VOLUME 3

Draft : Environmental Impact Statement

Chapter C2 Dredge Management Plan

C2.1 Purpose

This Chapter of the EIS provides a Dredge Management Plan (DMP), which has the purpose of identifying the preferred means of addressing environmental issues associated with dredging operations for the Cairns Shipping Development Project (CSDP), namely: widening and deepening of the outer and inner channels; and associated placement of material at the new Dredge Material Placement Area (DMPA) identified previously in the EIS.

In general, the DMP reflects and/or provides a greater level of detail to mitigation and monitoring commitments discussed in the preceding chapters of the CSDP EIS. This is achieved by setting out the framework for management, mitigation and monitoring of relevant impacts of the action within issue-specific management plans.

It will be used to guide detailed design, site establishment and construction of the Project. For a description of the activities to be undertaken in each of these stages, refer to **Chapter A4, Project Description.**

The principal objectives of this DMP are as follows:

- To minimise impacts to marine flora and fauna, and their habitats, during capital dredging and dredge material placement activities
- To adopt best practice management for the handling and storage of all waste materials on board the dredge
- To manage the risk of translocation of organisms in ballast water by the dredge vessel
- To minimise the risk of an environmental incident occurring such an oil spill, vessel collision or similar to prevent damage to the surrounding marine environment and the public
- To reduce or minimise nuisance noise on surrounding sensitive receptors from the dredging
- To minimise the air emissions produced during dredging operations and thereby minimise potential effects on the natural airshed.

C2.2 Scope

The scope of the DMP covers dredging-related works associated with the CSDP as follows:

- Capital dredging activities by various plants
- Associated placement of dredged material at sea within a DMPA
- General operation of the dredge vessel upon mobilisation, during the dredging campaign and prior to demobilisation.

The DMP does not address the construction of wharf side maritime structures or other land-based aspects of the project as these are covered in **Chapter C1, Environmental Management Plan (Construction and Operation).** It also does not apply to operational (maintenance) dredging issues which will be addressed as part of amendments to the port's existing Long Term Dredging and Disposal Management Plan (Worley Parsons, 2009) , and incorporated into the operational (maintenance) approvals as required.

Like the project Construction Environmental Management Plan (CEMP), the DMP is also a framework document to guide future construction activities (in this case dredging) and decision-making associated with the CSDP.

The DMP contains procedures, guidance and commitments to monitoring and other environmental management measures that will be required to be carried through into more detailed approvals (such as tidal works approvals under the *Sustainable Planning Act 2009*, an environmental authority for dredging under the *Environmental Protection Act 1994* and sea disposal permits) and by the future dredge contractor for the works as part of the contractor's Operational Environmental Management Plans.

It is recognised that compliance with the requirements of this DMP does not remove general obligations and responsibilities under relevant legislation, or for approvals or permits that will need to be obtained in the future in order to carry out the development.

C2.3 Terms of Reference and EIS Guidelines

The DMP responds to the Queensland Government's ***Cairns Shipping Development Project – Terms of reference for an environmental impact statement***, November 2012, issued by the Coordinator General. In particular, Section 4.1.1 and Section 4.1.2 and Section 11 of the Terms of Reference (ToR) are relevant to preparation of the DMP.

The DMP also responds to the Australian Government's EIS Guidelines (March 2013), in particularly, Section 5.10.9 (dredging and dredged material disposal related impacts), Section 5.11 (proposed avoidance, safeguards, management and mitigation measures) and Section 5.14 (monitoring and reporting)

C2.4 Legislation

The DMP has been developed in accordance with, and taking into account legislative requirements set out in Acts and Regulations at Commonwealth and State level that are listed below. Further, while consents and approvals have not yet been issued for the project, the DMP has been developed to include measures that Ports North believes is necessary for protection of sensitive environments that could be affected by the dredging and disposal activity.

C2.4.1 Legislation

Commonwealth legislation considered in development of this DMP (including Acts implementing relevant international conventions) includes:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*
- *Environment Protection (Sea Dumping) Act 1981 and Regulations*
- *Great Barrier Reef Marine Park Act 1975.*

The following State legislation is relevant to the proposed dredging:

- *State Development and Public Works Organisation Act 1971*
- *Coastal Protection and Management Act 1995 and draft Coastal Management Plan*
- *Environmental Protection Act 1994* and Environmental Protection Policies
- *Fisheries Act 1994* and Regulations
- *Marine Parks Act 2004* and Marine Parks (Great Barrier Reef) Zoning Plan
- *Transport Operations (Marine Safety) Act 1994* and Regulations
- *Transport Operations (Marine Pollution) Act 1995* and Regulations
- *Land Act 1994*
- *Nature Conservation Act 1992* and Conservation Plans
- *Sustainable Planning Act 2009* and Regulations.

Dredge Contractor Documents

- Contractual documentation
- Contractor Environmental Management System EMS

Other

- Ports North Environmental Policy
- Ports North EMS

C2.5 Ports North Environmental Management

C2.5.1 Environmental Policy

The Ports North Environmental Policy has the following commitments to demonstrate environmental leadership:

- Implement and maintain an environmental management system to meet the standard set by AS/NZ ISO14001:2004, as a tool for continual improvement in environmental performance
- Comply with relevant environmental laws, regulations, policies, procedures, and standards
- Identify, assess and minimise environmental risk and impacts of port activities
- Integrate environmental considerations and principles of sustainable development into management processes and decision making
- Maintain emergency, fire protection, security systems and infrastructure to protect the environment
- Strive to use resources efficiently, minimise waste and prevent pollution
- Apply sufficient and appropriate people and resources to achieve this Environmental Policy
- Define, measure and report regularly against objectives and targets and review the effectiveness of performance
- Communicate this policy to staff and stakeholders to build collaborative relationships to promote superior environmental outcomes
- All construction contractors should be familiar with this policy and actively promote achievement of these commitments in consultation with Ports North.

C2.5.2 Environmental Management System

Ports North maintains an Environmental Management System (EMS) that is consistent with international standard ISO14001:2004. This EMS identifies all risks including safety, business and environment as well as management controls or actions to prevent or minimise impacts. A register of risks and treatment plans is maintained for all significant risks. A key element of the EMS is the commitment to conducting environmental audits of all construction activities so that risks associated with these are identified so that Ports North can verify relevant permits, licences and project objectives are being achieved.

The Construction Contractor (s) will be provided with an applicable extract of the EMS and is expected to adhere to any relevant treatment plans.

C2.5.3 Incident Management

Ports North have a system in place for recording, reporting and investigating incidents that result in, or have the potential to result in, adverse environmental impacts. This ensures that all environmental incidents and near miss events are investigated in an effective and timely manner to ensure the cause is identified and corrective actions completed.

All Construction Contractors will have an obligation to report events that have or may cause environmental harm.

C2.5.4 Environmental Monitoring

Ports North undertake a range of monitoring programmes to manage potential impacts of the Port of Cairns. These include monitoring of water quality, biosecurity, land contamination and marine habitats.

These programmes will continue in addition to CSDP specific monitoring outlined in this DMP and any resultant conditions of approval which will be implemented by both Ports North and its Dredge Contractor as part of project implementation.

C2.6 Project Description and Stages

The following section describes the project and identifies, at a broad scale, the inputs that make up the Cairns Shipping Development Project. Many of the elements discussed will be directly addressed in **Section C2.9** of this management plan.

C2.6.1 Dredging Plant

A backhoe dredger (BHD) is a mechanical dredger, similar to an excavator which is mounted on a barge. A BHD is a stationary dredger anchored by three spud piles. It works by dredging the seabed using the bucket at the end of the excavator arm and placing the dredged material into a hopper barge which is moored alongside for disposal at the preferred dredge material placement area.

A medium size backhoe dredger having installed power in the order of 700 to 1,000 kW with bucket capacity of about 5 m^3 to 11 m^3 is proposed for the CSDP. The BHD will be supported by a number of hopper barges of about 1,000 m3 capacity towed by tug boats.

The dredging process of BHD involves the following sequences:

- Position BHD at the dredging area
- Excavation using bucket fixed at the end of the excavator arm
- Load the dredged material into a hopper barge which is moored alongside the BHD
- Tug boat tows hopper barge when it is full to the preferred marine dredge material placement area
- Hopper barge dispose dredge material by splitting the hopper or through bottom doors which is also called bottom dumping
- Tug boat tow hopper barge back to the BHD.

A trailing suction hopper dredger (TSHD) is a self-propelled sea-going hydraulic dredger equipped with a hopper and dredging installations to fill and unload the hopper. The dredging takes place at the draghead on the seabed which is connected to a suction pipe to fill the hopper. Two sets of suction pipes and dragheads, one on each side of the TSHD are used when dredging. The dredging process and hopper filling takes place while the TSHD is sailing along the dredged areas. The trailing speed during dredging is in the order of one to two knots.

For the CSDP, widening of the navigation channel requires dredging in areas as shallow as about -2 m to -2.5 m CD. Therefore, a shallow draft TSHD is required which can still comparatively hold large amounts of dredged material in the hopper and have enough power to dredge the firm clay. A medium size TSHD of hopper capacity of about 5,500 m3 with suction pipe of 1.0 m diameter is proposed for the CSDP. The loaded draft of the TSHD is in the order of 6 m to 7 m, therefore dredging has to be planned to commence at low tide at deeper areas and progress to shallow areas during high tide.

The dredging process of TSHD involves the following sequences:

- Position TSHD at the dredging area
- Lower the suction pipe with draghead at the end
- Dredging at draghead and hopper filling simultaneously while sailing
- When the hopper is filled to its capacity, TSHD will sail to the preferred dredge material placement area (DMPA)
- TSHD disposes of dredge material by bottom dumping
- TSHD sails back to the dredging area.

