SOMS UKC CONCEPT STUDY

38th Tripartite Technical Experts Groups Meeting
9-10 October 2013
Grand Inna Kuta
Bali, Indonesia

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Background

37th Tripartite Technical Experts Group

- Concept Study for real-time monitoring of UKC
- Benefits include:
  - UKC information for:
    - **SITUATIONAL AWARENESS**
    - **ENHANCING SAFETY OF NAVIGATION**
  - Optimising deep draft vessels management and operations
  - Leverage existing MEH infrastructure
- Importance of region
  - Great economic and natural significance

Source: Google Earth

Objectives

- Compile and Review
  - Present infrastructure, equipment, and data
  - UKC regulations and critical UKC areas
  - Shipborne equipment availability and suitability
- Propose a cost effective solution and road map
- GAP analysis to implement system
- Implementation
- Time lines
- Cost and Benefits

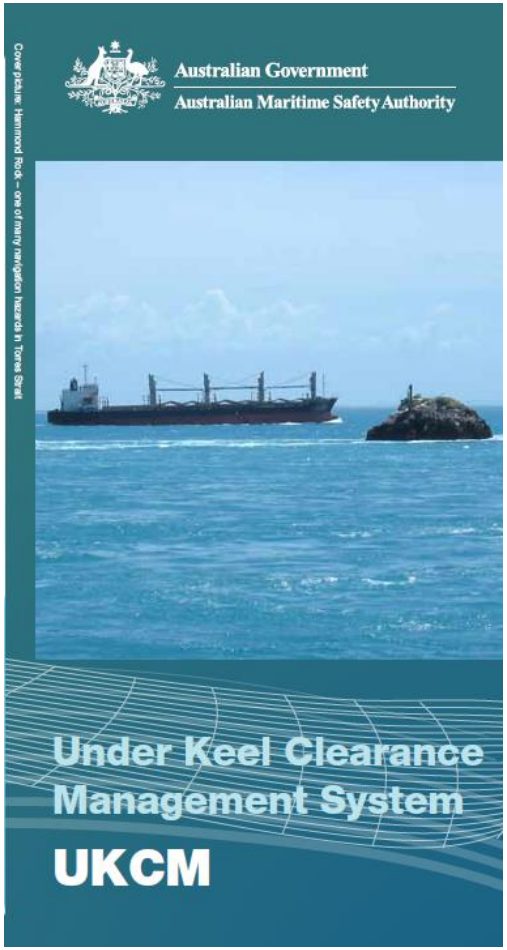
31st meeting of The Straits of Malacca and Singapore Revolving Fund Committee, 27 May 2010.

The Straits of Malacca and Singapore Revolving Fund Committee (RFC) consisting of members from the littoral States of Indonesia, Malaysia and Singapore, held its 31st Meeting in Singapore on 27 May 2010, amidst a concerted oil spill clean-up operation by the three States in the Singapore Strait.

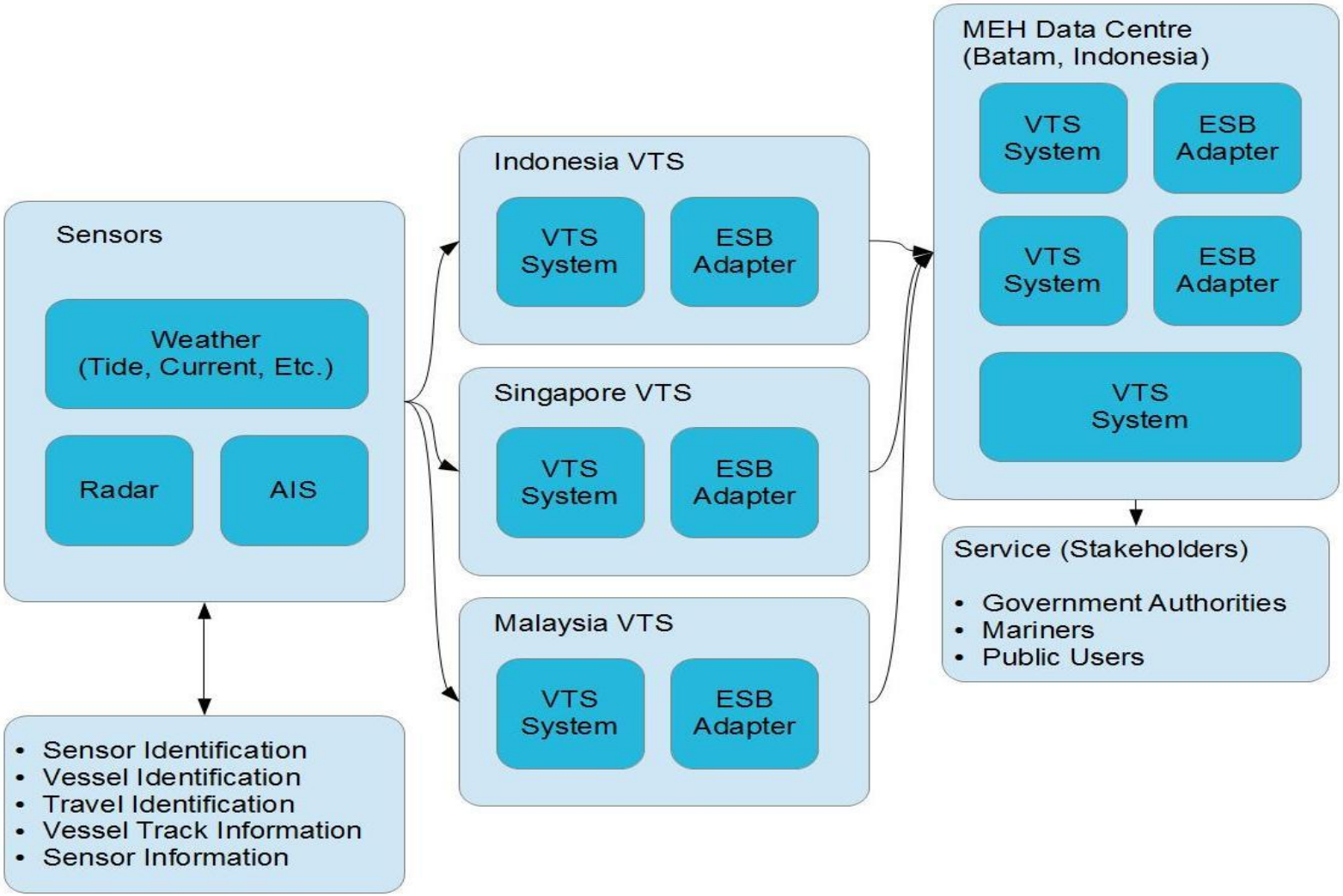
http://www.oilspillnews.net/oil-spill-clean-up/singapore-continues-oil-spill-cleanup-efforts-gov-monitor/

