

# Risk assessment for scheduling annual maintenance dredging at the Port of Gladstone

**7 November 2023**

To ensure the safe passage of vessels through the Port of Gladstone (PoG), Gladstone Ports Corporation (GPC) conducts annual maintenance dredging using the *Trailing Suction Hopper Dredger (TSHD) Brisbane*.

This risk assessment is to inform the scheduling process for the *TSHD Brisbane* and provides information to:

- determine if there are any PoG specific risks associated with the scheduling of maintenance dredging by the *TSHD Brisbane* with a focus on environmental windows impacting key environmental values;
- identify if any changes in current control measures are required; and
- demonstrate GPC's dredging activities are managed in alignment with the principles of the Maintenance Dredging Strategy (MDS).

In November 2016, the Queensland Department of Transport and Main Roads (TMR) released the MDS for Great Barrier Reef World Heritage Area Ports: Technical Supporting Document; which identified the PoG's environmental values, their distribution and environmental windows, which include seagrasses, corals and marine megafauna and their recruitment / breeding periods. It also documented an Environmental Review and Risk Assessment which provided a summary of risks from maintenance dredging and dredge material placement activities to the environmental values that have the greatest potential to be influenced by these activities. Through this process, the PoG was identified as Low Risk with a High Confidence level.

Under GPC's Environmental Management System (EMS), all environmental risks are assessed and recorded in GPC's risk management system in accordance with GPC's Risk Management Policy and Standard.

The risk assessment in Table 1 is an extract from GPC's risk management system which was subsequently modified to ensure it aligned with the Environmental Review and Risk Assessment in the MDS Technical Supporting Document. It uses the definitions of risk consequences, likelihood and hazard grades adopted for the Great Barrier Reef Region Strategic Assessment: Strategic Assessment Report, Great Barrier Reef Marine Parks Authority, Gladstone, which is provided in Appendix A. This process ensures that there is an annual review of the information used to inform the development of the *TSHD Brisbane*'s state wide annual maintenance dredging schedule.

## Overview

The risk assessment indicates that all risks associated with maintenance dredging at the PoG in 2024 are **Low** as a result of implementing the identified management controls.

While no new management controls are required, to assist in turtle protection, GPC added two (2) additional controls in 2018 to align with the Recovery Plan for Marine Turtles in Australia 2017-2027 (the Recovery Plan), and gain a better understanding of turtle fatalities in the PoG. These include:

1. Development of protocols for multiple marine megafauna fatalities to temporarily halt dredging until investigation is complete and corrective actions (where identified) have been applied.
2. Notification of opportunistic marine megafauna finds, where the remains (carcass or parts thereof) will be retrieved and stored appropriately for analyses.

These controls have been developed in accordance with specialist advice received from the Department of Environment and Science (DES).

All other existing controls for the protection of seagrasses, coral, marine megafauna and for the mitigation of risks associated with weather events, have been in place for many years and their application and effectiveness is well understood.

As a result, it is proposed that no environmental windows are required for maintenance undertaken by the *TSHD Brisbane* at the PoG. The ecological and environmental timings relevant to the PoG that were considered in this assessment are included in Appendix B. All management controls identified through this process have been documented in GPC's PoG Environmental Management Plan (EMP) for Maintenance Dredging.

Table 1. Scheduling risk assessment for *TSHD Brisbane* maintenance dredging: Port of Gladstone – 2023

		Inherent risk		Residual risk		
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
<b>Seagrass and seagrass recruitment</b> Potentially impacted to elevated turbidity and in turn reduction in benthic light and/or sedimentation as a result of dredge plumes or dredge material relocation.	<p>Seagrass communities occur throughout PoG with intertidal, subtidal and deep water seagrass meadows present. The intertidal and subtidal seagrasses have been monitored, at least once a year, since 2002. Seagrass in PoG is diverse and variable between years and highly seasonal.</p> <p>In October 2022, the overall seagrass condition was satisfactory after three years of good condition and with a period of poor or satisfactory seagrass condition prior to 2019. Seven of the fourteen annual monitoring meadows were in a good to very good condition and a further two in satisfactory condition. The large Pelican Banks meadow adjacent to Curtis Island decreased in biomass and the proportion of <i>Zostera muelleri</i> to be in poor condition after being in satisfactory condition in 2021. All meadows in the Western Basin, the Narrows and South Trees Inlet were in good or very good condition, except for one ephemeral deep-water meadow (Meadow 7) and Meadow 8 north of Fisherman's Landing that were in satisfactory condition.</p>	Unlikely/ Insignificant	Low	<p>Seagrass communities, management tools and health and growth requirements are very well understood in Gladstone. Comprehensive seagrass, water quality and light monitoring programs have been in place for many years. No adverse impacts from maintenance dredging have been detected. Existing management controls are demonstrably effective. e.g.</p> <p>GPC Controls            Management and Monitoring Plans and Procedures which include:            * Hydrodynamic modelling of estimated volumes,            * Assessment of modelled impacts against known sensitive receptor thresholds,            * Monitoring in alignment with modelling,            * Monitoring and triggers for sensitive receptors * Passage Island (&lt;6 mol/m<sup>2</sup>/day on a 14 day rolling average of BPAR applied conservatively in both the growing and senescent season),            * Adaptive management processes, and            * Long term monitoring of seagrass communities.</p> <p>Contractor controls - detailed in <i>TSHD Brisbane</i> EMP            * Engineering controls on <i>THSD Brisbane</i> e.g. Green valves (anti-turbidity), below keel discharge.</p>	Unlikely/ Insignificant	Low