C2.6.2 Likely Best Case Scenario - Base Case and Alternative Case (No Overflow)

The ‘likely best case’ scenario includes a base case and an alternative case dredging scenario. The difference between the base case and the alternative case within the ‘likely best case’ scenario is the use of different dredging equipment in the Inner Port. The base case assumes TSHD dredging of all material in the Outer Channel and a BHD dredging of all material in the Inner Port, while the alternative case assumes that some of the Inner Port dredging (soft material) would be undertaken by a TSHD instead of the BHD.

The most likely dredging scenario is expected to be somewhere between the two cases, with an expected duration of approximately 23 weeks. The final dredging scenario will depend on findings from detailed geotechnical investigations during detailed design; however both cases have been assessed in terms of potential impacts on the environment to provide flexibility and assurances that both methodologies would be acceptable.

Both the base case and alternative case scenarios assume no overflow dredging from the TSHD.

C2.6.3 Likely Worst Case Scenario – Constrained Overflow

The EIS Guidelines for the CSDP and GBRMPA modelling guidelines require consideration of impacts from a likely best case and likely worst case dredging scenario to understand the range of environmental impacts that could be expected during a project.

The likely best case (base case and alternative case scenarios) assumed that there was no overflow dredging undertaken in the program by the TSHD. However, occasional limited overflow dredging may be required due to various operational factors. It was therefore considered prudent as a ‘likely worst case’ scenario to consider dredging with constrained overflow within the TSHD program.

To represent likely worst case conditions, two scenarios were developed as follows:

- Soft silt and clay material -10 minutes of overflow dredging during 50 percent of TSHD cycles
- Stiff clays - 60 minutes of overflow dredging in areas of stiff clays in order to achieve target dredging productivity levels.

The 'likely worst case' scenarios were not carried out for the entire dredge campaign, but instead were carried out for a single 30 day period that coincided with the most extensive dredge plumes generated during the base case scenario. It is therefore expected that these scenarios are representative of likely worst case conditions, taking into consideration both climatic and operational factors.

Water quality modelling of a constrained overflow scenario (worst case) determined that dredging with constrained overflow does not change the findings of the water quality or marine ecology assessments; the temporary impacts to water quality are slightly greater than the no overflow case but do not result in measurable impacts on sensitive receptors such as corals and seagrass (refer to **Chapter B5, Water Quality and Chapter B7, Marine Ecology**).

Based on the overflow durations modelled as part of the likely worst case scenarios described above, the recommended upper limit of duration of overflow should be set to include the following:

- An average overflow duration of five minutes per cycle where the average overflow duration is calculated over a seven day period
- Within the above duration limits, only a single period of continuous overflowing undertaken per dredge cycle.

C2.7 Overall Dredging Mitigation and Monitoring Strategy

C2.7.1 Mitigation Measures

A range of mitigation measures will be committed to and required to be undertaken by Ports North and its future dredge contractor from the outset of the project. Use of a selection of mitigation measures from a range of possible options will be informed by the experience of the contractor, operational requirements, and direction from Ports North and where triggered, advice from the Expert Advisory Panel.

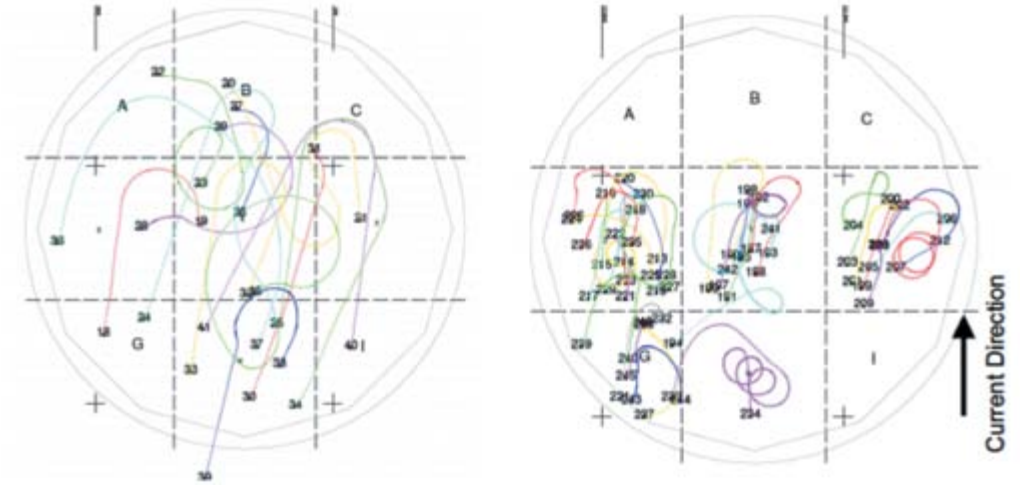
The mitigation measures which have been outlined and discussed within the relevant chapters of the EIS are summarised as follows:

- Logistics
  - The dredge operates at all times within the approved dredge footprint.
  - Accurate electronic position system used to track dredge movements at all times.
  - Hoppers are not overloaded.
  - Hopper compartments are maintained water tight during all dredging activities, except dredged material placement.
  - If required, use of high pressure jets on dragheads to loosen materials is restricted to dredging and placement areas only.
- Overflow of TSHD
  - Overflow if used during dredging by the TSHD is limited to durations as outlined in the modelled worst case scenario which includes:
  - An average overflow duration of five minutes per cycle where the average overflow duration is calculated over a seven day period
  - Within the above duration limits, only a single period of continuous overflowing undertaken per dredge cycle

    The top of overflow valves are not lowered during the transport component of the dredging cycle (dredging area to DMPA) to minimise spillage/overflow during transport
  - The dredge is fitted with a 'green valve' in order to minimise the spatial extent of turbidity plumes generated by dredge operation. The green valve ensures that any overflow from the dredge vessel is released under the keel of the vessel rather than close to the surface.

-• Placement
- Dredged material placement within the DMPA must be carried out in a planned manner with the TSHD steaming at low speed to avoid causing larger plumes.
- Dredge material is to be uniformly spread over the DMPA to minimise sediment mobilisation and turbidity plume extent beyond the DMPA boundary. This will be achieved through placement patterns that vary with the prevailing current direction. When currents are minimal, deposition will occur relatively uniformly over the DMPA in arc patterns (**Figure C2.7.1a**, left). When currents are present, deposition will occur in arcs in the up-current portion of the DMPA (**Figure C2.7.1a**, right) to take into account drift of sediment as it settles.
- Washing of the hopper compartment and pumping out of the hopper is to take place inside the DMPA.

Figure C2.7.1a Example of dredge material placement at DMPA during low current (left) and high current (right) (Worley Parsons 2010)



- Timing
  - Ensure the capital dredging of the channel by the TSHD is undertaken outside of the following months (October to February) based on the following reasons:
    - *o* October and November are known periods of coral spawning in the region
    - *o* Within Cairns Harbour ***Zostera muelleri*** seagrass biomass is typically greater in late spring, a key growing season for this species (McKenzie 1994). High water temperatures (and sometimes reduced salinity during flood events) during summer months can lead to seagrass stress, potentially reducing their resistance to other stressors such as low light conditions. During winter months, seagrass biomass is at a minima within Cairns Harbour (McKenzie 1994)
    - *o* Coral bleaching occurs during periods where higher than average water temperature (typically summer months) causes corals to expel their zooxanthellae due to thermal stress. Summer months also represent a period when floodwaters can introduce high ambient suspended sediment and nutrients levels, and reduced salinity, which can all lead to stress, bleaching and eventually mortality of corals (Jokiel 2004). High sediment and nutrients concentrations, above average water temperature and/or low salinity have complex interactive effects to corals, and in some species, high suspended sediment concentrations have been found to reduce the incidence of thermal stress (Anthony et al. 2007). Notwithstanding this, recognising that summer months represent a period where high natural coral stress can occur, dredging will be avoided during this period
    - *o* Dredging is avoided during the summer periods that are key spawning periods for recreational and commercially important fishery species.
- Reactive Monitoring and Corrective Action
  - Develop and implement a Reactive Monitoring Program (RMP) with appropriate triggers and corrective actions
  - Develop and implement a Validation Monitoring Program (VMP) to confirm the findings of the EIS as well as validate the CSDP has not had an significant impact on environmental values including relevant Matters of National Environmental Significance
  - These two programs are further defined in **Section C2.7.2** below.

Unless otherwise superseded or altered by approval conditions, these mitigation measures form commitments that will be required to be implemented by Ports North and its future dredge contractors in the implementation of the CSDP.

C2.7.2 Reactive Monitoring Program

C2.7.2.1 Program Aims and Design

The overall aim of the RMP will be to avoid or otherwise minimise impacts to sensitive marine environments that could be affected by dredging and placement activities.

At this early stage, it is anticipated that the RMP will have two interlinked components:

- A water quality dredge plume turbidity monitoring program
- A coral and seagrass monitoring program.

At this stage, light monitoring of photosynthetically active radiation (PAR) is not proposed. However the requirement for PAR monitoring (to compliment turbidity monitoring) will be assessed by the Expert Advisory Panel (**Section C2.7.2.3**).

The proposed design of the program is benchmarked and generally consistent with guidance provided in ***Water Quality Review and Monitoring*** (SKM 2012) developed as part of the GBRMPA Strategic Assessment. This monitoring program is proposed to be overseen by an Expert Advisory Panel. The RMP employs a range of trigger levels for further investigation and instigation of corrective actions. Monitoring of the two components of the RMP would be done in parallel. The proposed approach, methodology and equipment recommended for use are discussed below.

