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CAIRNS SHIPPING DEVELOPMENT PROJECT

Revised Draft Environmental Impact Statement

Chapter C2: Dredge Management Plan

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C2.1 Purpose

This Chapter of the revised draft 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 revised Cairns Shipping Development Project (CSD Project).

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 Revised Draft EIS. This is achieved by setting out the framework for management, mitigation and monitoring of relevant impacts of the action within issue-specific management strategies.

The DMP will be used to guide detailed design, site establishment, construction, and de-mobilisation phases of the Project. For a more detailed description of the activities to be undertaken in each of these stages, refer to **Chapter A3** (Project Description).

The principal objectives of this DMP are as follows:

- to minimise impacts to water quality, marine flora and fauna and their habitats during capital dredging, placement and dredge tailwater release activities
- to adopt best practice management for the handling and storage of all waste materials on board the dredge vessels
- to manage the risk of translocation of marine organisms by the dredge vessels
- 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 during dredging
- To reduce or minimise nuisance noise on surrounding sensitive receptors from the dredging and associated activities such as the operation of dredge booster pumps
- to minimise the air emissions produced during dredging and associated activities and thereby minimise potential effects on the natural airshed.

It should be noted that this DMP provides the outline of the main areas upon which a final overall project DMP will be based and to which sub-ordinate EMPs established for each of the specific project sections will refer. The final DMP will be informed by relevant updates to address the expected approval condition requirements that are required to be reflected in such a plan.

C2.2 Scope

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

- capital dredging by the Trailer Suction Hopper Dredge (TSHD) and Backhoe dredger (BHD) vessels
- establishment and operation of a dredge pump out temporary mooring and pipeline for hydraulic placement of the dredge material at the Barron Delta DMPA (for material dredged by the TSHD)
- management of the supernatant dredge tailwater from the Barron Delta DMPA into the Barron River
- placement of dredge material at the Tingira Street DMPA at the port (for material dredged by the BHD)
- general operation of the dredge vessels upon mobilisation during the dredging campaign and during de-mobilisation.

Figure C2-1 shows the proposed channel design. **Figure C2-2** shows the proposed land-based Northern Sands Dredge Management Placement Area (DMPA) and associated infrastructure. **Figure C2-3** shows the location of the Tingira Street DMPA.

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** (Construction Environmental Management Plan). 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 2010). Maintenance dredging is subject to a range of subsequent approvals under Commonwealth and Queensland legislation.

Like the project Construction Environmental Management Plan (CEMP) as outlined in **Chapter C1** (Construction Environmental Management Plan), 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 management and mitigation measures, along with complementary monitoring that will be required to be carried through into more detailed approvals (such as tidal works approvals under the *Planning Act 2016*, a marine park approval for the proposed temporary vessel mooring, an environmental authority for dredging under the *Environmental Protection Act 1994*) and by the selected dredge contractor for the works as part of the contractor's Operational Environmental Management Plans.

It should be 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 works.

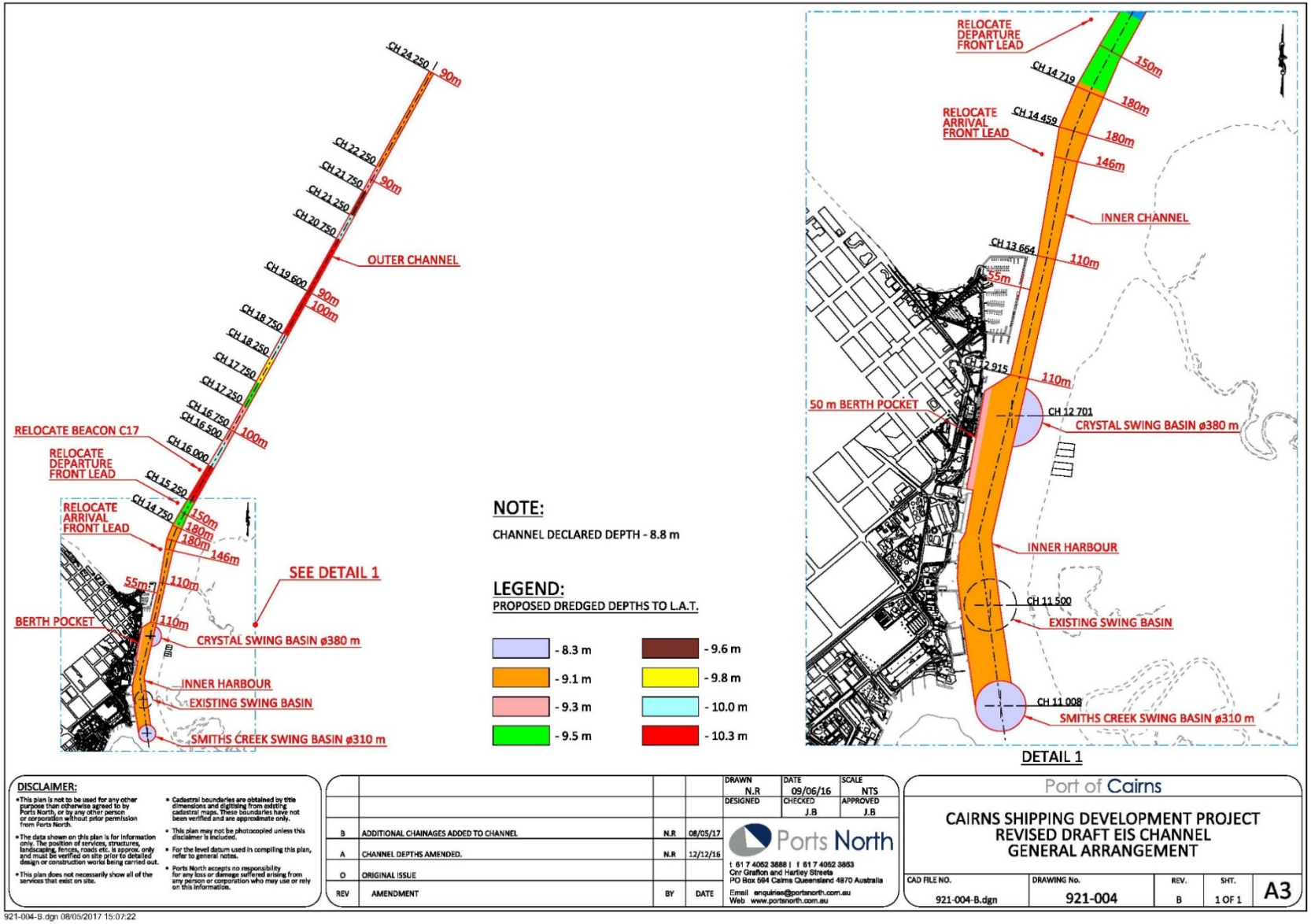

Figure C2-1 Proposed channel design.

