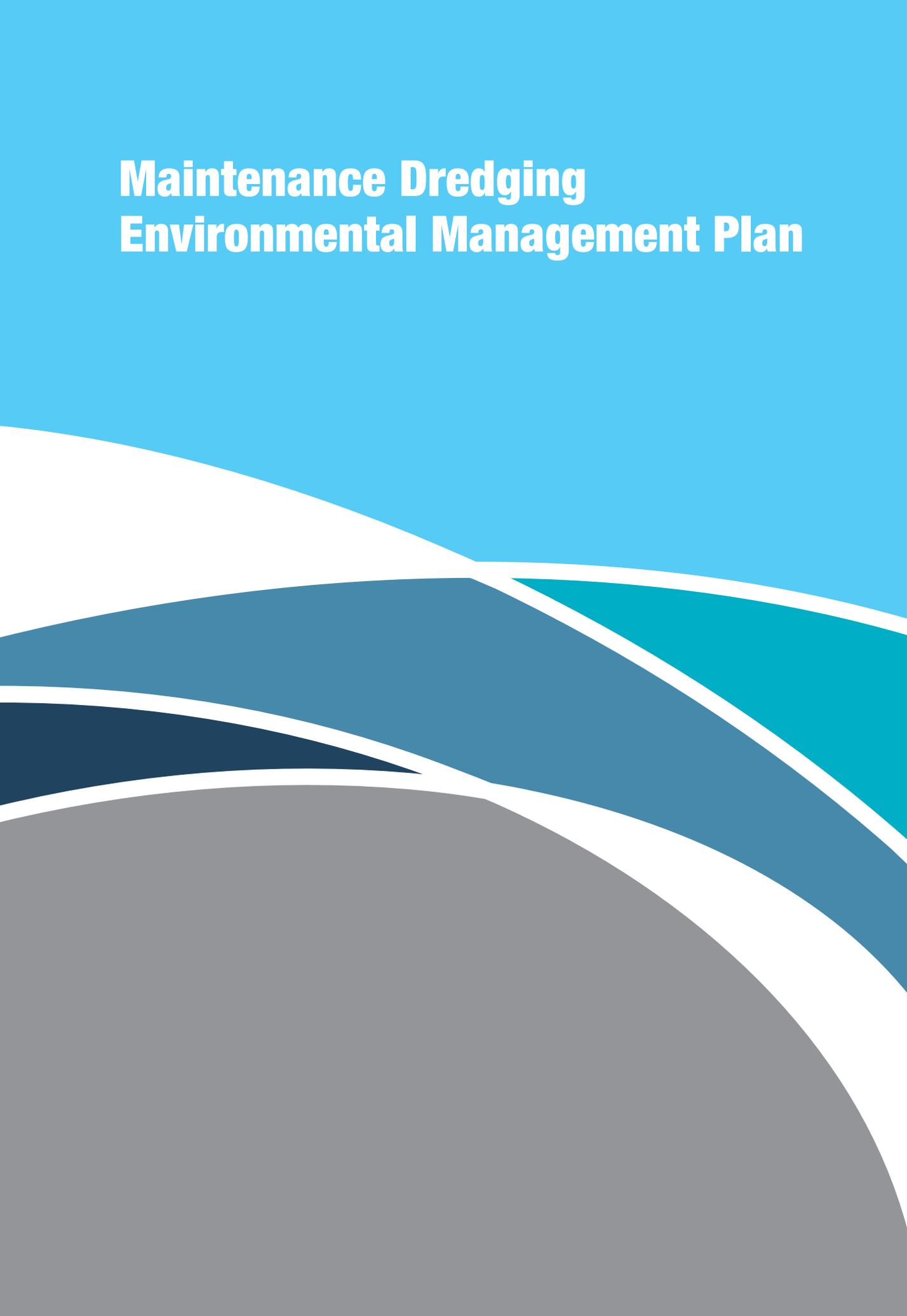


Maintenance Dredging Environmental Management Plan

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North Queensland Bulk Ports Corporation

Port of Hay Point

**Maintenance Dredging Environmental
Management Plan**

March 2018



DOCUMENT TRACKING

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1. Introduction

1.1. PURPOSE

The purpose of this Maintenance Dredging Environmental Management Plan (EMP) is to guide activities during dredging operations. It details the environmental management requirements to be followed by NQBP staff and contractors during maintenance dredging operations described in Section 4.

This EMP includes:

- the requirements for environmental management during the implementation of dredging¹ activities
- the responsibilities for implementing this EMP
- the project delivery standards (PDS) including environmental controls and limits to ensure that project objectives and targets are achieved.

This EMP should be read in conjunction with:

1. *Port of Hay Point Long-term Maintenance Dredging Management Plan (LMDMP)*, dated March 2018 (Rev 0). The LMDMP has been developed to inform long term planning and management of all dredging activities at the Port over a 25-year period.
2. *Port of Hay Point Marine Environmental Monitoring Program*, dated March 2018 (Rev 0). The monitoring plan outlines the monitoring arrangements that will apply in relation to dredging operations.

The current approved versions of these plans will be maintained on the North Queensland Bulk Ports (NQBP) website – www.nqbp.com.au.

1.2. CHANGES TO THIS EMP

This EMP will be reviewed and updated prior to each maintenance dredging operation/campaign at the Port of Hay Point.

It must be finalised and approved prior to initial dredging campaign commencing. It must not be finalised until all relevant permits and regulatory approvals have been granted.

1.3. PORT CONTEXT

The Port of Hay Point (the Port) is a major bulk commodities port managed by the North Queensland Bulk Ports Corporation Pty Ltd (NQBP). The Port has two coal terminals - Dalrymple Bay Coal Terminal (DBCT) and Hay Point Coal Terminal (HPCT). It is a coastal port with offshore trestle jetties extending approximately 4km seaward. The port's navigational areas include seven ship loading berths, an apron area, departure path and tug harbour. An approved Dredged Material Placement Area (DMPA) is located 7 km from the berth areas.

Left unmanaged, natural sediment fills up navigational infrastructure, impacting the depth necessary for safe loading, manoeuvring and transit of ships. A reduced ability to effectively load ships can have a substantial economic impact on the region that the port supports.

NQBP has undertaken an extensive research project to investigate the most sustainable way to manage accumulated sediment in and around the Port of Hay Point. The project: the *Port of Hay Point Sustainable Sediment Management Assessment for Navigational Maintenance (SSM)*, was to understand how the day to day operations at the Port of Hay Point are affected by marine sedimentation and to determine, if necessary, the best way to manage operations and sediments.

This innovative sediment management approach has been widely acknowledged and a similar framework is now applied in the Department of Transport and Main Road's *Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports*. This is applicable to all ports operating in the GBRWHA.

¹ For the purposes of this EMP the term "dredging" includes dredge material placement and other associated vessel activities.

