



The banner features three circular images: the PIANC logo with the text 'PIANC · A.D.1885 · AIPC · NAVIGARE NECESSE', a cargo ship, and a port with red cranes. To the right, the text reads 'PIANC APAC 2024', '3RD PIANC ASIA PACIFIC CONFERENCE', '27-30 AUGUST 2024', 'SYDNEY, AUSTRALIA', and the website 'www.piancapac.com'. Below the images is the tagline 'Connecting Asia Pacific ports in a changing world'.

Improved Port Planning and Risk Management using AIS and PPU Data

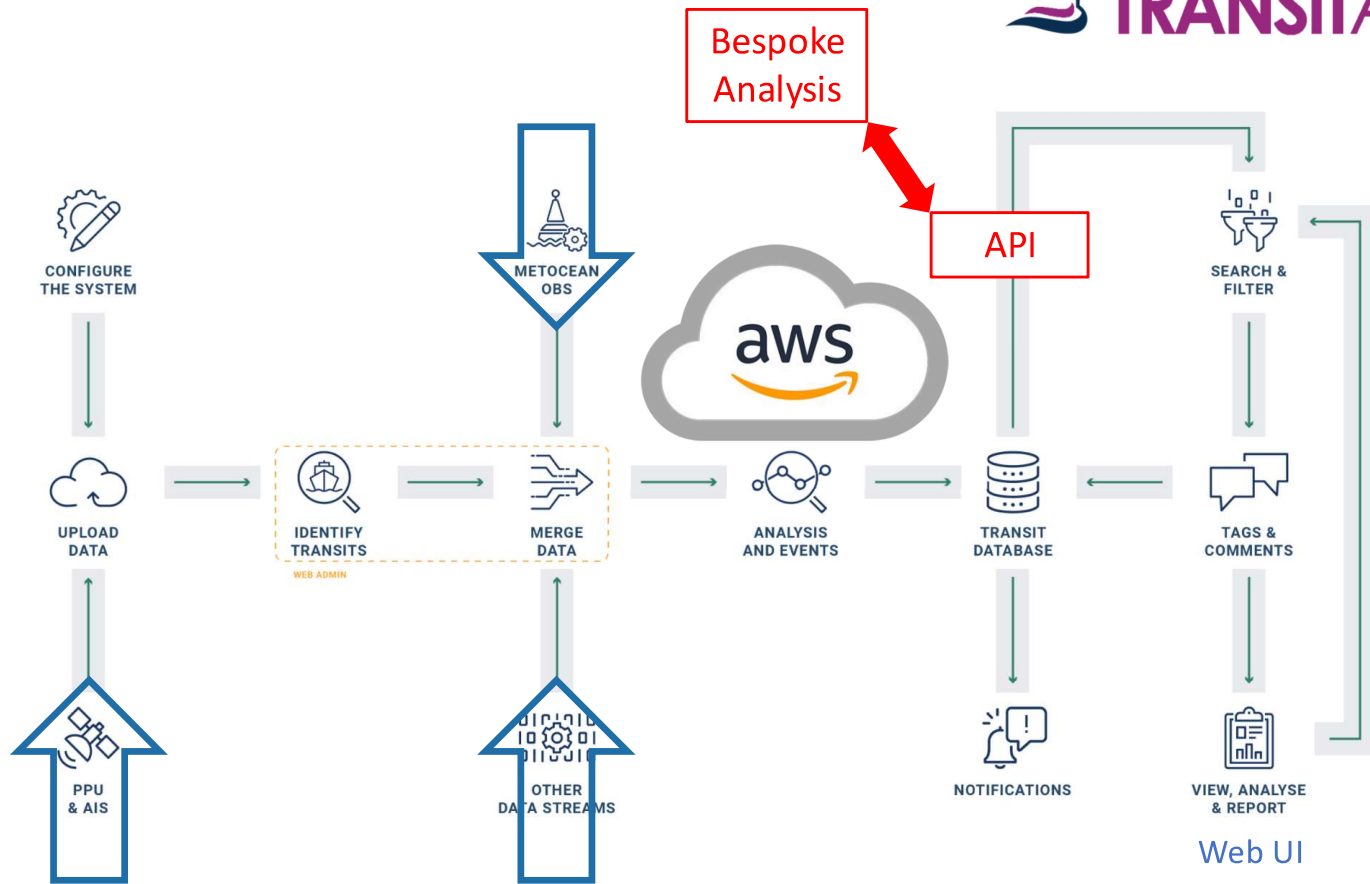
Dr. Giles Lesser, Dr. Matthew Turner, and Jonathan Stewart



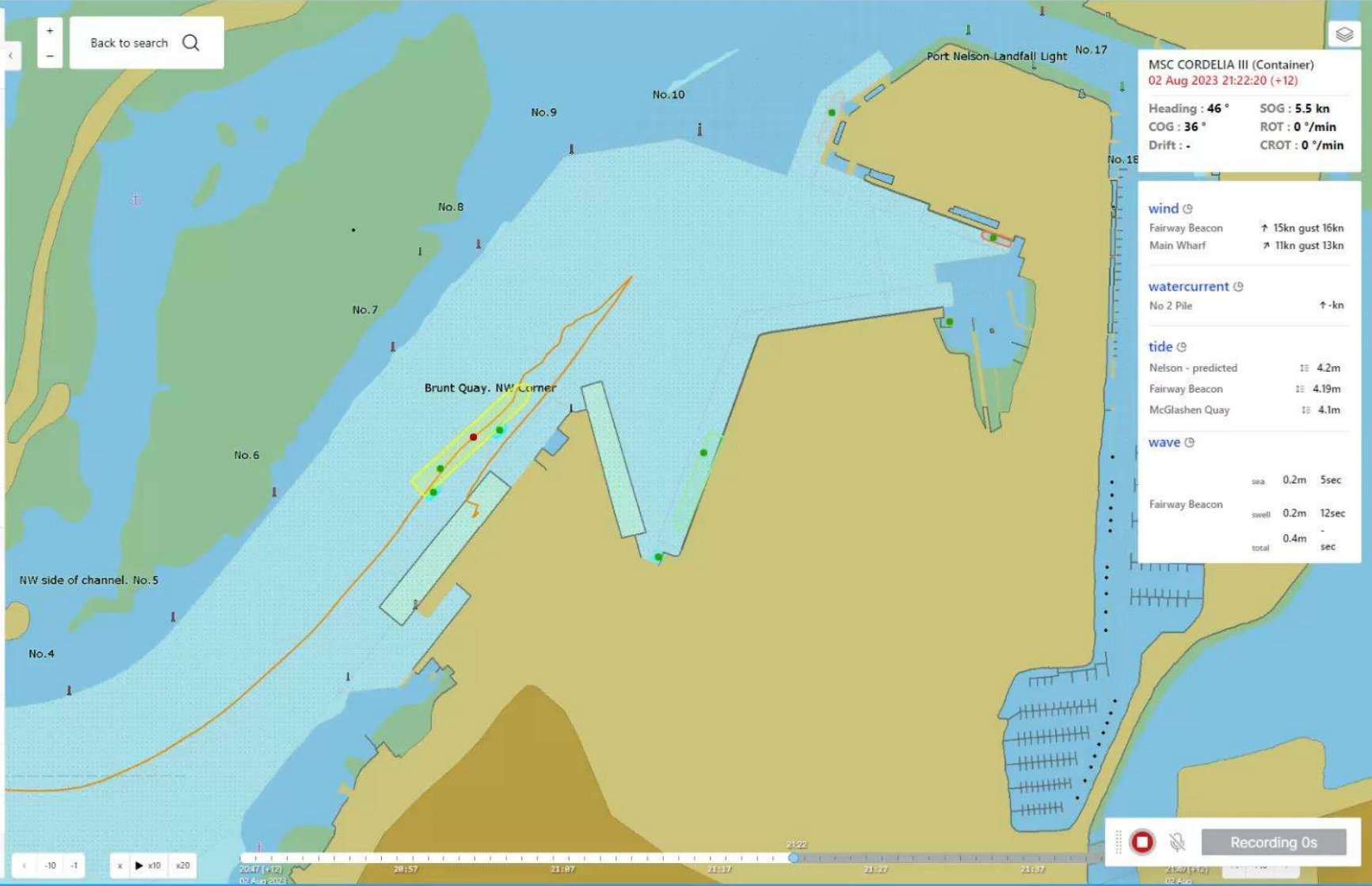
Typical port data sources and data storage