A schematic of the proposed RMP is shown in **Figure C2.7.2.1b**. Indicative monitoring locations under the RMP are shown in **Figure C2.7.2.1c**. These monitoring sites include:

- Indicative nearshore water quality monitoring sites (at locations of sensitive receptors)
- Indicative offshore water quality monitoring sites (sentinel sites located between the dredging area and offshore reef areas)
- Indicative coral and seagrass monitoring sites
- Approximate areas for control sites.

These monitoring sites have been initially selected based on the location of Benthic Primary Producer Habitat (BPPH) sensitive receptors (i.e. seagrass and corals), the location of previous water quality data collection sites, and the outputs of water quality modelling with respect to areas potentially influenced by dredged sediments as predicted in the EIS.

The offshore water quality monitoring sites will act as sentinel sites (i.e. they do not represent areas of sensitive receptors) which will be used to determine whether turbid dredge plumes are migrating towards offshore reef areas.

The location of all monitoring sites are only indicative at this stage and will be confirmed by the Expert Advisory Panel (refer **Section C2.7.2.3**). The indicative seagrass monitoring sites are located at existing remnant patches of seagrass. The location of remnant seagrass patches will need to be assessed prior to commencement of dredging.

Figure C2.7.2.1b Schematic of the RMP

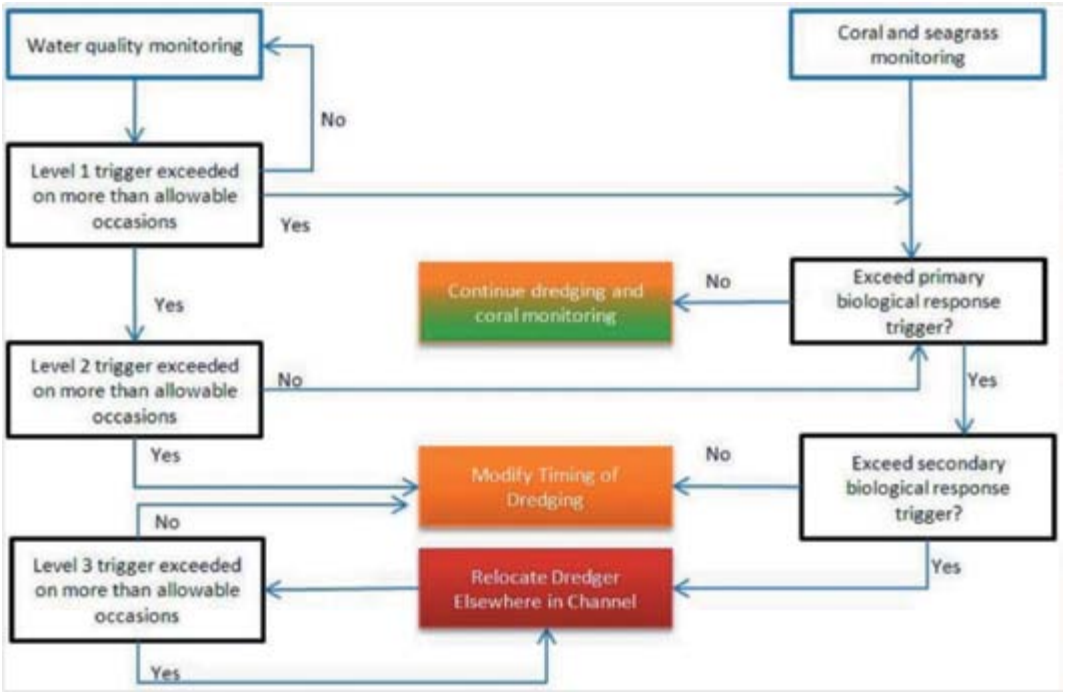
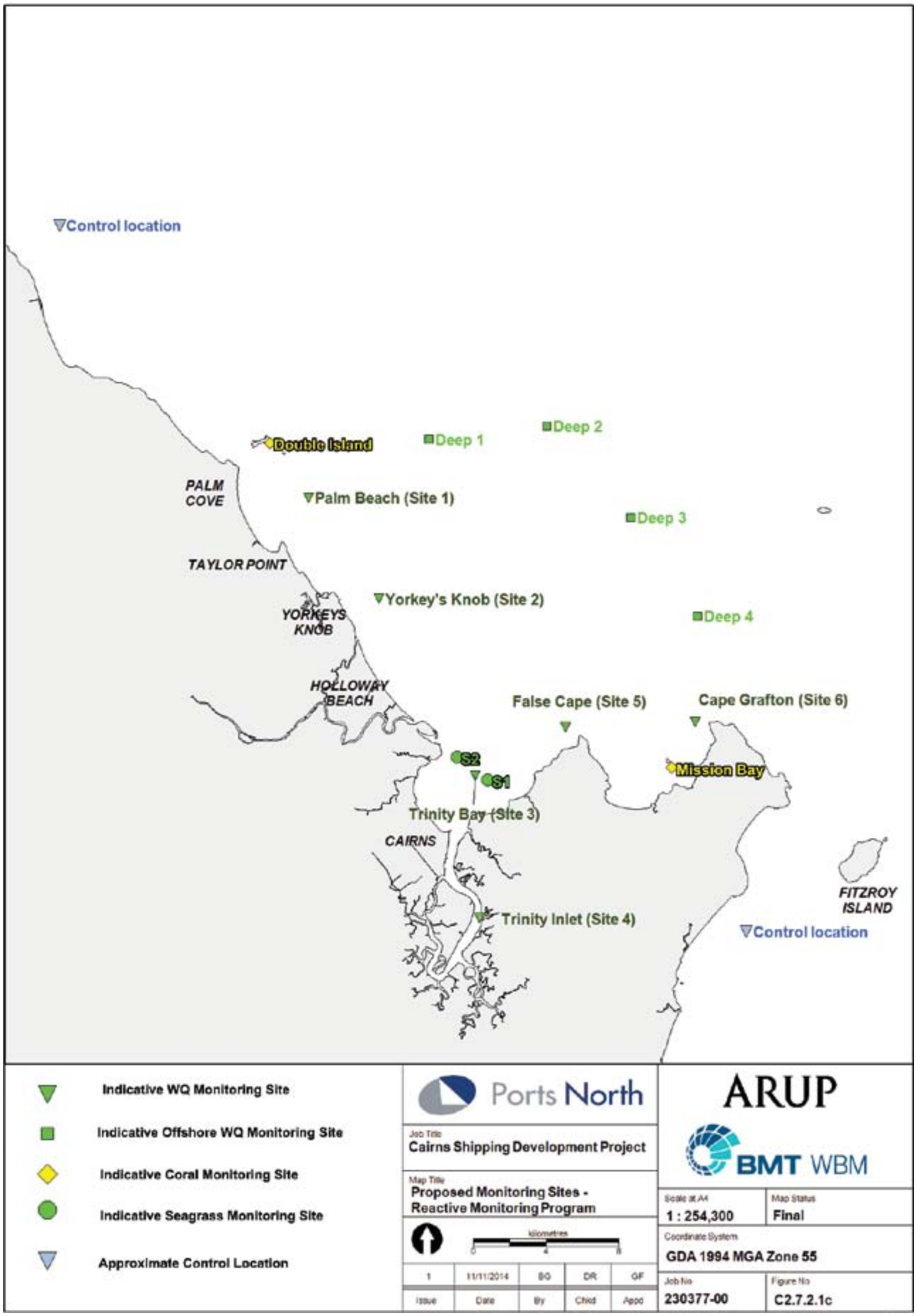


Figure C2.7.2.1c Proposed water quality monitoring locations for Reactive Monitoring Program



As shown in **Figure C2.7.2.1b**, the RMP will have three trigger levels which are described as follows:

- Level 1 Investigation Level (Green) – This trigger level provides for an initial water quality assessment through comparison of monitoring data to derived triggers values and background conditions. Water quality measured at compliance locations would be compared against a 'control' location to determine if increased turbidity levels are due to natural weather events (e.g. storm or high wind events) or are attributable to dredging. Also, monitoring equipment would be checked to ensure it is functioning appropriately. If it is determined as part of this investigation phase that the water quality is attributable to the dredging, there is a requirement to examine coral and seagrass monitoring data to determine if the detected water quality impacts are resulting in a biological response in sensitive receptors (seagrass and corals). The dredge would continue to operate during this period of investigation up until a level 2 trigger is reached
- Level 2 Management Response Level (Orange) – Exceedance of a level 2 trigger level means that the dredger will likely need to review its operations and/or take corrective actions to control a water quality impact. There are several practical mitigation measures and corrective actions that can be employed by the dredger to minimise impacts. Water quality and biological triggers as part of level 2 will be set on the basis of known stress tolerances of seagrass and corals. Where possible, the design of the RMP will be to ensure that these trigger levels are set such as to ensure they are triggered prior to unacceptable impacts occurring
- Level 3 Compliance Level (Red) – Exceedance of this trigger level would require immediate action by the dredge operator to suspend dredging or otherwise implement other mitigation measures such as moving the dredge away from the habitat where the exceedance occurs. Dredging would not be able to resume until monitored water quality reduced back to acceptable levels (below level 3). Generally this trigger will be set on the basis of known impact levels for biological systems (partial mortality of seagrass) based on background data. Level 3 trigger levels would also generally be set commensurate with performance measures set in development conditions.

C2.7.2.2 Establishing Trigger Values

The level of data collection and modelling investigations undertaken as part of this EIS are robust and in accordance with all relevant guidelines including the data collection and modelling guidelines published by the Great Barrier Reef Marine Park Authority. As such, the impact predictions are considered to be robust and suitable to allow regulators to determine the acceptability of impacts from dredging and placement activities on marine environmental values.

