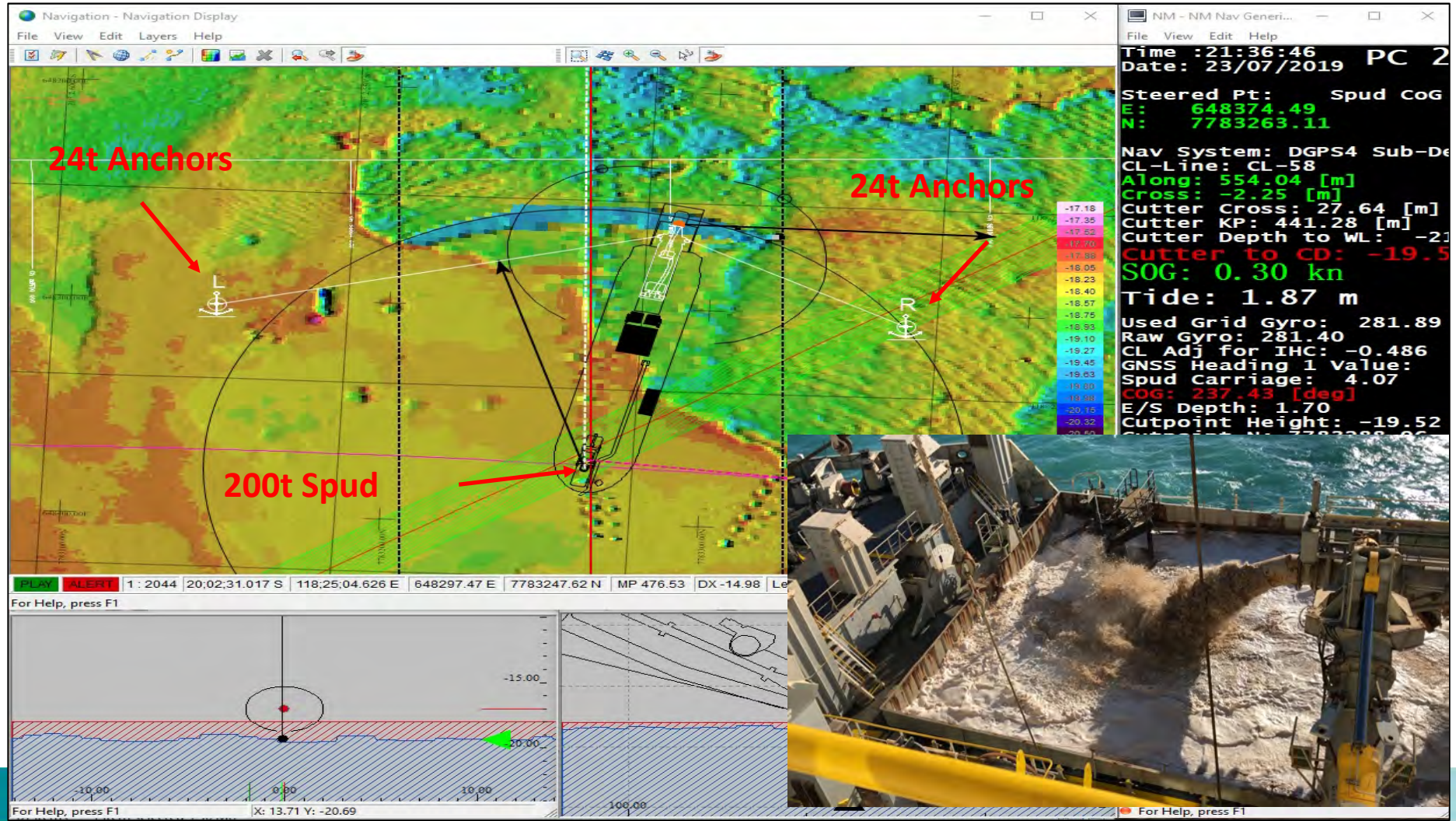
Project Execution:

Stage 2-2: April 2019 to August 2019



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Project Execution:

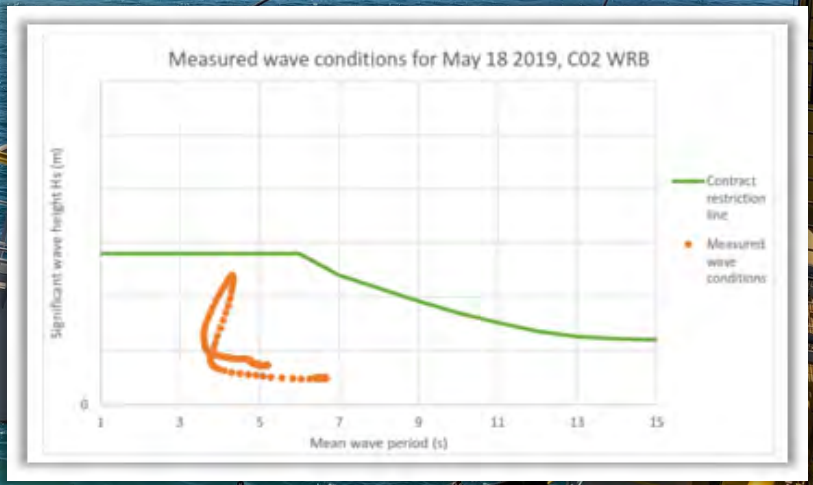
Stage 2-2 Project Risks

Project Risks (Mitigation)

