Upgrading Ocean Outfalls, Kiribati 2017
A Contractor's Perspective

REPUBLIC OF KIRIBATI

CCB envico

B K Fellenius

Ministry of Public Works & Utilities
South Tarawa Sanitation Improvement Sector Project
Upgrading of ocean outfalls at Betio, Bairiki and Bikenibeu

Marine Infrastructure Specialists

Date: 07 August 2019
Presenter: **Imran Lambay**

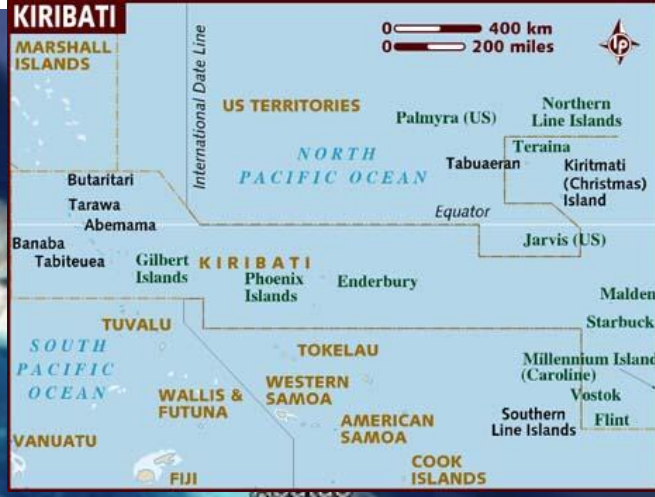
MARITIME CONSTRUCTIONS

Company Profile

- Marine specialist contractor providing construction, dredging and engineering services
- Completed over 100 dredging projects and 200 construction projects in last 21 years
- Awarded 5 Earth Awards for Environmental Excellence and an Engineering Excellence Award in 2012
- IMS (QHSE) ISO Certified in August 2009

MARITIME CONSTRUCTIONS

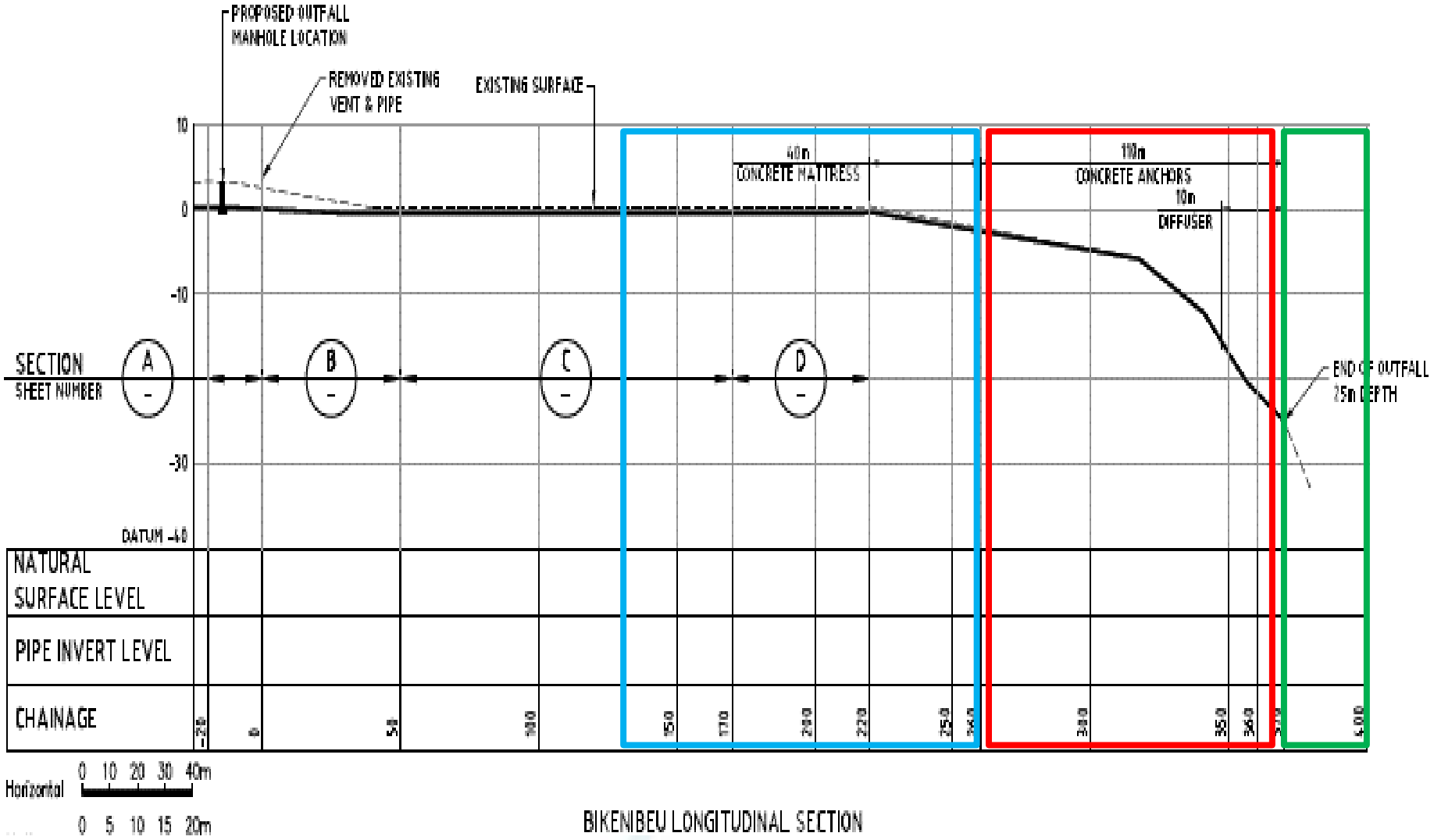
South Tarawa Sanitation Improvement Sector Project
Upgrade of Ocean Outfalls at Betio, Bairiki and Bikenibeu