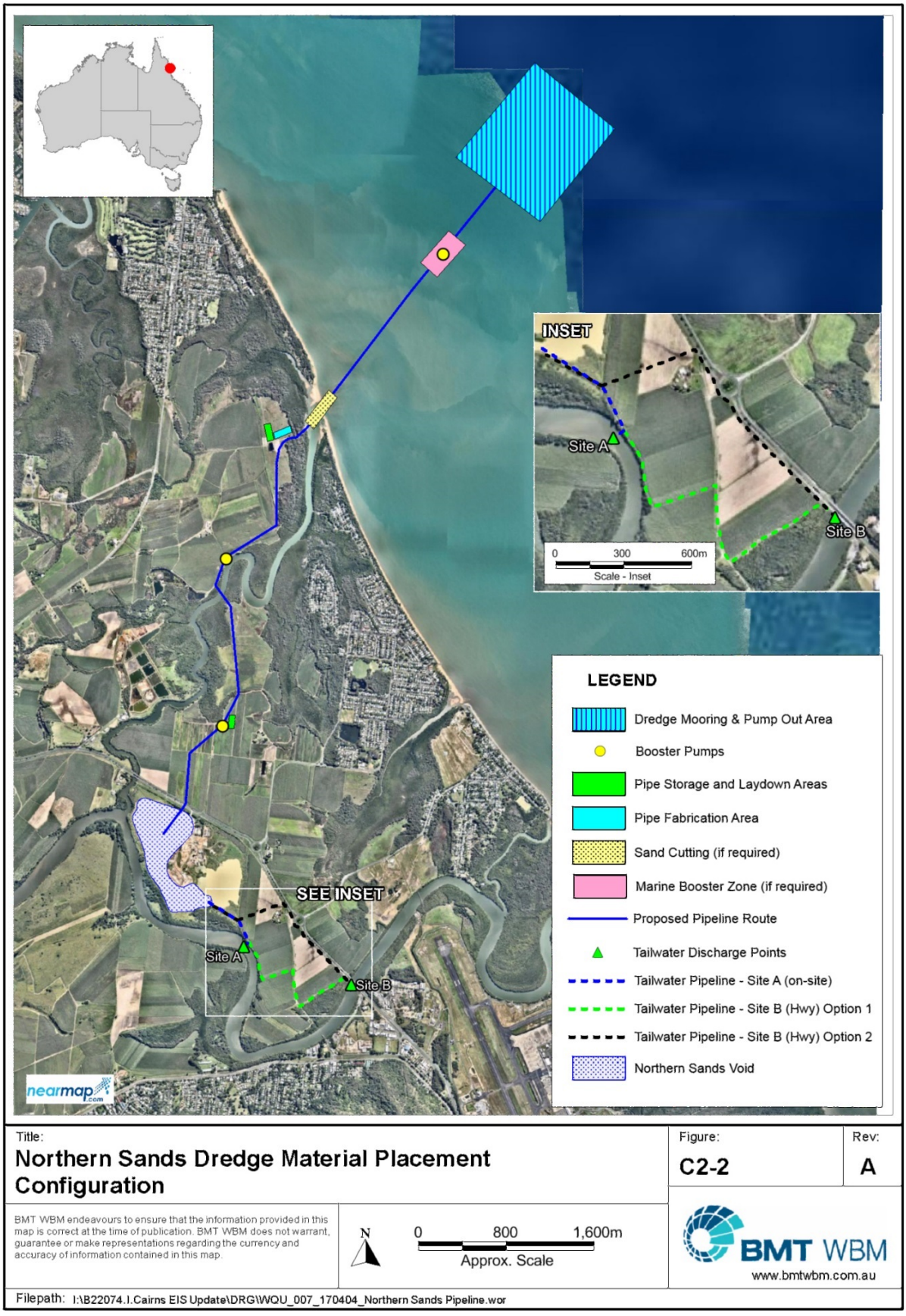

Figure C2-2 Northern Sands Dredge Material Placement Area configuration.