Stage 2-2:

- **Inclement Sea State > Excessive Project Costs**

Introducing the *"Sea State Verification System"* (SSVS)



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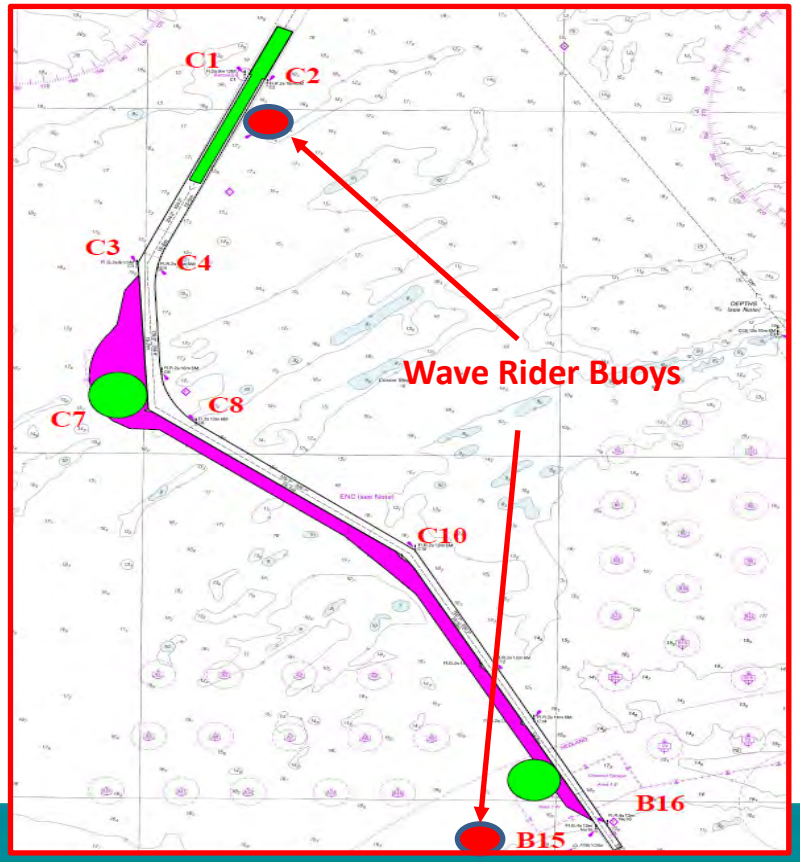
Channel Risk & Optimisation Project

Project Risks: Inclement Sea State, Contract Parameters

Contractual Parameters:

- Compensation Entitlement for 'Inclement Sea State'
- Contractor's provided Sea Sate limitations
- Superintendent verification applying 'Forecasts' & 'Measurements'
- 'Measurements' taken from PPA's Metocean Instruments

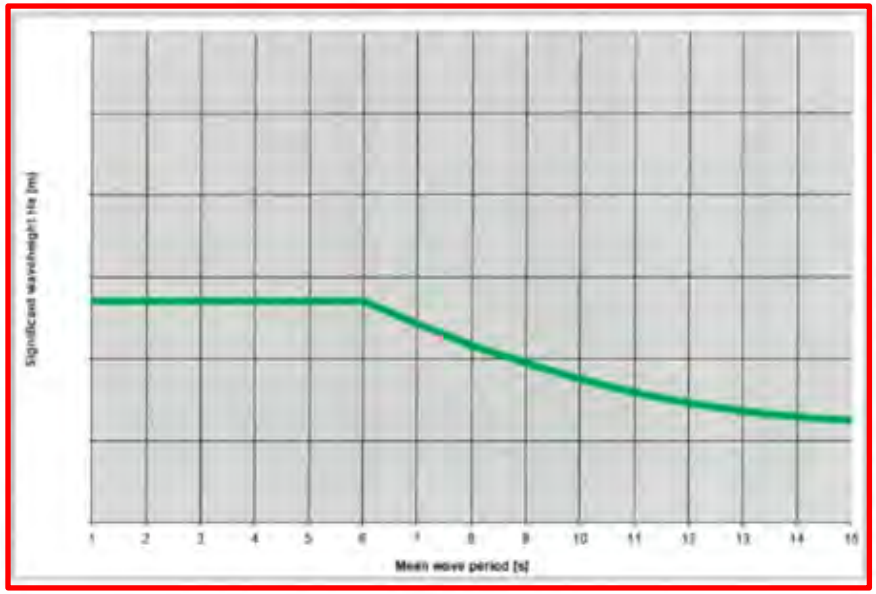


Vessel Operating Parameters

The Contractor may be entitled to a Stand By claim when the Contractor's vessels have to cease normal operations for a period of time due to *inclement sea state* conditions.