The SSM project investigated where specifically the sediment at the Port of Hay Point comes from, what impact it has on Port operations, whether accumulation can be eliminated or reduced, and what alternatives are available to reuse or dispose of any sediment that might need to be dredged.

The project has determined what is the best short and long-term approach to managing sediments within the Port. A clear preferred 25-year maintenance dredging strategy is now established that involves:

1. Use of operational measures to extend periods between maintenance dredging campaigns.
2. Use of traditional dredging in the short term (12 months) to restore navigational areas to safe design depths.
3. Use of traditional dredging to maintain navigational areas at safe design depths – every 3-5 years in a volume of between 200,000 and 250,000 cubic metres.
4. Placement of dredged material at sea at the existing dredge material placement area.
5. Commitment to a detailed investigation into mangrove restoration in Sandringham Bay with the intention of executing, if feasible, a restoration program in the next 10 years.

All reports are available at www.nqbp.com.au.

1.4. ASSESSMENT, MONITORING AND MANAGEMENT

In order to guide the implementation of this strategy NQBP has developed a series of reports, management plans and monitoring programs as shown in Figure 2. This EMP provides the dredging operational controls resulting from the extensive assessment and planning process.

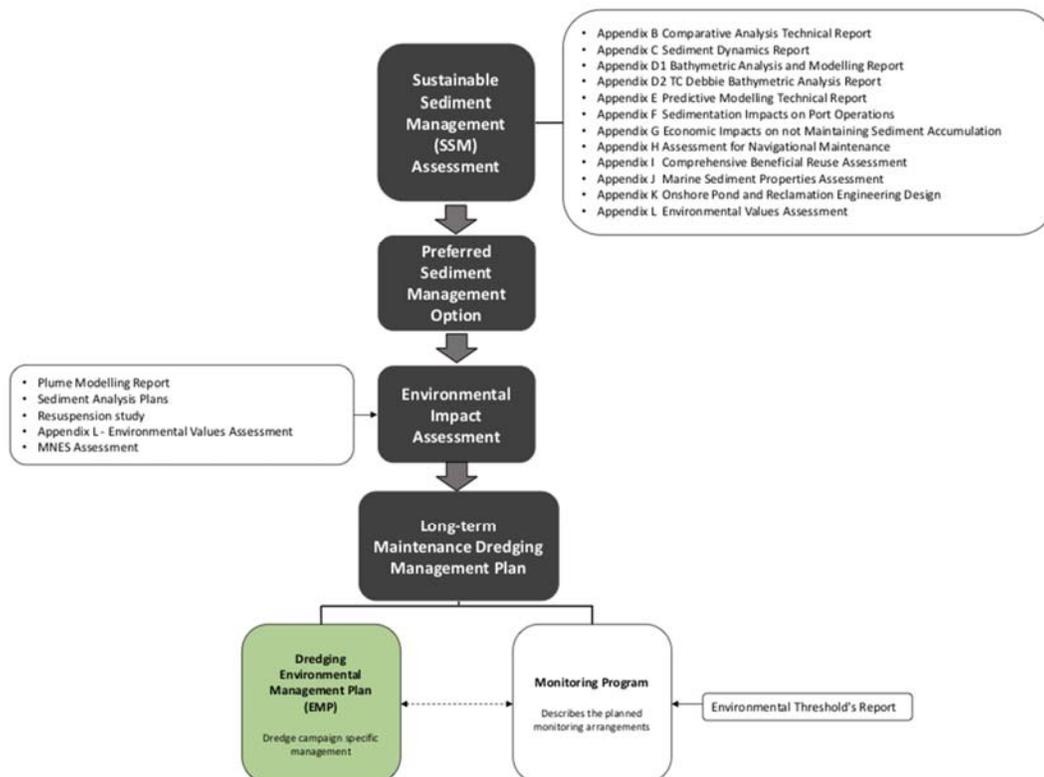


Figure 1: Port of Hay Point dredging assessment and management plan structure

2.Approvals

There are a number of State and Federal approvals necessary to conduct maintenance dredging and disposal at the Port of Hay Point. Table 1 provides a list of the current approvals that are relevant to this EMP.

Table 1: Current permit details

Permit	Permit No.	Activity
Environmental Authority (31 January 2014) - Environmentally relevant activity	EPPR01742813	Undertake maintenance dredging of navigational infrastructure
Development Approval (27 February 2006) - Operational Works (Tidal Works)	PDC00339006A12 IPDE00339106A22	Disposal of dredged material below high-water mark
Marine Park Permit	Pending	Dredging and placement inside Marine Park
Sea Dumping Permit	Pending	Loading and placement of material at sea.

Appendix A-D, provides copies of the current State and Federal permits, relevant for dredging operations to be undertaken in 2018.

NOTIFICATION AND OBLIGATIONS SCHEDULE

NQBP has developed a 'notifications and obligations schedule' (Appendix E) that clearly outlines relevant reporting requirements and obligations arising from all current permits. The schedule will separately show notification requirements and condition obligations for the periods:

1. Pre-maintenance dredging commencing.
2. During active maintenance dredging and disposal.
3. Post-maintenance dredging reporting and closeout.

The most current notifications and obligations schedule will be provided to respective regulators and the Technical Advisory Consultative Committee (TACC) prior to maintenance dredging occurring in any given year.

3.Roles and Responsibilities

NQBP as the Port Authority for the Port of Hay Point is responsible for the maintenance of:

- Departure Path and Apron Areas, and
- Half Tide Tug Harbour

NQBP also take on the responsibility of maintaining navigational infrastructure specific to Dalrymple Bay Coal Terminal (DBCT) and Hay Point Coal Terminal (HPCT), including:

- DBCT Berth Pockets x 4
- HPCT Berth Pockets x 3

As such, NQBP are the holder of all permits related to maintenance dredging at the Port of Hay Point.

The following personnel have responsibilities under this plan.

Table 2: Roles and responsibilities, 2018 dredging campaign

Position	Person	Contact details	Responsibility
NQBP Environment Manager	Kevin Kane		Compliance with all Permits and EMP requirements Adaptive management decisions
NQBP Principal Advisor - Environment	Damian Snell		Implementation of Monitoring Program Hourly review of adaptive monitoring and management data Notification of trigger level exceedances to Environment Manager and Vessel Master
NQBP Dredging Contract Manager	John Hinschen		Operational and contractual matters relating to the operation of the dredge
Vessel Master	TBA		All matters related to the safety of vessel and crew Compliance with maritime laws Implementation of management measures as detailed in this EMP
TSHD Brisbane Dredging Operations Manager	TBA		Management of overall operations of dredger
Regional Harbour Master	TBA		Contact for hazardous spills and shipping safety issues

3.1. TECHNICAL ADVISORY AND CONSULTATIVE COMMITTEE

NQBP has establish a Technical Advisory and Consultative Committee (TACC). The TACC's membership and role is outlined in the LMDMP.