TRANSITANALYST



- Transit
- Vessels**
- Transit vessels (7)
- BALTIC PEARL
309841000-Cargo
 - TOKATU
512443000-Other
 - F.VAUKAHA
512000113-Fishing
Draft: 6.3 m
 - AMALTAL EXPLORER
512000192-Other
 - TAHAROA EOS
563190000-Bulk Carrier
 - WECO MALOU
636021541-Tanker
 - FUJITRANS WORLD
636016327-Vehicle Carrier
- Port vessels (4)
- TOIA
512005663 -Tug
Draft: 4.5 m
 - HURIA MATENGA II
512007650 -Tug
Draft: 5.5 m
 - NELSON PILOT
512000706 -Pilot
 - WH PARR
512004353 -Tug
- Other vessels (22)



MSC CORDELIA III (Container)
02 Aug 2023 21:22:20 (+12)

Heading : 46 ° SOG : 5.5 kn
COG : 36 ° ROT : 0 °/min
Drift : - CROT : 0 °/min

wind

Fairway Beacon ↑ 15kn gust 16kn
Main Wharf ↑ 11kn gust 13kn

watercurrent

No 2 Pile ↑ -kn

tide

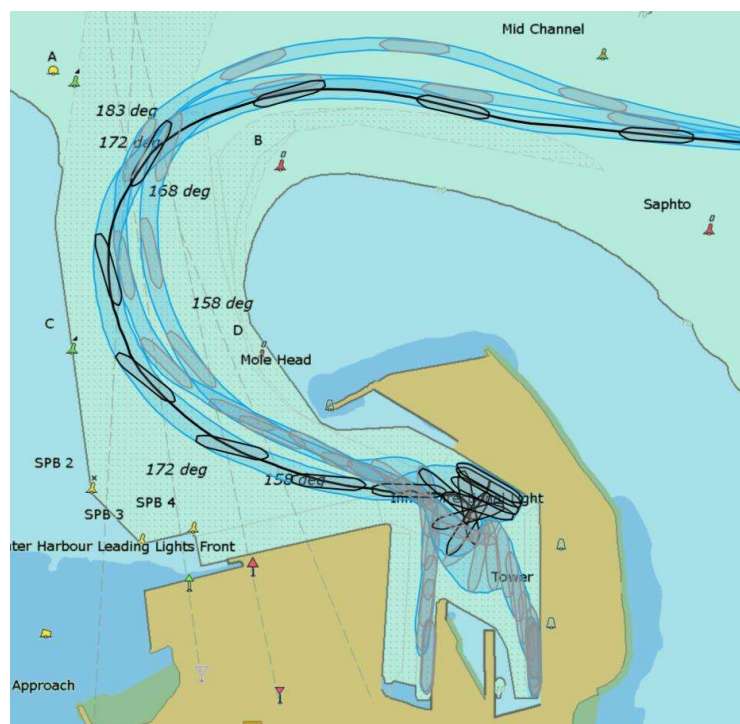
Nelson - predicted ⏱ 4.2m
Fairway Beacon ⏱ 4.19m
McGlashen Quay ⏱ 4.1m

wave

sea	0.2m	5sec
Fairway Beacon swell	0.2m	12sec
total	0.4m	sec

Recording Os

Pilotage use of TransitAnalyst



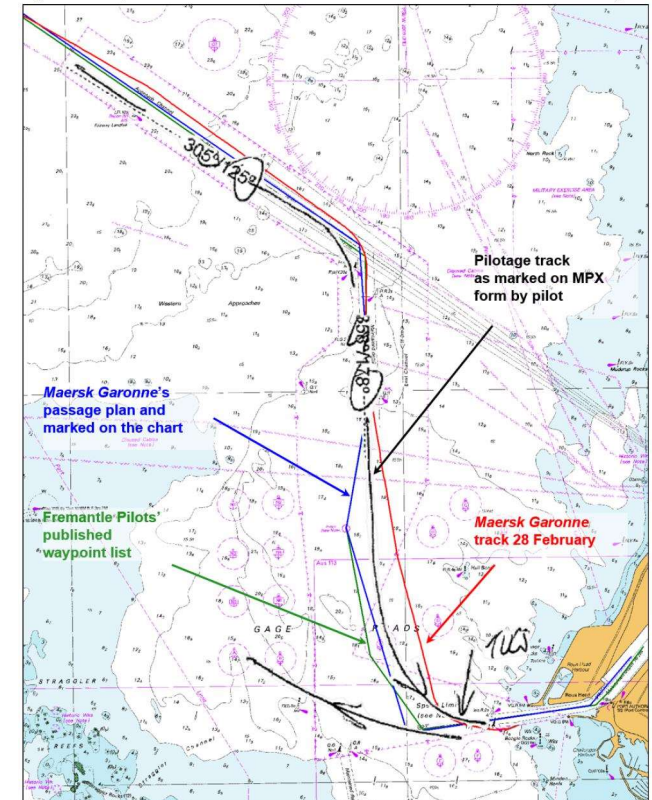
 TRANSITANALYST

- Motivated by "Flight Operational Quality Assurance" (FOQA)
- Break continuous vessel position data into identifiable transits.
- Tag transits to facilitate searching.
- Easily identify trends and outliers.
- Monitor compliance with plans and procedures.
- Risk identification and monitoring.
- Fosters discussion and collaboration.
- Invaluable for personal training and development.

An isolated error?

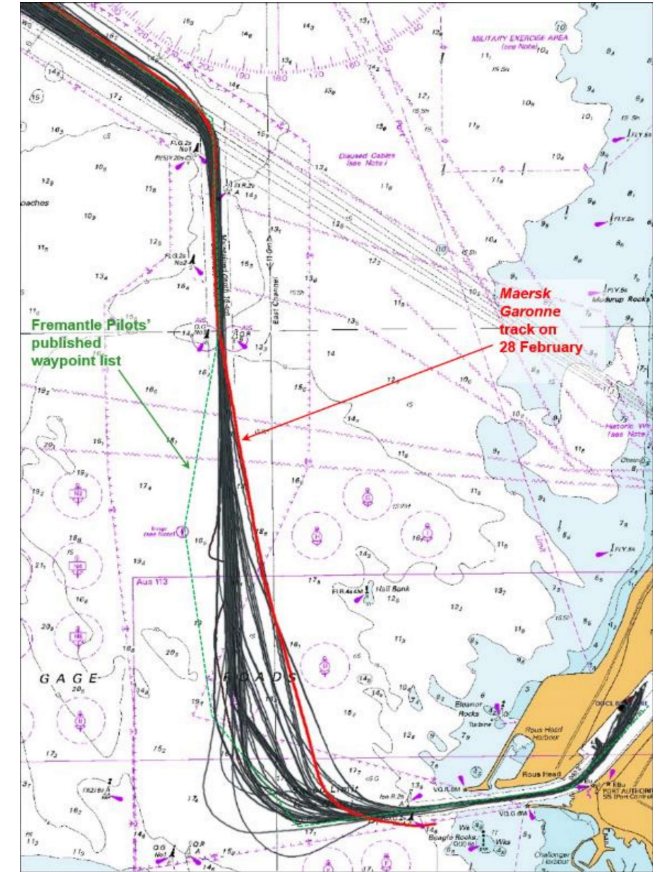


Figure 5: Comparison of *Maersk Garonne's* intended and actual tracks on 28 February