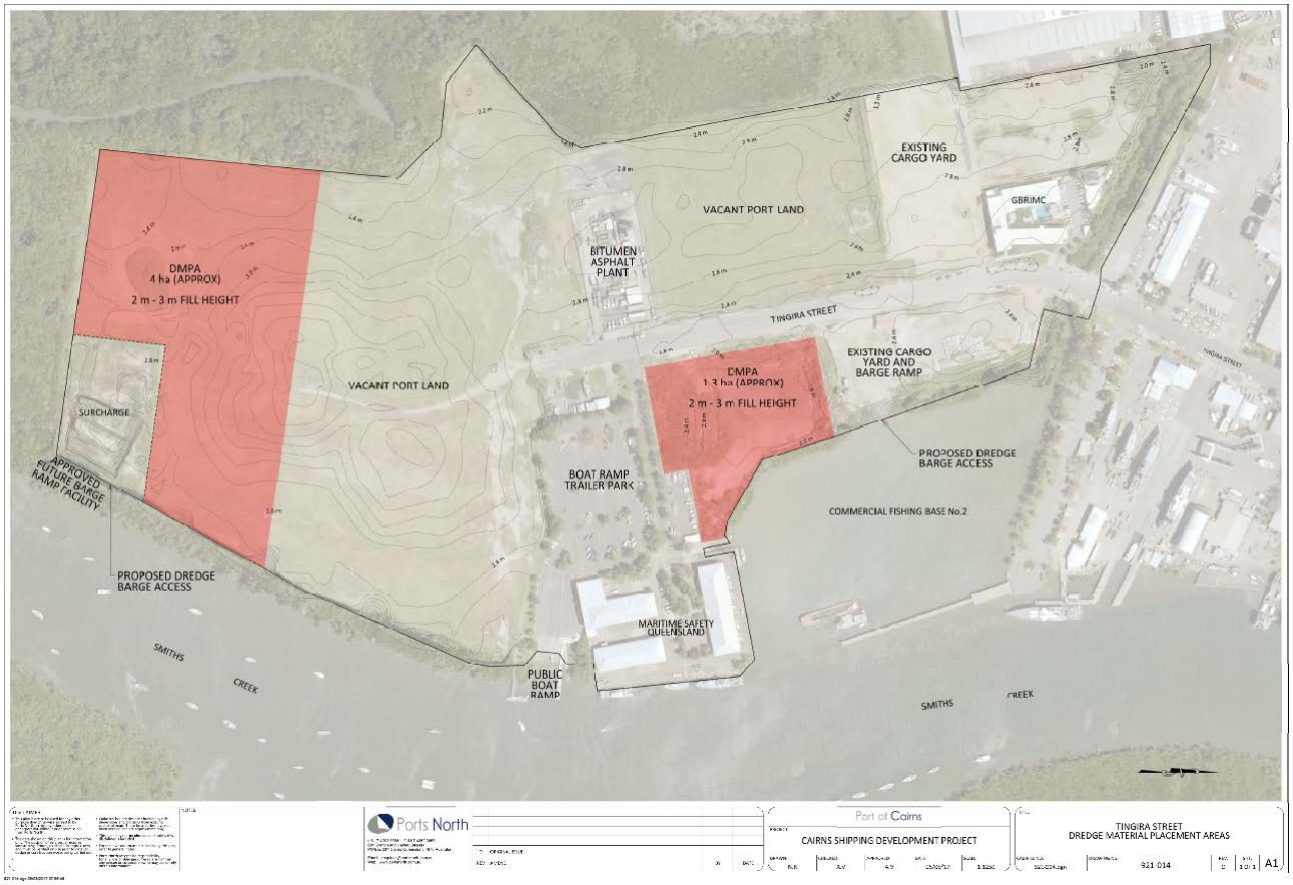

Figure C2-3 Tingira St Dredge Material Placement Area configuration.

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 land based placement activity.

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*
- *Great Barrier Reef Marine Park Act 1975* and Regulations.

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 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
- *Nature Conservation Act 1992* and Conservation Plans
- *Planning Act 2016* and Regulations.

C2.5 Project Description and Stages

The following sections describe the project and identify, at a broad scale, the dredging aspects of the Cairns Shipping Development Project (CSDP).

Dredging works are to be undertaken for the Project to widen and deepen the existing navigation channel and cruise shipping swing basin as well as to provide a new turning basin in the inner port. Two different dredging methods based on the sea bed material are proposed for the project which is summarised in **Table C2-1**.

Additional detail about the dredging and construction methodology can be found in **Chapter A3** (Project Description). Summary details are provided in the sections following.

TABLE C2-1 PROPOSED DREDGING METHODS

Sea Bed Material	Proposed Dredging Method
Very soft to firm clay in outer channel and part of inner port	Trailing suction hopper dredger (TSHD)
Firm to stiff clay in inner port and inner channel	Backhoe dredger (BHD) with barges and tug boats

C2.5.1 Dredging Plant - TSHD

C2.5.1.a Dredging

In the outer channel and part of the inner port, a medium-size TSHD will be mobilised. A 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. 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 1 to 2 knots. **Photo C2-1** shows a typical medium size TSHD.

The dredging process of TSHD involves the following sequences:

- position TSHD at the dredging area
- lower the suction pipe(s) with draghead at the end
- suction is commenced and uptake via the draghead and hopper filling simultaneously while sailing
- when the hopper is filled, suction is stopped and the draghead(s) are raised back onto the deck and the TSHD sails to the temporary mooring at the dredged material pump out site in Trinity Bay
- TSHD connects to the dredged material discharge pipeline at the temporary mooring and the dredged material is pumped as a slurry to the Northern Sands DMPA.

When the hopper is empty, and the pipeline has been pumped clean of solid material with water, the TSHD disconnects from the dredged material pipeline and mooring, and returns to the dredging area to recommence the cycle.

As inferred from the above, prior to the dredging and placement process, a range of site preparation works will be required as outlined in the sections below –

- installation of a temporary mooring facility
- installation of a dredge pipeline from the temporary mooring to the Northern Sands DMPA
- installation of dredge booster pumps along the pipeline route to assist the dredge vessel to convey the dredge material slurry to the DMPA.

Photo C2-1 Example of a Medium Size TSHD.

C2.5.1.b Temporary Mooring

The configuration of the temporary mooring used at the pump out site will be dependent on the site conditions, the dredging contractor's plant and equipment, and will need to be determined in consultation with the Regional Harbour Master. Options may include the following.

Dolphins

This arrangement uses (nominally 2) steel breasting dolphins to moor the vessel for the pump out operation. Each dolphin would consist of a number of steel piles driven into the seabed, interconnected by bracing. The dolphins would be equipped with bollards to accommodate spring lines, and fenders may also be used as an efficient means of energy absorption during berthing. In addition to the breasting dolphins, additional dolphins or anchor piles may be required to accommodate head and stern lines. Once the TSHD is secured in position the connection is made between to the dredged pipeline via is its bow coupling. The dolphins can be temporary in nature and removed at the completion of the dredging program.

Barge Mooring

Mooring the TSHD to a barge provides an alternative means to hold the TSHD in position during the pump out operations. A large spud barge of similar size to the TSHD would be mobilised and positioned prior to dredging commencing. The spud barge maintains its position by deploying four or more large, vertical 'spud poles' through its deck into the seafloor. The spud poles hold the barge in position and provide a safe working platform for the crew. The barge would be orientated in a position that best mitigates dominant sea conditions and the TSHD would be brought alongside and made fast to the barge using mooring lines. Once the TSHD is secured in position, the connection is made between to dredged pipeline via is its bow coupling.