That said, final water quality and ecological trigger values to support the RMP are not proposed to be set within the EIS based on the need for further baseline monitoring just prior to commencement of dredging. This further baseline monitoring will supplement the 12 month baseline water quality data used for impact assessment purposes in the EIS (**Chapter B5, Marine Water Quality**). These final water quality and ecological trigger values will be determined with input from regulators and scientific experts as part of the Expert Advisory Panel (**Section C2.7.2.3**).

The trigger values will be set using an approach similar to that used to determine impact assessment threshold values in **Chapter B5, Marine Water Quality**. The final trigger levels will consider a range of temporal scales, including 20th, 50th and 80th percentile trigger levels. This approach provides a metric for both chronic and acute impacts. These trigger levels will be based on different levels of concern, as follows:

- Level 1 (green) – slightly greater than average conditions. Trigger level calculated using background mean (of 30 day windows) plus half of one standard deviation at each percentile
- Level 2 (orange) – approaching limits of natural variability. Trigger value calculated using background mean (of 30 day windows) plus one standard deviation at each percentile. This trigger level represents the delineation of the zone of moderate impact as per Chapter B5, Marine Water Quality
- Level 3 (red) – limits of natural variability. Trigger value calculated using background 95th percentile (of 30 day windows) at each percentile.

The continuous monitoring data collected at each compliance monitoring location throughout the dredge campaign will be analysed using moving 30 day percentiles (20th, 50th and 80th). These will then be compared to the trigger values, with implementation of management actions if trigger levels are exceeded.

If trigger levels are exceeded during unusually high ambient turbidity conditions which may occur during large storms or unusually strong and sustained wind periods, the data from the control sites will be assessed to see if the high turbidity at the compliance monitoring sites is naturally occurring or attributable to the dredger. It is expected that the dredge would probably not be operating during large storm events when unusually high natural ambient turbidity would occur.

Monitoring of the four offshore water quality monitoring sites (**Deep 1 to Deep 4 in Figure C2.7.2.1c**) will be undertaken by profiling the water column on a weekly basis, or more frequently if weather conditions dictate (e.g. south westerly winds). These sites will act as sentinel sites (i.e. they do not represent areas of sensitive receptors) which will be used to determine whether turbid dredge plumes are migrating towards offshore reef areas. Monitoring data will be compared between the four sites to determine whether turbidity is significantly higher at any of the monitoring sites (indicating potential offshore migration of turbid plumes).

C2.7.2.3 Expert Advisory Panel

It is proposed that the RMP development and implementation (including the review of trigger levels outlined above) be overseen by an advisory panel of experts reporting to the Environmental Supervisor for Ports North. This Expert Advisory Panel should ideally be established at least 12 months prior to the commencement of dredging.

The advisory panel members will be appointed by and funded by Ports North and would likely include:

- Independent Chair
- GBRMPA
- Queensland Department of Environment and Heritage Protection (or successor in title)
- Queensland Department of Agriculture, Fisheries and Forestry (or successor in title)
- Recognised specialists in particular environmental fields
- Recognised specialist in dredging
- Port of Cairns Technical Advisory Consultative Committee (TACC) representatives as required.

The advisory panel would also be supported by individuals with expertise on seagrass, turtles, coral health, water quality, monitoring and statistics.

The function of the advisory panel will be to provide advice to Ports North in relation to the following:

- Review the trigger values derived as part of the additional data capture campaign and expected tolerances of seagrass to impact
- Endorse the control and impact site location plan and dredge mitigation strategy prior to commencement of works (see **Figure C2.7.2.1c**)
- Review environmental performance of the dredging against criteria and triggers and evaluate corrective actions implemented.

The RMP design and triggers will be established and presented to the Expert Advisory Panel (including regulatory agencies) well prior to dredging, with the expectation this program is approved and endorsed prior to commencement of works.

C2.7.2.4 Management and Reporting

The implementation of the RMP will be overseen by an Environmental Supervisor for the CSDP appointed by Ports North.

The Environmental Supervisor's role will be to:

- Liaise with the Superintendent for the dredging contract on behalf of Ports North
- Oversee the development and implementation of the RMP and other monitoring programs
- Provide secretariat and support services to the RMP Advisory Panel
- Liaise with Regulatory Agencies prior to, during and following the dredge campaigns including recording and actioning community and/or port users' complaints

- Prepare and review internal and external compliance reports (to be confirmed as part of future conditions and management arrangements) which are likely to include the following:
  - Compile and maintain a data register for monitoring data (updated weekly and archived for a minimum period of 5 years)
  - Prepare and submit a validation of modelling report based on validation monitoring (see below)
  - Provide reports (likely weekly) to regulatory agencies of dredge campaign progress and environmental performance against the RMP including all recorded exceedances of trigger values and corrective actions implemented.
- Undertake audits of the dredge contractor's environmental performance at least once every three months during the TSHD dredge campaign
- Prepare specific incident reports with respect to environmental or other major incidents and/or the implementation of corrective actions to Ports North and external agencies where relevant.

2.7.2.5 Construction Stage Monitoring Equipment and Approaches

The RMP can be supported using water quality instruments capable of continuous logging of data for a range of parameters, with anti-fouling guards and sensor wiping apparatus to prevent interference to sensors from marine growth. All instruments are to be capable of recording measurements of turbidity, dissolved oxygen (DO), pH, salinity and conductivity once every 10 minutes.

The instruments are to have capability to also record photosynthetically active radiation (PAR) data. PAR is an indicator of light available to sensitive receptors (e.g. seagrass and corals), and sensors allow light attenuation through the water column to be calculated for a general area. PAR monitoring has been carried out by TropWater at a range of sites throughout Cairns Harbour, which will provide useful baseline data for the RMP.

Telemetry and other appropriate water quality monitoring equipment would also be installed to ensure dredging can be reactive within a timely manner and flag exceedances in real time. This data would be available to both the contractor and the Ports North Project Superintendent, with alerts via mobile text message or email of any exceedance under the RMP.

As discussed in the EIS, the two key ecological receptors that have high biodiversity significance and are most sensitive to increased sediment concentrations are seagrass meadows and coral reef communities. Both corals and seagrass can show rapid (measured in weeks) responses to increased sediment concentrations, and therefore represent excellent biological indicators. The RMP will therefore monitor seagrass and corals as biological indicators of changes to marine ecosystems. The specific indicators to be monitored will be determined by the Expert Advisory Panel, but are expected to include:

- Seagrass cover/biomass
- Coral colony condition/health.

Baseline monitoring would occur at regular intervals (frequency to be determined by the Expert Advisory Panel) throughout the dredge campaign (to measure chronic or long term trends), supported by rapid deployments where water quality impacts are detected to try and detect acute impacts.

In this context, key constraints/issues to be considered in further developing the ecological component of the program would need to be able to:

- Cover off a large number of potential impact sites
- Allow rapid deployment of field staff and turnaround of results
- Be measurable in poor visibility
- Detect acute and chronic (stress) effects
- Take into account differences in communities within and among sites.

While care has been taken in preparing this RMP to recommend the best current approaches to monitoring and impact detection, new or improved technology or approaches may also be available by the time the campaigns are undertaken. A performance based approach is therefore the preferred approach as it allows flexibility to adopt new or improved technology as it becomes available.

C2.7.2.6 Additional Dredge Mitigation and Corrective Actions

The RMP will be used in 'real time' to guide the dredging campaign.

If an initial/investigation (level 1) trigger level is exceeded the dredge would continue to operate while the data from control and impact sites are compared and monitoring equipment checked to determine if the impact is attributable to dredging and further ecological monitoring is carried out.

However, once management action (level 2) triggers are reached, the dredge contractor will be responsible for taking actions to ensure impacts are avoided at sensitive receptors and impacts are controlled prior to defined trigger level exceedance (level 3). This will occur in consultation with Ports North and the Expert Advisory Panel discussed in the previous section.

The sections below set out the additional mitigation measures and corrective actions that can be implemented by the dredger to reduce impacts and ensure exceedances are minimised or avoided during the campaign. As outlined above, these actions would be assessed and are intended to be implemented prior to the ultimate (level 3) exceedance levels in the RMP being reached.

Preferential Movement of the Dredge to Other Segments

The dredger will have some flexibility in terms of the sequencing of channel dredging. While a sequential pattern has been adopted for the EIS modelling, if impacts are detected at a particular sensitive receptor a change to this 'normal' pattern can be adopted. Particularly given that the key impacts are light deprivation, preferentially dredging other segments whilst allowing a particular area to settle can be an important strategy to ensure seagrass and coral environments are obtaining necessary light to maintain photosynthetic processes.

Opportunistically, it should also be noted that the dredge vessel will need to undertake routine maintenance, refuelling and crew changes. During these 'down time' periods of the dredge, there will be environmental benefits accrued related to settlement of fines and allowance of greater light penetration back into surrounding environments (assuming background turbidity levels are also low). To a certain extent, the dredger can plan such maintenance to maximise environmental benefits in accordance with the RMP.

Dredging on High Tides

A component of the overall turbid plume generated by the dredge is through the operation of the propellers. This impact is generally greater where there is less underkeel clearance between the bottom of the dredge vessel (particularly when fully laden) and the seabed that is being dredged.

Based on this principle, an additional mitigation measure that can be employed by the dredge contractor is to dredge particularly sensitive areas of the channel (e.g. near sensitive receptors) on higher tides which maximise underkeel clearance. While not as effective as limiting hopper overflow, this approach will help to reduce the amount of turbidity generated by the dredge, also reducing the amount of displaced sediment that can be resuspended by natural wave and wind action.