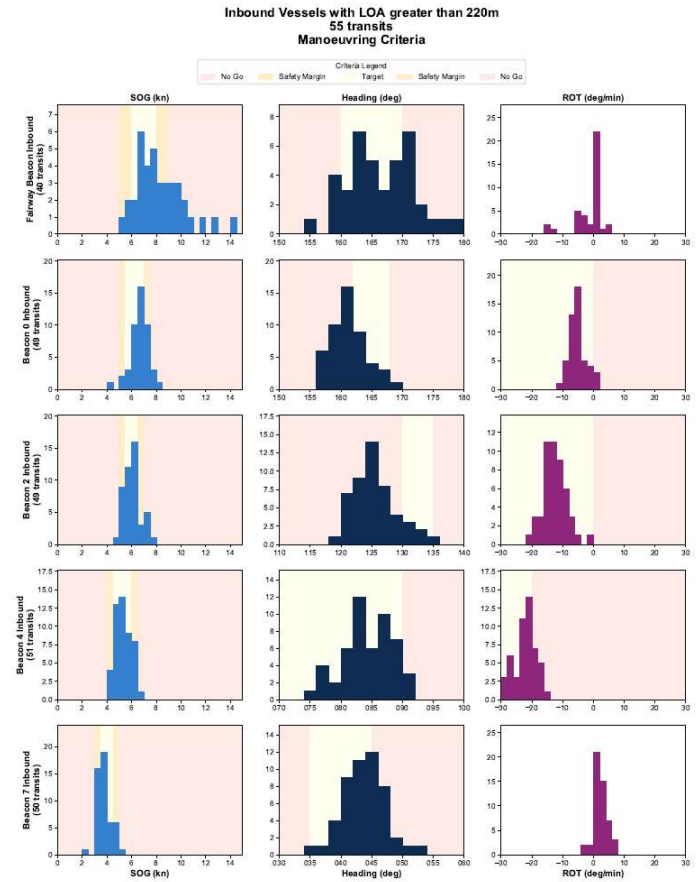
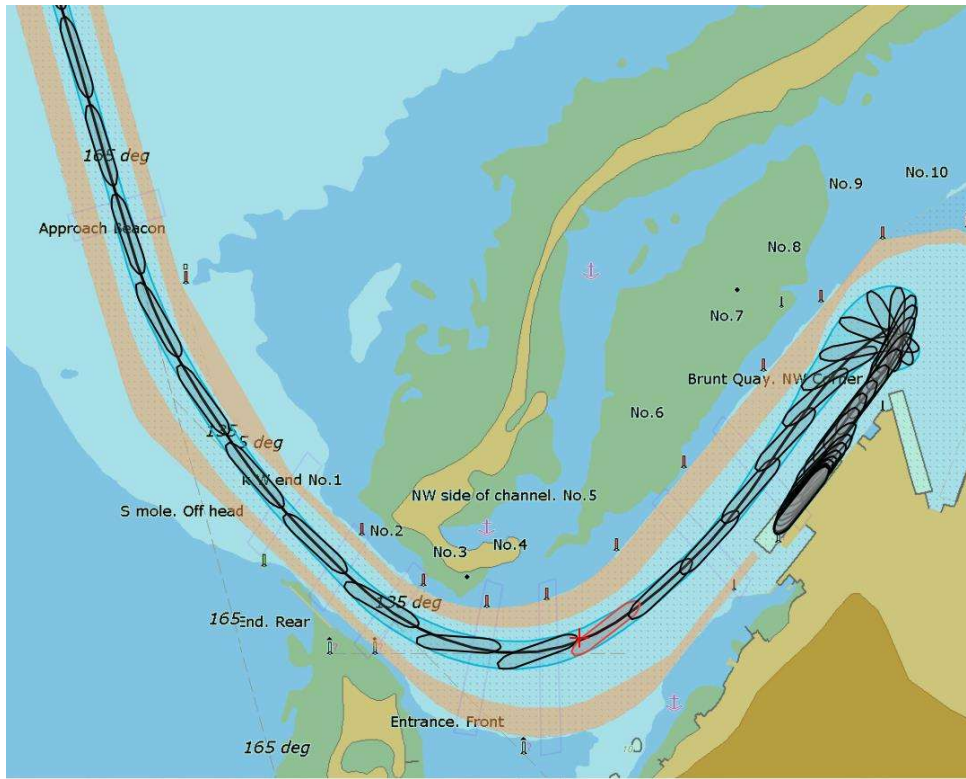


Source: Australian Hydrographic service (annotated by ATSB)