- Replace three storm damaged sewer lines at Betio, Bairiki & Bikenibeu
- Extend pipelines past reef flats & at shallow depths
- Re-establish ocean outfalls & diffusers

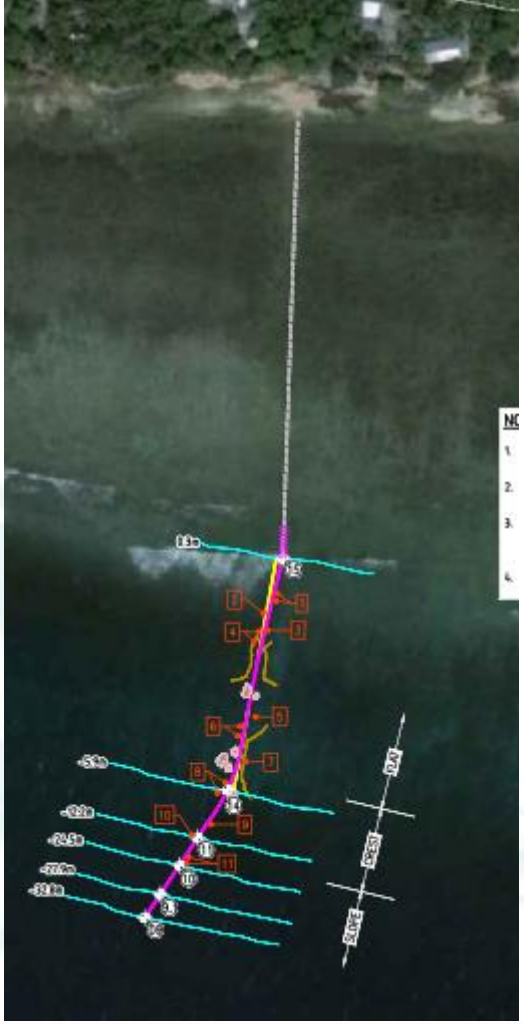
Marine Infrastructure Specialists

MARITIME CONSTRUCTIONS



BIKENIBEU LONGITUDINAL SECTION

Challenges

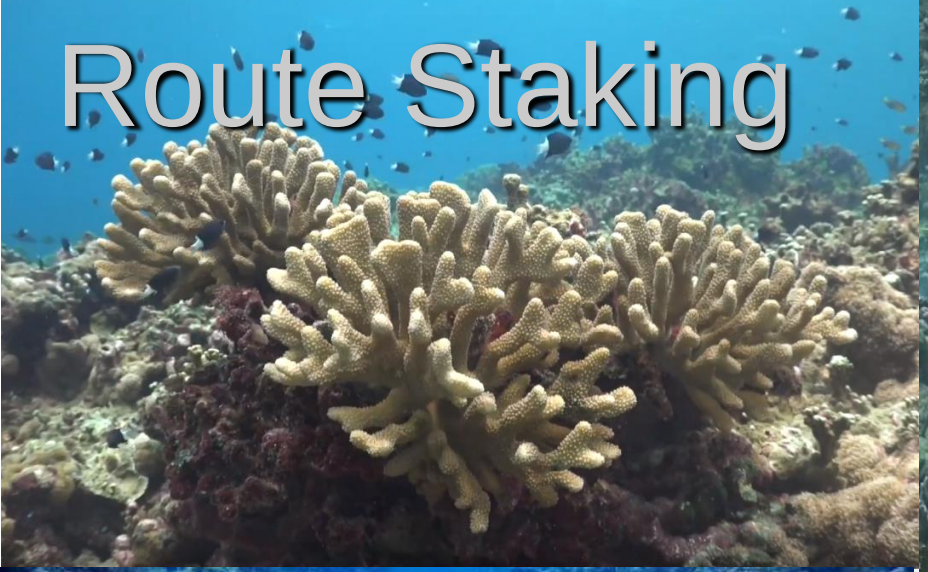


- Determining an optimal route to transport the pipeline across a living coral reef
- Installation of pipeline with minimal impact on;
  - Marine Environment
  - Significant coral species
- Establish outfall diffusers outside of wave surge zone on outer reef wall to maximise service life

Today's Presentation

- Environmental
  - Find an ecologically optimal route
  - Use specialised vessels for reef crossings
- Engineering
  - Design a high capacity clamped Tow Head and connection assembly
- Installation
  - Installation design to exert complete control over the pipes sink path
  - Incorporate the pipes natural S-curve under variable tension to increase accuracy of lay

Route Staking



- Several routes considered during marine life & environmental assessment in 2015
- Routes chosen to maximise use of natural sand channels & minimise clearing
- Route staking winding around obstructions
- Marked with buoys on the surface