During dredging operations, the TACC will be advised of any serious incidents or changes resulting from dredging.

Post the dredging campaign the TACC will be provided with information on the results of dredging operations, environmental monitoring and any instances where adaptive management measures were employed. Advice will be sought on improvements to the monitoring program and this EMP based on these results.

3.2. MONITORING ADVISORY GROUP

NQBP has established a Monitoring Review Group (MRG) consisting of qualified marine scientists and regulator representatives. The role of the MRG is to assist NQBP and the dredge operator in interpreting and applying the results of the real time monitoring program. Members of the MRG will be available at short notice to provide advice on the application of adaptive management measures, particular in the event that the live data is outside expected parameters.

3.3. TRAINING AND AWARENESS

All personnel involved in dredging operations shall be suitably qualified and experienced to undertake their roles. Personnel who have formal responsibilities under this plan will be briefed on the requirements of this EMP.

Briefing may include: pre-dredging all hands staff induction, tool box sessions, and ongoing awareness mentoring in the field. Records of training and inductions will be maintained.

All personnel involved will be required to complete a site induction which will incorporate key environmental aspects of the project. Induction topics will include the following:

- This EMPs provisions and requirements
- Legislative requirements and key environmental issues
- Emergency response
- Incident reporting
- Waste management
- Individual and organisational responsibilities
- Consequence of compliance failures, with particular emphasis on EMP undertakings.

3.4. COMMUNICATION

Internal and external communication and consultation arrangements are described below.

INTERNAL COMMUNICATION

Internal communication methods include telephone, ship to shore radio, meeting and notices distributed by email.

Daily meetings are scheduled between NQBP and the TSHD contractor. Environmental matters will be included as a standing agenda item at all meetings.

EXTERNAL COMMUNICATION

A variety of methods will be used to enable information to be distributed to interested members of the community and stakeholders. These may include the following:

- NQBP website (www.nqbp.com.au)
- Email
- Media releases
- Notices to Mariners.

Key communication activities and content include the following:

- Scheduled activities to be included on the NQBP website covering planned operational activities.
- All complaints will receive a response within one (1) business day. Complaints will be managed following NQBP's standard complaints procedure.
- Communication and advice to the TACC during and post the dredging operations.

4. Dredging Operations

4.1. DESCRIPTION OF OPERATIONS

In order to maintain navigable depths at the Port the SSM Project identified that NQBP must conduct maintenance dredging using hopper style dredging. Noting that drag bar activities will help to reduce the frequency of dredging, they will not be effective in removing all accumulated sediments.

Dredging during the 2018 campaign will be focussed on removing accumulated sediments from Apron, berths and tug harbour areas. The exact volumes and locations are outlined in section 4.2.

EQUIPMENT

The *TSHD Brisbane* will undertake the 2018 campaign.

A brief description of the *TSHD Brisbane* operations is provided below.

Material to be dredged is removed through two suction heads, which are lowered into position on either side of the vessel. As the vessel steams slowly at around 1 – 3 knots, large pumps draw water through the heads, which entrain the sediment and transport the water/sediment mixture aboard into a central collection hopper. The capacity of the hopper is dependent on the sediment type – with volumes (including both sediment and water) approximating 2,800 m³ for fine silts and 1,700 m³ for sands (of a maximum hopper capacity of 2,900m³). Each extraction run takes approximately 1 hour to complete. Whilst the suction heads are fitted with high-pressure water jets, which can be used to agitate consolidated sediment, they are rarely required for maintenance dredging.



The sediment/water ratio of material delivered to the central hopper of the *TSHD Brisbane* is typically quite low. Whilst it varies depending on the type of sediment being dredged, the sediment concentration is generally in the order of 10 – 30 % solids. To maximise dredge material capacity, these large volumes of water are managed using a central column weir, which is incorporated into the hopper. This arrangement allows excess water to decant from the sediment and overflow to discharge. Overflow occurs only toward the very end of the dredging run as the hopper nears capacity (typically the last ten minutes of a one hour dredging run).

Once the dredge has filled its hopper, the vessel will then relocate the material to the designated dredge material relocation ground. Dredged material is discharged below keel level to minimise turbidity generation. Each dredged material placement is manually logged using both satellite navigation and standard bridge equipment and is electronically fixed using a differentially corrected global positioning system (GPS). The time taken to place material over the dredge material relocation ground is typically about 15 minutes.

4.2. VOLUMES AND LOCATIONS

VOLUMES

The 2018 dredging campaign will focus on removing accumulated sediment from Apron, Berths and the Half Tide Tug Harbour (HTTH). The volumes for each location are provided in Table 3.

Table 3: Volumes by area, 2018 dredging campaign

2018 Dredge Volumes (m ³)	
HTTH	24,598
HP Boat Ramp	6,710
DBCT Berth 1	62,784
DBCT Berth 2	68,555
DBCT Berth 3	51,949
DBCT Berth 4	59,237
Apron	62,576
Departure Path	11,509
HPCT Berth 1	409*
HPCT Berth 2	309*
HPCT Berth 3	7,917
TOTAL	356,553

* Unlikely to be included in 2018 dredging campaign, not part of currently approved SAP.

LOCATIONS

The location of the dredging areas is shown in Figure 2 along with relevant geographical coordinates.