Implementation of this approach can be factored into the program based on the trigger levels detected in the RMP (pending Regional Harbour Master approval and shipping schedules).

Dredging with Flood and Ebb Tidal Currents and Wind Conditions

Numerical modelling and previous dredging activities undertaken by similar TSHD dredges in Trinity Bay have demonstrated the behaviour of plumes under various tidal conditions. In general, dredging during a flood tide will result in the movement of plumes to the south-west from the dredge position whilst dredging during an ebb tide will result in the movement of plumes to the north-east.

During periods where the prevailing south-easterly winds exceed 12-15 knots, plumes will tend to be pushed to the north-west, while during calm wind conditions plumes will generally travel more in line with the channel alignment. During periods where wind speeds exceed the 12-15 knot range there will generally be significant ambient material re-suspension within Trinity Bay and dredge plumes will tend to make up a smaller proportion of the total signal than during calm conditions. Therefore, during high wind periods, dredge plume generation is less of a concern.

The period where wind speeds are subsiding following a period of elevated wind and ambient turbidity conditions is when dredge plume generation should be most carefully managed in order to allow turbidity in the system (due to both ambient re-suspension and dredging) to return towards the relatively low levels that prevail during low wind speed conditions.

Mitigation activities could involve:

- Varying the location of dredge activities, i.e. targeting different parts of the footprint on consecutive cycles
- Further limiting or ceasing overflow
- Scheduling maintenance.

Implementation of this approach can be factored into the program during each tidal cycle based on the trigger levels detected in the RMP (pending Regional Harbour Master approval and shipping schedules).

Temporary Suspension of Dredging

Suspension of dredging is generally a last resort option if all other mitigation measures and corrective actions as outlined above have been unsuccessful to control impacts and the compliance (red) trigger has been exceeded.

The work method for TSHD operations is designed to operate 24/7 so as to minimise the overall duration of the campaign which has both cost and environmental benefits compared to a longer term dredge operation or intermittent capital dredge operations that involve multiple deployments of vessels.

Notwithstanding this, suspension of dredging operations will be undertaken if compliance trigger levels in the RMP (level 3) are exceeded at any monitoring site and dredging not re-commenced until water quality levels are below Level 2 (orange) trigger levels (to be confirmed by Expert Advisory Panel).

C2.7.3 Validation Monitoring Program

This section conceptually outlines the Validation Monitoring Program (VMP). The VMP will be detailed further by the Expert Advisory Panel.

C2.7.3.1 Plume Validation

Separate to impact monitoring described above, monitoring will be undertaken specifically targeted at validation of the dredge plume source assumptions that underpin the water quality impact assessments. This 'validation' monitoring would be undertaken at the commencement of each phase of capital dredging that was modelled as part of the CSDP.

The methodologies associated with this monitoring component will be governed by the goal of obtaining data for the dredge plume model validation. It is likely to involve a combination of vessel-mounted ADCP (or similar) and in-situ water quality measurements and sampling for laboratory analysis, specifically targeted at characterising the dredge plume intensity and spatial dimensions on top of the ambient suspended sediment climate.

The validation monitoring campaigns should occur early on during the operation of the key capital dredging equipment, namely the:

- TSHD dredging of the outer shipping channel
- TSHD dredging in the inner port
- BHD dredging in the inner port.

Outcomes of the monitoring should be spatial and temporal maps of the dredge plume during the validation exercise, quantification of the plume sediment characteristics and quantification of the range of plume generation source rates associated with the monitored dredging operations. These results should directly feed into water quality model simulations to validate the model configuration used in the EIS and to suggest any improvements to model input parameters (i.e. dredge plume source rates).

The water quality model that has been used for impact assessment in the EIS can also be utilised as a source of hindcast and forecast suspended sediment predictions during the dredging program. This would further inform interpretation of the reactive monitoring outputs, and allow for testing and selection of management strategies during the dredging programme. Interpretation and attribution of factors affecting measured turbidity during a dredging campaign can be a difficult task, and the additional information from the model including its ability to separate the background and dredge plume contributions can be of assistance in this regard.

The model can also be extended to include prediction of seabed Photosynthetically Active Radiation (PAR) (e.g. in addition to TSS), which would allow for assessment of the light reductions attributable to the dredge plumes. This extension would assist with distinguishing potential impacts from the dredging in the context of natural background variations in PAR.

C2.7.3.2 Biological Validation

As discussed in the EIS, the key ecological receptors that have high biodiversity significance and are most sensitive to increased sediment concentrations are seagrass meadows and coral reef communities. Both corals and seagrass can show rapid (measured in weeks) responses to increased sediment concentrations, and therefore represent excellent biological indicators. The Validation Monitoring Program (VMP) will therefore monitor seagrass and corals as biological indicators of changes to marine ecosystems.

The EIS predicts that benthic macroinvertebrate communities within and directly adjacent to the dredging area and the DMPA will most likely be affected by dredge plumes in the short-term. Based on case studies elsewhere, rapid recovery is expected (i.e. within 12-24 months of the completion of dredging). As outlined in the EIS, benthic macroinvertebrates represent a source of prey for many fish species of commercial and recreational importance within Cairns Harbour, and also support a range of ecosystem processes. Benthic macroinvertebrate communities will therefore be monitored to validate impact predictions, thereby increasing the knowledge base and understanding of the impacts of dredging and dredged material disposal activities. Major impacts are not expected to other ecological receptors (i.e. fish, prawns, mangroves etc.), and for this reason, will not be monitored in the VMP.

The aim of this component of the VMP is to monitor any changes to soft sediment benthic macroinvertebrates, seagrass and reef habitats and communities, and on the basis of this information, validate the predictions outlined in the impact assessment study. The following is a conceptual description of the key elements of the monitoring program. The Expert Advisory Panel will refine and develop this monitoring program prior to commencement of dredging.

The monitoring program design for the VMP will involve sampling at multiple control and potential impact locations before and after the dredging campaign. This conforms with a type of Before-After-Control-Impact (BACI) design.

Sampling will be undertaken at least two times before and two times after the dredge campaign (i.e. four monitoring episodes). This minimum level of temporal replication is required to avoid temporal pseudo-replication.

Control sites should have similar environment characteristics as potential impact locations, but outside the potential influence of dredging. It is preferable that the control sites monitored in the RMP are adopted in the VMP. Modelling results from the EIS will be reviewed to identify potential candidate potential impact and control locations. A short list of potential sites will be prepared, and a pilot biological survey and review of existing information will be undertaken to determine their suitability of these locations. Key environmental influences that should be considered in this assessment are:

- Bathymetry
- Reef morphology and condition (reefs only)
- Seagrass condition and species composition (seagrass only)
- Sediment type (benthic macroinvertebrates only)
- Degree of wind/wave exposure
- Water quality conditions.

Multiple sites should be sampled at each location in order to assess the degree of variation at scales measured in hundreds of metres.

Indicative reef monitoring locations could include:

- Fitzroy Island - Control location
- Port Douglas reefs - Control location
- Double Island - Potential impact
- Mission Bay - Potential Impact.

It is envisaged that seagrass meadows at Ellie Point would represent a potential impact location for seagrass monitoring program. Control locations for seagrass monitoring will need to be selected taking into account planned regional seagrass mapping to be carried out by JCU in 2014.

Quantitative survey methods will be used to characterise:

- Reef substrate cover and condition. Sites should be stratified by depth/habitat, and multiple transects should be sampled in each strata. Corals and where possible macroalgae should be identified to genus. Percentage cover of substrate class/reef taxa should be enumerated for each transect
- Seagrass meadow species presence/absence, composition, biomass, cover and extent
- Soft sediment benthic macroinvertebrate abundance, taxonomic richness, diversity, biomass, as well as community similarity and trophic structure.

Explicit impact hypotheses will be generated. Analysis of Variance (ANOVA) and multivariate analysis will be used to identify changes in community structure over time and across a range of spatial scales.

C2.7.4 Conclusion

A firm commitment to implementation of an adaptive management approach based on sound scientific principles and real time data is essential to confidently manage impacts from dredging and placement activities and avoid significant impacts to affected marine habitats.

The process outlined in the strategies above have been developed in accordance with best practice guidelines and are both realistic and achievable to ensure the environmental goals of the project are realised and impacts to the World Heritage Values of the project area are avoided or minimised to acceptable levels.

Inclusion of a commitment to form and fund an expert advisory panel to oversee the capital dredging monitoring campaign is a further safeguard to ensure transparency, robustness and best practice is implemented as part of the CSDP.

C2.8 DMP Elements

This section of the DMP identifies general and specific environmental strategies for each element of the DMP related to the dredging and dredge material placement activity that will need to be addressed by the dredge contractor.

Unless specifically stated, commitments to activities such as environmental monitoring may be undertaken by the contractor, by Ports North or by a third party contracted by Ports North depending on the procurement approach taken for the works. As such, the focus of the DMP is on outlining the management and monitoring commitments with the responsibility for implementing the commitments to be developed as part of the procurement strategy for the project and subsequently as part of the operational dredge management plan in consultation with relevant Agencies.

The requirements in this section are intended to apply in addition to the general requirements outlined in **Section C2.5** of this DMP and in most cases will need to be integrated within documentation and the document updated to include actions required to address any conditions of approval imposed on the dredging activity under relevant legislation (including the EPBC Act, GBRMP Act, Sea Dumping Act and relevant State legislation).

C2.8.1 Purpose

The purpose of the environmental strategies within the DMP are to:

- Identify potential and actual environmental aspects and impacts associated with the works
- Describe the appropriate measures to prevent, monitor and manage all possible effects
- Indicate the corrective action(s) to be undertaken if an undesirable impact or unforeseen level of impact occurs
- Outline monitoring, auditing and reporting actions.