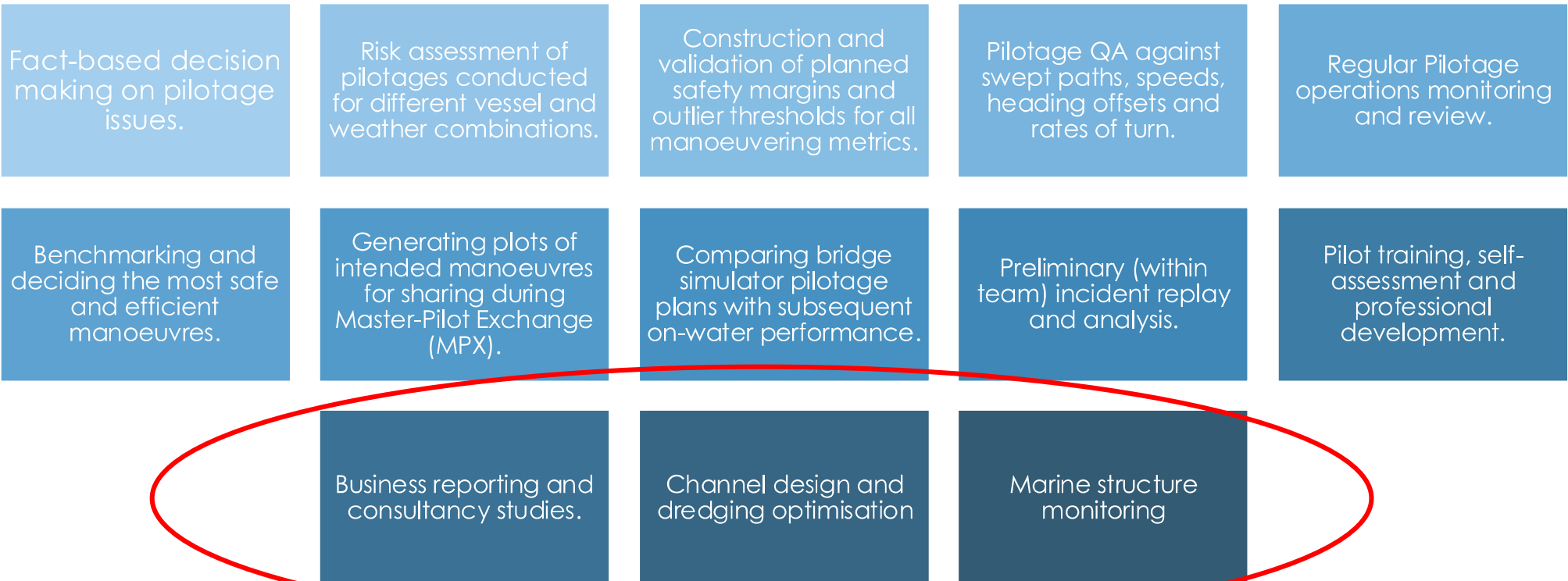
An undetected pattern



Pilotage: Critical Navigational Elements



TransitAnalyst Use Cases



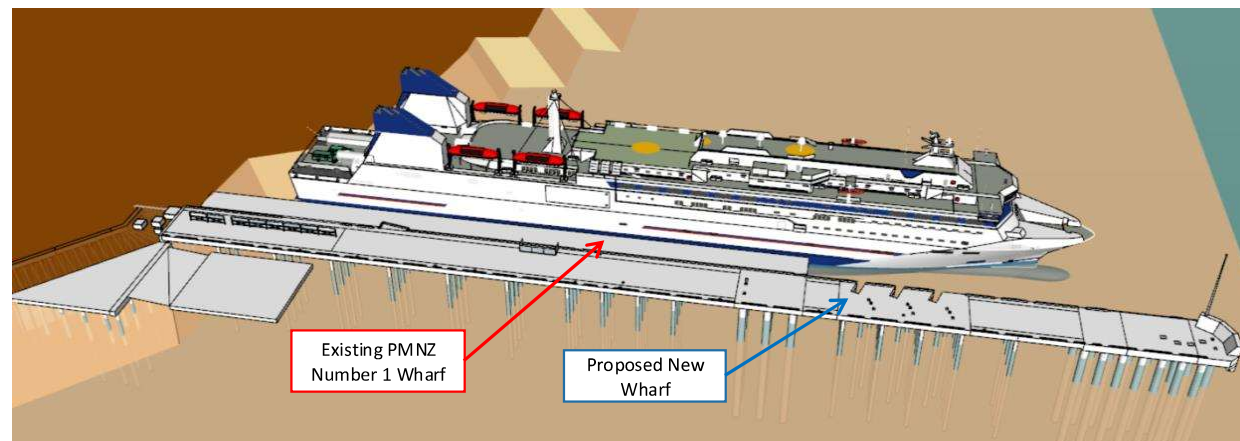
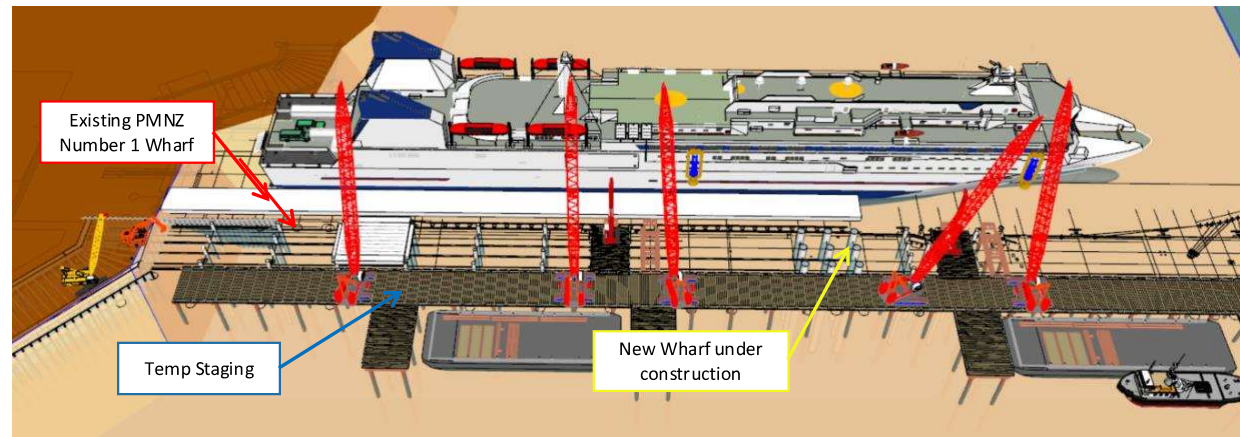
IREX – Picton

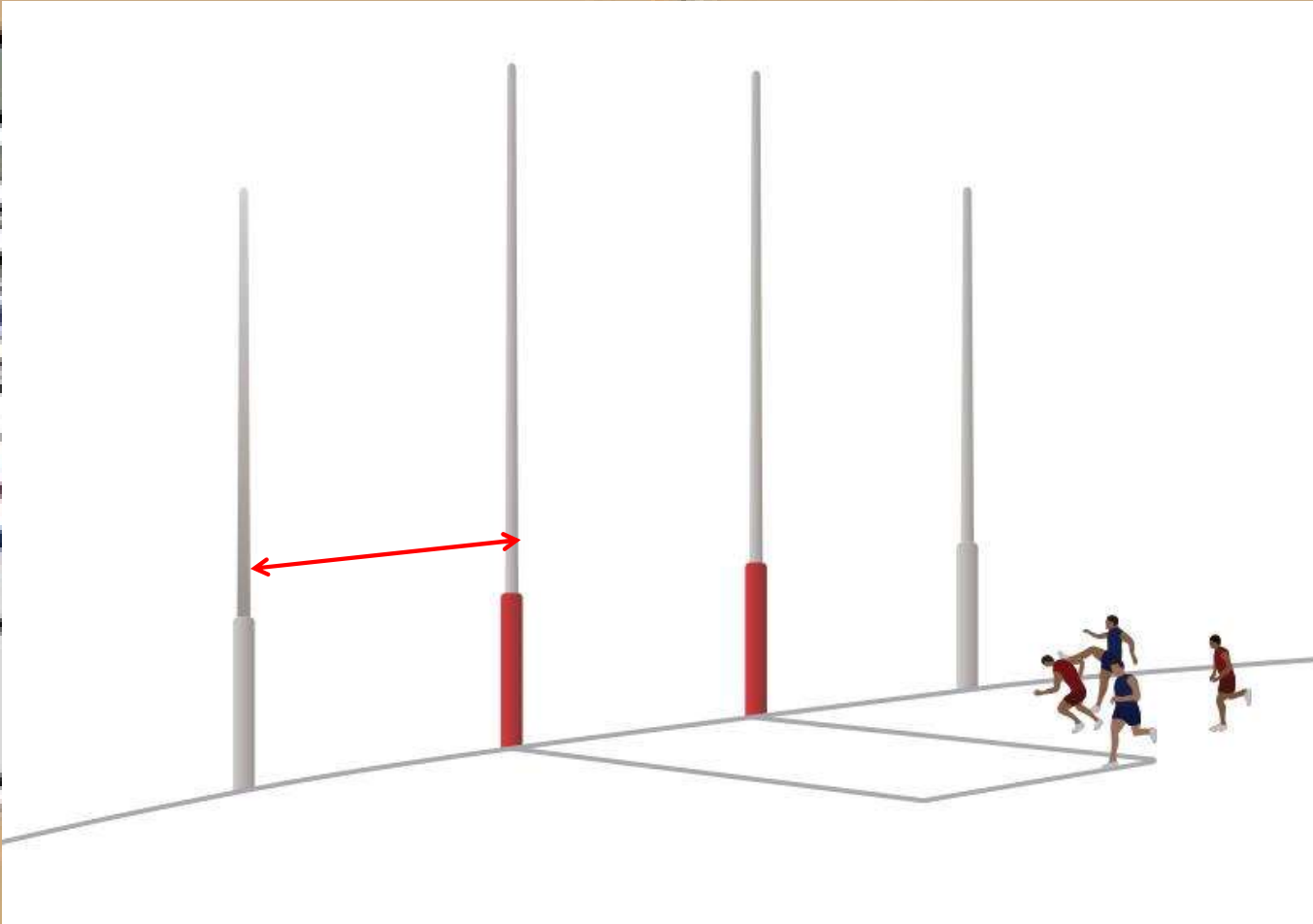
- KiwiRail operate Interislander ferry service between Wellington and Picton in NZ
- The Inter-Island Resilient Connection Project (IREX) was a project by KiwiRail to upgrade the service: ferries and wharf
- Project risk management and design parameters informed by data from existing operations
- Case studies
 - Construction zone analysis
 - Berthing velocities and approach angles