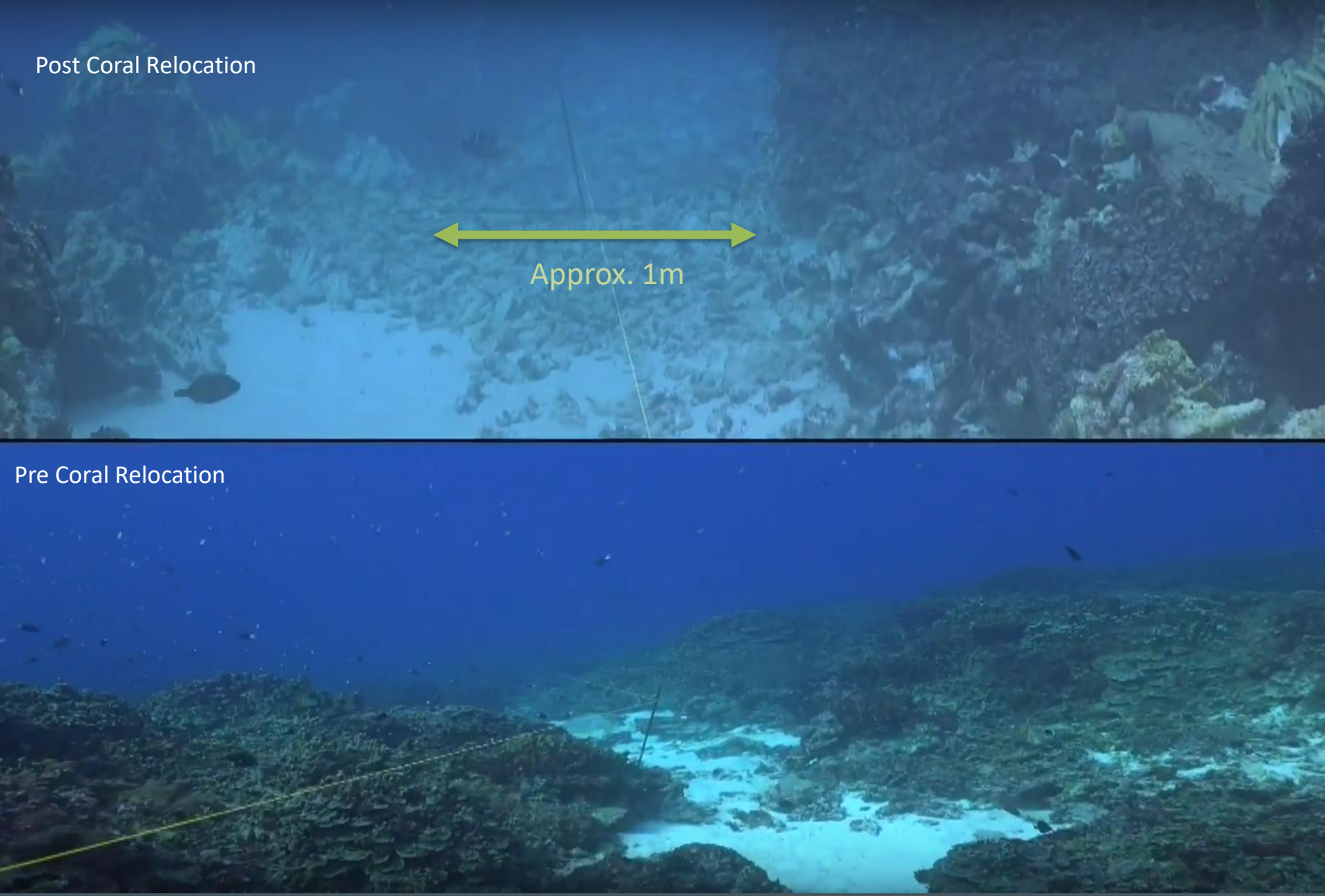
MARITIME CONSTRUCTIONS

Coral Relocation

- Over 400 Dives over 42 dive days
- 260 hrs bottom time
- Coral relocation & rock obstruction removal