Anchor Mooring

Under this arrangement, the TSHD drops its anchor(s), or picks up chains, via floating buoys, to concrete anchor blocks placed on the seabed, prior to connecting to the floating line through its bow coupling. The TSHD may either swing on its anchor to suit the prevailing conditions, or otherwise use its dynamic positioning system to maintain position. As a result, the pump out station may need to be located further offshore to

ensure sufficient draft is available for the dredge at all times. In considering whether the TSHD can discharge while at anchor, consideration will be given to prevailing site conditions and potential marine safety hazards in consultation with the Regional Harbour Master.

C2.5.1.c Dredge Pipeline

The dredged material pipeline consists of a single pipeline nominally 1 m internal diameter in size which will include some or all of the following components:

- floating line
- submerged pipeline and risers
- onshore pipeline.

Floating Pipeline

For the Northern Sands DMPA, a small section of floating pipeline (e.g. up to 50 m) may be used to connect the riser to the TSHD depending on the type of mooring.

A riser is a small section of flexible line used to bring a submerged line to the surface for connection to the floating line / connection point the seaward end. A small pontoon/buoy anchored to the seafloor is used to provide access to the surface end of the riser and to maintain its position.

Submerged Pipeline

The submerged line is the component of the pipeline that connects the riser line to the onshore pipeline. This submerged line is made from steel and is not typically anchored, as it filled with seawater and / or dredged material at all times and holds its position on the seafloor through its self-weight.

The submerged pipeline will be fabricated by welding pipe components together onshore into ‘strings’ between 300 m to 1000 m long. Pipe strings will be capped with blank flanges to allow them to float and to be transported (towed) over water by multicat / tug.

Laydown areas of up to 1 ha and 0.5 ha will be needed for pipe storage. Up to 0.5 ha will be required for a submerged pipeline fabrication yard and the dredging contractor will need a further 1 ha for his general works area (e.g. storage of plant and equipment, temporary workshop etc.). This could either be located close to the dredge pipeline shore crossing, or at an existing yard within the port. If the fabrication yard is located near the shore crossing, a temporary cutting may be required at the beach / through adjacent sand bars to allow the strings to be towed offshore. Each pipe string is connected to the next by either a ball joint or a bolted flange connection one at a time and is also partially submerged to wait for the next. Once the pipe strings are fabricated the first string can be towed to the submerged pipeline location by multi-cat and / or tugs for connection to the onshore pipeline. It will then be partially submerged with the seaward end kept afloat for connection to the next pipe string. Each pipe string is connected to the next by either a ball joint or a bolted flange connection one at a time and is also partially submerged to wait for the next. The process is repeated until the submerged pipeline reaches its desired length, before it if finally connected to the riser which brings the pipeline to the surface.

If an existing yard within the port is used to fabricate strings, a multi-cat workboat and / or tugs will be used to pull the strings offshore and to transfer them either to a temporary storage location where they will be held until all strings are fabricated, or directly to the offshore submerged pipeline location. The temporary storage location could be a sheltered area within the port which allows the floating strings can be safely anchored, or they could be submerged to rest on the seafloor at a location that does not present a hazard to navigation.

The offshore pipeline will make landfall at or to the north of the Richters Creek mouth and traverse approximately 300m up Richters Creek across tidal estuarine sandflats, before exiting the creek at an existing mangrove clearing corridor on Lot 139/NR3818. The pipe fabrication area may be located in the vicinity of this point on Lot 100/NR3818.The pipeline will then traverse agricultural lands, crossing Richters Creek again approximately 2.7km upstream and pass under the Captain Cook Highway via existing culvert(s) to the Barron Delta DMPA as shown on **Figure C2-2**.

Onshore Pipeline

The onshore pipeline will require a cleared construction corridor, including road access along the length (circa 5 km) of its route. The corridor needs to be of sufficient width (7- 10 m) to allow for delivery of the pipe by truck, the unloading and installation of pipe components by telescopic handler / excavator, and vehicle access for inspection and maintenance throughout the dredging program. The onshore pipeline is joined by bolted, flanged connections and the pipe is seated on discrete earthen mounds approximately 500 mm in height.

From the shoreline the pipeline will be above ground generally running along existing cane farm headlands on the north side of the creek, prior to crossing to the south side. From the south side of the crossing the pipeline will generally run along cane farm headlands through the cane fields to the Captain Cook Highway. The pipeline will cross the highway via existing drainage culverts before entering the Northern Sands site for delivery of dredged materials. The proposed discharge pipeline will either run directly to the Barron River at a location adjacent to the site or run along existing cane farm headlands to discharge at the Barron River at a location adjacent to the bridge on the Captain Cook Highway.

It is expected that construction of the pipelines will generally only require relatively minor clearing and earthworks; however works to provide access for construction vehicles and construction plant will be required.

For most of the pipeline route, earthworks are expected to involve clearing of vegetation where required, formation of access tracks and then formation of pipeline support pads. In areas where soft soils are present (e.g. mangrove areas) the pads are likely to comprise sand bags supported on a layer of geotextile placed for both separation (from underlying soils which are likely to be PASS) and reinforcement (for bearing capacity). In other areas not underlain by soft soils or PASS the pads are likely to comprise mounds of insitu soils.

At some locations (e.g. where the pipeline comes onshore, where the pipeline discharges to the Barron River and/or the banks of the creek crossing) engineered crane pads and more significant pipe support pads will probably be required. Such pads are expected to comprise imported crushed rock fill with geotextile reinforcement.

A sketch of the prospective Richters Creek pipeline crossing is shown on **Figure C2-4**.