		Inherent risk			Residual risk	
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
	<p>Monitoring of deep-water seagrass adjacent to the East Banks Sea Disposal Site (EBSDS) in 2019 had shown that there was minimal change in condition of seagrass, thus indicating that the placement of dredge material at the EBSDS is having little impact on the adjacent seagrass meadow. This monitoring is due to be undertaken in 2024.</p> <p>During the activity based monitoring program undertaken in 2023 (pre, during and post dredging) light levels at the BPAR monitoring site remained above the threshold limit.</p>			<p>* Notification requirements,            * Dredging and material relocation locations and volumes as per the defined requirements of GPC's approvals.</p>		
<p><b>Corals</b>            Potentially impacted due to elevated turbidity, reduction in benthic light and sedimentation as a result of dredge plumes or dredge material relocation.</p>	<p>Coral reef habitats include shallow fringing and subtidal reefs within PoG, near North and South Entrances and along Facing Island.</p> <p>Surveys undertaken of the reef communities along the eastern side of Facing Island in 2023 showed that there are essentially two major community types within the monitored sites. Firstly, outer Facing Island sites and Rundle Island sites were highly similar and were coral dominated, without the macroalgae <i>Sargassum</i>. The other major community type included sites closer to the harbour entrance, which was dominated by</p>	Possible/ Insignificant	Low	<p>Existing management controls are demonstrably effective. For example.</p> <p>GPC Controls Management and Monitoring Plans and Procedures which include:            * Hydrodynamic modelling,            * Assessment of modelled impacts against known sensitive receptor thresholds,            * Monitoring in alignment with modelling,            * Monitoring and water quality triggers for turbidity and adaptive management processes            * Long term monitoring of reef communities</p> <p>Contractor controls - detailed in <i>TSHD Brisbane EMP</i></p>	Unlikely/ Insignificant	Low

		Inherent risk			Residual risk	
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
	<p>macroalgae and the coral genus <i>Turbinaria</i>. Since 2018, there has been little improvement in sites at Facing Island (some non-statistically significant increases in coral cover), and a fairly large reduction in coral cover was observed at one site (FAC3). This site has become more 'harbour entrance-like', as its living coral cover has reduced and its macroalgal cover has increased, and one of the most tolerant genera of corals <i>Turbinaria</i> has increased in cover. In contrast, the regional reference sites (Rundle Island), have improved, with coral cover increasing. There were very minor changes in coral disease and low numbers of coral recruits at all sites. The decline in coral cover at one of the Facing Island sites (FAC3) is intriguing because it is not widespread across Facing Island, and out of context with changes at Rundle Island and the greater region. It is perhaps more likely that the reduction in coral cover at FAC3 is related to localised changes in water quality or patterns in local disease or predation. Therefore, it is unlikely that maintenance dredging activities (re-mobilised sediments) result in long-term changes to adjacent reef communities.</p>			<ul style="list-style-type: none"> <li>* Engineering controls on <i>THSD Brisbane</i> e.g. Green valves (anti-turbidity), below keel discharge;</li> <li>* Notification requirements,</li> <li>* Dredging and material relocation locations and volumes as per the defined requirements of GPC's approvals.</li> </ul>		