Existing Systems

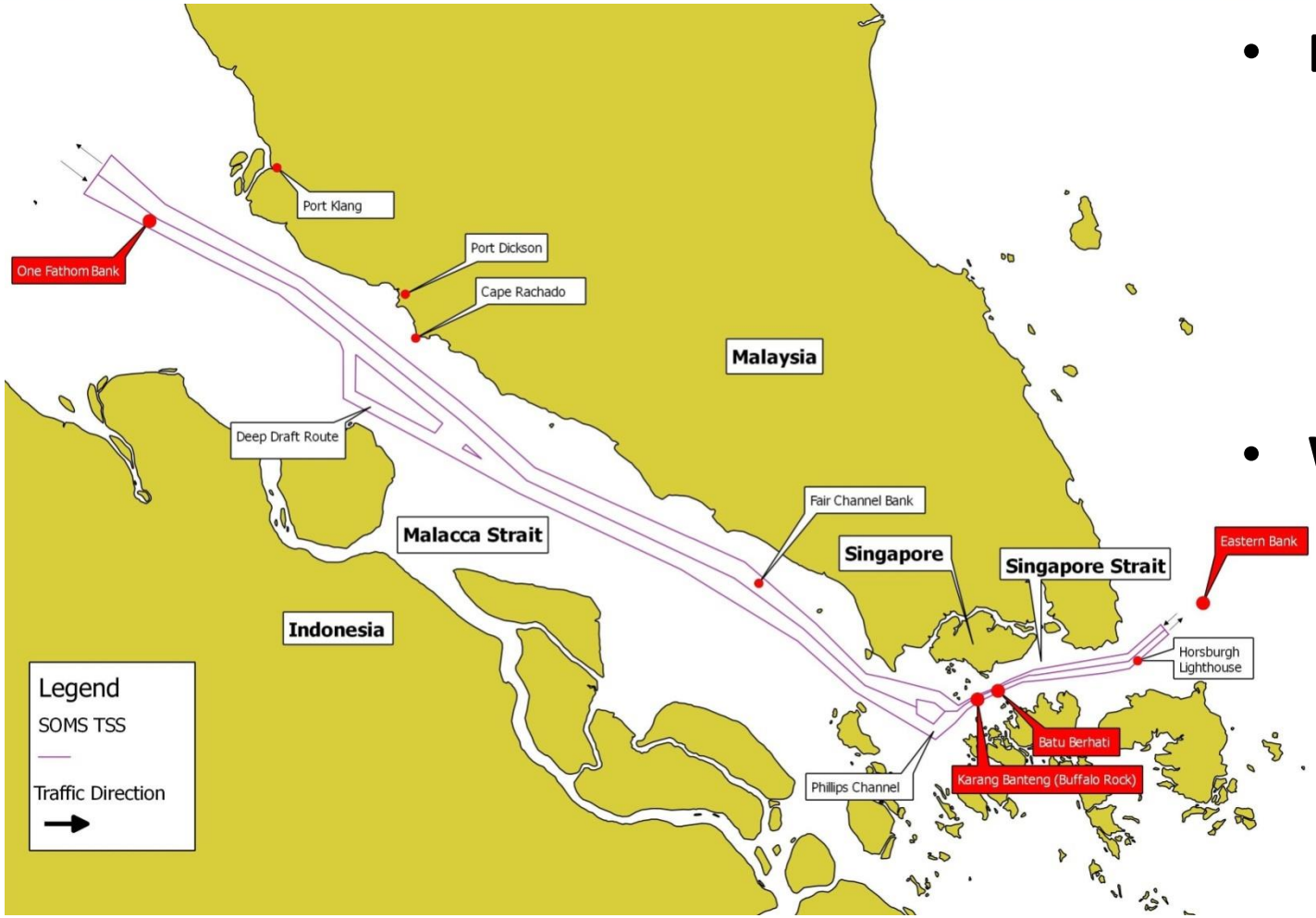
- Traffic Separation Schemes
- Straitrep
- MEH
  - Provides most of IT Infrastructure
  - Co-ordinates data/systems between littoral States
- Region precedence
  - AMSA Torres Straits UKCM



SOMS Infrastructure



SOMS – Critical UKC Areas



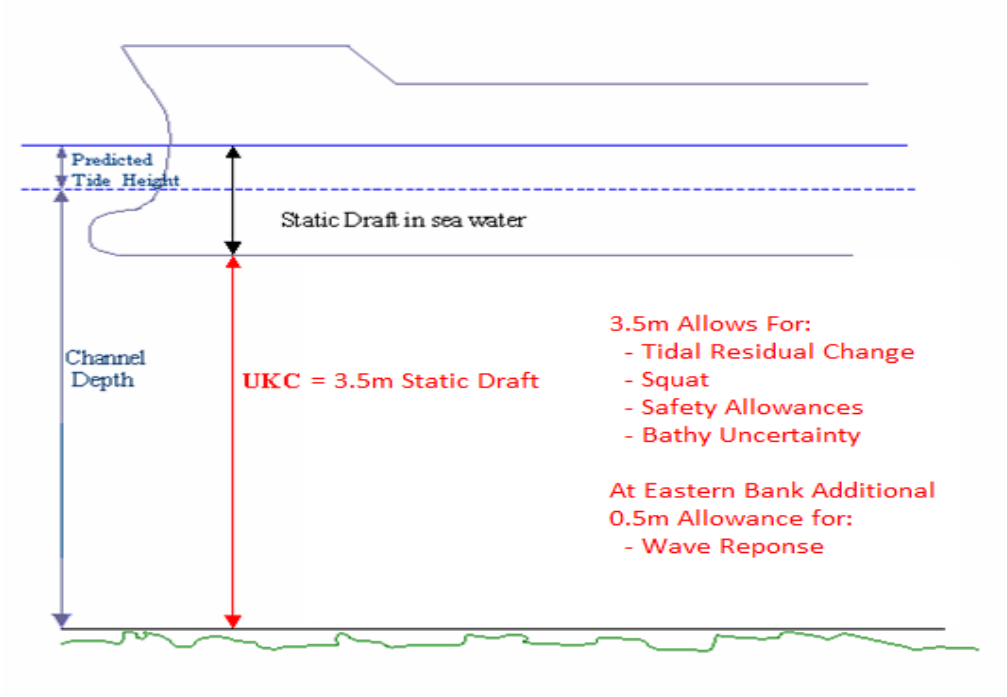
- **East Bound**
  - **One Fathom Bank**
  - **Kareng Banteng (Buffalo Rock) ***
  - **Eastern Bank#**
- **West Bound**
  - **No major areas for vessels <16m**