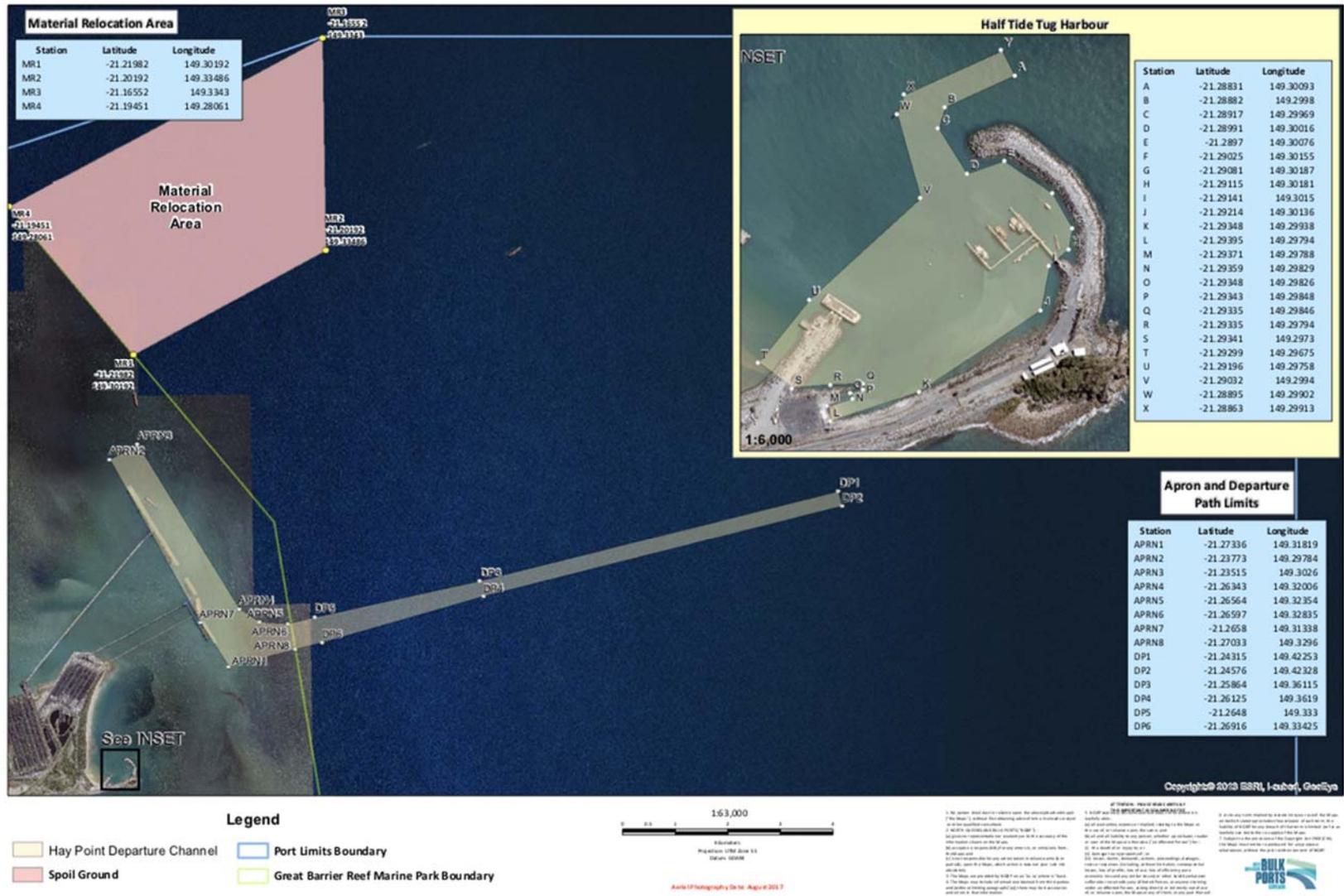


Figure 2: Dredging areas at the Port of Hay Point

5.Environmental Risks

To inform this EMP an environmental risk assessment has been undertaken of potential dredging scenarios and volumes (ELA 2018). Supporting this risk assessment were:

- a detailed plume modelling study looking at potential water quality changes across various dredging volumes (Royal HaskoningDHV 2018)
- an environmental thresholds study (Royal HaskoningDHV 2018)
- an environmental values report (Jacobs 2016).

There are a number of environmental values that occur in the vicinity of the Port of Hay Point. The plume modelling and risk assessment undertaken has indicated that these impacts are highly unlikely to be residual or significant from maintenance dredging.

A summary of the key findings of the impact assessment are:

- Resuspension of sediments from maintenance dredging is comparable to natural suspended sediment concentrations (SSC) during calm conditions
- Numerical modelling of sediment transport demonstrates that natural SSC levels are much higher than those generated by maintenance dredging
- Analysis against intensity and duration thresholds indicated that dredging would not drive conditions outside those experienced naturally at dredge volumes up to 800,000 m³
- Impacts to sensitive habitats such as seagrass and coral communities are likely to be negligible to low. Seagrass communities are naturally low density and ephemeral and have been shown to recover post-dredging. Coral communities lie outside of area predicted to be impacted by turbidity and sedimentation, and ecologically relevant turbidity thresholds will be used during dredging to further prevent impacts
- Protected species are also unlikely to be significantly impacted by maintenance dredging. The Port of Hay Point does not provide critical habitat resources for any marine species and disturbance to habitats will be low. Indirect disturbances can be effectively managed via best practise dredging operations. The short timeframe of each campaign will also reduce impact
- Impacts to protected areas including the GBRWHA and GBR Marine Park will also be low to negligible.

The activities associated with maintenance dredging are well tested and understood. It is considered that there would be limited ongoing management and monitoring requirements once the placement of dredged material has been completed. Ambient monitoring, which has been in place since mid-2014, will continue as per the Marine Environmental Monitoring program

A summary of risks is provided in Table 4. This risk assessment is based on the application of standard mitigation measures as outlined in section 6.

Table 4: Summary of environmental risk findings

Risk activity (cause)	Consequence	Likelihood	Potential environmental receptors
Dredge material placement	Temporary loss of benthic habitat	Low	Transient seagrass beds and seagrass habitat Benthic macroinvertebrate communities
Dredge material placement and associated sediment plume	Changes to water quality	Low for volumes below 800,000m ³	Coral and rocky reef habitats at Round and Flat Top islands, and Slade Islet
Dredge material placement and associated sediment plume	Sediment deposition	Low for volumes below 800,000m ³	Coral and rocky reef habitats at Round and Flat Top islands, and Slade Islet
Movement of dredge vessel from the Port of Hay Point to the dredge material placement area	Potential for marine fauna vessel strike	Low	Transitory threatened and migratory marine animals
Dredging suction	Potential for marine fauna to be caught	Low	Foraging marine turtles

While impacts from proposed dredging campaigns under 800,000m³ are expected to be minimal and temporary in nature, in accordance with good management practice a program of mitigation and adaptive management will be implemented during dredging campaigns. Management will be based on real time scientific data, observations and adaptive management responses to ensure dredging activities and associated changes in environmental conditions are monitored and controlled.

6.Environmental Management

6.1. STANDARD MEASURES

DREDGER SPECIFICATIONS

Mitigation of potential turbidity and suspended solids impacts from dredging and dredge material relocation is partly achieved through the use of suitable and specifically designed modern vessels. The following are considered the minimum standard of specification for TSHDs that will be selected to undertake maintenance dredging works in the Port of Hay Point.

The 2018 dredging campaign will be undertaken by the TSHD Brisbane, which meets these specifications.

Table 5: Environmental specifications for the dredger

Parameter	Trigger	Action
Management Controls	Continual	The dredger will operate under this EMP at all times Permit conditions, dredge dumping procedures, any associated adaptive monitoring arrangements and corrective actions are incorporated into the EMP.
	Continual	TSHDs undertaking dredging works at the Port of Hay Point will include the following specifications: <ul style="list-style-type: none"> ○ Central weir discharge system ○ Below keel discharge point ○ Low wash hull design ○ Electronic positioning system (GPS) ○ Turtle exclusion devices on intake heads.
	Reporting	Electronic logs of each dredge material relocation event will be maintained
	Notification	Any exceptions to the EMP will be reported to NQBP Principal Advisor – Environment within 24 hours of the exception being identified. Emergency incidents must be reported immediately.
Responsibility	Primary	Vessel Master
	Secondary	NQBP Principal Advisor - Environment

DREDGE MATERIAL PLACEMENT

Impacts to the dredge material relocation ground and adjacent areas will be minimised through relocation of the dredge material in such a manner as to uniformly spread it over the relocation ground. This is achieved through deposition patterns that vary with the prevailing conditions. When currents are minimal, deposition will occur relatively uniformly over the dredge material relocation ground area in arc patterns (refer Figure 3 left). When currents are present, deposition will occur in tighter arcs in the up-current portion of the dredge material relocation ground to take into account drift of sediment as it settles (refer Figure 3 right).