CSD Spread:

Acting reasonably, the *Superintendent* shall verify a stand by claim for the CSD Spread for *inclement sea state* conditions taking in consideration the *Contractor's* provided sea state limitations indicated by the green graph in the figure below, sea state conditions as forecasted by the ARGOSS System and the sea state conditions data as generated by PPA's metocean instruments near Beacon C2, Beacon 15 and Beacon 16. The Contactor shall provide the Superintendent with copies of all ARGOSS generated predictions during the execution of the Works.



With reference to the figure above:

Significant Wave Height (Hs): The mean of the 1/3 highest waves measured during a period of 3 hours.

Mean Wave Period (Tm): The mean of all wave periods measured during a period of 3 hours.

Green Graph: CSD limiting sea state conditions

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Project Risks: Inclement Sea State, Contract Parameters

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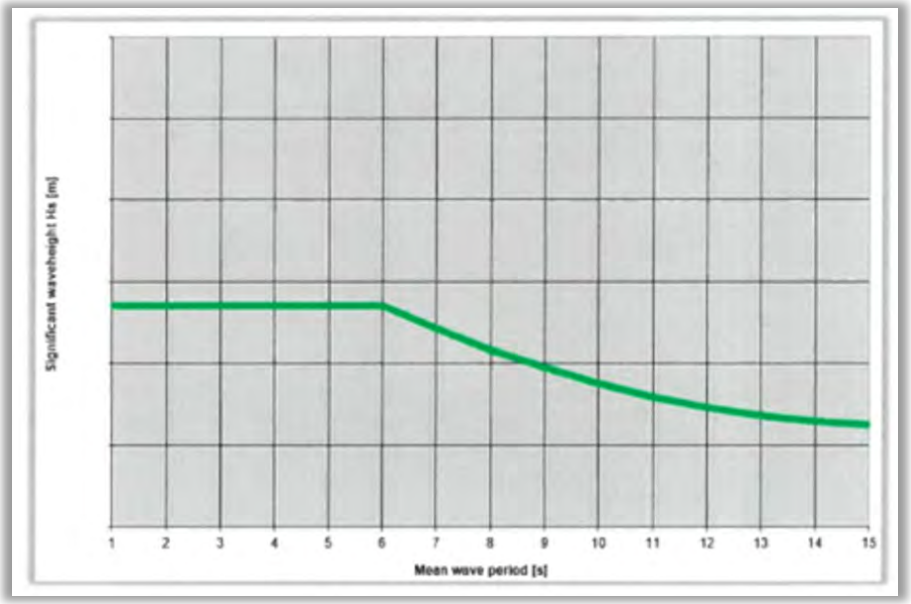

In determining the *Contractor's* claim for a period of stand by for *inclement sea state*, the *Superintendent* shall take into consideration the total wave spectrum as determined from the raw data generated by the PPA Metocean instruments and application of the formula Tp=1.17xTm whereby:

Tp = Peak wave period corresponding with the wave period with the highest energy

Hs = Significant Wave Height

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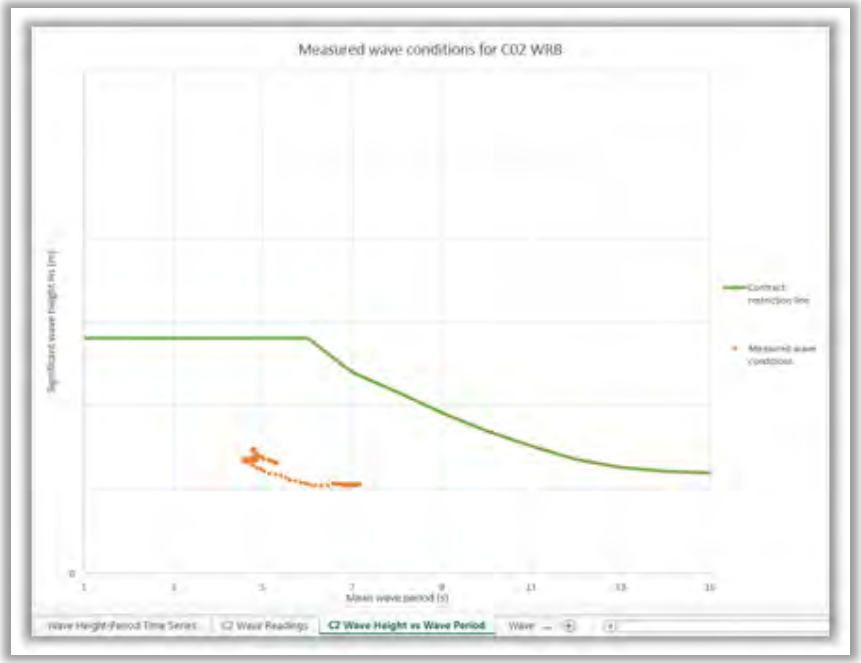
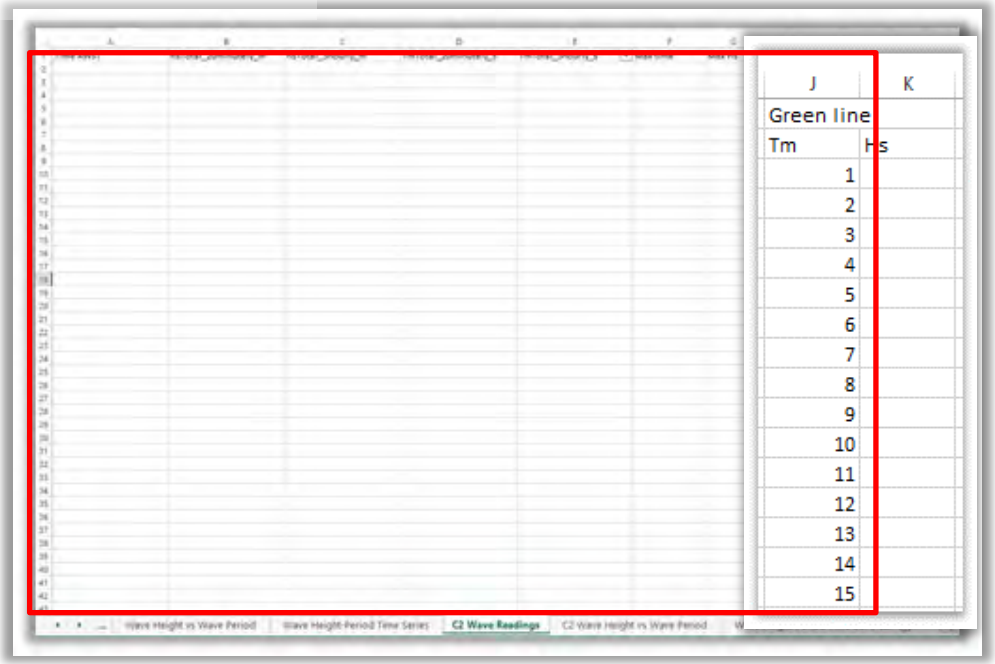
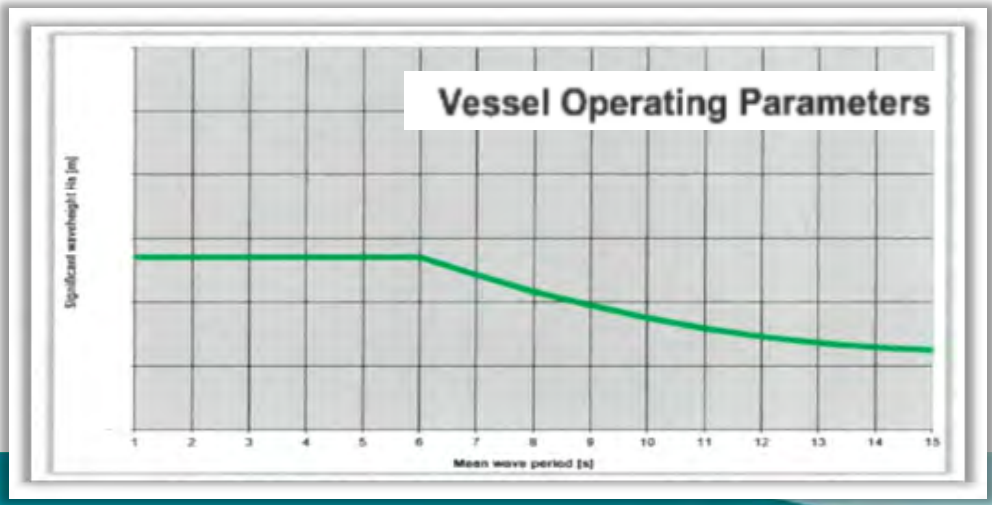
Project Risks: Inclement Sea State, Verification

Sea State Verification System:

1. Template containing:
   - 'Vessel Operating (Contractual) Parameters'
   - Data Entry
   - Evaluation Graph







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Project Risks: Inclement Sea State, Verification