*Batu Berhanti shallower but has wider channel and can be safely avoided

Outside TSS (and report scope) but controls and must be considered

UKC Management

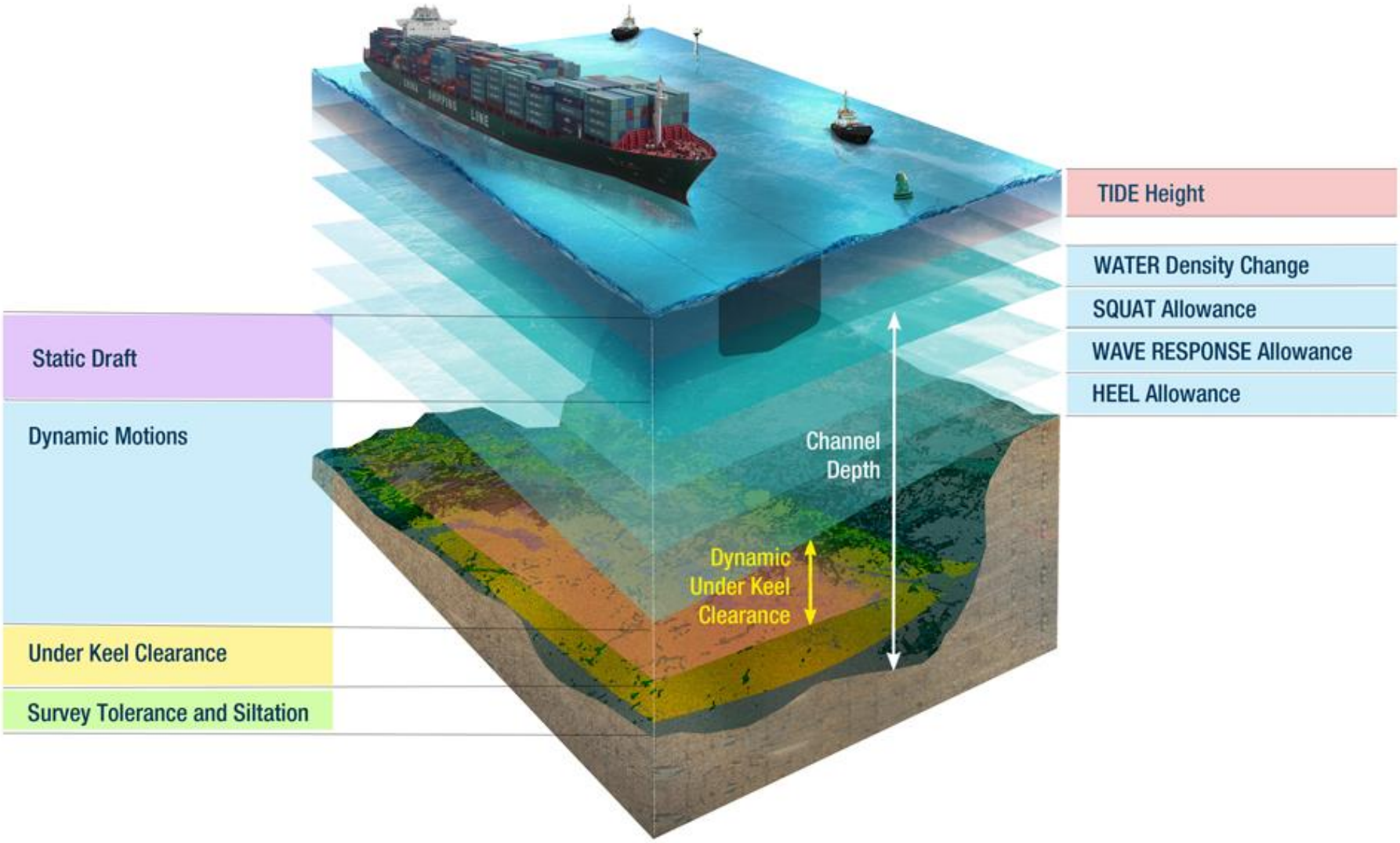
"Deep-draft vessels and VLCCs shall allow for an under-keel clearance (UKC) of ***at least 3.5m at all times*** *during the entire passage through the Straits of Malacca and Singapore"*



Ambiguity: "at least" has been interpreted as:

- **Gross (includes all allowances),** or
- **Nett (excludes allowances, primarily squat)**

UKC Factors

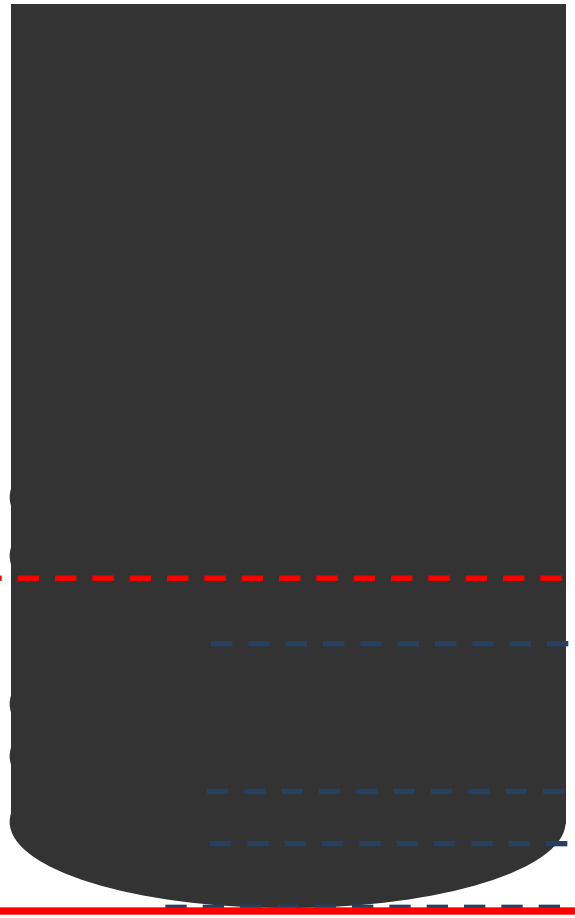

TIDE Height
WATER Density Change
SQUAT Allowance
WAVE RESPONSE Allowance
HEEL Allowance
Static Draft
Dynamic Motions
Under Keel Clearance
Survey Tolerance and Siltation
Channel Depth
Dynamic Under Keel Clearance

GROSS – TOP DOWN approach

VARIABLE RISK

Nett Clearance changes for every transit

Is it Safe, Marginal or Unsafe?



Static Rules

(Minimum clearance is determined from the draft)

Static Allowance

Tidal Residual

Fixed UKC Allowances

Squat

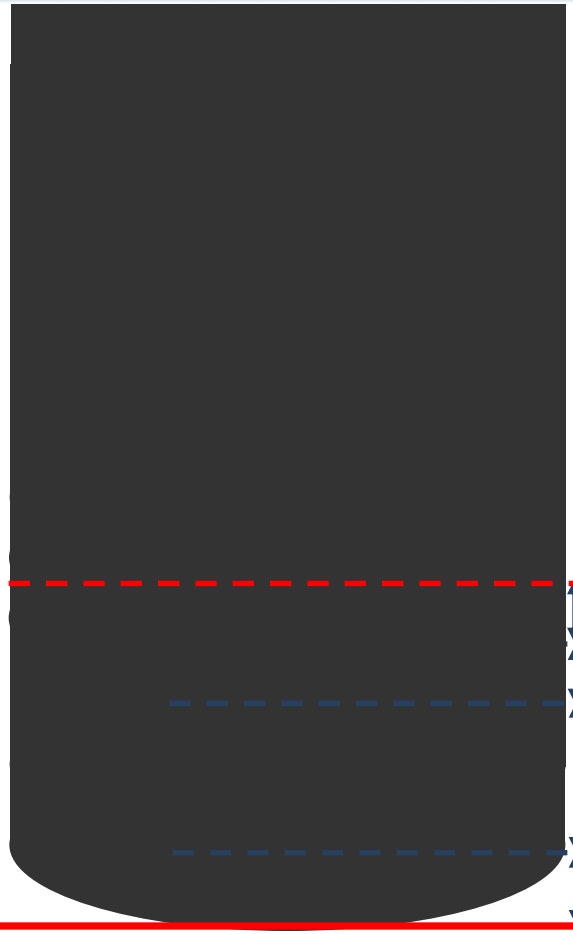
Heel

Wave Response/Setdown

Variable Nett UKC Clearance

NETT – BOTTOM UP approach

CONSTANT RISK
Minimum NETT Clearance maintained for every transit
Always Safe!