- Dredge material will be spread in a manner that sediment mobilisation and turbidity plume generation is minimised (e.g. bottom / keel discharge)
- A DGPS will be used to ensure the dumping is within the designated area
- Each load of the TSHD will be dumped in a manner that distributes the dredged sediments evenly across the designated area.

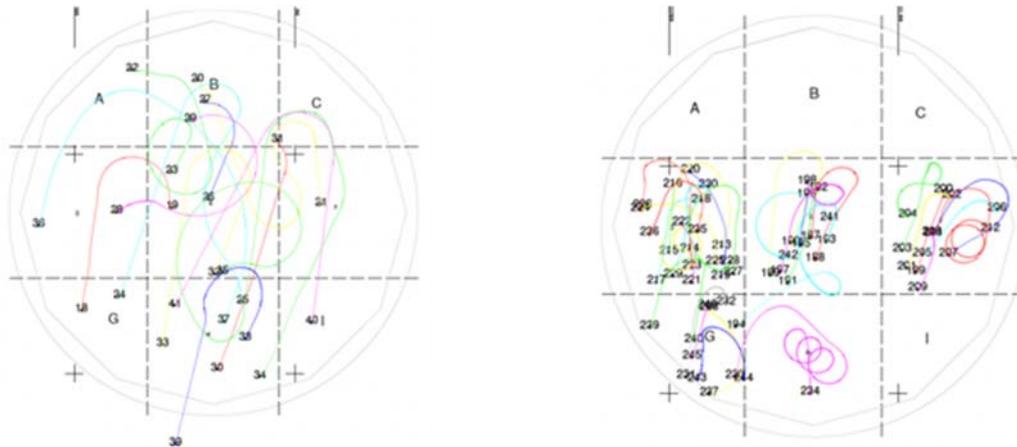


Figure 3: Example of dredge placement plot during periods of low current (left) and high current (right)

CULTURAL HERITAGE

Cultural heritage refers to both European and Indigenous heritage.

Table 6: Cultural heritage

Parameter	Trigger	Action
Heritage	Continual – during at-sea operations	Ensure dredging and material relocation is undertaken within the approved areas only Undertake opportunistic visual inspection of dredge load and dredge heads, reporting any items of suspected cultural significance. If items are found, retain and report to relevant authorities through Vessel Master and NQBP Observe all site-specific requirements which may influence dredge operations.
	Notification	If items are found, retain and report to relevant authorities through Vessel Master and NQBP
Responsibility	Primary	Vessel Master
	Secondary	NQBP Principal Advisor - Environment

WASTE MANAGEMENT

The following procedures will apply to the management of waste during dredging operations.

Table 7: Waste management

Parameter	Trigger	Action
General Waste	Continual - during at-sea operations	<p>Supply of appropriate collection bins in areas such as galley, crew quarters and mess.</p> <p>Transfer of bins as required to large bins on-deck.</p> <p>Material placed in bin to be as compacted as possible to reduce space requirements.</p> <p>All on-deck bins secured in position to prevent movement whilst at sea.</p> <p>Where facilities exist to recycle material, appropriate separation of refuse.</p> <p>Bin lids to be chained down to prevent wind- blown material loss at all times.</p> <p>All collection points to be emptied to on-deck bin when 75% capacity.</p> <p>Visual check to ensure that on-deck bins have sufficient capacity to retain general waste until next scheduled on-shore transfer.</p>
	Loss of general refuse over-board during collection, storage or transfer	If practicable, retrieve material that was lost. Review procedure causing material loss and rectify immediately.
	Notification	Reporting of material loss over-board to Vessel Master and NQBP in accordance with incident
Sewage	Continual – during at-sea operations	<p>All sewage effluent (including greywaters and blackwater) generated onboard shall be directed to the onboard treatment system.</p> <p>Treated effluent shall be diverted to onboard holding tanks</p> <p>Effluent from the treatment system and holding tank is to be discharged in appropriate locations to ensure compliance with relevant legislation</p> <p>Pump-out of sludge tank to be managed as for untreated sewage discharges and, by way of appropriately licensed contractors where required.</p>
	Accidental discharge or discharge in prohibited area	Review procedure resulting in sewerage discharge in prohibited location and rectify immediately. Review sewage storage system inputs and operation. Modify procedures, to improve discharge quality
	Notification	<p>Reporting of sewerage discharge location in Sewage Log Book. Any exceptions reported to vessel master and NQBP</p> <p>All sewage spills to be reported to Maritime Safety Queensland.</p>
Hazardous waste	Continual – during at-sea operations	<p>All hazardous waste to be stored in appropriate manner (contained and banded) and clearly marked in accordance with legislative requirements.</p> <p>All appropriate spill kit equipment will be on site and all personnel will be trained in the use of spill kits.</p>

	During transfer	<p>Hazardous waste to be collected by licensed contractor, for disposal at approved facility</p> <p>Bunkering of fuel to be undertaken by licensed contractor and levels shall be monitored at all times</p> <p>Spill response equipment shall be easily identifiable and conveniently located</p>
	Spill	Vessel Master to assist with clean up of spill, review procedure breakdown and correct if required. This may include staff training
	Notification	Vessel Master must report any spills to the marine environment to NQBP's Principal Advisor - Environment on 0409 282 110 (24 hours); and notify Maritime Safety Queensland on 07 4052 7470 or 1300 551 899
Emissions	Continual – during at-sea operations	<p>Noise</p> <p>All noise reduction equipment to be maintained as per manufactures' specifications</p> <p>All noise from activities must not exceed the acoustic quality objectives specified in the Environmental Protection Noise Policy 2008</p> <p>Light</p> <p>Where practicable, LED lighting will be used to provide more direct illumination of tasks and reduce light spill.</p> <p>Use of external vessel lighting will be minimised unless required for safety purposes</p> <p>Air quality</p> <p>All combustion plant particularly main and auxiliary engines to be maintained as per manufactures' specifications</p> <p>Appropriate adjustment of trim and ballast to ensure effective operation</p> <p>Exhaust stack to be visually monitored to ensure no visual dark emissions</p>
	Evidence of inappropriate emissions or complaint	Vessel Master to investigate source of emissions or basis of complaint. If this relates to inappropriate work practices, inform crew of necessary changes and ensure these are undertaken. If complaints relate to plant, investigate effectiveness of emissions reduction equipment and review/replace as required.
	Notification	Any complaints to be reported to NQBP, Vessel Master, PBPL Environment Manager and PBPL Manager Dredging Operations.
Responsibility	Primary	Vessel Master
	Secondary	NQBP Principal Advisor - Environment

BALLAST WATER AND WASHDOWN

Ballast water from the TSHD Brisbane will be managed in accordance with the Biosecurity Act 2015.