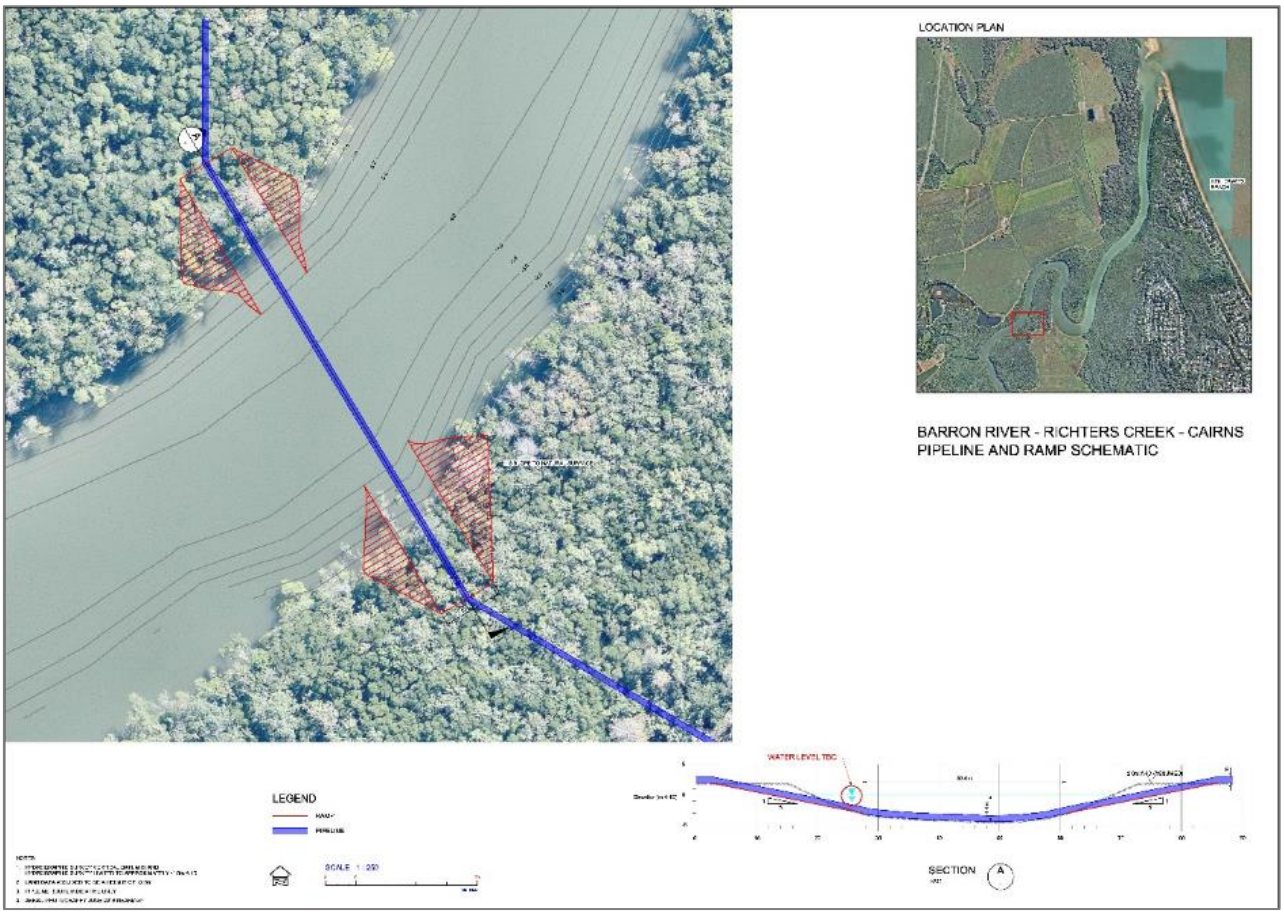

Figure C2-4 Richters Creek crossing – sketch.

It is proposed that the pipeline crossing would involve laying a submerged pipe on the bed of the creek. Installation would involve earthworks on each bank to create a ramp down to water level (to reduce any sharp/rapid bends in pipe). The pipe would be constructed on one side and then pulled (or floated and sunk depending on the length) across the creek and sunk onto the creek bed. The ramp will be approximately 10 m wide (plus batters) to allow for the pipe and access for earthmoving equipment.

During earthworks and installation of the pipeline, there is potential for increased turbidity due to disturbance of bed and bank sediments, and runoff from exposed soils during earthworks. For works such as these, standard practice is to install erosion and sediment controls. As such, the potential impact of increased turbidity in Richters Creek during these works would be short-term and negligible.

As most of the pipeline routes are proposed along existing cane farm headlands, earthworks for access tracks are expected to be relatively minor. The headlands generally provide all weather access, particularly during the dry season when construction is proposed. If soft ground conditions are encountered on existing or proposed tracks, 'bridging' layers comprising imported crushed rock fill (with geotextile separation and/or reinforcement if required) can be placed.

Booster pump stations (see below) are expected to comprise portable equipment supported on engineered pads comprising insitu soils. The pumps may need to be surrounded by earth bunds likely comprising insitu soils for noise reduction.

C2.5.1.d Booster Pumps

A booster pump is a very large, portable pump which is connected into the dredge pipeline to boost pumping pressure. Multiple booster stations can be connected in series when required, and they can be either land based or located offshore on barges.

It is expected that between two to three booster pumps will be required for dredging with placement within the Barron Delta precinct. At this stage of project planning, the revised draft EIS makes provision for the possibility of a marine booster as well as land based boosters as shown on **Figure C2-2**.

Floating booster stations are barge mounted and are towed to position before they are anchored to the seafloor. They are typically located close to the dredge and out of the surf zone. The booster pump station is connected either side to small lengths of floating line which are linked to the submerged line by risers.

Land based booster stations are delivered by road transport and sufficient access needs to be maintained at all times to allow inspections, maintenance and refuelling.

Some land based booster stations need to be located close to a suitable water source which can supply and receive large quantities of service water (for gland flushing) and in some cases for engine cooling water. Gland water leaves the system via the dredged pipeline along with the dredged material. Depending on the type of pump selected by the contractor, cooling water may or may not be required. If cooling water is required, a small reticulation pond can be established to recycle the water in a closed system to minimise demand and prevent releases to the environment.

Details for water supply and any associated approval requirements will be confirmed following a decision on the project and as part of the detailed design phase, noting the number of booster pump stations required will depend in part on the size of the dredge vessel selected to undertake the works.

C2.5.1.e Placement Activity

The concept design for the Barron Delta DMPA is described in **Chapter A3** (Project Description). The operation will consist of underwater placement of soft clay dredge material within the existing water filled quarry void, which will be bunded to 6.0 Australian Height Datum (AHD) to 7.5 m AHD and enlarged to the north as part of future 'business as usual' quarry expansion plans, prior to the proposed use in 2019, forming a total bunded placement area of 29.6 ha. The perimeter level of the existing void is approximately 3.5 m AHD therefore bund height will be up to 4 m.