C2.8.2 General Requirements

This section of the document outlines the general environmental requirements of the DMP that a future dredge contractor would be expected to fulfil. Ports North's role with respect to this section would be to ensure these requirements are addressed and met by the contractor as part of the contract and to ensure activities are being carried out consistently with any existing procedures or protocols within Port Limits or under relevant corporate environmental policies or strategies, and all approvals, conditions and licences.

Section C2.9 identifies particular elements or aspects of the dredging activity under which there are specific requirements that will need to be met in addition to the general requirements stated below.

General Requirements – Dredging	
Objective	To ensure dredging operations and associated activities comply with relevant environmental duties and obligations as set out in legislation and with the environmental permit requirements.
Applicability	All capital dredging works and associated activities
Performance Criteria	All relevant permit and licence conditions will be met.
Implementation Strategy	The dredge contractor will need to address the following requirements: <u>General Method Statement</u> A general method statement will need to be prepared outlining the intended scope of works and methodology to be employed. At a minimum, the method statement should include the following: <u>Introduction</u> • Description of the General Scope of Works (noting this may need to be by Stage only) • References to International Dredging Standards. Company Standards (such as quality, OHS and environment management systems), how they apply to the current project and any other project specific document • Responsibilities of the Contractor and Key Staff (on the dredge vessel and on shore) • Provide a clear map of the areas where the proposed dredging activities are to take place consistent with regulatory approvals • Provide a general description of the dredging process and the specifics of the plant to be used in the dredging process including the proposed dredging methods, dredging control, dredging patterns, vessel navigation routes to be used and vessel operations while at the pump out location including ancillary activities such as waste management and fuel bunkering • Include Specific Method Statements in accordance with the requirements outlined in **Section C2.9** of this DMP <u>Site-Based Environmental Management Plan (Dredge Operations)</u> Regulatory permits will likely require preparation of a site-based environmental management plan related to the dredging operation to be submitted to the relevant regulatory agencies (e.g. DEHP). The management plan (hereafter referred to as the 'Dredge Operations' EMP) must address the following: • Environmental commitments – including a commitment by senior management of the contractor to achieve specified and relevant environmental goals • Identification of environmental issues and potential impacts • Control measures for routine operations to minimise the likelihood of environmental harm • Contingency plans and emergency procedures for non-routine situations • Organisational structure and responsibility • Effective communication • Staff training • Record Keeping • Periodic review of environmental performance and continual improvement.

In addition to the general requirements above, the Dredge Operations EMP must also address specific requirements (such as water quality monitoring) as outlined in **Section C2.9** of this DMP.

Maintenance of Measures, Plant and Equipment

The dredge contractor must ensure that all measures, plant and equipment necessary to undertake the activity are operated and maintained in a proper and efficient condition.

This includes appropriate servicing and maintenance of engines and emission control devices such that emissions comply with relevant guidelines and standards.

Complaint Response (General Requirements)

All complaints received by the dredge contractor related to environmental issues such as noise, air, or water quality must be recorded including investigations undertaken, conclusions formed and actions taken. Notification about the complaint and any associated response must be provided to Ports North in a timely fashion.

The complaint response procedure will include:

The time, date name and contact details of the complainant

- Reasons for the complaint
- Any investigations undertaken
- Conclusions formed
- Any actions taken.

Reasonable and Practicable Measures

The dredge contractor must take all reasonable and practicable measures to prevent and/or minimise the likelihood of environmental harm being caused.

Notification of Environmental Harm

The dredge contractor is responsible for ceasing activities and notifying Ports North if it becomes aware of material or serious environmental harm (as defined in the ***Queensland Environmental Protection Act 1994***) as a result of carrying out of the dredging and associated works. The contractor must also contact the relevant agencies as per approvals/legislation as soon as practicable after becoming aware of any release of contaminants not in accordance with the condition of any approvals granted.

Notifications of Commencement

The contractor must inform Ports North and regulatory agencies of its intention to commence dredging within timeframes identified in any approvals granted.

Insurances

The dredge contractor will be responsible for taking out and maintaining public liability and other insurances. Copies of the insurance covers must be provided to Ports North prior to the commencement of works.

Signage

Before dredging commences and during the whole operation, the dredge contractor will be responsible for displaying a sign that shows the name of the dredge vessel and the relevant permit numbers (to be provided) at on-shore locations accessible to the public to inform stakeholders about the activity, as applicable under respective approvals.

Monitoring	Record of Monitoring The dredge contractor must keep records of all monitoring results required by Ports North or as part of regulatory agency permit requirements. Specific monitoring requirements and the frequency of reporting are contained in Section C2.9. Record of Dredging Volumes and Megafauna Sightings/Incidents The dredge contractor must keep records on the volume and size distribution of material removed from the approved dredge footprint area. These records must be provided to Ports North in the timeframe specified in any approvals. The dredge contractor must also keep records of megafauna sighted and/or any incidents with megafauna as required in any approvals granted.
Reporting	<u>Record of Monitoring</u> The dredge contractor must keep records of all monitoring results required by Ports North or as part of regulatory agency permit requirements. Specific monitoring requirements and the frequency of reporting are contained in **Section C2.9.** <u>Record of Dredging Volumes and Megafauna Sightings/Incidents</u> The dredge contractor must keep records on the volume and size distribution of material removed from the approved dredge footprint area. These records must be provided to Ports North in the timeframe specified in any approvals. The dredge contractor must also keep records of megafauna sighted and/or any incidents with megafauna as required in any approvals granted.
Auditing	The documentation outlined in the Implementation Strategy above will need to be to the satisfaction of regulatory agencies. Copies of all plans will be provided to Ports North for review prior to lodgement with regulatory authorities. A weekly report about dredging volumes must be provided by the contractor to Ports North as outlined above. Other specific reporting requirements are outlined in Section C2.9 of this DMP.
Corrective Action	Record of Monitoring The dredge contractor must keep records of all monitoring results required by Ports North or as part of regulatory agency permit requirements. Specific monitoring requirements and the frequency of reporting are contained in Section C2.9. Record of Dredging Volumes and Megafauna Sightings/Incidents The dredge contractor must keep records on the volume and size distribution of material removed from the approved dredge footprint area. These records must be provided to Ports North in the timeframe specified in any approvals. The dredge contractor must also keep records of megafauna sighted and/or any incidents with megafauna as required in any approvals granted.

C2.8.3 Specific Environmental Strategies

Section C2.9 outlines the specific environmental strategies of the DMP which include:

- Marine Megafauna Management
- Sediment Quality
- Vessel wastewater management (including wash down of plant and equipment)
- Ballast water and marine pest incursion management
- Vessel waste management
- Fuel management
- Noise quality
- Air quality
- Emergency planning and procedures.

For each value identified, an environmental management strategy and actions have been developed to address potential risks that may arise. Each value has a stated environmental objective, performance criteria, management actions, monitoring, reporting and corrective actions. The structure used for the strategy and actions, as recommended in the State ToR, is outlined below.

Element	Description
Element	Aspect of construction or operation to be managed (as it affects environmental values).
Objective	The operational policy or management objectives that applies to the element.
Performance Criteria	Measurable performance criteria (outcomes) for each element of the operation.
Implementation Strategy	The strategies, tasks or action program (to nominated operational design standards) that would be implemented to achieve the performance criteria and also include the implementation agency for each element of the EMP.
Monitoring	The monitoring requirements to measure actual performance (for example, specified limits to pre-selected indicators of change).
Reporting	Format, timing and responsibility for reporting and auditing of monitoring results.
Corrective Action	The action (options) to be implemented in case a performance requirement is not reached and the person(s) responsible for action (including staff authority and responsibility management structure).
Responsibility	The person(s) responsible for action.
Timing	When certain actions should be undertaken.

C2.9 Environmental Strategies and Management Plans

C2.9.1 Marine Megafauna

This section outlines requirements that are to be met associated with the management of potential interactions between dredge equipment and marine megafauna. Management of underwater noise from marine piling and other construction activities associated with the CSDP are addressed in **Chapter C1, Environmental Management Plan (Construction and Operation).**

Objective	• To minimise the risk of disturbance or injury to marine fauna, including mammals and sea turtles resulting from the dredging and placement activities. • To establish and maintain awareness of the importance of protecting marine fauna including mammals and sea turtles.
Potential Impacts	• Injury to marine megafauna from vessel strike. • Injury to marine megafauna from draghead operation. • Disturbance of marine megafauna from vessel lighting.
Performance Criteria	• No incidents of vessel related disturbance to marine mammals and sea turtles. • All members of the dredging team to complete an induction, which will include information on marine mammal and sea turtle management requirements. • Vessel masters and spotters trained in marine mammal and sea turtle interaction procedures.
Monitoring & Reporting	• Monitoring of marine mammals and turtle activity to be performed by a person from the bridge of each vessel. • A record of sighted animal to be maintained, indicating the sighting of each individual animal and actions taken. • Down-time to be reported as Environmental Delay in the equipment daily report. • Immediate reporting of any incident involving injured or killed animals to Ports North and regulatory agencies. • Details of the incident are to be compiled into an incident report.

