Gladstone Ports Corporation

Growth, prosperity, community.

The Port of Gladstone Sustainable Sediment Management Project

Feasibility Assessments - 19 June 2020

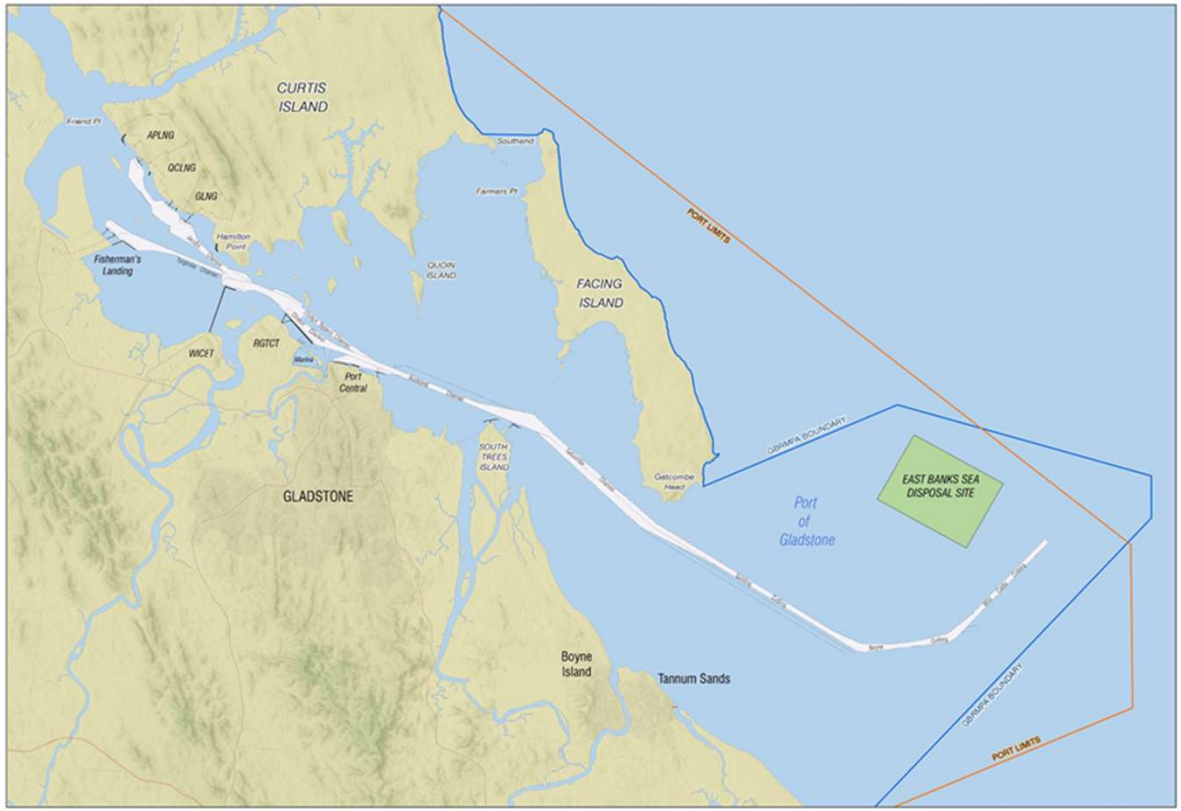
PoG Sustainable Sediment Management Project

Agenda

- Welcome (Gordon Dwane)
- Context and expectations (Gordon Dwane)
- Project Overview & Recap (Gordon Dwane)
- Feasibility Assessment Approach (Andy Symonds)
  - Approaches considered
  - Assessment methodology
- Feasibility Assessment Results (Andy Symonds)
- Next Steps (Gordon Dwane)

About the Port of Gladstone

- Approximately 50km of channel and Sea Disposal Site within Port Limits but not in GBRMP
- Naturally turbid macro-tidal estuarine system driven by tides, winds, waves and rainfall



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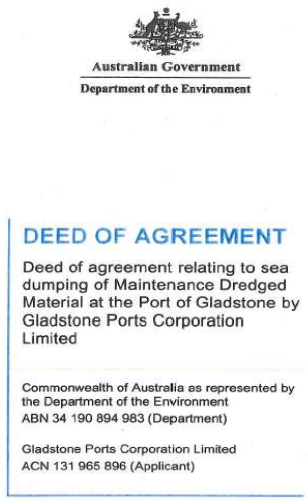
Project Outline

- Undertake research and monitoring relating to the consequences of maintenance dredging material on the marine environment
- Investigate the possibility of avoiding or reducing the need for maintenance dredging
- Delivers GPC's commitments made via a Deed of Agreement with DoEE
- Assist GPC implement the relevant aspects of the Maintenance Dredging Strategy (TMR)