		Inherent risk			Residual risk	
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	<p>Overall, the 2022 results demonstrate the continued lack of recovery of coral communities within Gladstone Harbour.</p> <p>Annual surveys undertaken of permanent coral monitoring locations within PoG for the Gladstone Healthy Harbour Partnership (GHHP) showed an improvement in coral condition from 2015 to 2017 despite coral cover still remaining poor in 2017. GHHP surveys undertaken from 2018 to 2022 showed a decline in coral condition. This continued trend was the result of low cover of living coral, high macroalgal cover, low abundance of juvenile corals, and a poor score for change in hard coral cover at most of the surveyed reefs. While coral cover was low at all reefs surveyed, the coral cover at Seal Rocks South has steadily increased since 2018.</p> <p>The continued decline to very low densities of juvenile corals observed in 2022 is likely influenced by multiple processes. Ongoing pressures such as high macroalgal cover and the widespread presence of the bio-eroding sponge <i>Cliona orientalis</i> appear to be hindering the recovery of the coral communities in Gladstone Harbour which along with the high water temperatures in early 2020 are likely to have reduced juvenile</p>					

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	<p>densities by increasing the mortality rate of settled corals or potentially limiting the fecundity of adult corals over the late 2020 spawning season.</p> <p>However, based on dredge plume monitoring, modelling studies, and surveys, it is considered extremely unlikely that sediment plumes created by the activity are driving these spatial patterns. Both monitoring and modelling indicate that sediment plumes created by the activity are short- term features (measurable for &lt; 1 hour) that do not have significantly large enough concentrations to impact reef communities.</p>					
<p><b>Coral spawning</b> Potentially impacted by dredging related high suspended sediment and settlement levels as a result of dredge plumes or dredge material relocation.</p>	<p>Coral spawning occurs on the full moon for up to six (6) days usually in October or November, but potentially December depending on presence of suitable conditions.</p> <p>See coral description provided above.</p>	Unlikely/ Insignificant	Low	<p>Existing management controls are demonstrably effective. e.g. GPC Controls Management and Monitoring Plans and Procedures which include:</p> <ul style="list-style-type: none"> <li>* Hydrodynamic modelling,</li> <li>* Assessment of modelled impacts against known sensitive receptor thresholds,</li> <li>* Monitoring in alignment with modelling,</li> <li>* Monitoring and water quality triggers for turbidity and adaptive management processes</li> <li>* Long term monitoring of reef communities</li> </ul> <p>Contractor controls - detailed in <i>TSHD Brisbane EMP</i> * Engineering controls on <i>TSHD Brisbane</i> e.g. Green valves (anti-turbidity), below keel discharge;</p>	Unlikely/ Insignificant	Low

		Inherent risk		Residual risk		
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
				* Notification requirements, * Dredging and material relocation locations and volumes as per the defined requirements of GPC's approvals		
<b>Marine megafauna</b> breeding Potentially impacted as a result of dredge strike or entrainment.	<p>The ocean side of Curtis Island is an index beach for a medium density population of nesting Flatback turtles as recognised by the Recovery Plan. Green and loggerhead turtles are also known to nest along this beach and beaches within the region.</p> <p>While not formally recognised by the Recovery Plan, the PoG does represent a foraging area for green turtles. The majority of the Green turtles within PoG forage over the inter-tidal and sub-tidal flats adjacent to outside and inside of the outflow areas of the estuaries.</p> <p>Australian humpback dolphins occur throughout the PoG and bottlenose dolphins have been observed on the ocean sides of Facing and Curtis Islands.</p> <p>Dugongs occur throughout PoG and this region is recognised as a Dugong Protection Area B under State legislation.</p> <p>Humpback whales make their annual migration through the Great Barrier</p>	Unlikely/ Minor	Low	Existing management controls have been effective with no marine megafauna strikes. e.g.  GPC Controls Management and Monitoring Plans and Procedures which include: Long term monitoring of marine megafauna  Contractor controls - detailed in <i>TSHD Brisbane EMP</i> * Ensuring turtle deflectors are fitted to drag heads, * Visual monitoring prior to relocation activities, * Opportunistic monitoring in vessel hopper, Protocols on retrieved megafauna to allow for DES to retrieve and analyse, * Protocols for marine megafauna multiple strike, which may include halting dredging, * Notification requirements for strikes and finds of marine megafauna	Unlikely/ Minor	Low