IREX Situation

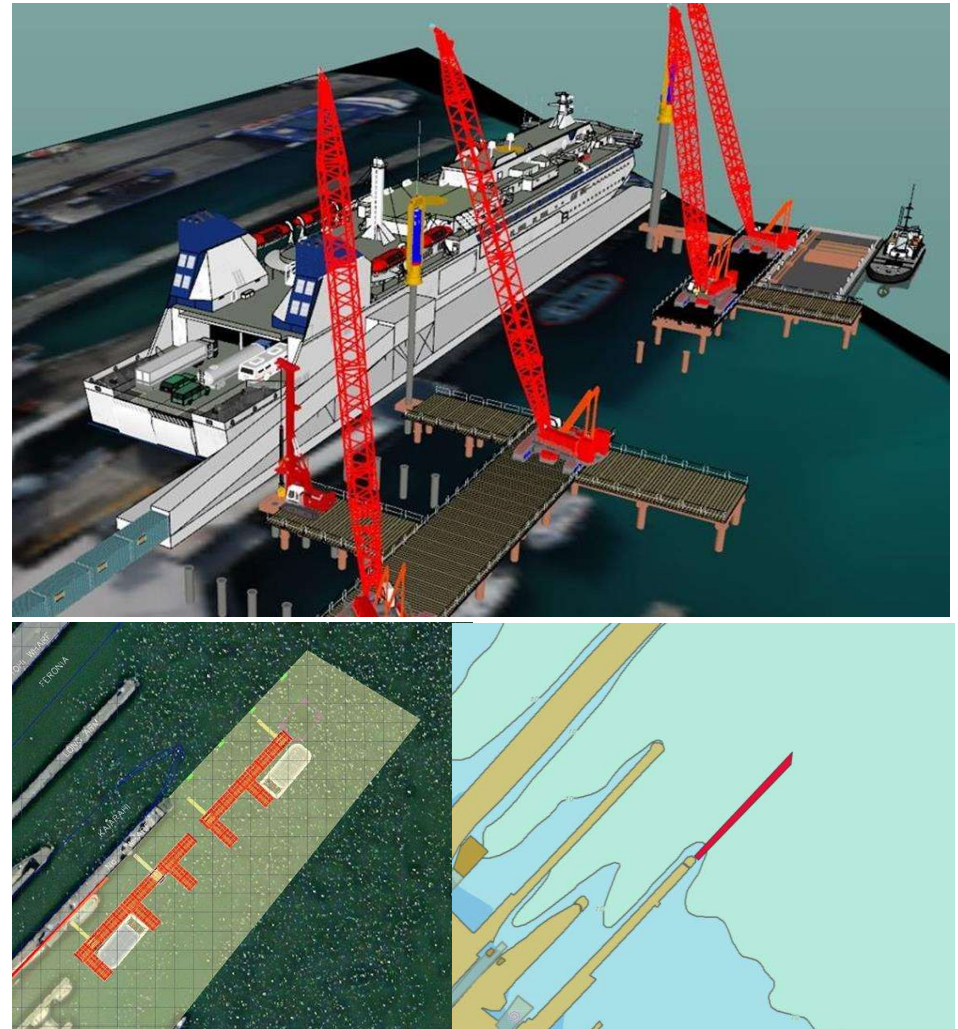
- IREX was a slightly unique scenario compared to a lot of wharf upgrade projects,
- The plan was to construct the new wharf right next to/on top of an existing structure that needed to stay operational during construction
- The 18,000t Ferries come in under their own power without the support of Tugs (unless in abnormal conditions)
- This posed a big risk on construction, staging of work and the safety of the workers and plant.
- The new wharf was only 9m away from the existing berth





IREX Construction Zone Analysis

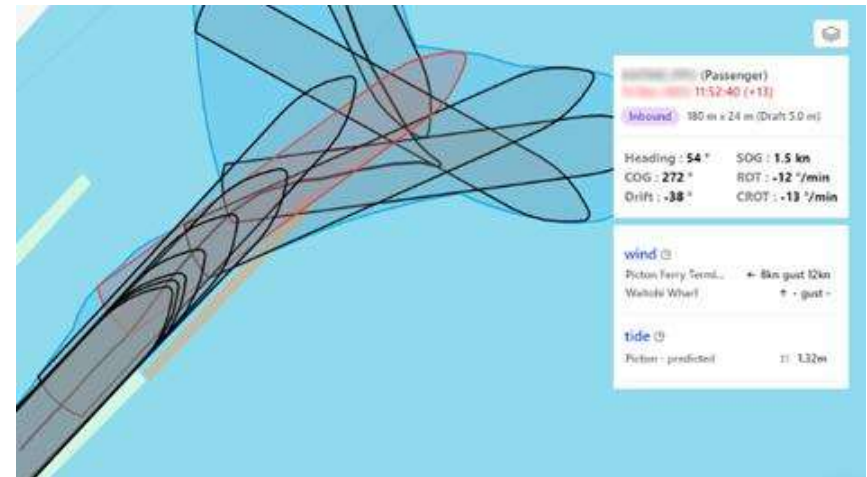
- As an essential service, ferry services had to continue during construction (up to 12 vessel movements per 24hr)
- Risk of ferry incurring into construction zone was assessed.
- Study quantified the proximity of ferries into the future work zone
 - Ability of ferry masters avoid the area
 - Impact of environmental conditions (wind) on ability to avoid zone