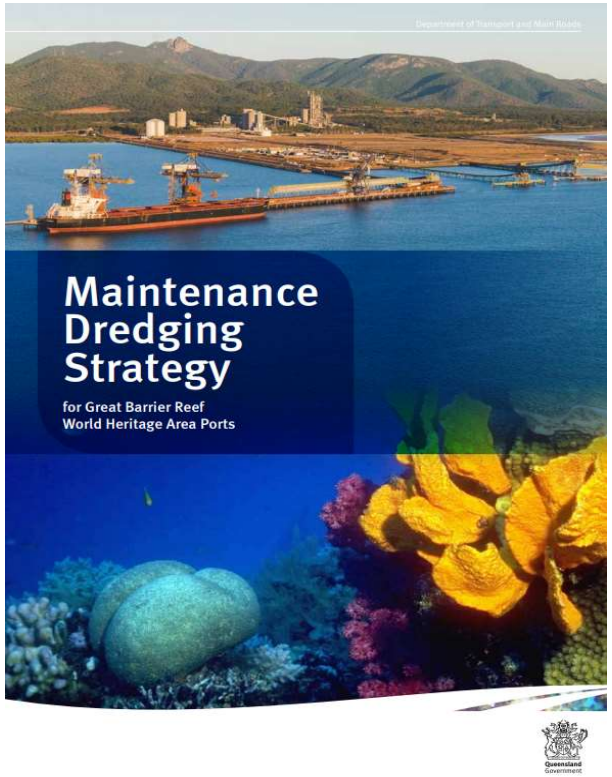

Australian Government
Department of the Environment

DEED OF AGREEMENT

Deed of agreement relating to sea dumping of Maintenance Dredged Material at the Port of Gladstone by Gladstone Ports Corporation Limited

Commonwealth of Australia as represented by the Department of the Environment
ABN 34 190 894 983 (Department)

Gladstone Ports Corporation Limited
ACN 131 965 896 (Applicant)



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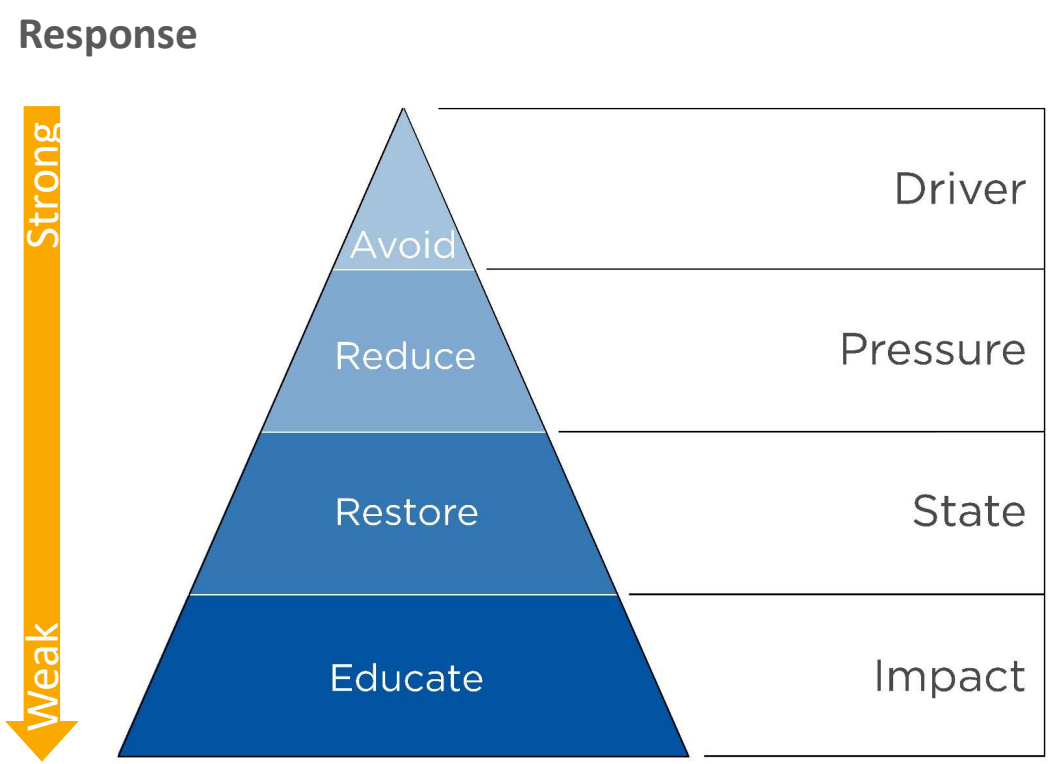
Maintenance Dredging Strategy

Objectives

- Developing the knowledge base
- Review management options
- Select option(s)
- Implement option

Hierarchy of Controls



Project Context

- Maintenance Dredging and Disposal
- Water Quality (light, contamination), deposition
- Water quality, habitats, sediment dynamics, OUV
- Fishing, aesthetics, legislation, social, economic