Table 8: Ballast water and washdown procedures

Parameter	Trigger	Action
Ballast water	Before leaving Port of origin	Undertake a thorough hopper wash within the material relocation area If discharge pipes have been utilised during operations, undertake a thorough flush of these systems Inspect hopper and dredge gear (esp. heads) to ensure that no material which may transport organisms (such as sediments, organic material or waters) is retained
	During transit between areas of operation	Any ballast tanks holding seawaters will be exchanged prior to arrival with seawaters at a location as distant from the coastline or other shallow (<100m) areas as possible, but not less than 12nm Ballast tanks filled with freshwaters will be retained without treatment Waters held within the hopper during transit will be treated as for other ballast waters
	During dredging operations	Release of ballast waters will be minimised at all times
	Reporting	A record will be kept of volumes, location and times of ballasting and de-ballasting operations
Washdown	At all times	Sweep deck in preference to washing where possible Washdown of the deck and or dredge head shall only occur within the designated disposal areas Only dredged material to be release as a result of vessel washing activities (i.e. no release of oil or other contaminants)
	Notification	Reporting by crew to Vessel Master of any observations of contamination to the waterway whilst washing the deck/equipment Reporting in accordance with hazardous waste measures
Responsibility	Primary	Vessel Master

6.2. ADAPTIVE MANAGEMENT MEASURES

WATER QUALITY

While impacts from temporary changes to water quality are not expected, the Port of Hay Point Monitoring Program (NQB 2018) establishes a framework for real time monitoring water quality changes at key sites to inform adaptive management measures to ensure unpredicted impacts do not eventuate.

The adaptive monitoring program is based on detailed water quality thresholds based on intensity, duration and frequency analysis as outlined in the Port of Hay Point Marine Environment Monitoring Program (NQB 2018).

Monitoring Sites

Four sites will be monitored for adaptive management purposes:

- Round Top Island (Trigger Site) – prevailing southerly conditions
- Victor Island (Trigger Site) – prevailing northerly conditions
- Freshwater Point (Control Site) – prevailing southerly conditions.
- Slade Island (Control Site) – prevailing northerly conditions.

Respective trigger sites and control sites have been determined based on prevailing wind direction, as outlined in Figure 4.

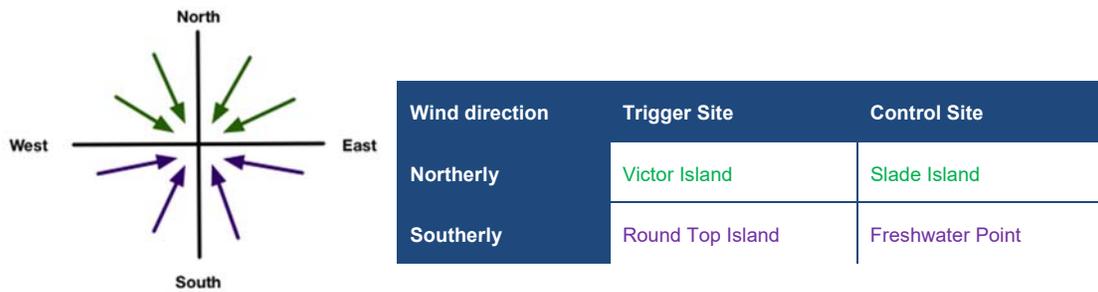


Figure 4: Wind directions and respective trigger and control sites

At these sites SSC/NTU intensity thresholds have been established, as detailed in Table 9.

Table 9: Wet and dry season intensity thresholds

Site	Intensity (mg/l)	Intensity (NTU)
Wet Season (92 nd percentile data)		
Round Top Island	15	11
Freshwater Point	83	104
Victor Island	47	32
Slade Islet	52	43
Dry Season (95 th percentile data)		
Round Top Island	15	11
Freshwater Point	38	48
Victor Island	49	34
Slade Islet	37	31

Additionally, duration thresholds have been developed to reflect either a 40 day or 20-day dredge duration.

Duration thresholds are developed from the full three-year dataset (excluding TC Debbie) and are represented as:

- **Average** – the average recorded cumulative time the intensity threshold is naturally exceeded over the given period
- **90th Percentile** – the cumulative time the intensity threshold is naturally exceeded
- **Maximum** – the highest recorded cumulative time the intensity threshold is naturally exceeded over the given time period.

Duration threshold values for the trigger sites are shown in Table 10. Adaptive monitoring will use NTU as this is more useful than SSC for real time loggers and management purposes.

Table 10: Intensity and duration thresholds - 40 day period (wet and dry seasons)

Trigger Sites	Intensity (mg/l)	Intensity (NTU)	Average Duration (hrs)	90 th Percentile Duration (hrs)	Maximum Duration (hrs)
Wet Season (92 nd percentile)					
Round Top Island (southerly)	15	11	77	164	300
Victor Island (northerly)	47	32	77	241	291
Dry Season (95 th percentile)					
Round Top Island (southerly)	15	11	48	82	115
Victor Island (northerly)	49	34	48	94	150

Application of Triggers

At trigger sites the real time data is used to establish the cumulative duration (using real time 1 hour averages) above the threshold value. If and when the cumulative duration increases and reaches either the: average duration; 90th percentile duration; or max duration, a series of management zones are triggered.

If the 1-hour average is above the NTU threshold then the duration of time above the intensity threshold is recorded on the relevant trigger site graph (see Figure 5 for an example). This will produce an ongoing cumulative count of time above the respective threshold (if the value is below the threshold, no increase in duration is recorded and the graph line will run horizontal). Once the cumulative duration exceeds the average, 90th or max durations then escalating management responses are required.

While the cumulative hourly plot remains under the average duration, that is within Management Zone A, no response is required and dredging can operate as normal.

If the cumulative hourly plot increases and exceeds the other management zone thresholds then the instantaneous logger readings from the respective control site is reviewed to determine if the threshold exceedance is being caused by dredging or natural conditions, as follows:

1. If the control site reading is also above that site's intensity threshold (92nd/95th% NTU) then the raised turbidity level will be assumed to be primarily being driven by natural conditions making management actions unnecessary and ineffective.
2. If the control site readings are below that site's intensity threshold (92nd/95th% NTU) it should be assumed that dredging is resulting in the raised turbidity level at the trigger site, corresponding management response should be implemented.