The Northern Sands void holds permanent water, consisting primarily of groundwater and seasonally influenced stormwater runoff. Monitoring indicates that the lowest seasonal water level is approximately -1.0 m AHD, with an average of 0.0 m AHD. Dredge material that has PASS and self-neutralising soft clays (SNP) will be placed underwater, with the PASS materials deposited initially to ensure they remain under at least 1m of permanent water to prevent oxidation, followed by the SNP.

The Barron River DMPA (at Northern Sands) will consist of the following elements:

- facility capacity required during placement is up to 2 600 000 m^3. Material is expected to further consolidate with time to approximately 1 000 000 m^3 (with additional void shaping, estimated final settled bed level at approximately 0.0 m AHD approx.)
- temporary perimeter bunding to at least 100-year flood immunity (Q100) plus freeboard (6.0 to 7.5 m AHD), which will minimise risk of sediment remobilisation in the event of event exceedance
- water volume above 6.0 m AHD approx. 350 000 m^3 (allowing 300 mm free board from top of bund)
- soil/rock wall at Reedy/Snake island to separate DMPA from southern sand pit
- dredged material will be delivered into the DMPA as a slurry of approximately 1:6 (solid:water ratio) through the dredged material pipeline in approximately five pulses per 24 hr period
- an adjustable weir (e.g. drop-board weir box) will be used to control supernatant water levels and to pass it into a final pumping pond prior to its release as tailwater. The weir box typically has boards that can be added or remove to set the height of the overflow (and hence water levels) inside the DMPA and is used to control tailwater quality
- a temporary 5 ha tailwater treatment pond may also be constructed on site depending on the outcome of further detailed design phase considerations
- tailwater is proposed to be discharged via pumping to an outfall in the Barron River under the Captain Cook Highway bridge.

Bunding will be constructed using insitu soils from the northern 'business as usual' resource expansion area, which will be designed and placed under Registered Professional Engineer Queensland (RPEQ) supervision in accordance with existing site management procedures including site environmental permits, acid sulfate soil management guidelines, erosion and sediment control plans and geotechnical assessments.

C2.5.1.f Demobilisation

At the completion of dredging, the dredging contractors floating plant and shore based equipment will be demobilised from site. Following the uncoupling and removal of the dredge material pipeline, the mooring / pump out station, including pump out facility anchoring equipment will be demobilised and removed.

Once dredging is completed, the pipelines will be flushed with seawater to ensure they are free of all dredged material. The floating line will be disconnected from the riser or onshore pipeline and towed to shore. Any damage to intertidal areas such as the Richters Creek pipeline crossings will be repaired and rehabilitated, as agreed with the Department of Agriculture, Fisheries and Forestry and approval conditions.

The submerged pipeline will be disconnected from the onshore pipeline and filled with compressed air from the seaward end. This forces all the water from pipeline at the shoreward end, allowing the submerged pipe to float back to the surface. The ball joints or bolted connections will then be disconnected from the seaward end, allowing each pipe string to be towed back to shore by multi-cat / tug. Once onshore, the pipe strings will be cut back into pipe components of sufficient size to allow for their removal from site.

The onshore and tailwater water pipelines will also be disassembled back into their components in the field before they are removed either to a temporary construction yard or to a Portsmith consolidation yard (by 20t articulated vehicle) thence to railhead, port or road (B Double) transport. Soil plinths supporting the pipeline and any earthen acoustic bunding will be flattened and the local landform re-established and stabilised and any disturbance to paddocks and internal tracks made good, in accordance with landowner agreements.

Following the completion of placement activity and subsequent material settlement, the containment bund at the Northern Sands site will be fully or partially lowered to a height such that at least 3 m of water will be maintained over the surface of the material to prevent resuspension should flooding occur during the subsequent wet season following the works. It is expected that the bunds will be lowered to a minimum height of 5.8 m AHD (Q100 level) over the following 12 months and after subsequent consolidation, bunds will be removed as the material will not resuspend.

C2.5.2 Dredging Plant - BHD

C2.5.2.a Dredging

For dredging of firm to stiff clay in the inner port area and parts of the channel, a medium-size BHD with ancillary vessels will be mobilised. BHD is a mechanical dredger, similar to an excavator which is mounted on a barge. A BHD is a stationary dredger anchored by three or four 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 placement at the preferred dredge material placement area. **Photo C2-2** shows a typical dredging operation of a BHD.

The dredging process of BHD will involve 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 or barge mounted skips moored alongside the BHD
- tug boat tows hopper barge when it is full to the Tingira Street DMPA
- barge mounted excavator(moored to shore) transfers material to heavy haulage vehicles for short hauling, then end dumping at placement site or transfer of skips to flat top haulage vehicles for dumping at placement sites
- tug boat tows hopper barge back to the BHD.

C2.5.2.b Placement

The Tingira Street DMPA is described in **Chapter A3** (Project Description). The DMPA at Tingira Street is identified in Ports North Land Use Plan as an industrial hardstand. Its use as a DMPA will mean that the placed stiff clay will provide fill as well as surcharge to accelerate the settlement of the land and thereby bring forward the site development. Once the placement campaign is completed, site development timing and nature are likely to proceed as a project unrelated to the CSDP and as demand for port-related industrial demand arises.

The total area of the DMPA is approximately 53 000 m^2 indicating that with about 100 000 m^3 of dredged material, filling to an average thickness of about 2.0 m would be required, if the material is evenly spread across the area. Given that the Tingira Street site has been progressively filled since the 1980s with the aim of creating land suitable for commercial/industrial development, proposed filling operations in the DMPA is expected to be carried out with the same aim. On this basis initial fill placement is expected to be carried out to achieve design levels, with the balance of filling expected to be used for surcharging targeted areas.

It is expected that relatively minor site preparation will be required at the DMPA site prior to placement of dredged stiff clays. This is expected to involve trimming of the surface to remove the existing terrestrial grasses/vegetation and then formation of bunds (estimated to be <0.5 m high) around the perimeter of the placement areas using insitu clay materials.