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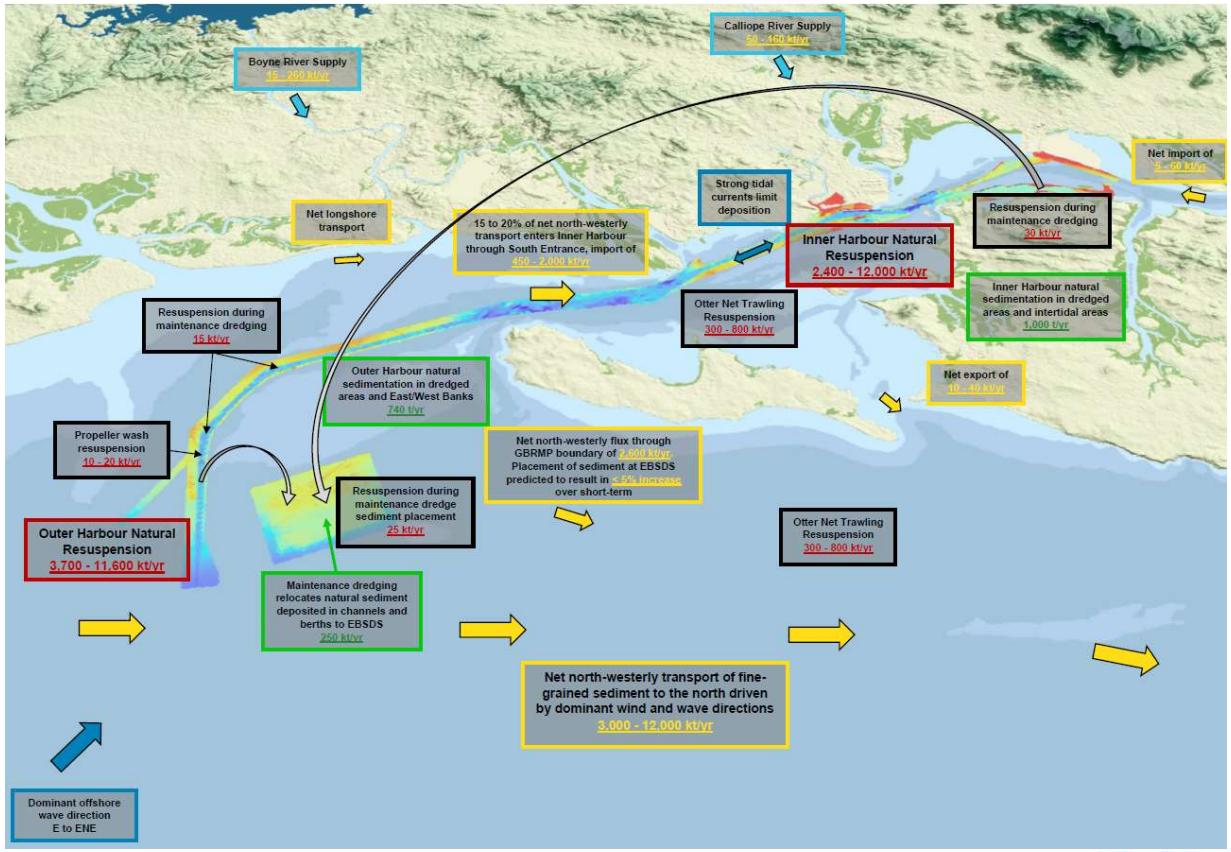
Conceptual Sediment Budget



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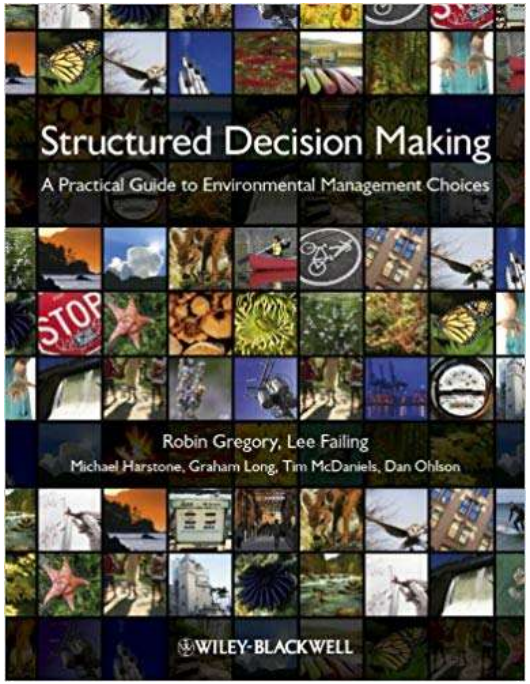
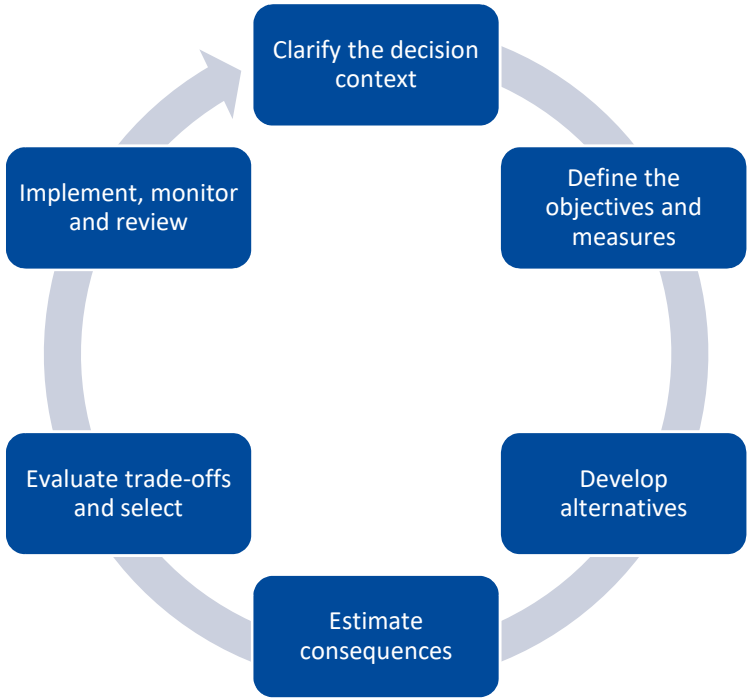
Stakeholder Engagement