NETT UKC (using real time data) is referred to as a DYNAMIC APPROACH

Required Water Depth

Variable UKC Allowances

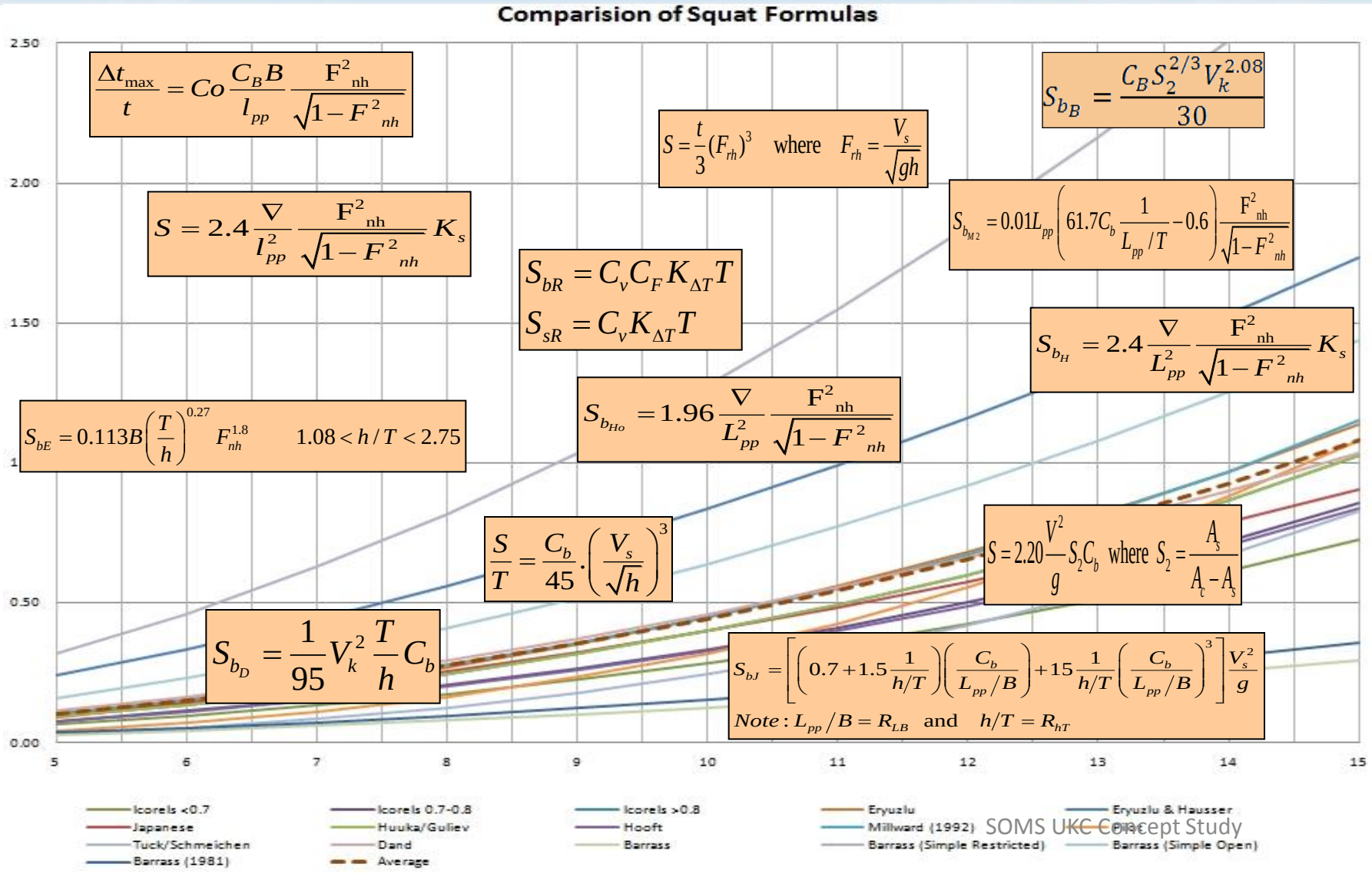
- Wave Response/Setdown
- Heel
- Squat
- Tidal Residual

Fixed NETT Allowance: Minimum Predetermined Clearance

Existing UKC Uncertainties

- Vessel draft discrepancies
- Water Levels
  - Inter tidal station heights
  - Predicted astro source tide variances
  - Environmental (actual) tidal differences
  - Transit planning variances (ETA, speed, currents, water levels)
- Bed Depths
  - Lack of recent survey data (UKHO 1950-1970 data)
  - Sand Waves (13m+; sailing directions highlights depth uncertainties)
- Squat
  - Planned speed v Actual speed
  - Formulae used and significant variation
  - Actual currents to predict squat from SOG

Squat - Which formulae?

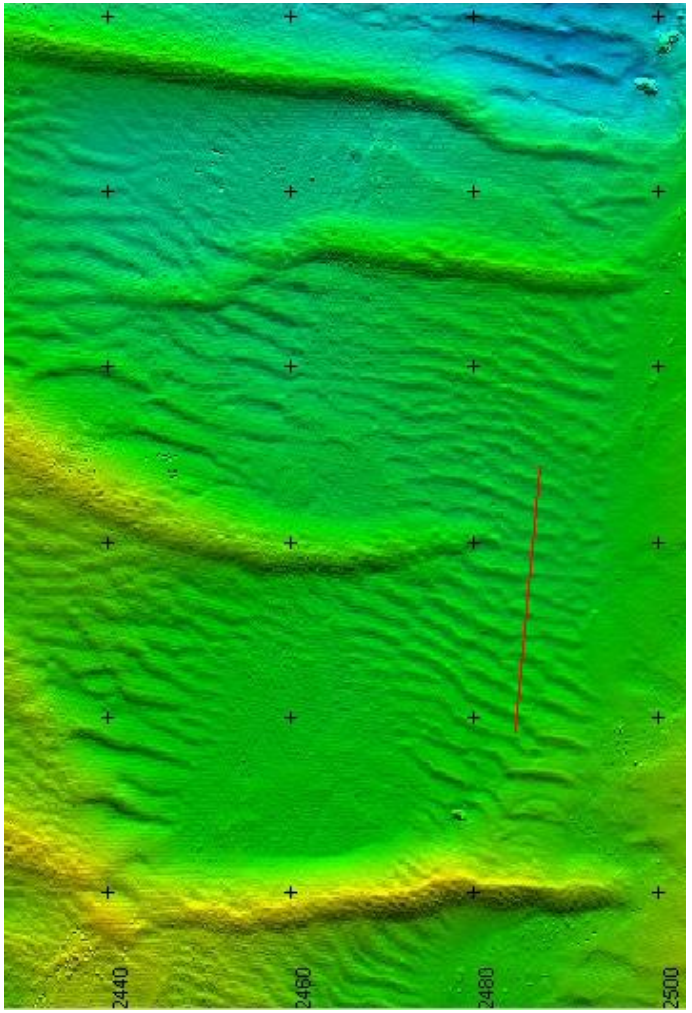


GAP Analysis

- Bathymetry
  - Historical data, Sand waves, Monitoring
- Environmental Data
  - Tide, Currents, Wave data
- Shore Infrastructure
  - IT, AIS, DGPS, Telecommunications, VTS/MEH
- Shipborne Equipment
- Numerical Modelling
  - Met-ocean, Vessel squat/heel, Wave motion