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Wed 9/10/2019 11:20 PM

DUKC.waveReport@pilbaraports.com.au

3 hourly Wave reports for date 20191009_1800

To Frans Schlack; Jodie Leahy

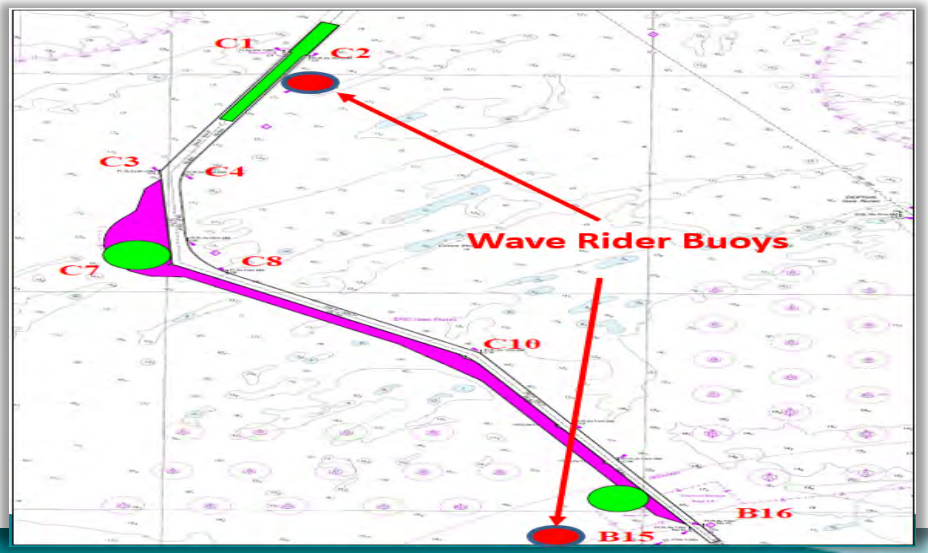
20191009_1800_B15WRB_3hourly.csv 1 KB

20191009_1800_C02WRB_3hourly.csv 1 KB

3 hourly Wave reports for date 20191009_1800

Sea State Verification System:

2. PPA's WRB Data:
   - Automated Via Email:
   - Every 3 hours (Contractual Parameter)
   - Every 24 hours (Compilation 0:00>23:59 hrs)



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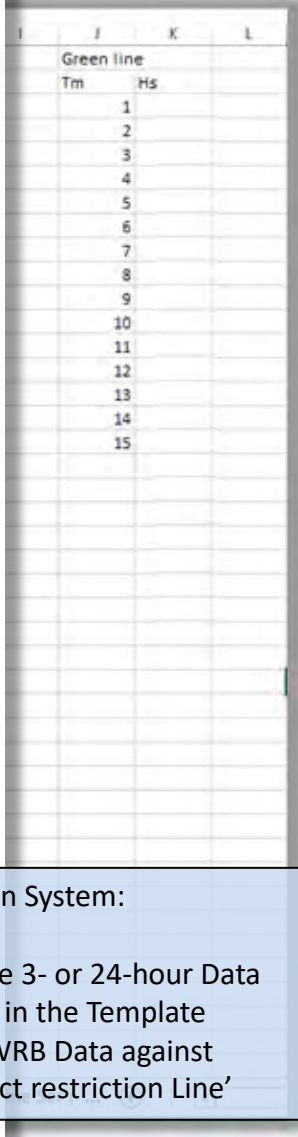
Project Risks: Inclement Sea State, Verification



Sea State Verification System:

3. Procedure:
   - Copy the 3- or 24-hour Data
   - & Paste in the Template
   - Check WRB Data against 'Contract restriction Line'

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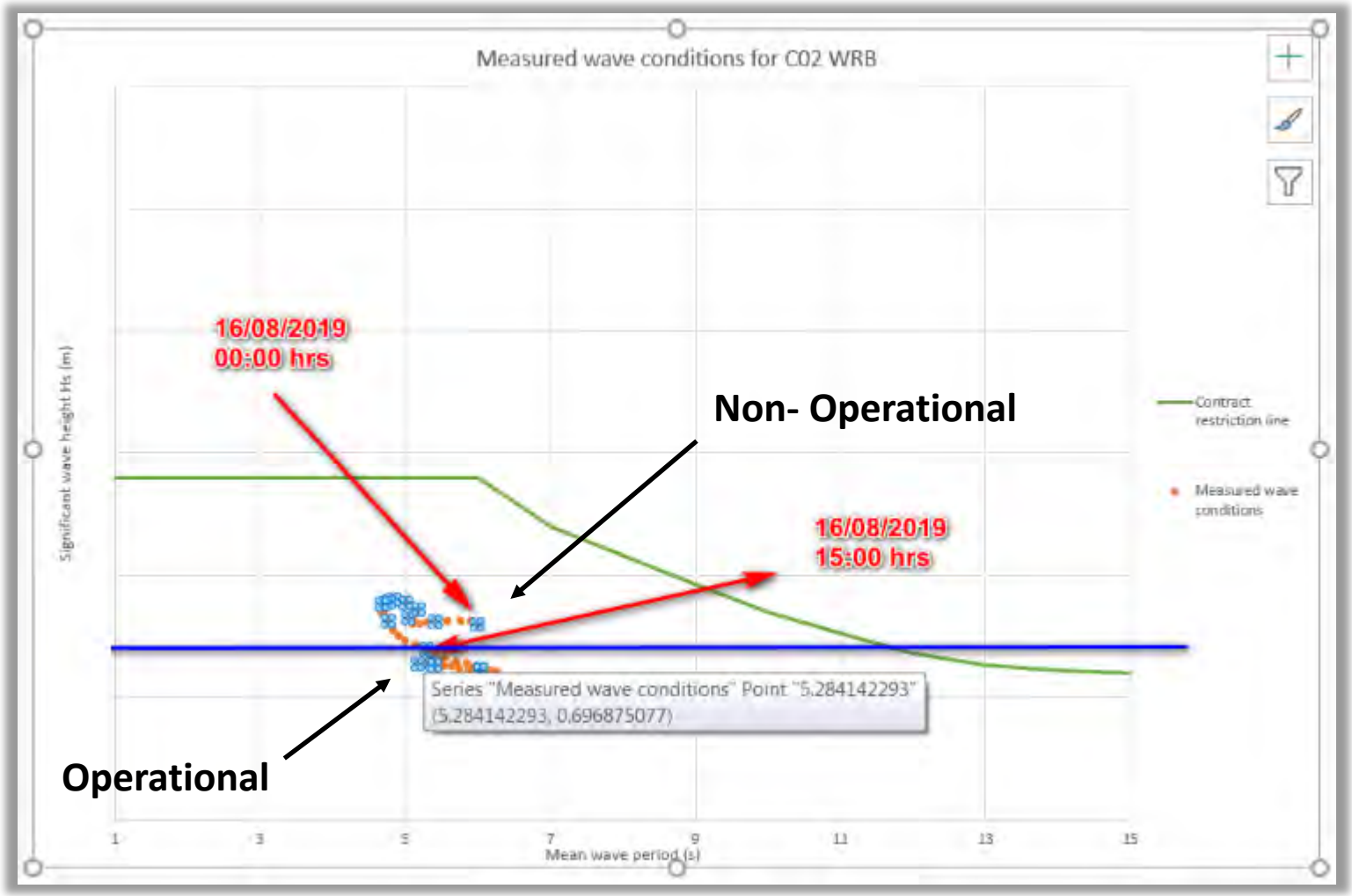
Sea State Verification System: Operationally