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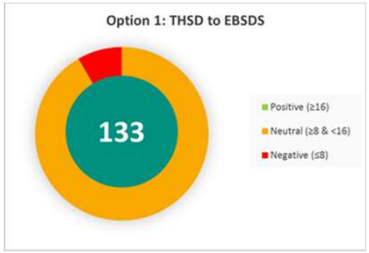
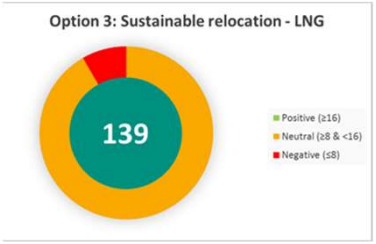
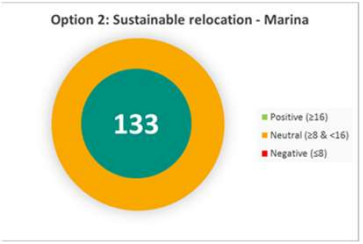
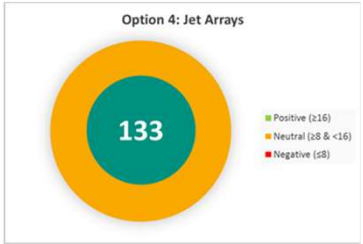
Sustainable Sediment Management Update

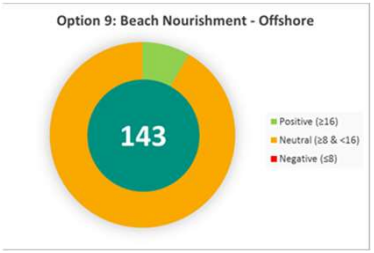
Existing methodology
Reduce Dredging
Beneficial Reuse











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Feasibility Assessments

Option	Score
Existing Approach – Placement at EBSDS	133
1) Offshore Beach Nourishment	143
2) Sustainable Relocation, LNG Terminals Region	139
2) Habitat Restoration, Seagrass	139
3) Sustainable Relocation, Marina	133
3) Habitat Restoration, Coastal	133
3) Jet Arrays	133
4) Onshore Beach Nourishment	130

LNG Terminals – Sustainable In-channel Relocation

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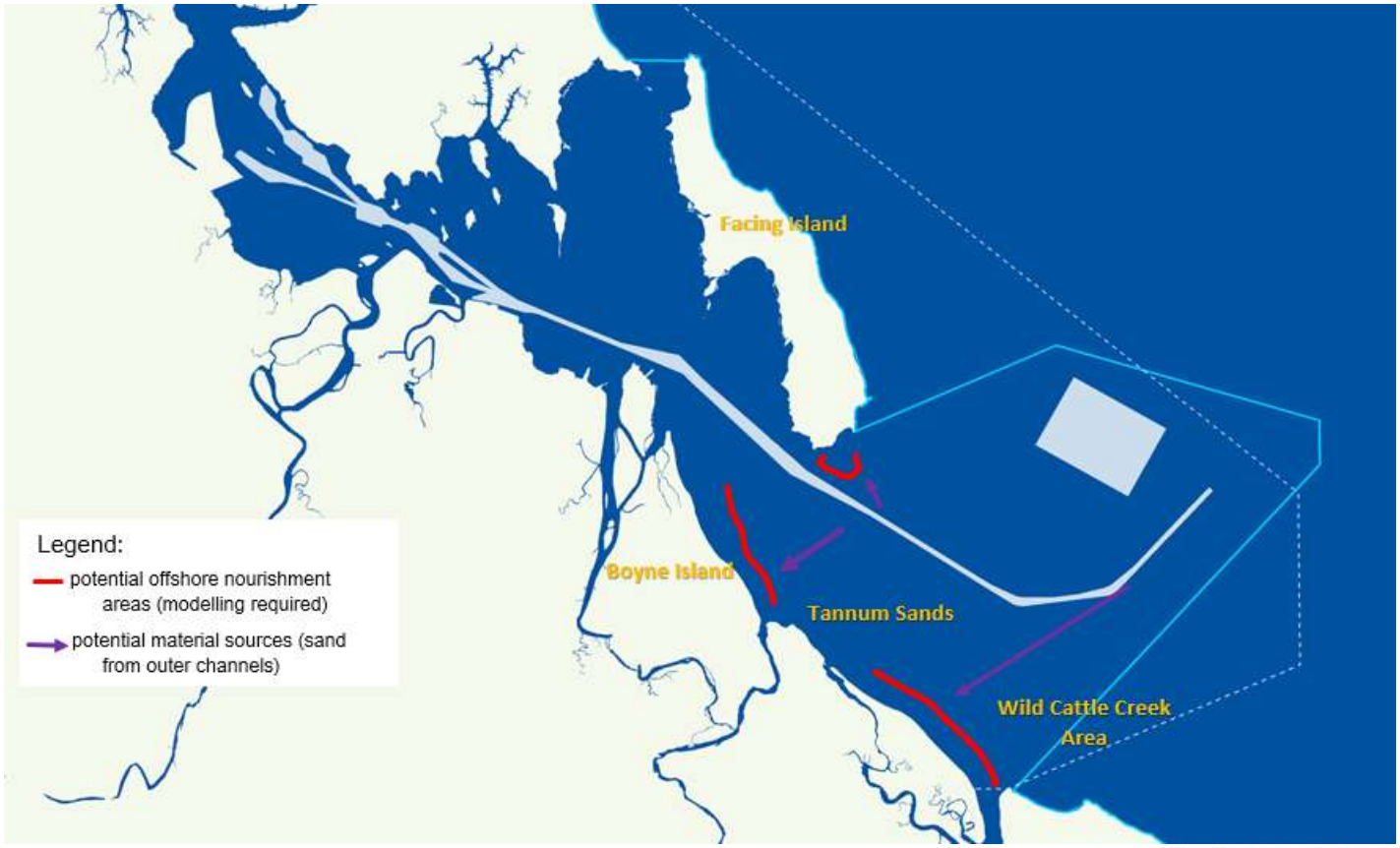
Beach Nourishment - Offshore