As the material is being placed mechanically into bunded cells on the DMPA site, there will be no supernatant dredge tailwater to manage. On the basis of prior experience with handling stiff clay material, dredging of these clays is likely to generate ‘chunks’ of material with relatively small amounts of entrained seawater. As such, these materials are likely to be ‘sticky’ as drying progressively occurs.

Placement operations are expected to comprise unloading of trucks into stockpiles along a ‘working face’ for subsequent spreading, drying as required and compaction. Spreading is expected to require tracked plant (i.e. dozers) rather than wheeled plant (i.e. graders).

In terms of environmental management, the following matters are relevant to the Tingira Street DMPA:

- The results of available laboratory testing on samples of the stiff clays proposed for dredging indicate that the clays are typically of high plasticity with <10% sand content. The stiff clays are not ASS.
- Conventional erosion and sediment control (ESC) measures would be implemented during the works (e.g. in accordance with Far North Queensland Regional Organisation of Councils requirements). In addition to bunding around the reclamation cells, a sediment fence will be installed around the entire perimeter of the placement areas in addition to other erosion control measures.
- An adequate setback buffer zone from the mangroves on the western boundary and Trinity Inlet to the east will be maintained, so as to ensure geotechnical stability of existing reclamation bund walls and a perimeter maintenance access, which also acts as a buffer in the event of bund sediment loss.
- Groundwater quality in the DMPA site area is generally quite poor, with high levels of salinity in the low permeability clays surrounding and underlying the site area. Proposed dredged material placement operations are highly unlikely to result in a lowering of groundwater levels within PASS materials such that acidic groundwater would be generated. Similarly proposed operations are not likely to increase groundwater levels surrounding the site and hence impacts on terrestrial vegetation with high salt tolerance are not likely.
- Flooding and storm tide impacts on the site and from site filling in adjoining areas have been assessed to be minor and acceptable (refer **Chapter B17** (Hazard and Risk)).
- Surface water flows from the bunded areas are only likely to occur as a result of rainfall (as opposed to seawater associated with the deposition process). A stormwater management plan will be developed for the management of the site during construction and post placement (refer **Chapter C1** (Construction Environmental Management Plan)). Stormwater flows are not likely to impact groundwater levels or quality.

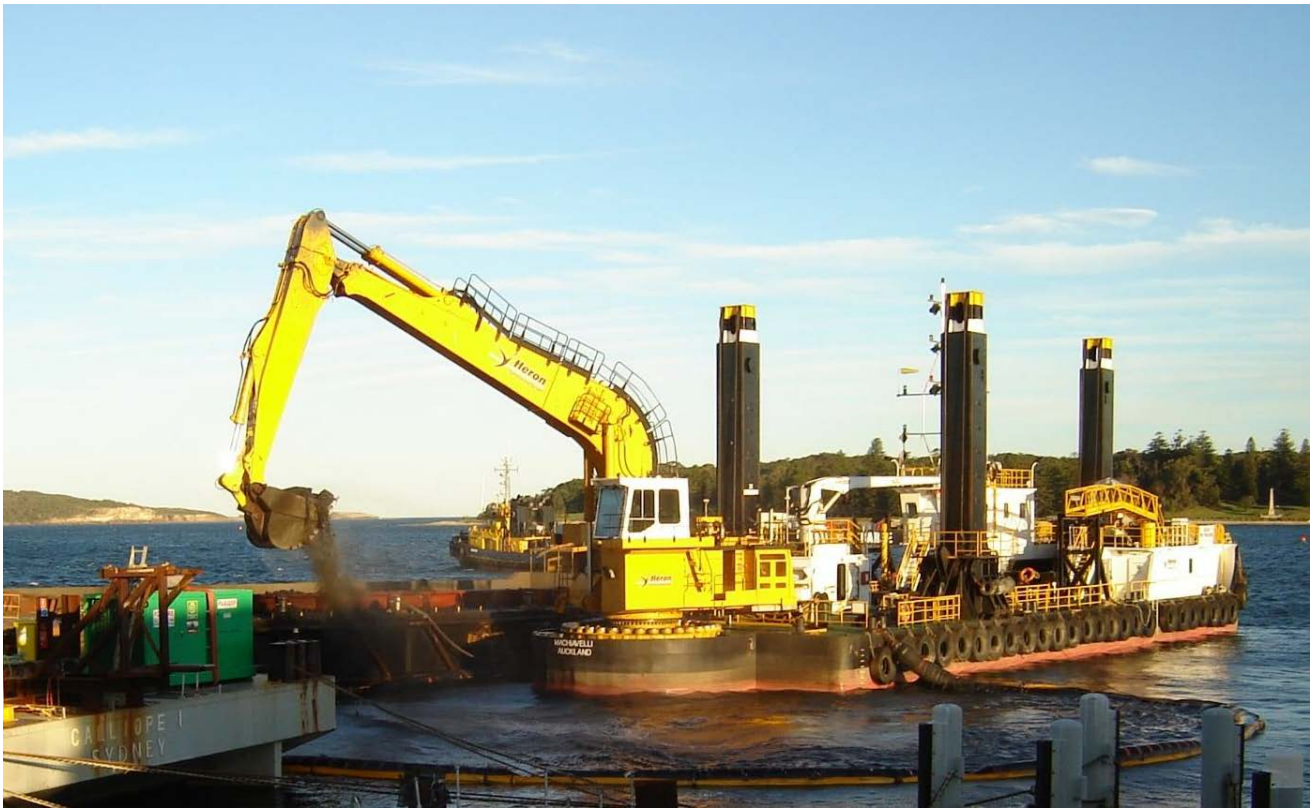

Photo C2-2 BHD Dredging and Loading into Hopper Barge

C2.5.3 Summary of Dredging Work

A summary of the proposed dredging work by TSHD and BHD is provided in **Table C2-2**.

Subject to approval, the dredging programme is anticipated to be undertaken during the 2019 dry season (May to October). Both dredge plant will seek to operate 7 days a week with 24 hour operations subject to weather, maintenance and environmental requirements.

The temporary mooring and dredge pipeline will need to be established prior to dredging works and as such would be expected to have an indicative duration of 6 months on site, taking into account mobilisation and demobilisation timing.