Old concrete anchor blocks are removed or relocated

MARITIME CONSTRUCTIONS



MARITIME CONSTRUCTIONS

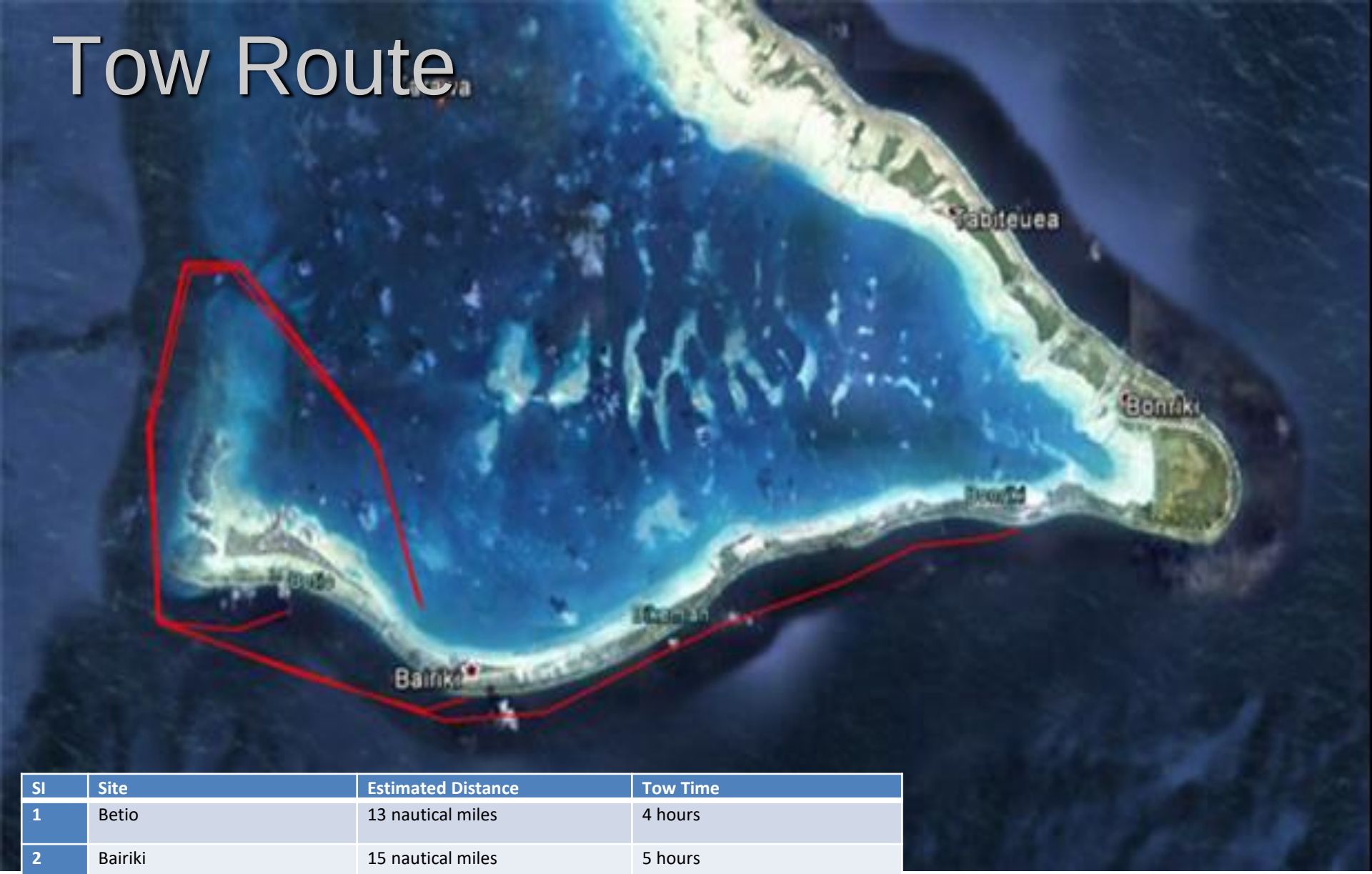
Mobilised Equipment

- Specialised ultra-shallow draft vessels for reef works
- 3 jet boats mobilised from Australia, on scheduled shipping
- A significant 3T Bollard Pull to keep the pipeline under tension during lay
- Local Boats utilised for dive team and pipe control

Naniki Wet Store

- Component assembly, HDPE welding
- Ends capped, stored in floating condition, with concrete anchor blocks attached to pipe

Tow Route



SI	Site	Estimated Distance	Tow Time
1	Betio	13 nautical miles	4 hours
2	Bairiki	15 nautical miles	5 hours
3	Bikenibeu	24 nautical miles	7 hours