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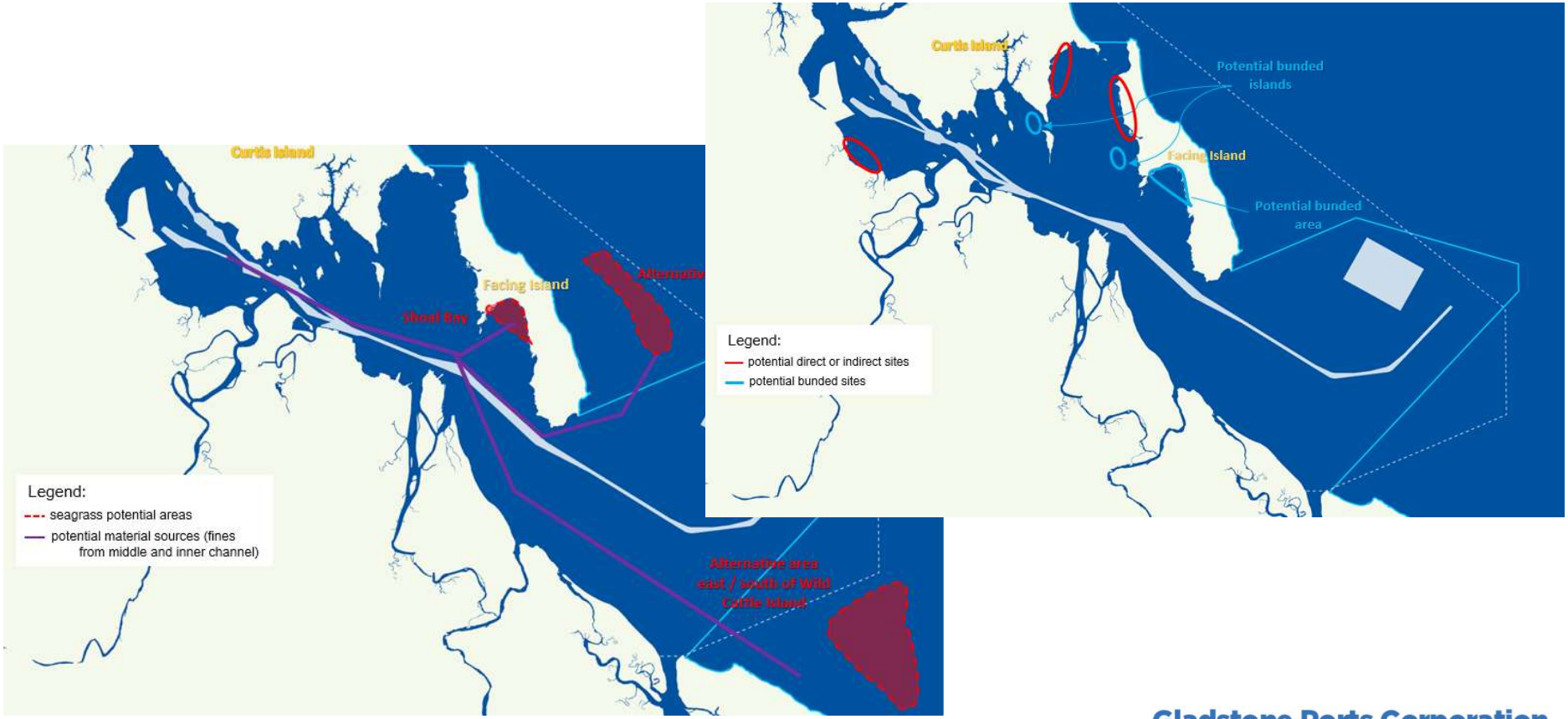
Habitat Restoration / Creation – Seagrass and Coastal Ecosystems