Bathymetry

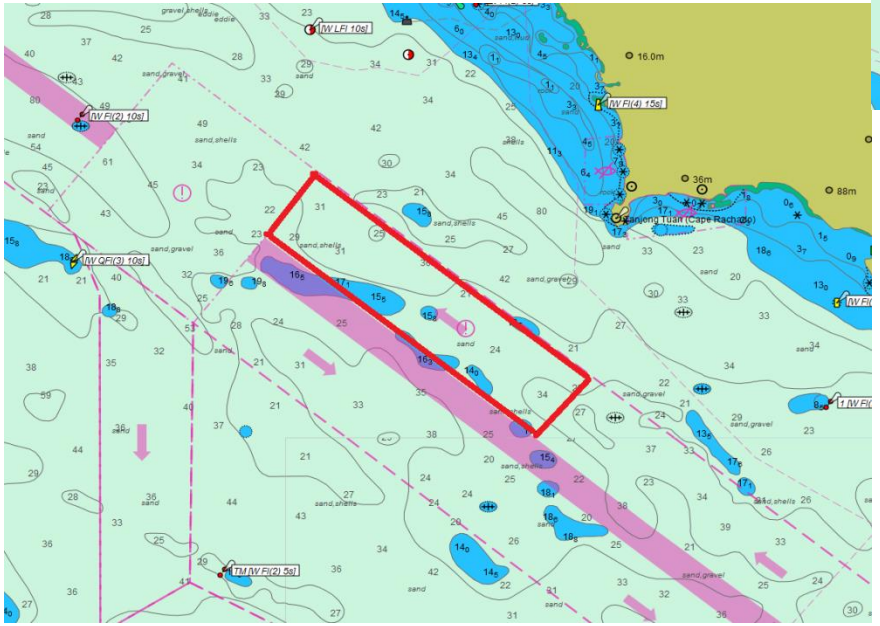
- Largest uncertainty
- Sand wave data from 1970's
  - Literature suggests relatively stable
  - Shipping Community Monitoring
- Data
  - Recent surveys conducted
  - Data not incorporated into commercial charts
- ENC production
  - Up to date survey data
  - Higher contour resolution



Sand wave monitoring

One Fathom Bank

Offshore of Cape Ricardo

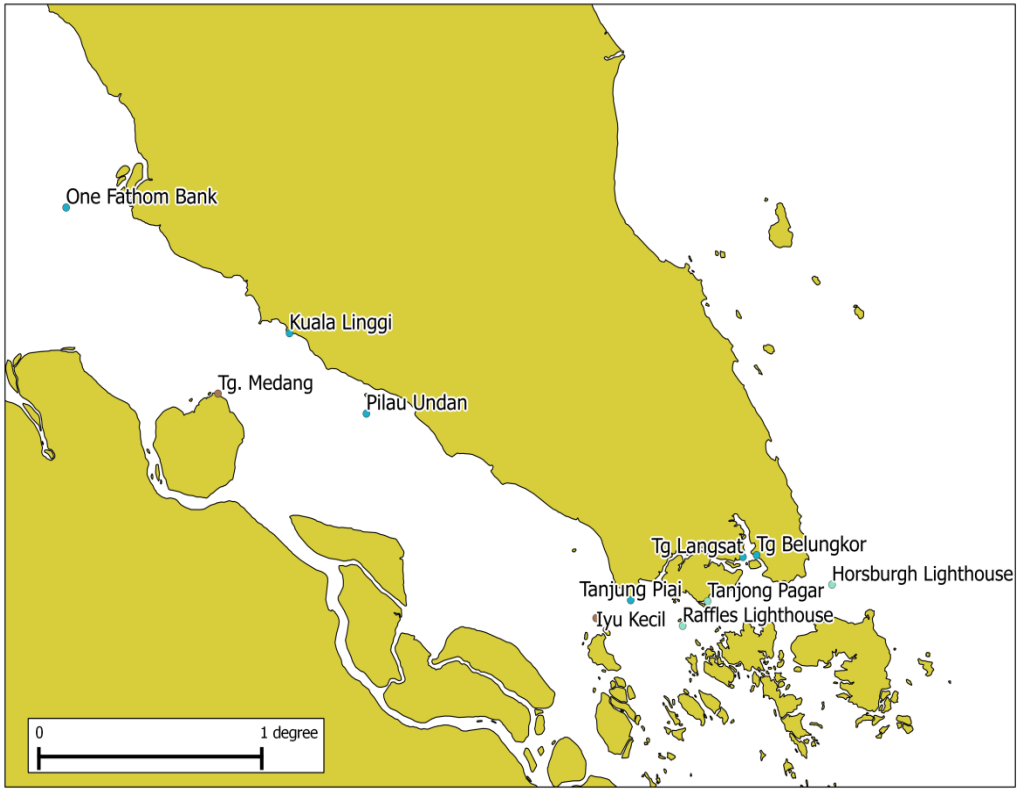


Regular monitoring recommended

- Regular surveying
- Shipping Community Monitoring

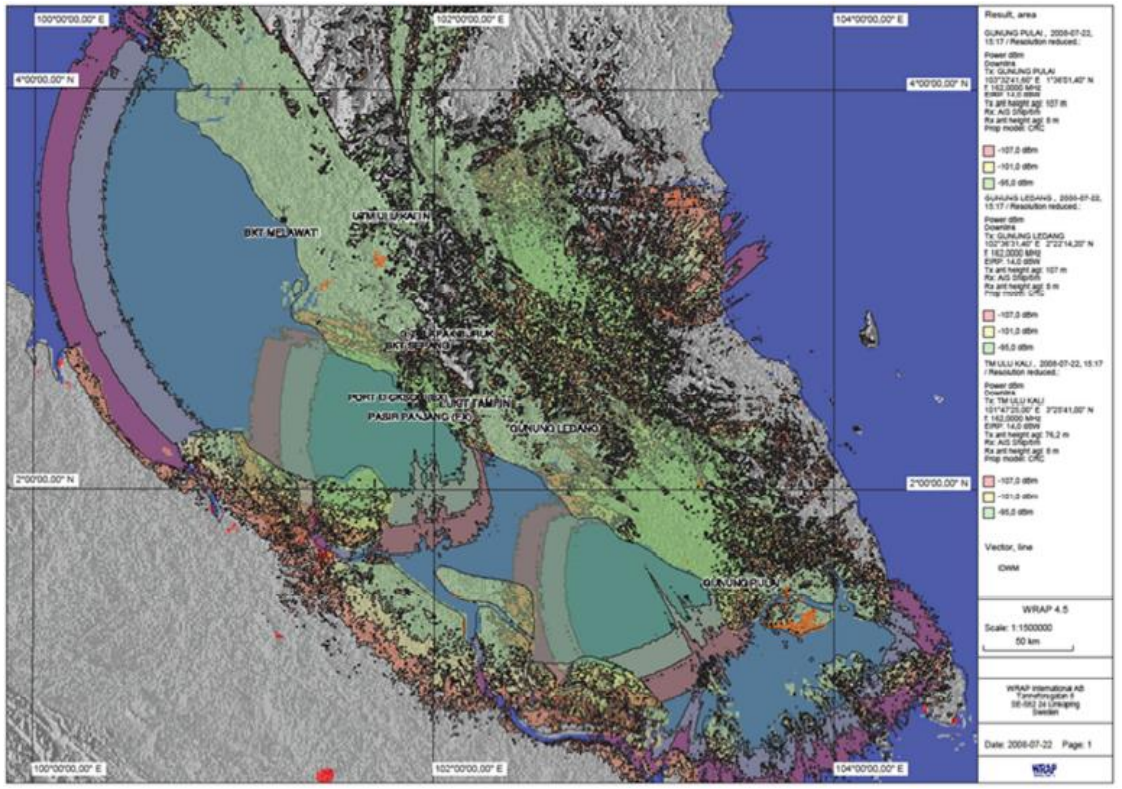
Real time data

- Real-time tide data well covered
  - Malacca 6 Stations
  - Singapore 5 Stations
- UKC critical locations covered
  - One Fathom Bank
  - Kareng Banteng
- Real time currents
  - 4 stations
  - Near UKC critical location