IREX Construction Zone Analysis

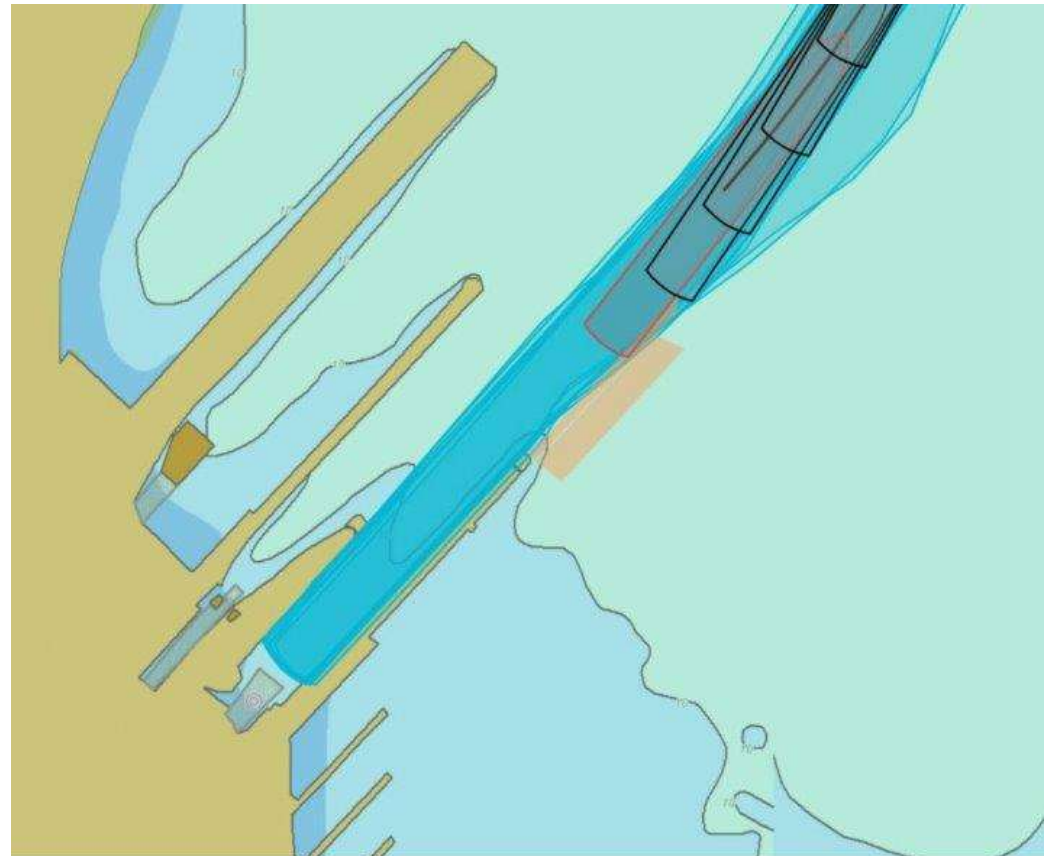
- Monthly statistics reported
- Incursions reduced over time
 - Improved training
 - Enhanced data – PPU units provided to masters
- Data assisted in refining ferry manoeuvring plans
- Stakeholder confidence that the risks of construction and operation could be managed

Period	# Transits (% derived from PPU data)	IREX zone incursions (% of transits)
Aug 2023	102 (31%)	8 (8%)
Sept 2023	103 (36%)	14 (14%)
Oct 2023	160 (56%)	8 (5%)
Nov 2023	131 (82%)	0 (0%)



IREX Risk Review Using Transit Analyst Data

- As part of the risk review, the team found that after 4 months of transit analyst data there was still an unacceptable level risk of an incursion event
- Even after targeted training and better communication, there was still the minor incursions occurring
- It was decided that a physical barrier was required as a last line of defence. To further mitigate the risk

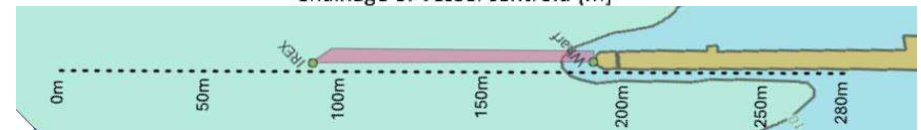
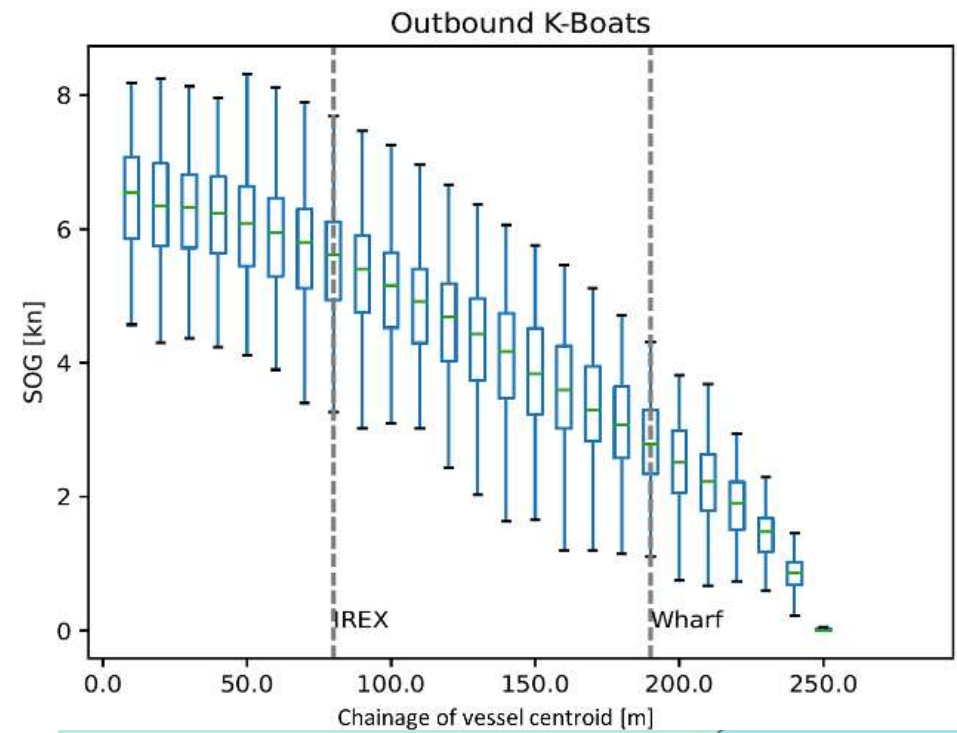
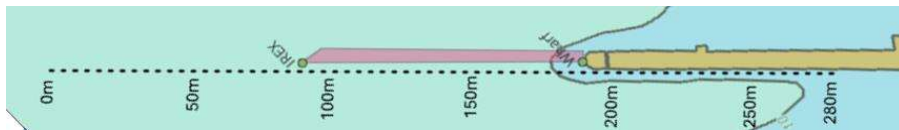
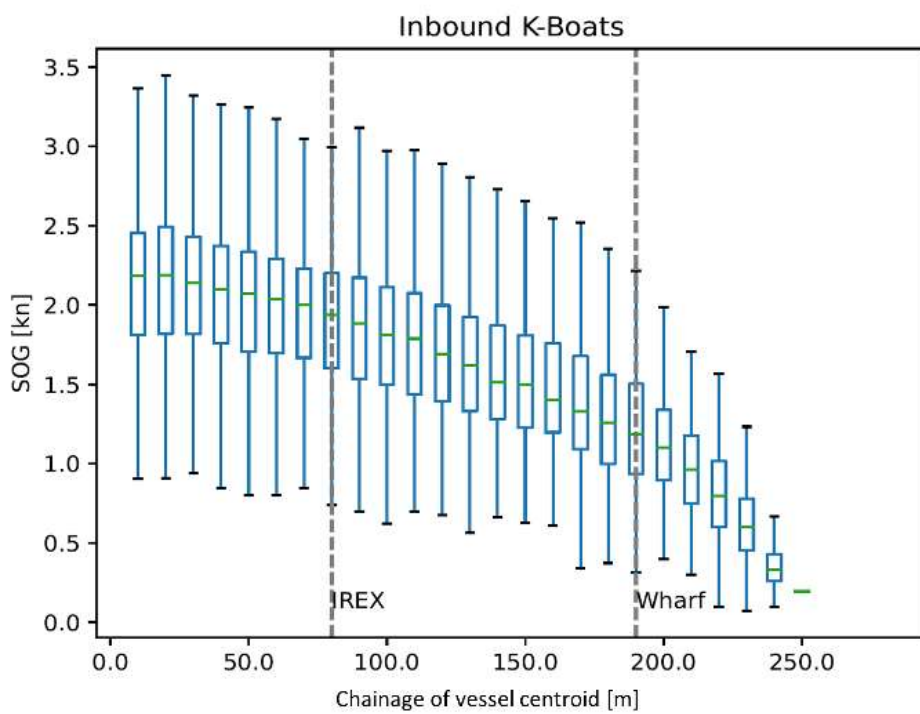