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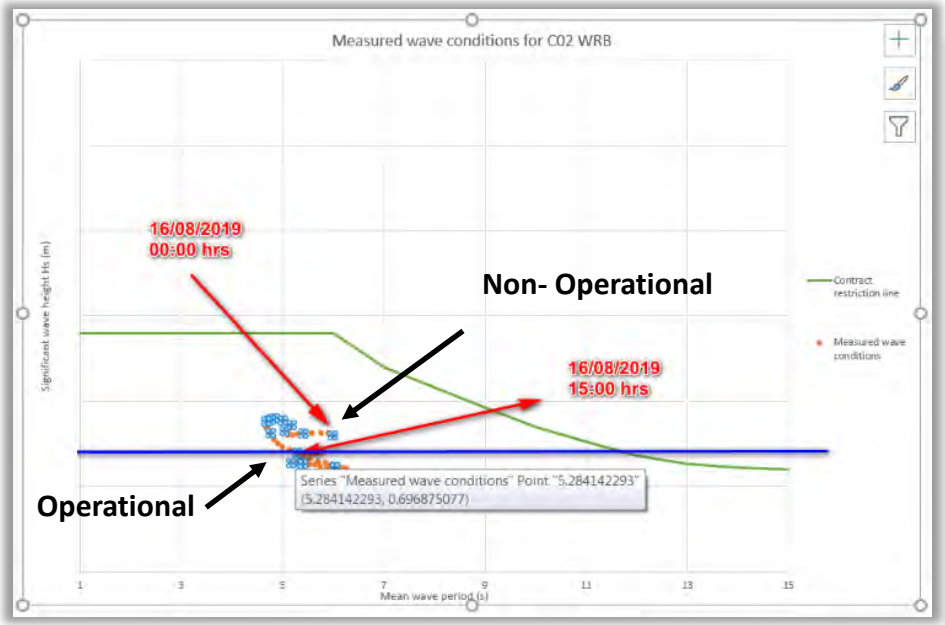
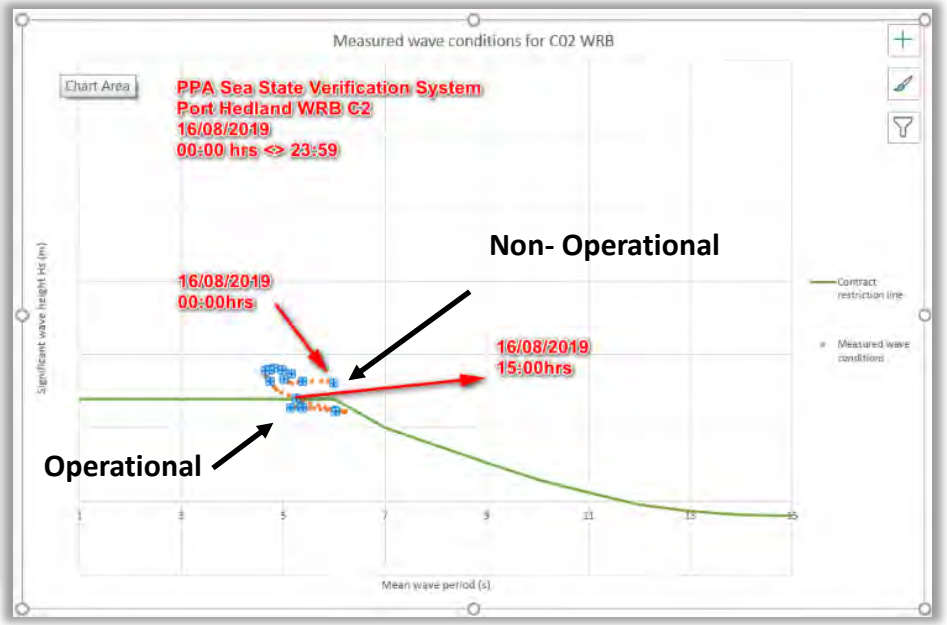
Sea State Verification System: Operationally