Shore Infrastructure

- AIS
  - SOMS coverage good
  - Initial communication technology
- Marine Broadband
  - 8x AIS data capability
  - Trial recommended
- VTS-MEH
  - Integration of VTS centre
  - data into MEH



Shipborne Equipment Survey

www.km.kongsberg.com

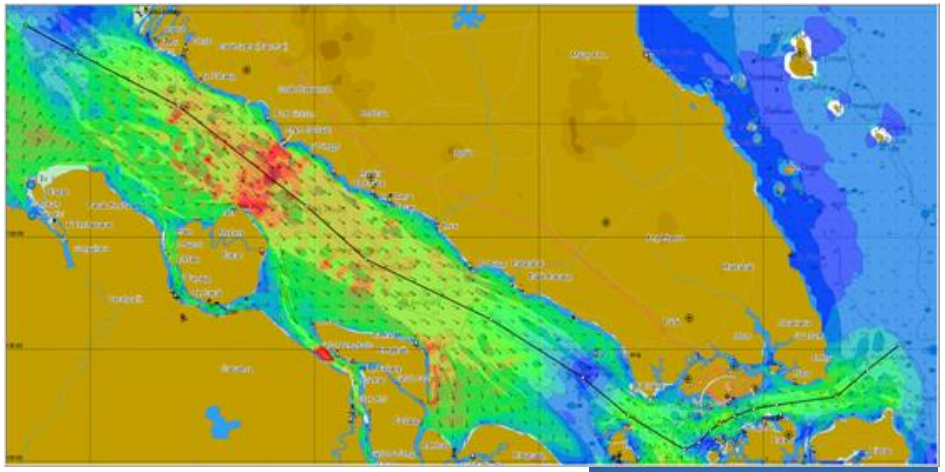
- Meets SOLAS requirements
- ECDIS – still being implemented
- Communication Equipment:
  - AIS, VHF
  - SatComms (A and C)
  - Broadband availability: limited
- eNav integration still in its infancy
- PPU equipment
- Training

Existing equipment will allow for implementation of a Real-time UKC Monitoring system

53 Vessels responded to survey

Numerical Modelling

- Existing infrastructure sufficient



- Met Ocean Forecasting
  - Tide, Currents
  - Spatial & Temporal

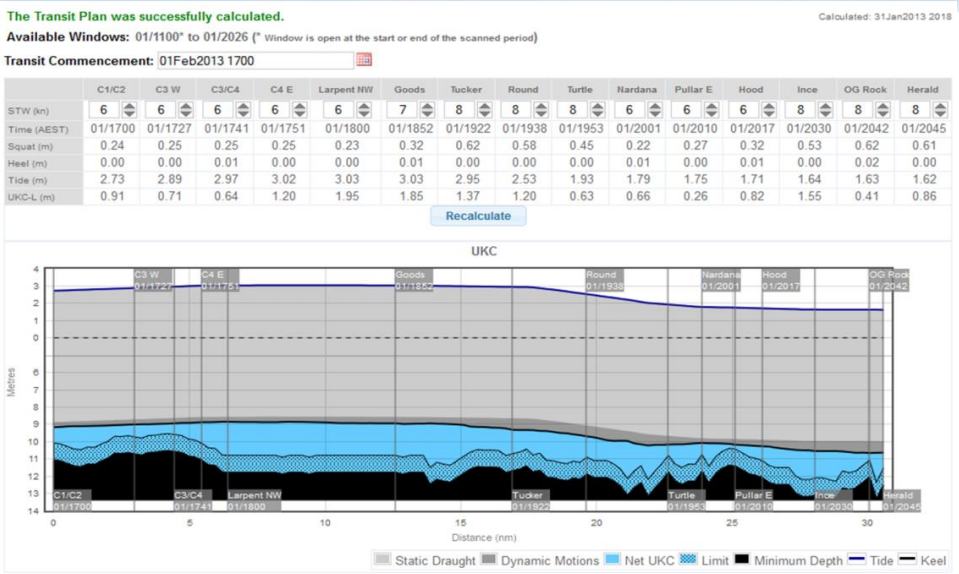
- Vessel Modelling
  - UKC Components
  - Accurate squat models
  - Measurement verification campaign

GAP Analysis - Findings

- **UKC Monitoring System requirements are well covered by existing shore infrastructure**
  - Real time tide and current devices
  - Full AIS coverage
  - Central integration of SOMS data
- **No additional ship borne equipment required**
- **No significant barriers to implementation**

Anticipated User Needs

- Differing Users
  - Regulators/Administrators
  - Shipmasters/Pilots
  - Commercial Operators



- Differing Needs
  - Long and short term planning/optimisation
  - Tidal windows/Transit planning (speed optimisation)
  - Real time Monitoring/Compliance and Control
  - Ensured safety - breaches/warnings (present/predicted)
  - Contingency planning
  - Data archival, reporting, auditing

Vision

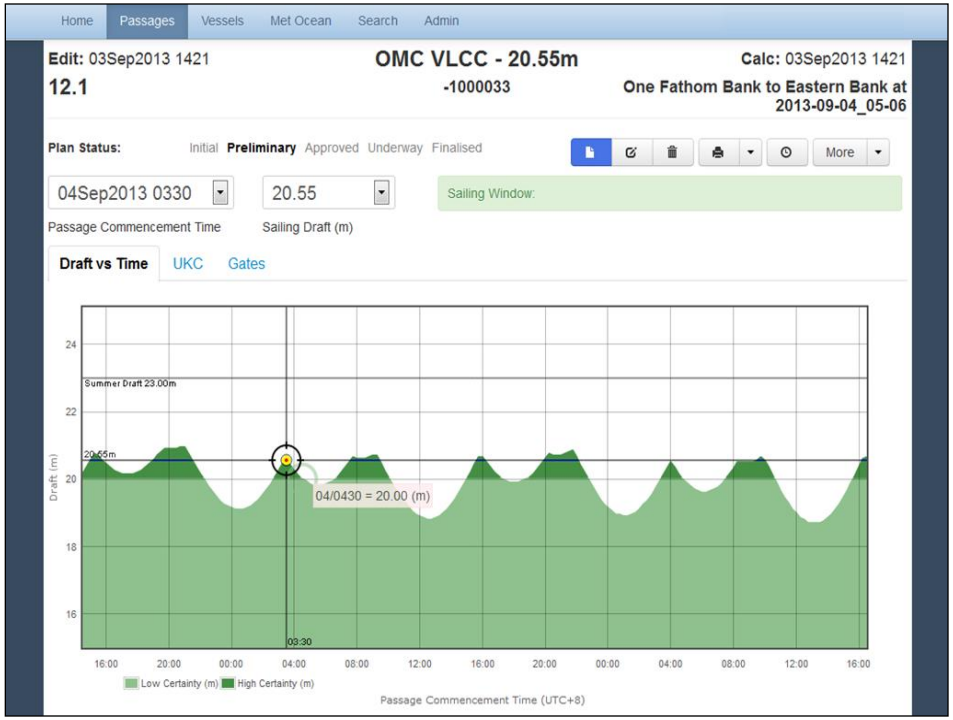
The effective MITIGATION of grounding hazards within the SOMS area