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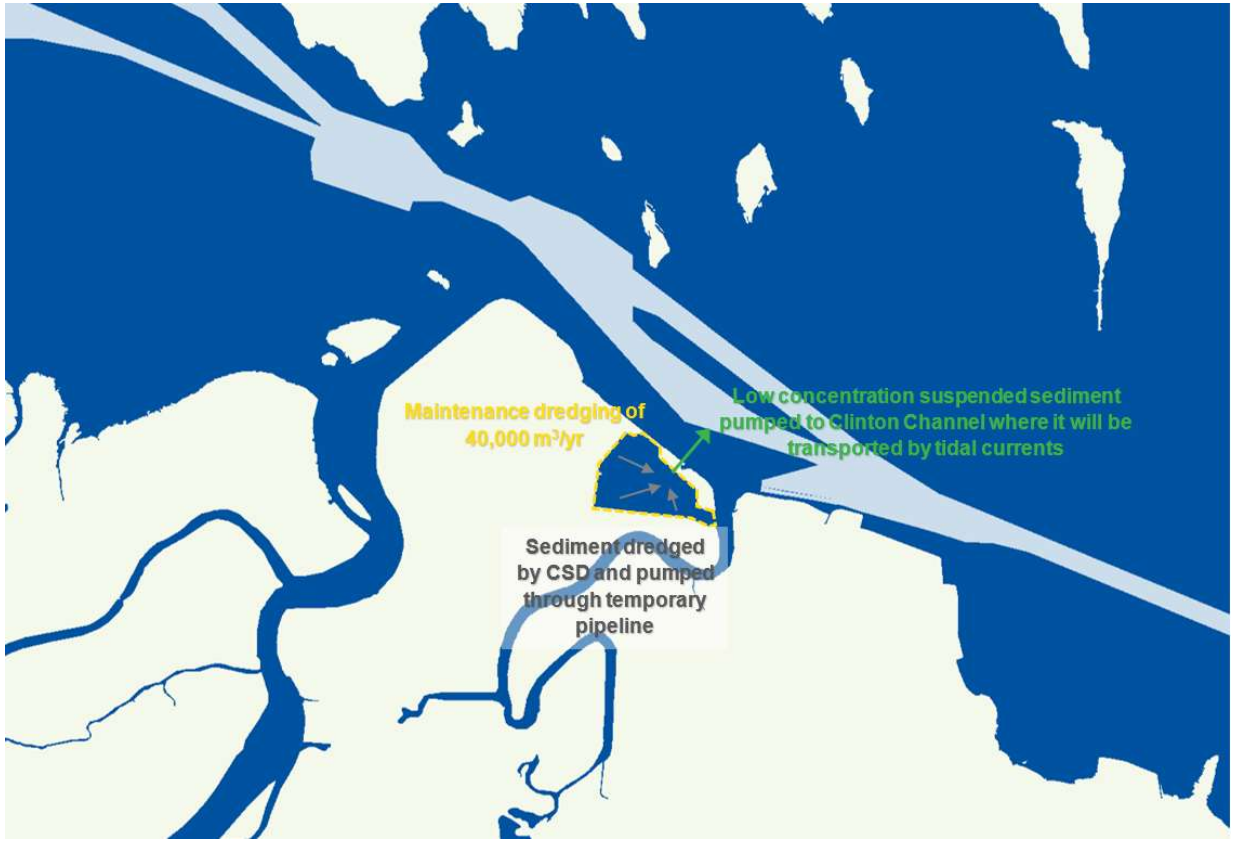
Marina – Sustainable In-channel Relocation



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ASSESSMENT METHODOLOGY

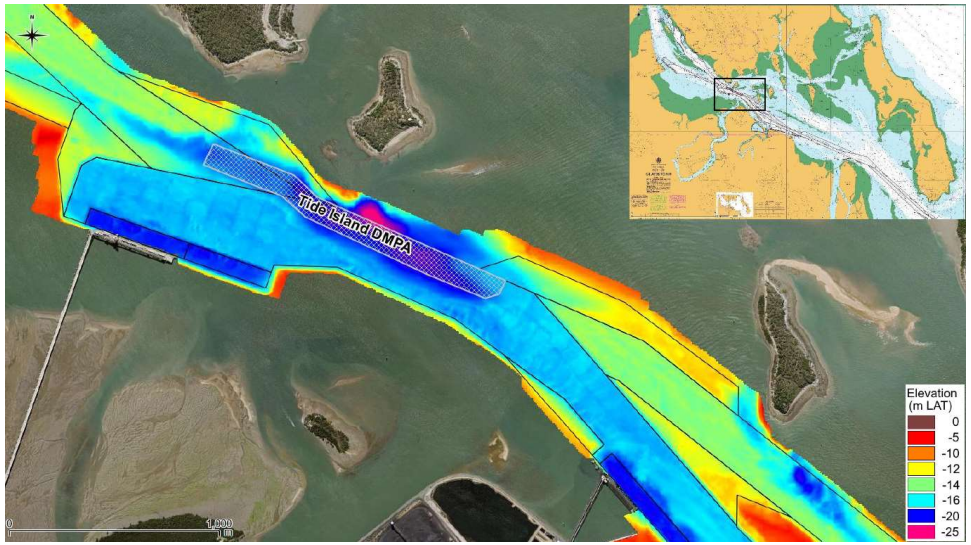
- Option Development
  Site selection, sediment requirements (type, volume and frequency), dredging approach and cost estimate.
- Numerical Modelling
  Optimise approach, predict any impacts due to plumes and predict transport and fate of sediment to help assess feasibility.
- Feasibility Assessment
  Likelihood of success based on numerical modelling.
  Impacts, costs and limitations, compared to alternative sites and ongoing maintenance dredging.
  Recommendations.

Separate reports for each of the four approaches considered

LNG Terminals – Sustainable In-channel Relocation

LNG Terminal Sustainable In-channel Relocation

- Fine-grained sediment from LNG Terminals and Fishermans Landing.
- Potential for up to 150,000m^3/yr to be placed.
- Reduction in dredging time and cost for region by more than half (and GHG emissions).
- Sediment predicted to be transported away from Tide Island DMPA and deposited as a widespread thin layer of sediment throughout much of Port Curtis (as intended).