IREX Risk Review Using Transit Analyst Data

- Arup were engaged to complete this temp works design
- These structures would protect the construction team and their plant during ferry arrivals and departures



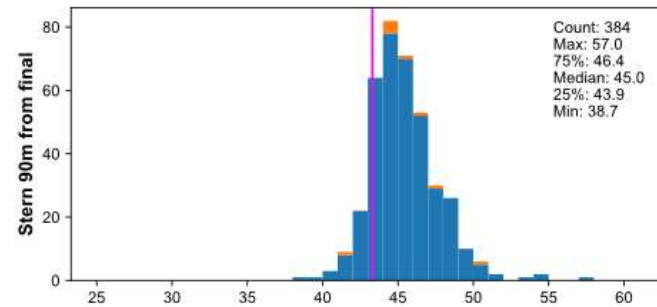
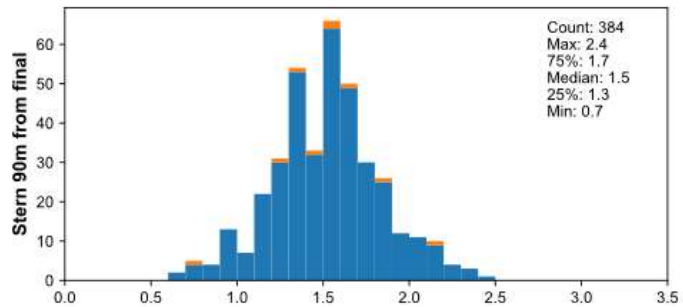
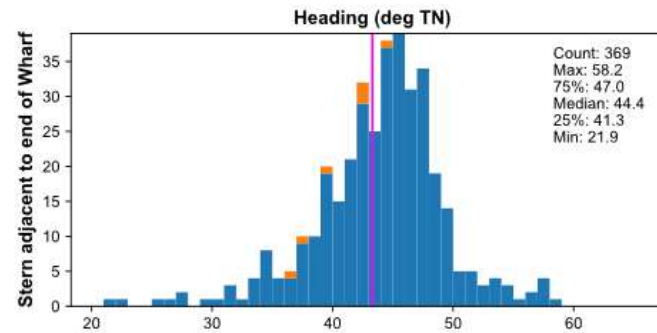
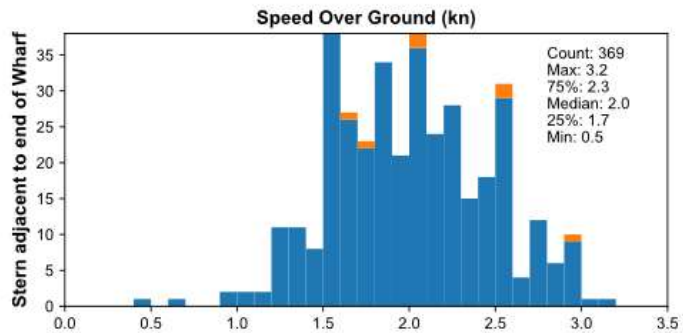
Example: Berthing velocities



IREX project: Picton berthing example

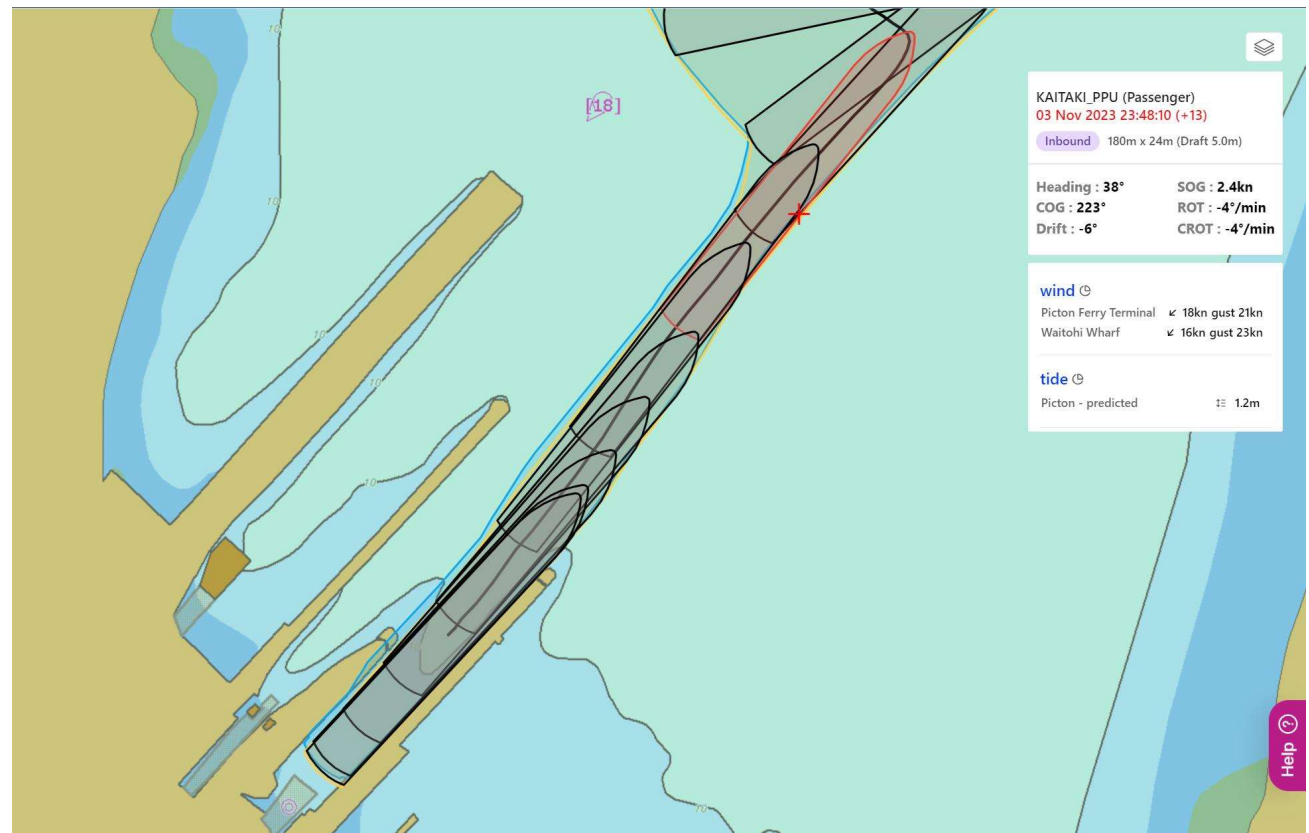
Berthing data for INBOUND transits of the ARATERE at Picton between 2021-12-16 and 2022-10-07.

Transits berthing in high winds (speed > 25kn or gust > 35kn) are highlighted in orange.
 Berth fender line bearing (43.3°) is shown as a magenta line.