- Implementation of a proven and recognised operational **eNav** solution
- Integrate with Vessel Traffic Management Systems
- Enhanced passage planning and decision making process by making comprehensive information available to all parties
- Safer Navigation

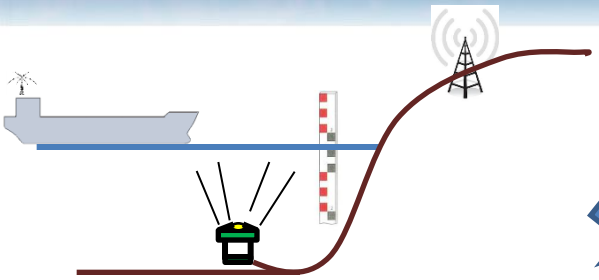
Solution - SOMS Real Time UKC

- NETT UKC regime with calculated UKC of every vessel
  - Specific UKC allowances/ accurate predictions and models

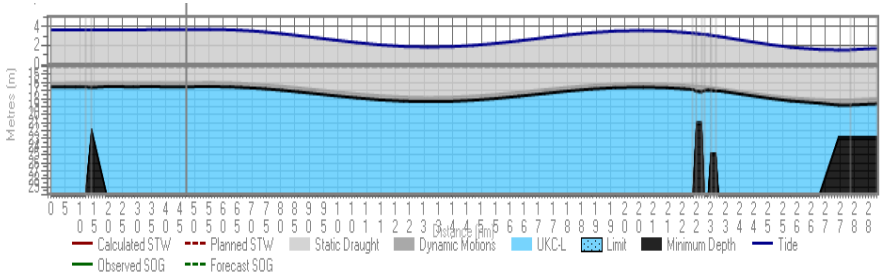
- Real time environmental data
- Shore based system
- Ship operator/vessel access
- Monitoring of deep draft vessels
- Accurate transit planning:
  (tidal window, speed control)
- Data archiving, auditing
  and reporting



Proposed System



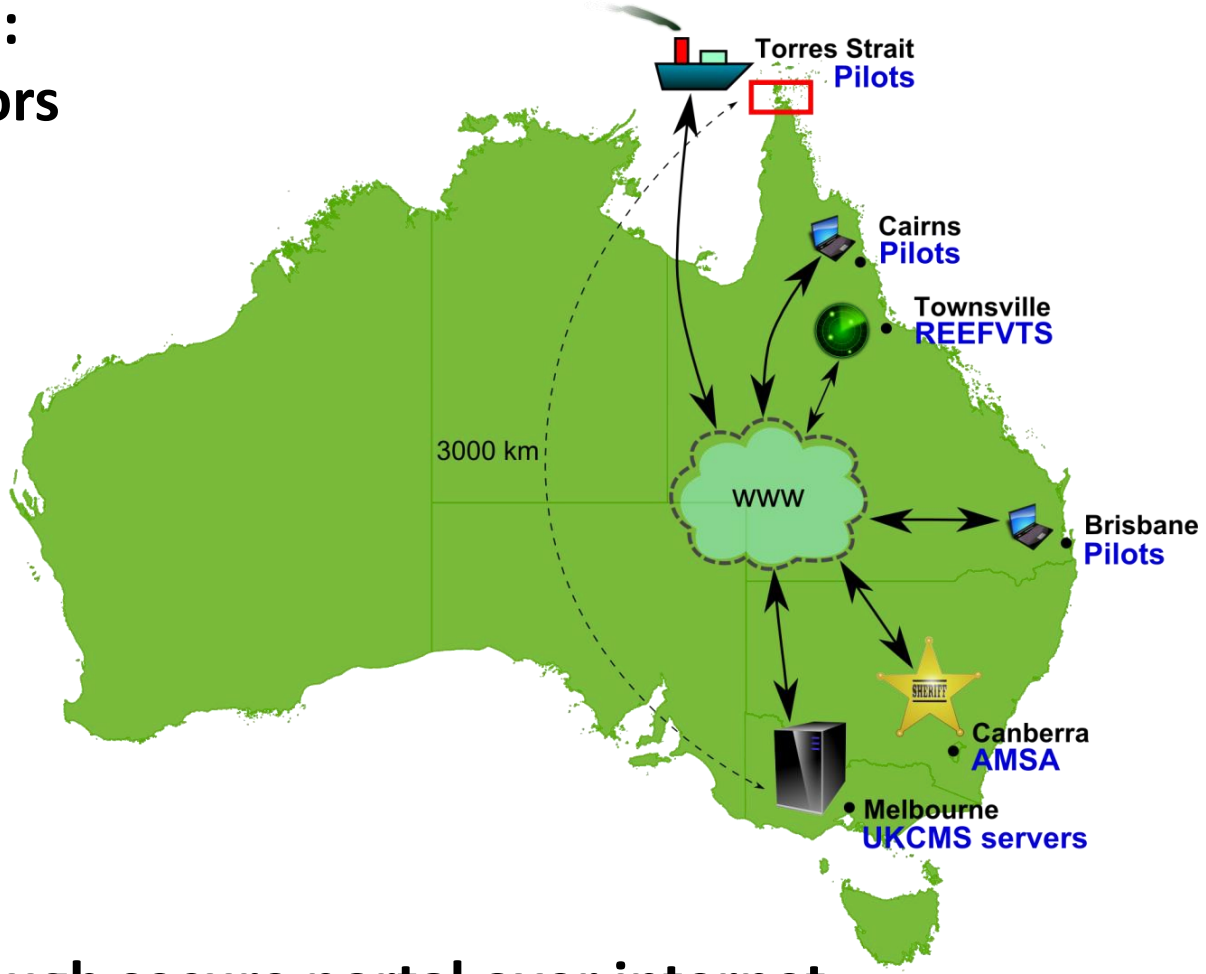
MEH



Information sharing (Web/AIS)

Distributed stakeholders:

- **Littoral State Regulators**
- **System Operators**
  - **VTS**
  - **AIS/DGPS**
- **Port Authorities**
  - **National Authorities**
  - **Local Ports**
  - **Pilots**
- **Shipping Industry**
  - **Vessels**
  - **Agents**
  - **Terminals**



Information sharing through secure portal over internet

Implementation Stages

OMC International

Stage 1 Passive

- Monitoring
- Auditing
- Reporting Compliance

Stage 2 UKC Review

- Data Assessment
- Implement GAP findings
- Regulators Stake Holders

Stage 3 Active

- Predictive Warnings
- Full modelling
- Tidal Windows/ Transit Plans

Stage 4 Draft & Load Planning

- Long range planning
- Draft Optimisation
- Tidal Window Optimisation

Phased implementation

- **First stage - Operational within months**
- **Full implementation - 2+ years**

Stage 1

Passive

- Monitoring
- Auditing
- Reporting Compliance

Aims

- Compliance Monitoring at critical locations
- Reduce knowledge gaps
- Passive : No user input required
- Positions, draft and enviro data from MEH
- Full scale vessel motion (squat) validation
- Bathymetric surveys
- Gross Compliance and NETT UKC profiles documented and distributed