		Inherent risk			Residual risk	
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
	<p>Reef region from June to August. Individual whales have been sighted within the PoG.</p> <p>Turtle strike data provided by PBPL indicates that five (5) turtles have been captured during maintenance dredging in the PoG since 2000, which all occurred prior to 2011.</p> <p>Based on validated modelling results, most sensitive receptors (including seagrasses and corals) are unlikely to be affected by maintenance dredging plumes. Therefore no flow on effects to marine megafauna is expected.</p>					
<p><b>Extreme Weather</b></p> <p>Potential impacts to environmental resources and water quality may occur as a result of dredging immediately following an extreme weather event.</p>	<p>Severe weather events have the potential to increase the volume of accumulated material in shipping channels and berth pockets, which can present additional operational and environmental hazards.</p> <p>Severe weather in Gladstone usually occurs between December and March (BOM data 1957-2019) and therefore relocation of this accumulated material immediately following an event at this time of the year would have negligible to no impact on spawning, breeding or recruitment.</p>	Rare/ Insignificant	Low	<p>GPC has experienced evaluated turbidity before, during and after dredging. This data has been evaluated against weather (wind, rain and tide) and found that Port of Gladstone is influenced by weather events and that no discernible impact has been found on sensitive receptors from the activity.</p> <p>GPC Controls            Management and Monitoring Plans and Procedures which include:            * Emergency management section gives guidance for extreme events that allows for risk assessment jointly between PBPL and GPC to determine what additional controls to employ. The actions could also include halting dredging, and are dependent on the risk to the</p>	Rare/ Insignificant	Low

		Inherent risk			Residual risk	
Threat	Description and risk commentary	Likelihood and consequence	Risk	Management controls	Likelihood and consequence	Risk
				environment and the vessel.		

# Appendix A

Risk ratings as per: *Great Barrier Reef Region Strategic Assessment: Strategic assessment report, GBRMPA, Gladstone (GBRMPA, 2014)*

## Consequence description and definition

Consequence	Extent of the impact based on current management	
	Broad scale	Local scale
<b>Catastrophic</b>	Impact is clearly affecting, or would clearly affect, the nature of the value over a wide area. Recovery periods greater than 20 years likely.	
<b>Major</b>	Impact is, or would be, significant at a wider level. Recovery periods of 10 to 20 years likely.	Impact is, or would be, extremely serious and possibly irreversible to the condition of a value. Condition of the affected value possibly irretrievably compromised.
<b>Moderate</b>	Impact is, or would be, present at a wider level. Recovery periods of 5 to 10 years likely.	Impact is, or would be, extremely serious to the condition of a value and possibly irreversible over a small area. Recovery periods of 10 to 20 years likely.
<b>Minor</b>	Impact is, or would be, not discernible at a wider level. Impact would not impair the overall condition of the value, including sensitive populations or communities, over a wider level.	Impact is, or would be, significant to the condition of value at a local level. Recovery periods of 5 to 10 years likely.
<b>Insignificant</b>	No impact or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the value.	No impact or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the value.

Note: Recovery periods relate to major capital dredging programs and not maintenance dredging.

## Likelihood description and frequency

Likelihood	Expected frequency of a given threat
<b>Almost certain</b>	Expected to occur more or less continuously throughout a year
<b>Likely</b>	Not expected to be continuous but expected to occur one or more times in a year
<b>Possible</b>	Not expected to occur annually but expected to occur within a 10-year period
<b>Unlikely</b>	Not expected to occur in a 10-year period but expected to occur in a 100-year period
<b>Rare</b>	Not expected to occur within the next 100 years

## Hazard Risk Grades

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
<b>Almost Certain</b>	Low	Medium	High	Very high	Very high
<b>Likely</b>	Low	Medium	High	High	Very high
<b>Possible</b>	Low	Low	Medium	High	Very high
<b>Unlikely</b>	Low	Low	Low	Medium	High
<b>Rare</b>	Low	Low	Low	Medium	High

# Appendix B

## Port of Gladstone Ecological / Environmental Timings

Subject Matter	Event and Time period/s
Seagrass	Growing Season: July to December.
Corals	Spawning: Inshore reefs – up to 6 days after the first full moon in October. GBR region – up to 6 days after the first full moon in November. Can vary according to suitable conditions.
Flatback turtles	Mating: Unknown. Nesting: October to January (peak: late November to early December). Hatching: December to March (peak: February).
Green turtles	Foraging: all year round in PoG, therefore not included in the graph (not documented in the Recovery Plan for this area but known from other studies).
Loggerhead turtles	While known to be present, limited understanding of use of PoG.
Dolphins	No known significant events or time periods.
Dugongs	No known significant events or time periods.
Whales	Migration through GBR region: June to August.
Wet / Cyclone Season	Generally December to March.