Vessel Operational (Contract) Parameters

Vessel Operational (Modified) Parameters

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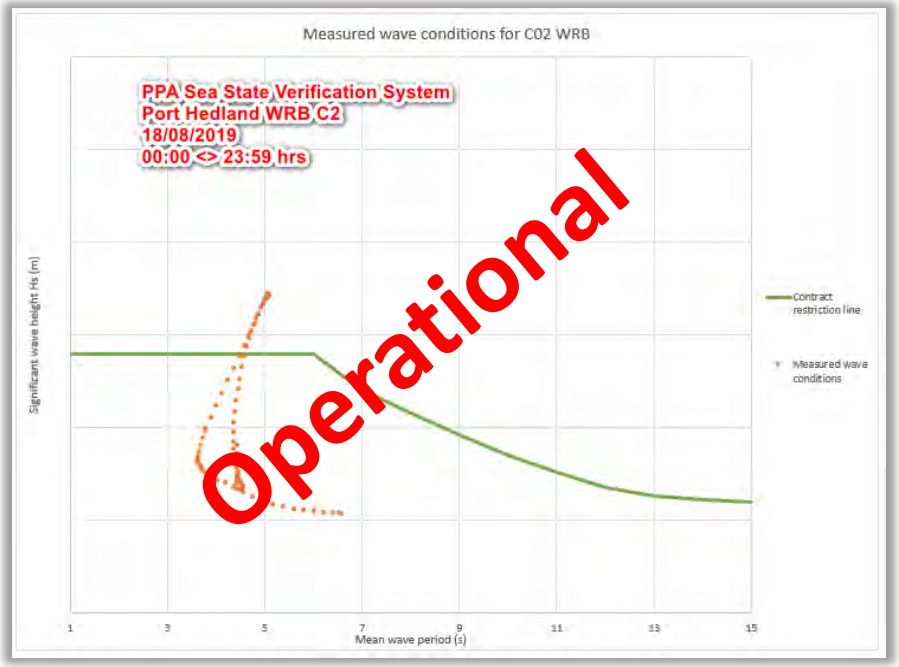
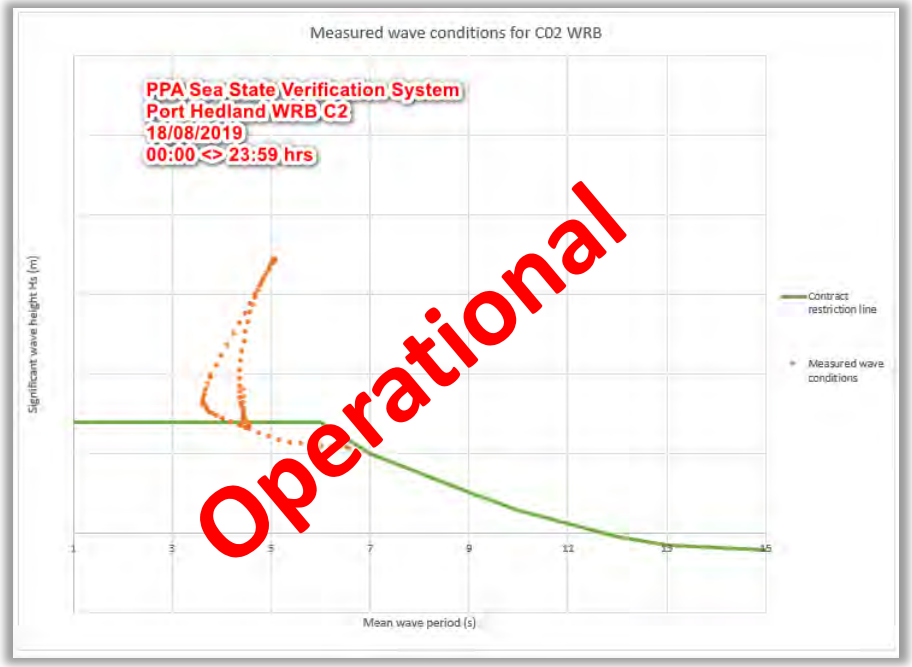
Sea State Verification System: Operationally