Where there is doubt or where readings are only marginally different or cannot be explained, the MRG will review the data, climate conditions and other factors, such as where and when the dredge was operating. Based on available information the MRG will provide advice on appropriate management response.

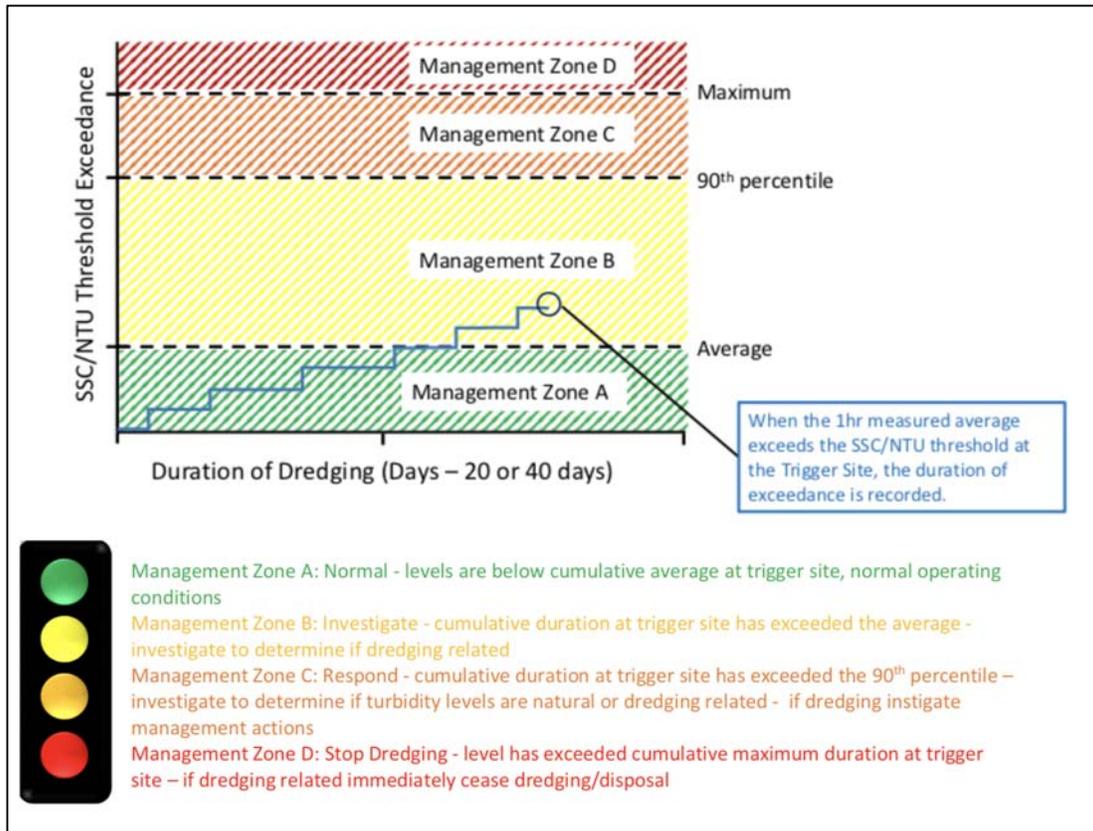


Figure 5: Hypothetical example plot showing duration trigger limits and management zones

The following tables indicate the combinations of trigger site and control site conditions and when management responses are or are not required.

Table 11: Wet season with northerly wind 92nd% trigger and control site scenarios

WET SEASON		NORTHERLY WIND			
Cumulative duration level	Trigger site	Control Site			
	VICTOR	SLADE			
Zone A	●	<43	●	>43	●
Zone B	●	<43	●	>43	●
Zone C	●	<43	●	>43	●
Zone D	●	<43	●	>43	●

Table 12: Dry season with northerly wind 95th% trigger and control site scenarios

DRY SEASON		NORTHERLY WIND			
Cumulative duration level	Trigger site	Control Site			
	VICTOR	SLADE			
Zone A		<31		>31	
Zone B		<31		>31	
Zone C		<31		>31	
Zone D		<31		>31	

Table 13: Wet season with southerly wind 92nd% trigger and control site scenarios

WET SEASON		SOUTHERLY WIND			
Cumulative duration level	Trigger site	Control Site			
	ROUND TOP	FRESHWATER			
Zone A		<104		>104	
Zone B		<104		>104	
Zone C		<104		>104	
Zone D		<104		>104	

Table 14: Dry season with southerly wind 95th% trigger and control site scenarios

DRY SEASON		SOUTHERLY WIND			
Cumulative duration level	Trigger site	Control Site			
	ROUND TOP	FRESHWATER			
Zone A		<48		>48	
Zone B		<48		>48	
Zone C		<48		>48	
Zone D		<48		>48	

Table 15: Management responses based on trigger and control site combinations

TRIGGER	CONTROL	MANAGEMENT RESPONSE
		= NO ACTION (CONTINUE DREDGING OPERATIONS AS NORMAL)
		= INVESTIGATE
		= NO ACTION
		= RESPOND – TURBIDITY REDUCTION MEASURES
		= NO ACTION
		= STOP DREDGING (until instantaneous NTU falls below 92 nd /95 th % @trigger site)
		= NO ACTION

Management Actions

Based on the Management Zones the following response actions apply (Table 16).

Table 16: Management responses actions

Status	Action				
NO ACTION	No response actions required. Apply standard measures to ongoing dredging program				
INVESTIGATE	<p>This zone indicates that the cumulative duration has increased beyond the average. The NQBP Principal Advisor -Environmental should investigate to determine if the exceedance is potentially dredging related. Examine:</p> <ol style="list-style-type: none"> 1. the monitoring equipment for any faults/defects that may have influenced data collection at both monitoring and control sites. 2. the dredge and disposal activity and locations in the 24 hours preceding exceedance. 3. the results against: <ul style="list-style-type: none"> o recent meteorological and current/wave/tide conditions (particularly due to any events or wind direction that may not also be affecting control site) o sediment transport patterns using MODIS or other aerials/satellite imagery. 4. where possible, examine the trigger site to ensure no natural processes or other human activity (e.g. vessel movements, fishing activity) are contributing to the elevated turbidity level. 5. whether any significant rainfall events resulting in increased surface runoff or river sedimentation outfall from Pioneer River or Bakers Creek are affecting the trigger site. <p>If it is determined that dredging activities have contributed to the exceedance, the dredging operations should be placed on a warning status.</p>				
RESPOND	<p>If the trigger site cumulative duration and instantaneous control site reading indicate that dredging is causing an exceedance above the 90th percentile duration, the Vessel Master should be informed and the following management measures should be progressively applied.</p> <ol style="list-style-type: none"> 1. Change the disposal location and vessel route within spoil grounds 2. Slow vessel speed during disposal 3. Alteration of overflow regime 4. Change the dredging location (e.g. move to Half Tide Tug Harbour) 5. Modification of disposal phase with respect to the tide (e.g. dispose on ebb tide only) 6. Reduce the dredge load <p>The measures should be applied sequentially. One measure should be applied to each sequential disposal run and NTU monitored at the trigger site to determine if levels stabilise or fall. If they continue to increase or remain above the threshold then the next measure should be applied and so forth. Normal operations can resume once NTU falls below threshold or matches equivalent percentile reading at control site. Additionally, climate conditions should be used to inform expected turbidity responses.</p>				
STOP DREDGING	<p>If the trigger site cumulative duration and instantaneous control site reading indicate that dredging is causing an exceedance above the max duration, the Vessel Master should be informed dredging and disposal should cease until either:</p> <ul style="list-style-type: none"> - NTU falls below threshold or trigger site matches equivalent percentile reading at control site - Weather conditions have stabilised to a point where continued raised NTU is unlikely. 				
Responsibility	<table border="0"> <tr> <td style="padding-right: 20px;">Primary</td> <td>Vessel Master</td> </tr> <tr> <td>Primary</td> <td>NQBP Principal Advisor - Environment</td> </tr> </table>	Primary	Vessel Master	Primary	NQBP Principal Advisor - Environment
Primary	Vessel Master				
Primary	NQBP Principal Advisor - Environment				