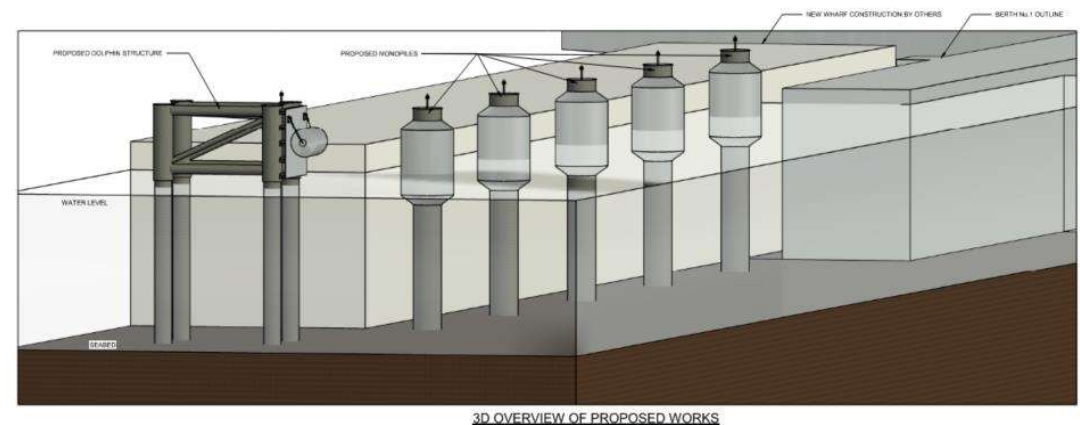
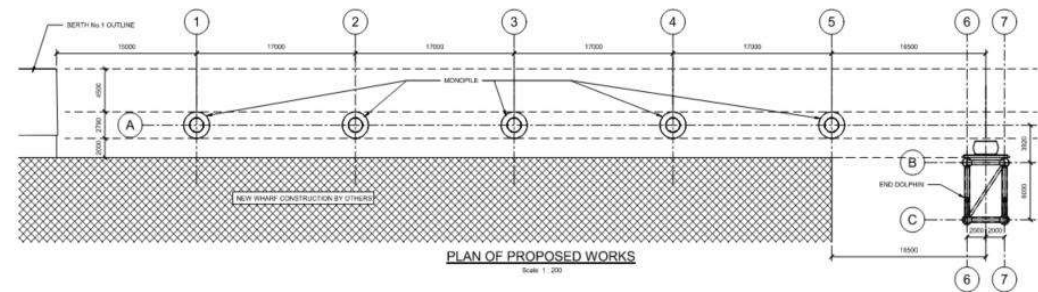
Improving berthing velocity and approach angle precision

- Precision issues limit AIS use
- Accuracy improved by:
 - Permanently installed PPU units on ferries
 - Ferry berthing position known allowing calibration.



IREX Design Using Transit Analyst Data

- Temporary structures would only be installed for less than 12 months
- ARUP were able to use the analysis data to inform their design more suited to temp works
- This included fine tuning the position and spacing of the mono piles, using 90th percentile of actual recorded berthing velocities and angles from recorded PPU data
- Assisted with fender selection and design refinement including the end dolphin shape and fender position (an additional fender was added on the northern end)

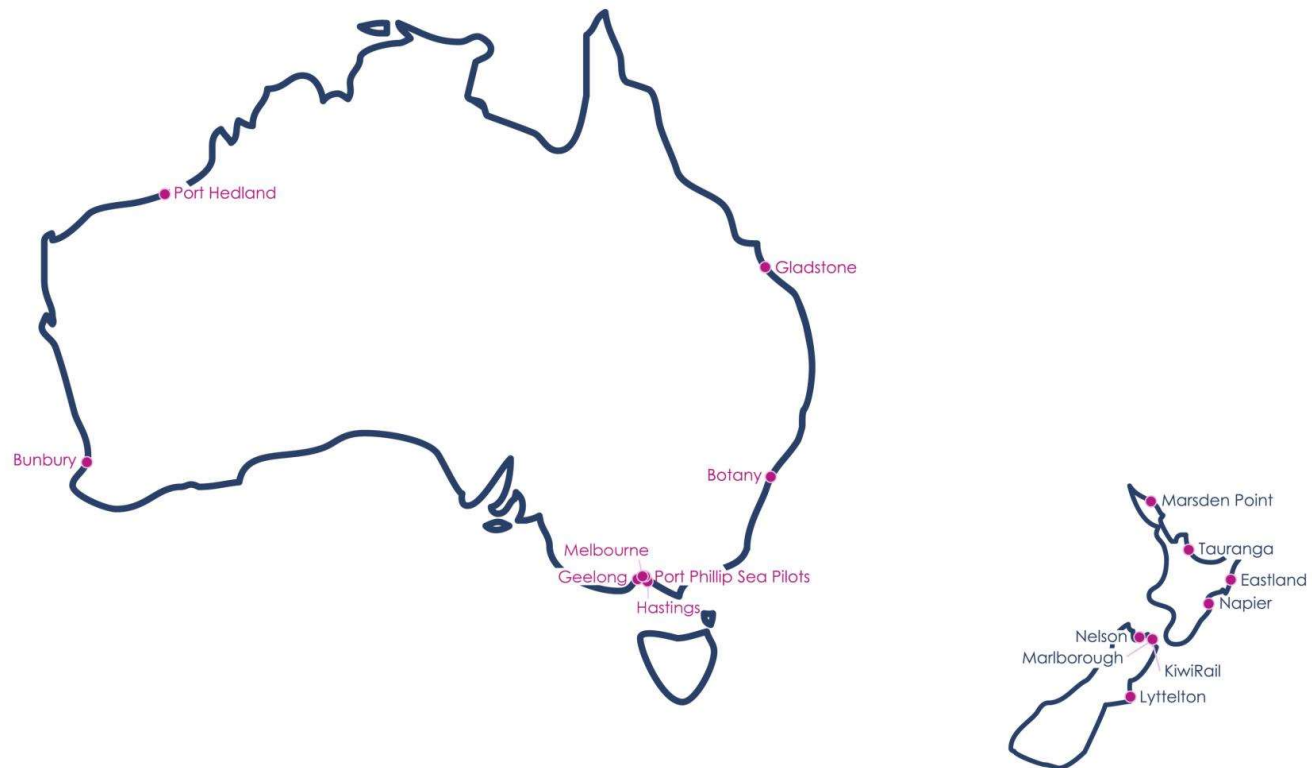


Conclusions



- TransitAnalyst already set up in many Aus/NZ ports.
- Simple data analysis can be automatic.
- More complex analysis simple and efficient.
- Better access to accurate data for port planning, design, and maintenance.
- Assists with risk assessments and mitigations
- Assists with design input/parameter selection / validation/calibration
- Assists with taking a risk-based design approach
- Come and talk to us!

Australian & New Zealand Transit Analyst Clients



 **TRANSITANALYST**

Pilotage big data made easy

Summary

- Not the first time AIS data has been used for port engineering and risk management.
- However, a large % of ports in Australasia now have a TransitAnalyst system in place for pilotage reasons and this is pre-processing, performing QC, and storing the data.
- Pilots now use PPU hardware on most jobs in Australasia. This means that the accuracy limitations of AIS data can often be overcome using more precise PPU data.
- This means that large databases of existing vessel manoeuvres are now available at many Australian ports and the TransitAnalyst API allows easy access to quality-assured data – significantly reducing the overheads of attempting to use AIS or PPU data.
- Using local data for infrastructure design is more precise and fit for purpose
- Improved risk management is possible using ongoing near-real-time analysis of AIS/ PPU to actively monitor and assess transit data against design assumptions.