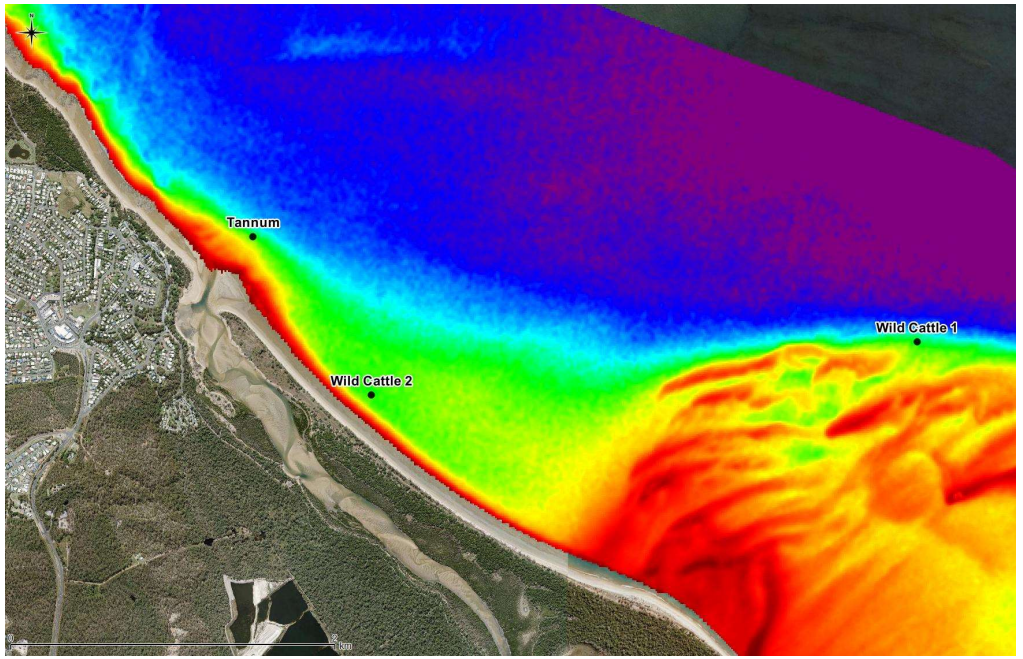
Note: if it is assumed that 75,000m^3/yr is placed at Tide Island DMPA instead of EBSDS this would reduce dredge time from 10 days to 4.3 days and cost from $990,000 to $430,000.

LNG Terminals – Sustainable In-channel Relocation

- At nearby sensitive receptors (seagrass) the excess SSC from the dredging and placement is comparable to natural spring tide peaks over the duration of the dredging, then reduces to peaks of approximately half of the natural turbidity.
- Predicted to result in a zone of low impact where the excess SSC from the dredging may cause water quality to deteriorate beyond natural variation. The zone is predicted to predominantly cover designated channels as opposed to sensitive receptors. Placement at EBSDS is not predicted to result in a zone of low impact.
- Approximately 10% of the relocated sediment is predicted to be redeposited in the LNG Terminals dredged areas, compared to 4% for placement at EBSDS.
- Could be used as a long-term placement option give volume capacity below declared depths (1 million m^3) and the dispersive nature of site predicted by model.
- Uncertainty as to how much sediment could be placed during each campaign without resulting in risks to nearby sensitive receptors.

Beach Nourishment - Offshore

- Sand sized sediment from Wild Cattle Cutting.
- Likely to be at least 20,000m^3/yr available.
- Increase in dredging time and cost by 1.5 to 2 times relative to EBSDS (and GHG emissions). Time increase up to 1 day, cost up to $100,000.
- Sediment predicted to be transported both alongshore and onshore, with sediment most likely to reach the shoreline when placed either at Tannum or Wild Cattle 2. Net northerly longshore transport predicted.



Beach Nourishment - Offshore

- The placement options at Wild Cattle 2 and Tannum are predicted to result in small localised zones of low impact near the placement sites and along the shoreline to the north-west. These areas are where the excess SSC from the dredging may cause water quality to deteriorate beyond natural variation. The zones are not predicted to extend into the historical areas of seagrass.
- Due to the net northerly longshore transport of sediment, the Wild Cattle 2 site is predicted to result in the most sediment being in the active beach zone on the Wild Cattle Island beach, while the Tannum site results in the most sediment being in the active beach zone on the Tannum Sands beach.
- Sediment from the placement mounds is not predicted to be returned into the dredged channels over the 7 month model simulation period.
- Likely offshore placement could be used as a long-term placement option to provide gradual ongoing nourishment to beaches in the region.
- Uncertainty over timeframes for sediment to be transported onshore.

Habitat Restoration / Creation – Seagrass and Coastal Ecosystems

- Mixed sediment required for all sites.
- Volumes from 4,500 to 30,000m^3.
- Placement by TSHD Brisbane, either rainbowing or pumping (Shoal Bay).
- Costs vary depending on site, Passage Island less expensive than placement at EBSDS.
- Majority of sediment retained in possible seagrass habitat at Shoal Bay and Passage Island, but transported into deeper water at Quoin Island. Passage Island preferred option.

Option	Habitat Creation/ Restoration Site	EBSDS
Quoin Island (4,500 m^3)	$60,000	$40,000
Shoal Bay (30,000 m^3)	$5,400,000	$250,000
Passage Island (8,100 m^3)	$70,000	$170,000

Note: CQU undertook habitat suitability modelling to identify sites where seagrass meadows could be enhanced. Used along with sediment availability and dredging constraints to identify three possible locations to consider.