Implementation Strategies	Responsibility	Timing	Corrective Action
Prior to commencement of dredging activities, employees responsible for marine megafauna spotting will receive training from a person suitably qualified in marine megafauna.	Dredge contractor	Prior to commencement of dredging	• In the event of an environmental incident, appropriate emergency response measures shall be implemented to ensure environmental harm from the event is minimised. • Assist in capture of injured animals per advice from regulatory agencies. • Other strategies will be implemented, as advised by regulatory agencies or Ports North, to reduce likelihood of incident recurring. • Supplementary monitoring to be undertaken to confirm compliance after taking remediation action.
A lookout will be maintained for cetaceans while the dredge sails between the dredging area and DMPA. In the event that a cetacean (except dolphins) is sighted, vessel speed and direction will be adjusted to avoid impact in the observed individual (within the safety constraints of the vessel).	Dredge contractor	During dredge carriage from dredging area to DMPA	
Marine mammals' observation and response procedures including the application of exclusion zones will be implemented when dredge or other ancillary vessels are under-way.	Dredge contractor	At all times during dredge operation and carriage	
Marine mammals (except dolphins which are highly mobile) and turtles observation and response procedures including the application of a 300 m exclusion zone will be implemented during dredging and placement activities. Dredging operations shall be stopped where these fauna are observed within 300 m of the operating dredge until the animals have moved further than 300 m or have not been sighted for 15 minutes.	Dredge contractor	At all times during dredge operation and carriage	
Turtle deflectors/chains etc. will be mounted on the draghead of the TSHD.	Dredge contractor	At all times during dredge operation and carriage	
Where practicable, water jets on the draghead will be switched on before the dredge pump is started and will remain on until the dredge pump is stopped to direct sea turtles away from the draghead thus avoiding direct contact.	Dredge contractor	At all times during dredge operation and carriage	
Dredge pumps will only be started when the draghead is close to the seafloor (not while lowering pipe).	Dredge contractor	During dredge operation	
The dredge pump will be stopped as soon as possible after the completion of dredging.	Dredge contractor	During dredge operation	
Light levels from the dredging works will be limited to those lights that are necessary for the safe operation of the vessel and the health and safety of those on board.	Dredge contractor	At all times during dredge operation and carriage	

C2.9.2 Sediment Quality

This section outlines requirements that are to be met associated with sediment quality, and outlines controls that will be implemented to minimise impacts to water quality, seabed and marine flora and fauna through the disturbance of marine sediments. These are documented in **Chapter B4, Sediment Quality**.

Objective	To minimise impacts to water quality, seabed and marine flora and fauna through the disturbance of marine sediments.
Potential Impacts	Acid generation if Potential Acid Sulfate Soil (PASS) material is allowed to oxidise over extended periods between dredging and placement
Performance Criteria	• Dredge sediments remain waterlogged or are exposed to air for periods less than 24 hours; • Dredging and placement occurs as per the approved works drawings and designated placement area
Monitoring & Reporting	• Ports North to be notified in the event of any dredge material required to be stored in the hopper longer than 24 hours. • The Port's routine sediment monitoring program will be continued once CSDP capital works are complete so as to monitor possible operational impacts.

Implementation Strategies	Responsibility	Timing	Corrective Action
Dredge material should ideally remain waterlogged and not be left within TSHD hopper or dump barges for periods longer than 24 hours to minimise the risk of PASS oxidisation.	Dredge Contractor	At all times during dredge operation and carriage	• If dredge material is required to be stored in hopper or dump barges for longer than 24 hours (e.g. in case of vessel breakdown), material is to be tested for acid sulfate soil (ASS) and treated (if necessary) prior to placement at the DMPA • Ports North to be notified of situation
Dredging and placement occurs as per project approval conditions for extent of works and location of placement area	Dredge Contractor	At all times during dredge operation and carriage	

C2.9.3 Vessel Wash Down Management

This section outlines requirements that are to be met associated with vessel wash down procedures during operations such as wash down of the decks and wash down of the dredge head and other equipment. It does not include discharge of sewage or other waste (addressed later in this document).

Objective	To minimise the release of potential contaminants to the environment from wash down operations.
Potential Impacts	Release of contaminated solid wastes, degreasers or wash down materials into the environment.
Performance Criteria	No inappropriate use of degreasers or wash down in sensitive environments.
Monitoring & Reporting	• Visual inspection for contamination of waters whilst washing deck or equipment • Ports North to be notified in the event of any unintentional spill of contaminant associated with wash down.

Implementation Strategies	Responsibility	Timing	Corrective Action
Wash down of the deck and/or dredge-head shall only be undertaken in accordance with relevant permits and approvals.	Dredge contractor	During vessel wash down	• If an unintentional release of contaminant occurs, review of procedures and rectify immediately.
Only dredge sediment to be released in approved areas as a result of vessel wash down activities	Dredge contractor	During vessel wash down	

C2.9.4 Ballast Water and Marine Pest Incursion Management

This section outlines requirements that are to be met by the dredge contractor associated with ballast water management before leaving the port of origin, during transit between areas of operation, during operations, and following completion of dredging activities prior to departing the Port of Cairns.

Objective	To ensure risk of translocation of organisms in ballast water or on the hull of a dredge vessel is minimised.
Potential Impacts	Introduction of high risk ballast water or harmful marine organisms/pests into the Great Barrier Reef Marine Park (GBRMP) and Port of Cairns.
Performance Criteria	• No high risk ballast water brought into Port limits • Ensure ballast water discharge and marine pest inspections occur in accordance with department of Agriculture, Fisheries and Forestry (DAFF) standards • No harmful marine organisms are translocated on the underkeel hull, dredge-head or within the hopper of the dredge.
Monitoring & Reporting	• Monitoring and audits may be carried out by DAFF on the dredge contractor at the prerogative of the agency. Ports North will assist the agency by facilitating access and implementing any corrective actions required as a result of direction from applicable agency • Hopper water discharge and replacement records are to be kept in the Ship's log and made available upon request • A record will be kept of volumes, location and time of all ballasting and deballasting operations.

Implementation Strategies	Responsibility	Timing	Corrective Action
In accordance with the *National Bio-fouling Management Guidance for Non-Trading Vessels* (Australian Government 2008), prior to leaving the dredge vessel's port of origin: • Assess the biofouling risk of the vessel prior to departing for Australia and take remedial action as necessary • Undertake regular inspections of areas most prone to biofouling (e.g. damaged paint, propellers, bow and stern thrusters, sea chests and cooling pipes) • Implement a regular schedule for maintenance and dry docking to apply antifouling coatings • Regularly ensure marine growth prevention systems are operating efficiently and effectively • Inspect ship hull, hopper and dredge gear (especially dredge-head) to ensure that no material which may transport organisms (sediments, organic material, or waters) is retained.	Dredge contractor	Prior to leaving the vessel's port of origin	• If an unintentional release or exchange occurs, review of ballast and deballasting procedures and rectify immediately. • If marine pests are encountered on ships hulls or other equipment, they are to be treated and removed in accordance with DAFF instructions before commencing work.
In accordance with the International Maritime Organisation (IMO) Ballast Water Convention 2004, during transit between the Port of Origin and Port of Cairns: • No deep water ballast exchanges to occur within the GBRMP • Any ballast tanks holding seawaters to be exchanged with a minimum of 150% of design volume with seawaters at a location as distant from the coastline or other shallow (<100 m) areas as possible but not less than five nautical miles from the coast • Any waters held in the hopper during transit to be treated as for other ballast water.	Dredge contractor	Transit between port of origin and Port of Cairns	
During operations at Port of Cairns: • On arrival at the Port of Cairns, the dredge is to operate in accordance with DAFF and Australian Quarantine regulations • Hull inspections to be carried out if requested by DAFF for attached marine pests. Works to not commence until ships and plant certified as free of marine pests to DAFF standards.	Dredge contractor	At all times during dredging operations and carriage	

Implementation Strategies	Responsibility	Timing	Corrective Action
Leaving Port of Cairns: • When leaving the port of operations, all relevant DAFF rules pertaining to ballast water management are complied with.	Dredge contractor	Upon completion of all dredge operations	

C2.9.5 Vessel Waste Management

This section outlines requirements to manage wastes generated from or incidental to the dredging operations. It is separated into three categories:

- Solid waste and garbage
- Sewage
- Hazardous waste.

C2.9.5.1 Solid Waste and Garbage

Objective	To ensure that general refuse produced on-board the dredge vessel is collected, retained and transferred to an appropriate facility without unintentional material loss.
Potential Impacts	Discharge of solid waste into the environment.
Performance Criteria	• No loss of solid waste material overboard during collection or transfer. • No discharge other than at berth.
Monitoring & Reporting	• Dredge crew to carry out regular visual inspections of collection points and visual inspection of on-deck bins. • Dredge contractor to report any loss of waste material or any community complaints received about solid waste management to Ports North.

Implementation Strategies	**Responsibility**	**Timing**	**Corrective Action**
Vessel fitted with appropriately sized waste disposal bins.	Dredge contractor	At all times	• If practicable, take measures to retrieve material that is lost. • Review procedures causing material loss and take immediate action to rectify.
Vessel bins to be secured and fitted with secure lids to prevent material being blown overboard during storage or handling.	Dredge contractor	At all times	
Where practicable, ensure all material compacted to further prevent unintentional loss.	Dredge contractor	At all times	
Ensure the bins are collected and emptied while at berth at appropriate intervals (e.g. emptied at 75% capacity or below).	Dredge contractor	At all times	

C2.9.5.2 Sewerage

Objective	To ensure sewage generated on-board is appropriately treated and managed.
Potential Impacts	Release of untreated sewage in nil discharge zones
Performance Criteria	All sewage discharge to meet relevant legislative requirements (Queensland *Transport Operations (Marine Pollution) Act 1995* and Regulation).
Monitoring & Reporting	• Testing and analysis of the treatment system and resultant sewage discharge by an accredited laboratory should be undertaken at the beginning of dredge campaign. • Reports about the testing and analysis of the treatment system and sewage discharge provided to Port of Cairns including details of maintenance or correction action. • If untreated sewage is released in a nil discharge zone, the breach must be reported to Maritime Safety Queensland (MSQ) as soon as possible including estimates of the likely volume of sewage discharged and the location of the release. Depending on the volume of material discharged and the sensitivity of the location of the discharge, the dredge contractor may be directed to undertake water quality monitoring and/or clean up at its cost.