Vessel Operational (Contract) Parameters

Vessel Operational (Modified) Parameters

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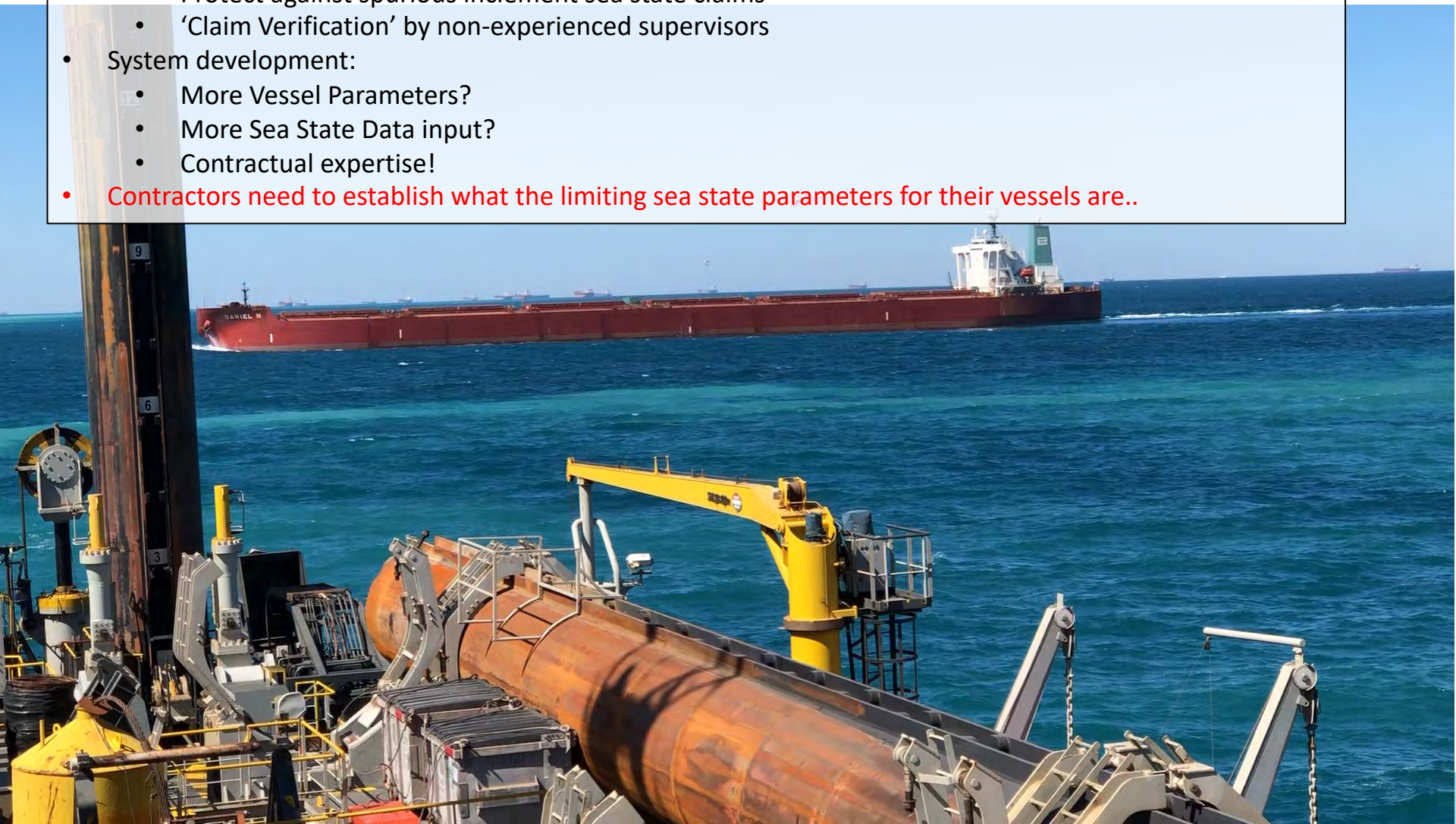
Sea State Verification System Summary:

- System Aims:
  - Create a ‘Level Playing Field’ at a Project’s Tender Stage
  - Protect against spurious inclement sea state claims
  - ‘Claim Verification’ by non-experienced supervisors
- System development:
  - More Vessel Parameters?
  - More Sea State Data input?
  - Contractual expertise!
- Contractors need to establish what the limiting sea state parameters for their vessels are..



Questions or Comments?

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Last Chance to Register for FOO 2019!

The third Forum for Operational Oceanography will be held on the 15-16 October 2019, at the **Pullman Albert Park Melbourne**. We have 100 registered attendees but still room for some more. So don't miss out.

The program has two central themes:

1. **Opportunities** for operational oceanography to drive the development of Australian marine industries
2. **Risks** to Australian marine industries and the role of operational oceanography in helping to manage them