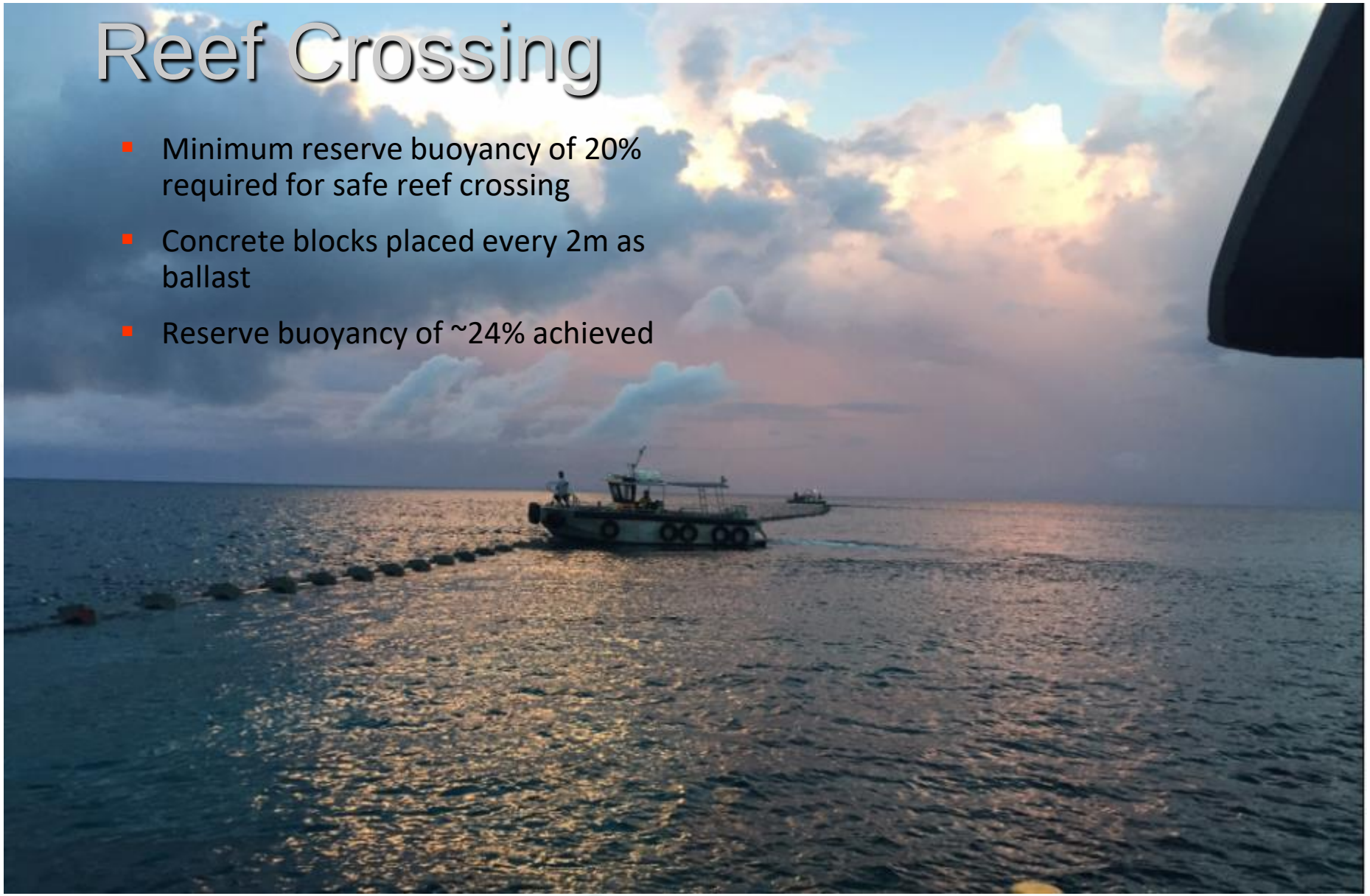
Towing Pipe

Towing pipe into place

MARITIME CONSTRUCTIONS

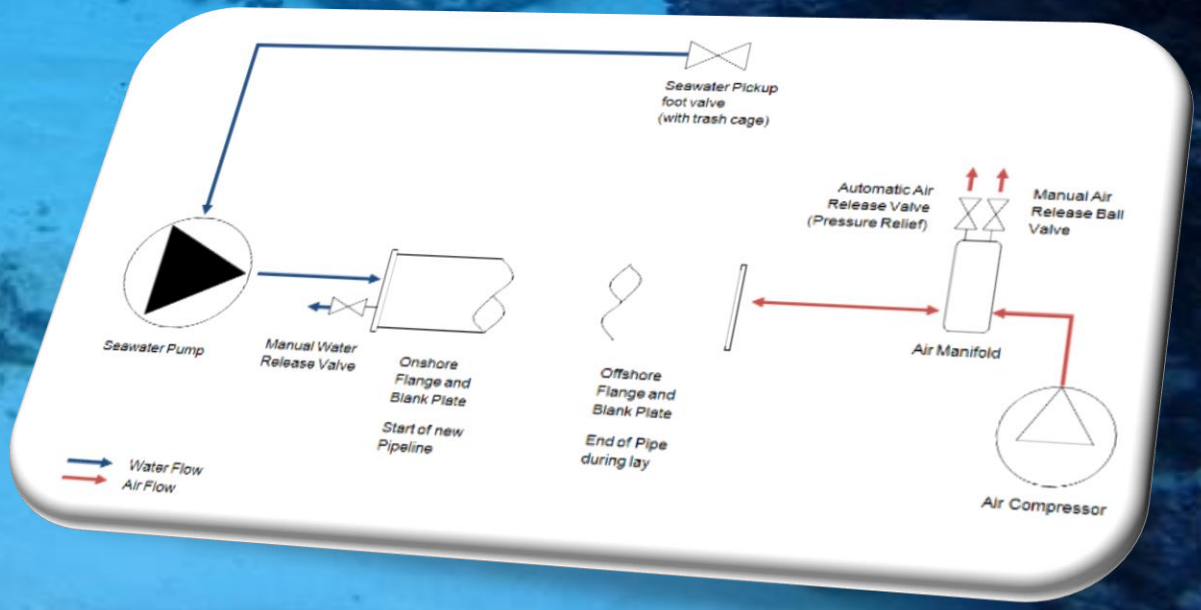
Reef Crossing

- Minimum reserve buoyancy of 20% required for safe reef crossing
- Concrete blocks placed every 2m as ballast
- Reserve buoyancy of ~24% achieved



Controlled Sinking

- Pressurized system for control of sinking process
- Buoyancy manipulation by pump & compressor assembly
- Basic pump-compressor assembly diagram
- Pipeline tensioned from the seaward end