Stage 2

UKC Review

- Data Assessment
- Implement GAP findings
- Regulators Stake Holders

Data Assessment and Review

- Collate data collected
- Quantify reduction in risk
- Quantify potential economic benefits

Implementation of GAP findings

- ENC's
- Sand wave analysis/assessment
- Numerical Modelling

Regulators/Stakeholders

- NETT UKC regime

Stage 3

OMC International

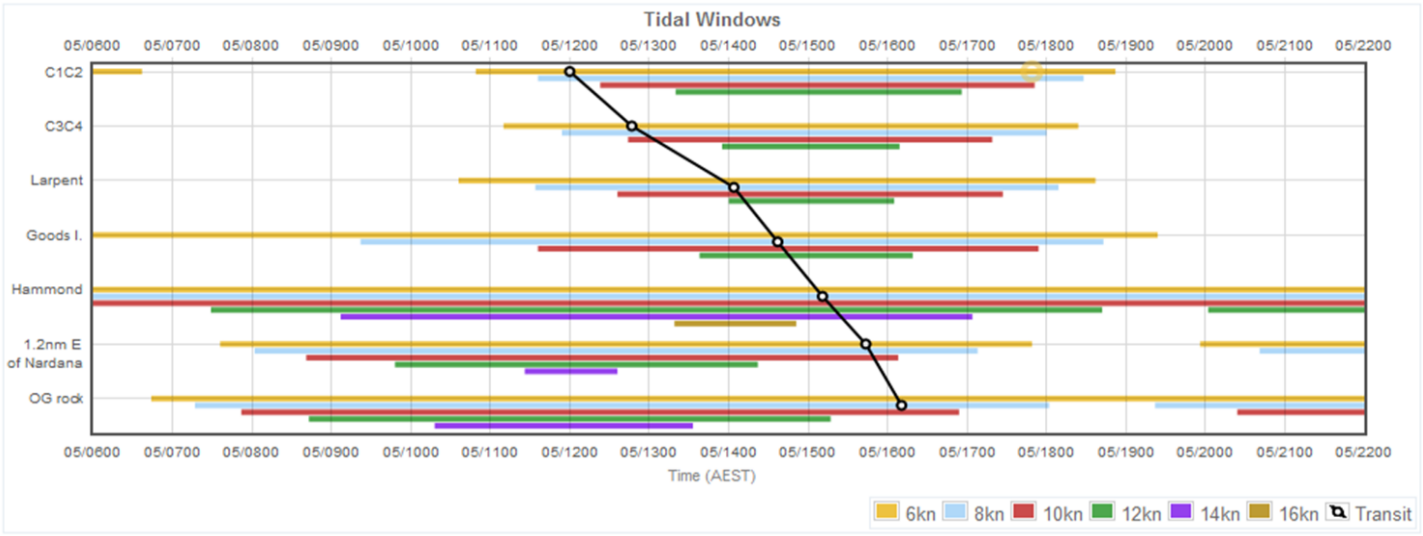
Active

- Predictive Warnings
- Full modelling
- Tidal Windows/ Transit Plans

NETT UKC Regime

- SOMS-wide real time UKC monitoring
- Predictive (distributed) warnings
- Distribution of UKC information to shipboard users
- Environmental prediction models

Tidal Windows



Stage 4

Draft & Load Planning

- Long range planning
- Draft Optimisation
- Tidal Window Optimisation

Long Range

- Long term transit planning for commercial operators
- Met-ocean long range predictions
- Ocean Voyage Planning (economical speed/bunkers)

Optimisation

- Load (draft) / Voyage optimisation
- Transit (speed) planning/optimisation
- Met-ocean short range real time predictions

Conclusion

www.awesomeperak.com

A real time UKC monitoring system will provide

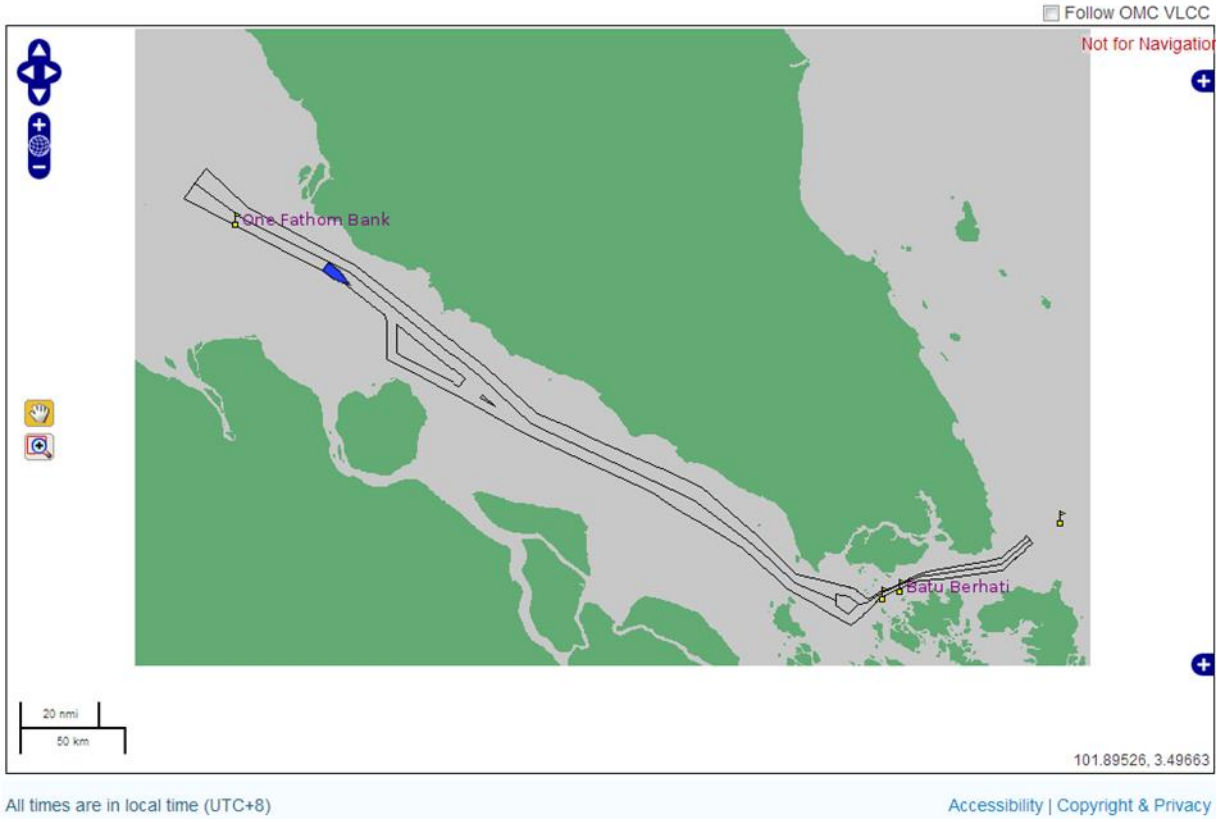
SAFETY and ECONOMIC benefits

- **Staged implementation with reviews**
- **Integrated with existing infrastructure (MEH)**
- **Identified GAPS do not impede implementation**
- **No additional shipborne equipment**

Improved and an Assured Safety Regime for Vessels

Real Time UKC Monitoring

- Prototype Demonstration



Thank You