MARINE FAUNA

There is a low probability of impacts to marine mega fauna during operation of dredging plant and equipment, and during transit between dredge site and dredge material relocation ground.

Direct physical impact to marine fauna from collision with the TSHD is unlikely as the vessel will be moving at low speeds. Most fauna that may be encountered (turtles, dolphins and whales) are generally able to avoid slow moving vessels. Direct impacts to turtles through intake into the suction heads is possible, however, the drag heads will be fitted with turtle exclusion devices. Specific management actions to be implemented are detailed in Table 17.

Table 17: Triggers and adaptive management actions for marine fauna

Parameter	Trigger	Action
Megafauna (turtles, dolphins, whales and dugongs)	Continual – during at-sea operations	Bridge personnel to maintain watch for marine fauna during dredging, transit and dredge material placement
	Warning: Megafauna present outside 150m radius monitoring zone	Continue monitoring presence Prepare for response if animals move within 150m of the dredge
	Exceedance: Megafauna present within monitoring zone	Stop dredging Dredging to commence only when megafauna have exited monitoring zone or not observed for 20 mins <u>or</u> the dredge vessel moves to another area of the dredge/ placement sites to maintain a minimum distance of 150m. Record observations and actions in Master’s log
Turtles	Continual	Drag head to be fitted with turtle exclusion device
Turtles	Lowering and raising of drag head	Stop suction of dredge as dredge head is lowered/ lifted
Reporting		
Responsibility	Primary	Vessel Master
	Secondary	NQBP Principal Advisor - Environment

6.3. INCIDENT MANAGEMENT

All NQBP Hay Point staff, and any contractors involved, have the responsibility to report any significant incidents and emergencies. This requirement will be included in inductions and reinforced at operational meetings.

Environmental incidents and hazards, including pollution incidents will be managed in accordance with either the *TSHD Brisbane* on-board emergency procedures or the Port of Hay Point emergency response procedure (for in water incidents).

All incidents will be reported and recorded in accordance with NQBP’s policies, procedures and permit conditions.

In the first instance, reporting should be to the operational works supervisor, but generally, the Environment Manager will have the responsibility to initiate corrective action for environmental incidents.

In the case of an environmental emergency, after first notifying the Environment Manager, the operational works supervisor may make contact with NQBP’s nominated consultants, who would help co-ordinate and manage a response. Depending on the nature and magnitude of the incident, the Environment Manager may be required to notify government regulators.

7. Reporting

7.1. RECORD KEEPING AND AUDITING REQUIREMENTS

During dredging activities, NQBP (or their contractors) will keep records which detail:

- the times and dates of when each material disposal run is commenced and finished
- the position (by GPS) of the vessel at the beginning and end of each dumping run with the inclusion of the path of each dredge material relocation run
- the volume of dredge material (in cubic metres) dumped for the specific operational period. These records will be retained for audit purposes
- detail of any spill of oil, fuel or other potential contaminant, details of remedial action and monitoring instigated as result.
- details of any marine mega fauna observations during dredging activities
- time and duration of any alterations to the program, including stop work actions, as a result of any environmental mitigation measure.
- NQBP will undertake internal audits during each dredging campaign

Post the dredging program, NQBP will

- undertake a bathymetric survey of the dredged area and dredge material placement site within one month of the completion of all dumping activities
- within two months of the completion of the bathymetric survey provide a digital copy of the final survey results to the RAN Hydrographer, copied to relevant regulatory agencies
- continue monitoring as per the *Port of Hay Point Marine Environmental Monitoring Plan*.
- Provide a report on the bathymetry to the Managing agency within two months of the bathymetric survey being undertaken. This report will include a chart showing the change in sea floor bathymetry as a result of dumping and include written commentary on the volumes of dumped material that appear to have been retained within the disposal site.
- To facilitate annual reporting to the International Maritime Organisation, NQBP must report to the Department and the Managing Agency by 31 January each year, including on the day of expiry of the sea dumping permit or completion of all dredging under this permit.

7.2. MONITORING OF ENVIRONMENTAL PERFORMANCE

Environmental performance will be monitored through adaptive monitoring, observations and surveys. The Port of Hay Point Dredging Environmental Monitoring Program (ELA 2018) set out all monitoring requirements related to dredging.

Result of the monitoring program feed back into ongoing performance reviews of environmental management including future editions of this EMP.

The TACC is involved in the review of monitoring data and subsequent changes to management actions.

7.3. INCIDENTS AND CONTINGENCY ARRANGEMENTS

Significant environmental incidents should be logged in writing, with all relevant details recorded, after corrective action has been completed.

Should an environmental incident occur during the course of dredging or dumping, NQBP will take measures to mitigate the risk or impact. NQBP would report the following information to DEHP/GBRMPA, within 24 hours:

- nature of incident and type of risk associated with the incident, including (where possible) volume, nature and chemical composition of substances released
- measures taken to mitigate the risk
- the success of the measures undertaken
- proposed future measures (if required) and monitoring.

8. References

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9. Appendices

APPENDIX A: ENVIRONMENTAL AUTHORITY (31 JANUARY 2014) - ENVIRONMENTALLY RELEVANT ACTIVITY

APPENDIX B: DEVELOPMENT APPROVAL (27 FEBRUARY 2006) - OPERATIONAL WORKS (TIDAL WORKS)

APPENDIX C: GBR MARINE PARK PERMIT

APPENDIX D: SEA DUMPING PERMIT

APPENDIX E: NOTIFICATIONS AND OBLIGATIONS SCHEDULE'