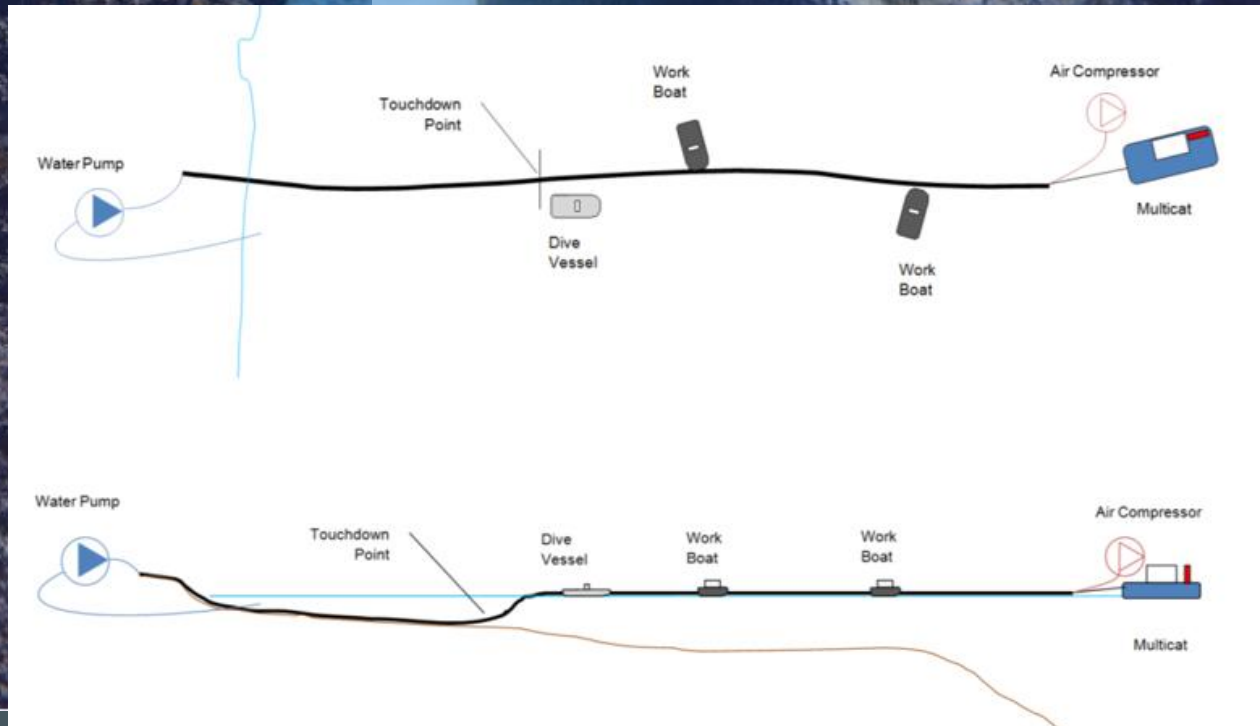


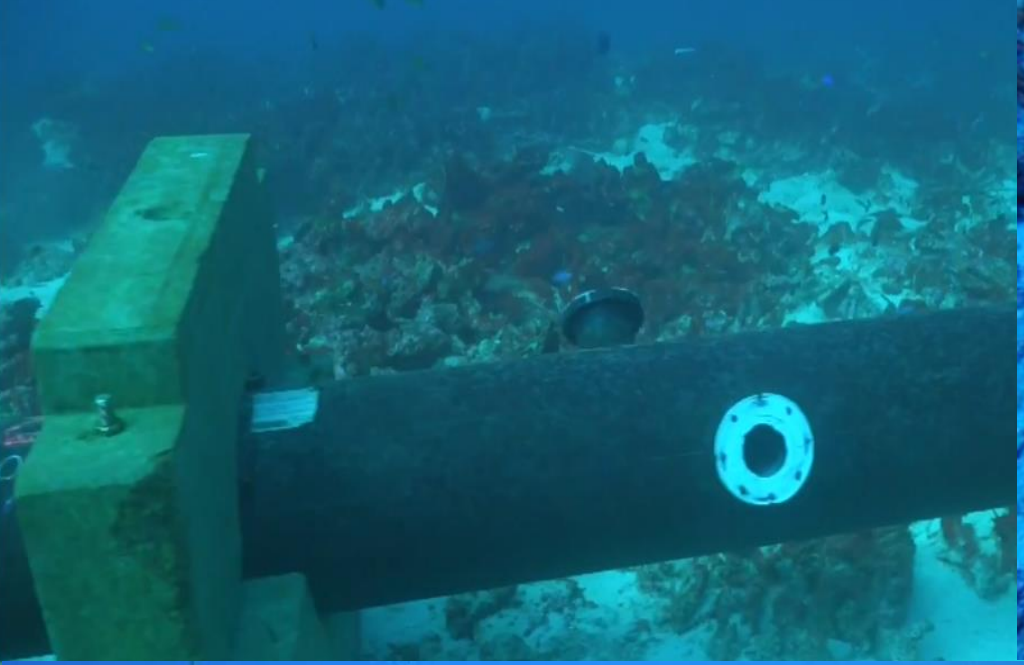
Controlled Sinking

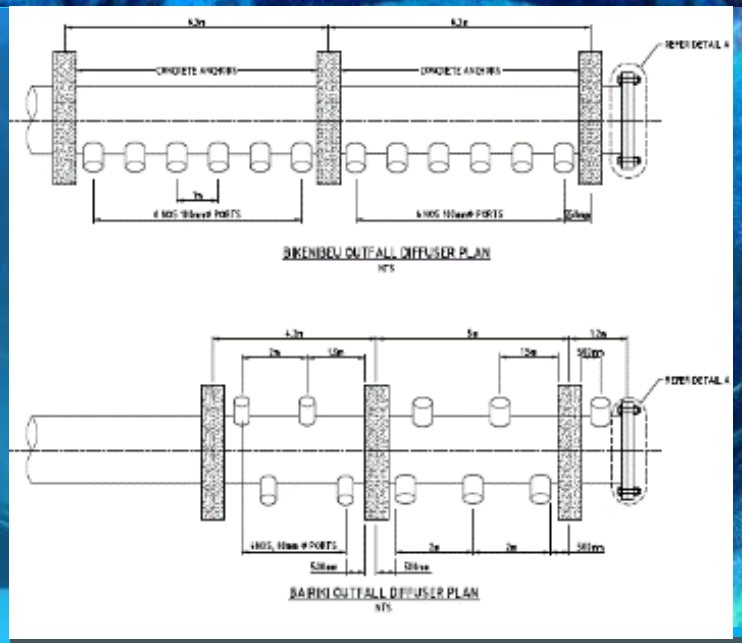
Pipeline guided through bending route

Moving ‘touchdown point’ fully monitored & controlled

Pipe is under tension & its bend radius is steered by progressive rising/sinking







MARITIME CONSTRUCTIONS

Conclusion

- Engineered design solutions
- Accurately laid along route
- Minimised disturbance to marine environment
- Very good relations with multiple government agencies
- Take ownership for delivering the final product

MARITIME CONSTRUCTIONS

Questions?

MARITIME CONSTRUCTIONS