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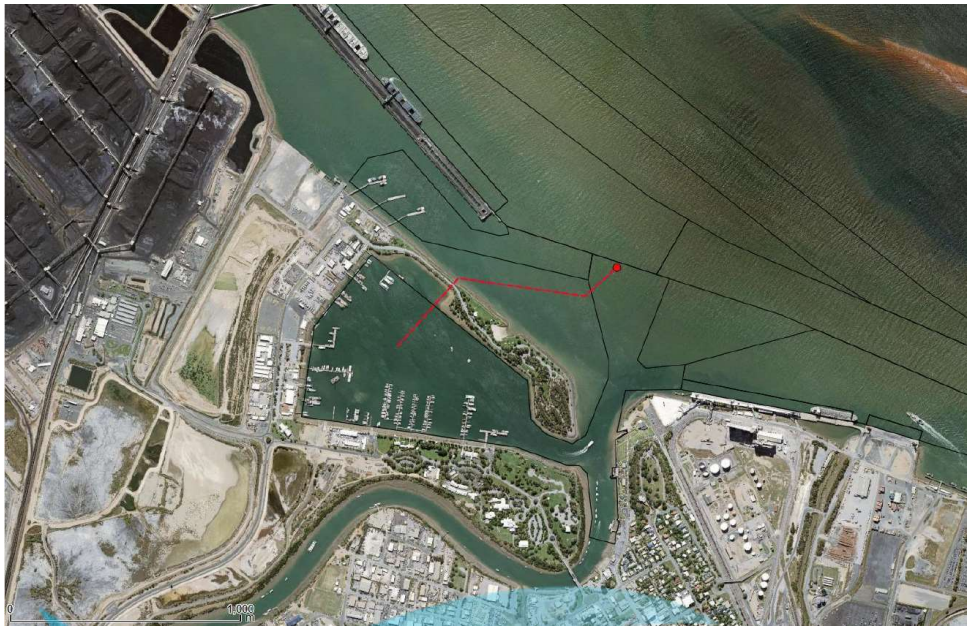
Habitat Restoration / Creation – Seagrass and Coastal Ecosystems

- Passage Island is not predicted to result in increases in SSC at nearby coral reefs, while the other two options could. There is a short duration increase in SSC (days) at the neaby seagrass meadow at South Passage Island, but given the natural variability in SSC in the region this is not likely to result in an impact (no zone of low impact predicted).
- In the order of 7% of the relocated sediment is predicted to be redeposited in the dredged areas of the PoG for the Passage Island option (less than 1% for other options).
- Passage Island could be used as a medium-term placement option.
- Limitation as the seagrass meadows in the Passage Island region are currently the healthiest they have been since 2009, showing that the seagrass has naturally restored itself. Therefore additional habitat restoration in the area is currently unnecessary, although placement could be used to increase seagrass area.

Marina – Sustainable In-channel Relocation

- Fine-grained sediment from Marina.
- In the order of 40,000m^3/yr, frequency and volume could be adjusted based on monitoring results.
- Medium CSD proposed.
- Increase in costs relative to onshore placement from $2.5 million every 5 years to $3.3 million.
- Sediment predicted to be transported away from Clinton Channel release site and deposited as a widespread thin layer of sediment throughout much of Port Curtis (as intended).



Marina – Sustainable In-channel Relocation

- At nearby sensitive receptors (seagrass and coral) the excess SSC from the dredging and placement is predicted to be low relative to the natural conditions, with the natural turbidity predicted to be at least two to four times higher.
- Zone of low impact (where dredging may cause water quality to deteriorate beyond natural variation) predicted to be at release location for annual dredge volume (40,000m^3), when volume increased to five year volume (200,000m^3) the zone of low impact is predicted to increase but still stay confined to the dredged channels.
- In the order of 10 to 13% of the relocated sediment is predicted to be redeposited in the dredged areas of the PoG (3 to 6% back in the Marina).
- Could be used as a long-term placement option give the dispersive nature of site predicted by model.
- Uncertainty as to whether dredging would need to be annual or could be less frequent and a higher volume.

Recommendations

The approaches have been found to potentially be feasible, although there are uncertainties or limitations with each approach. Based on this it is recommended that pilot studies should be undertaken along with monitoring to further assess the long-term feasibility of some of the approaches. Details of the proposed pilot studies are provided below (note: all assume use of TSHD Brisbane):

- LNG Terminals Sustainable Relocation: 10,000m^3 of predominantly fine-grained sediment from the LNG Terminals region is placed at the Tide Island DMPA over a continuous 12 hour period (complete flood-ebb tidal cycle).
- Offshore Beach Nourishment: 4,500 to 7,500m^3 of predominantly sand sized sediment from Wild Cattle Cutting is placed at the Tannum/Wild Cattle 2 site. The placement should be by bottom dumping and aim to create a mount 0.5 to 1m high.
- Marina Sustainable Relocation: 2,000m^3 of predominantly fine-grained sediment pumped through dredger suction arms at Clinton Channel during flood and ebb stages of the tide.

Pilot Study Monitoring

Specific detailed monitoring proposed for the pilot studies to help inform feasibility of placing larger volumes in the future. Monitoring would include:

- Tracer Investigation: sediment tracers with comparable physical properties to sediment being placed would be released with the dredged sediment. The transport and fate of these tracers would be monitored over next 6 to 12 months to understand how material is transported and its fate.
- Impact Monitoring: monitoring at any sensitive receptors identified by the modelling as being potentially at risk from the activity.
- Hydrographic Survey: repeat surveys of the Tide Island DMPA and Tannum/Wild Cattle 2 sites to determine whether sediment has been retained or dispersed.

The scale of ongoing monitoring after pilot study if approach is deemed feasible will be dependent on results of pilot study, but will be significantly less involved than during the pilot study.

Close and Next Steps

- Approval Obligations for Pilot Studies
  - EA Amendment
  - Pre-lodgement with SARA
- Pilot Studies – September 2020 Maintenance Dredging Campaign
- Monitoring – 2020 to 2021
- Long-term Feasibility – 2021

Any Questions ?

Gladstone Ports Corporation
Growth, prosperity, community.

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