Implementation Strategies	Responsibility	Timing	Corrective Action
All sewage generated on-board is to be directed to the on-board treatment system. The system must be designed to meet the Queensland legislative standard for Grade A treated sewage.	Dredge contractor	During all at sea operations	• Ensure regular review of sewage storage system inputs and operation. • Modify procedures to meet discharge requirements.
Effluent from the treatment system is only to be discharged in appropriate locations to ensure compliance with the Queensland *Transport Operation (Marine Pollution) Act* and Regulation (refer to s48 of the Act and Sch. 4 of the Regulation).	Dredge contractor	During all at sea operations	
The requirements of the legislation (including relevant maps) for treated and untreated sewage discharge are to be included as part of the dredge contractors Operational Environmental Management Plan and discussed as part of the training and induction process for relevant crew.	Dredge contractor	During all at sea operations	
All effluent is to be diverted to holding tanks when operating in nil discharge areas.	Dredge contractor	During all at sea operations	
The holding tank is to be pumped out either in accordance with untreated sewage requirements under Queensland legislation or otherwise by appropriate licensed contractors while the dredge is in port.	Dredge contractor	Dredge vessel at berth	

C2.9.5.3 Hazardous Waste

Objective	To ensure hazardous waste generated on-board is appropriately managed.
Potential Impacts	Release of hazardous waste into the environment.
Performance Criteria	No inappropriate storage or disposal of hazardous waste.
Monitoring & Reporting	• Dredge crew to carry out regular visual inspections of hazardous waste storage containers to determine their integrity and identify if any spills or leakage has or is occurring. • Incident reports to be provided to Ports North detailing any spills or incidents involving hazardous waste and clean-up operations.

Implementation Strategies	Responsibility	Timing	Corrective Action
During at sea operations all hazardous waste must be stored in an appropriate and secure manner and clearly marked in accordance with legislative requirements.	Dredge contractor	During at sea operations	• If procedures break down or a spill occurs, procedures to be reviewed and staff trained about appropriate responses.
Where required, all hazardous wastes shall be transferred to appropriate containers and transported to an appropriate facility for disposal.	Dredge contractor	As required	
Collection and transport of designated hazardous wastes is to be undertaken only by a licensed contractor.	Dredge contractor	As required	
All procedures to minimise spills or leakage during storage and transfer shall be followed. Spill response equipment must be easily identifiable and conveniently located so as to respond to a spill if it occurs.	Dredge contractor	At all times	

C2.9.6 Fuel Management

This section outlines requirements that are to be met associated with the bunkering of fuel by the dredge vessel during the operation. This section deals with fuel transfer; the section below on emergency planning and procedures deals with general oil spills and response.

Objective	• To ensure bunkering of fuel to the dredge vessel is appropriately managed and spillage is prevented. • In the event of a spill, there is a rapid response to minimise impacts on the marine environment.
Potential Impacts	Release of fuel or oil into the environment.
Performance Criteria	No spills or leaks during fuel transfer operations.
Monitoring & Reporting	• Visual inspections of fuel-dispensing requirements and surrounding water are undertaken during operations and after fuel transfer. • Ports North is to be notified in the event of any unintentional spill of fuel or oil associated with fuel bunkering.

Implementation Strategies	Responsibility	Timing	Corrective Action
During fuel bunkering a licensed contractor is used and fuel levels are monitored both by the contractor and the dredge vessel.	Dredge contractor	During fuel bunkering	• If an unintentional release or spill occurs, review of procedures and rectify immediately. • Implement contingency and clean-up procedures as per relevant plans outlined in Element 9.9: Emergency Planning and Procedures
Dredge vessel to apply for and give notification as to the transfer of bulk liquids to Port Control as per Port of Cairns Procedures and appropriate forms.	Dredge contractor	As required	

C2.9.7 Noise Quality

This section outlines requirements that are to be met with regard to nuisance noise issues from dredging operations.

Objective	• To protect the acoustic amenity and minimise nuisance noise on surrounding sensitive receivers. • To respond effectively to any noise quality issues that arise during construction.
Potential Impacts	Acoustic nuisance to other port users and public
Performance Criteria	There are no complaints lodged from the public or port users about noise associated with dredge operations.
Monitoring & Reporting	• Investigation will be required in response to any noise complaints received during the dredging operation. The need for noise monitoring will be discussed with the appropriate regulatory agencies in response to any noise complaints received during the dredging operation, and if monitoring is necessary, it is to be conducted in accordance with the DEHP Noise Measurement Manual 2000 and AS2436-2. • The results of any noise monitoring are to be provided to Ports North within 14 days following completion of the monitoring. • In the event that the monitoring indicates an exceedance of a performance criteria set out in a permit or other statutory instrument, refer to Corrective Actions.

Implementation Strategies	Responsibility	Timing	Corrective Action
Ensure that engines and equipment on board the dredge are properly maintained in good working order.	Dredge contractor	At all times	• In the event that response noise monitoring indicates an exceedance of the noise criteria, an investigation shall be undertaken into the noise source(s). • The investigation should include, at a minimum, assessment of the layout and positioning of noise-producing plant and activities and determine actions that could be taken to minimise noise emission levels to surrounding receptors. • Follow-up measurements are to be conducted two weeks later to confirm whether excessive noise levels have continued. If noise levels continue to exceed criteria, the dredge contractor is to submit a plan to Ports North indicating how noise can be further mitigated.
Maintain and operate all equipment on board the dredge in a safe and efficient manner.	Dredge contractor	At all times	
Carry out non-essential maintenance during day-light hours.	Dredge contractor	At all times	
The contractor staff are aware of noise requirements within relevant permits and/or approvals.	Dredge contractor	At all times	

C2.9.8 Air Quality

This section outlines requirements that are to be met with regard to nuisance air quality issues from dredging operations.

Objective	• To protect the air quality of surrounding sensitive receptors. • To respond effectively to any air quality issues which arise during construction.
Potential Impacts	Nuisance caused by dust or other emission to public or other port users
Performance Criteria	There are no complaints lodged from the public or port users about air quality associated with dredge operations.
Monitoring & Reporting	• The need for air quality monitoring will be discussed with the appropriate regulatory agencies in response to any air quality complaints received during the dredging operation. • The results of any air quality monitoring, if required, are to be provided to Ports North within 14 days following completion of the monitoring • In the event that the monitoring indicates an exceedance of a performance criteria set out in a permit or other statutory instrument, refer to Corrective Actions.

Implementation Strategies	Responsibility	Timing	Corrective Action
Ensure that engines and equipment on board the dredge are properly maintained in good working order.	Dredge contractor	At all times	• In the event that responsive air quality monitoring indicates an exceedance of the air quality criteria, an investigation shall be undertaken into potential cause(s). • Follow-up measurements are to be conducted two weeks later to confirm whether air quality is within performance criteria. If air quality continues to exceed criteria, the dredge contractor is to submit a plan to Ports North indicating how air quality issues can be further mitigated.
Maintain and operate all equipment on board the dredge in a safe and efficient manner.	Dredge contractor	At all times	
The contractor staff are aware of air quality requirements within relevant permits and/or approvals.	Dredge contractor	At all times	

C2.9.9 Emergency Planning and Procedures

This section outlines requirements that are to be met associated with emergency planning and procedures for environmental incidents that could result from dredging and pump-out operations. This includes, but is not limited to, ship collisions and similar incidents.

Objective	To identify and reduce the potential for an environmental incident before it occurs so as to prevent damage to the surrounding marine environment and the public.
Potential Impacts	Environmental incidents, including release of contaminants, such as oils and fuels, into the environment
Performance Criteria	• No environmental incidents occur during the dredging campaign. • In the event of an incident, there is a rapid response to minimise impacts on the marine environment.
Monitoring & Reporting	Ports North to be provided with copies of the following prior to the commencement of work: • The shipboard oil pollution emergency plan (as per Implementation Strategy) • The environmental incident risk assessment (as per Implementation Strategy) Ports North is to be notified in the event of any incident while the vessel is operating in port limits.

Implementation Strategies	Responsibility	Timing	Corrective Action
The dredge vessel has and maintains a shipboard oil pollution emergency plan (or equivalent) which outlines the role, responsibilities and actions to be followed should an uncontrolled release of oils/fuels occur.	Dredge contractor	Prior to commencement of operations	• If an incident occurs, review procedures and rectify immediately. • Implement contingency and/or clean-up procedures as set out in relevant plans.
A risk assessment regarding potential environmental incidents that could occur during the dredge operation is to be prepared by the dredge contractor prior to commencing work. The risk assessment should: • Identify the incidents/hazards that may occur during the campaign • Identify the environmental consequences of the hazard occurring • For each hazard, identify measures that can be implemented to prevent the likelihood of the hazard occurring and/or will reduce the severity of consequences Contingency measures that are to be implemented in the event of an incident occurring	Dredge contractor	Prior to commencement of operations	
All on-board procedures are to be made available to all crew	Dredge contractor	At all times	
The vessel is to have at least two lines of communication (VHF and mobile phone) with Port Control and maintain constant contact	Dredge contractor	At all times	
Dredge contractor is to meet all requirements of the Regional Harbour Master, including Notice to Mariners	Dredge contractor	At all times	
Protocols should be developed with the Regional Harbour Master for dropping the anchor lines as part of normal operations to ensure safe passage of vessels.	Dredge contractor	Prior to commencement of operations	

C2.10 References

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