The sequence of works will be that TSHD operations will likely occur prior to and then in parallel with the BHD operations and the impact assessment has been undertaken with this assumption.

While not overlapping, it is likely that the *TSHD Brisbane* will carry out maintenance dredging works shortly before the capital works are commenced so as to ensure any accrued maintenance dredge material in the channel is removed from the dredge footprint. The maintenance material will be placed at sea at the approved offshore dredge material placement area (offshore DMPA) in accordance with current arrangements and statutory permissions.

TABLE C2-2 SUMMARY OF DREDGING WORK

Dredging Fleet	Construction Activity	Location	Indicative Duration on Site (months) #
Main Vessels			
1 x Medium TSHD	Dredge very soft to soft clay and firm clay and relocate to Barron River DMPA.	Outer channel and part of inner port.	~3 months (12 weeks) (excepting delays due to weather, maintenance and/or environmental requirements)
1 x Medium BHD 2 x self-propelled hopper barges or 2 x hopper barges plus 1 tug boats	Dredge firm and stiff clay and relocate to Tingira Street DMPA.	Inner port and parts of the inner channel	~ 2 months (5-6 weeks) (excepting delays due to weather or maintenance)

includes time for mobilisation and demobilisation

C2.6 Ports North Environmental Management Framework

The dredging and associated placement works associated with the CSDP will be undertaken in accordance with the Port's overarching environmental management framework as outlined below.

C2.6.1 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.

C2.6.2 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 required as a condition of the works contract to establish and implement relevant management plans, procedures, and reporting so as to enable Ports North to ensure project permit and approvals requirements are met. Ports North will inform the appointed contractor of requirements to ensure the project objectives are being achieved consistent with the EMS framework.

C2.6.3 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 to Ports North and to respective agencies as required under applicable laws and conditions.

C2.6.4 Environmental Monitoring

Ports North undertake a range of monitoring programmes to manage potential impacts from the organisation's activities at 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 later 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.

C2.7 DMP – General Requirements

C2.7.1 Overview

The strategies, actions and requirements in this section and **Section C2.8** represent the commitments to management and monitoring for the CSD Project as they relate to dredging and associated activities. These measures and commitments will be required to be addressed by the dredge contractor in addition to any statutory approval requirements and conditions for the project (noting in the event of an inconsistency, the statutory approval requirement will prevail).

Unless specifically stated, commitments to activities such as environmental monitoring may be undertaken by the dredge 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 including the performance measures to be achieved with the responsibility for implementing the commitments to be further developed as part of the procurement strategy for the project and subsequently as part of the operational dredge management plan prepared by the dredge contractor.

C2.7.2 Purpose

The overall purposes 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.

C2.7.3 General Requirements

This section of the DMP outlines the general environmental requirements of the DMP that the appointed 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.

The general requirements are stated below in **Table C2-3**.

TABLE C2-3 GENERAL REQUIREMENTS FOR DREDGING

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: **General Method Statement** 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: • 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 of this DMP **Environmental Management Plan (Dredge Operations)** Regulatory permits will likely require preparation of an environmental management plan related to the dredging operation to be submitted to the relevant regulatory agencies. 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.
	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.

General Requirements – Dredging	
	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. **Notifications of Commencement** The dredge 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	Refer monitoring requirements as outlined in the specific environmental strategies in **Section C2.8**. The dredge contractor must keep records of all monitoring results required by this DMP or as part of regulatory agency permit requirements. 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. The dredge contractor will be required to undertake bathymetric surveys pre, during (progress check) and post dredging and at the dredge pump out area.
Reporting	Refer reporting requirements as outlined in the specific environmental strategies in **Section C2.8**. This may include the development of further plans of management, monitoring and survey reports, reporting on compliance matters or similar Copies of all plans will be provided to Ports North for review prior to lodgement with regulatory authorities. 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 *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. Any compliance breach must be reported within 24 hours or otherwise as quickly as is reasonably practicable. An annual compliance report will likely be required as a condition of any controlled action approval under the *Environment Protection and Biodiversity Act 1999*.

(Continued over)

General Requirements – Dredging	
Auditing	Refer auditing requirements as outlined in the specific environmental strategies in **Section C2.8**. Audits may be conducted by Ports North and/or regulatory authorities periodically A third party audit will likely be required as a condition of any controlled action approval under the *Environment Protection and Biodiversity Act 1999*.
Corrective Actions	Refer corrective actions as outlined in the specific environmental strategies in **Section C2.8**.

C2.8 Specific Environmental Strategies

C2.8.1 Introduction

This section outlines the specific environmental strategies of the DMP which include:

- Water Quality and Marine Ecology
- Marine Megafauna
- Marine Sediment Quality
- Dredge Pipeline – Terrestrial and Aquatic Ecology
- Dredge Pipeline – Erosion and Sediment Control
- Vessel Wash Down Management
- Ballast Water and Marine Pest Incursion Management
- Vessel Waste Management
- Fuel Management
- Noise Quality
- Air Quality
- Landscape and Lighting
- Emergency Planning and Procedures for Environmental Incidents.

For each element identified, an environmental management strategy, measures and actions have been developed to address potential risks that may arise. Each element has a stated environmental objective, performance criteria, management actions, monitoring, reporting and corrective actions.

C2.8.2 Water Quality and Marine Ecology

This section summarises the measures that will be implemented to minimise impacts to water quality and marine ecology. This section excludes specific measures for protection of marine megafauna which are outlined in **Section C2.8.2**.

Objective	To minimise impacts to water quality and protect marine ecological values of the study area including seagrass, corals, benthic habitats and the estuarine habitats of the Barron River.
Potential Impacts	The principal impacts to be managed under this section include: • Impacts to water quality (from capital dredging and tailwater release) • Impacts to seagrass, corals and other marine habitats (from capital dredging) • Impacts to environmental values and riparian vegetation including marine plants along the Barron River (from tailwater release as surface water and groundwater) and adjacent to the Tingira Street DMPA
Performance Criteria	Performance criteria are set out in this section for the following: - Tailwater management discharge - Setting trigger values for receiving environments for surface water and ground water based on 20th, 50th and 80th percentile values derived from baseline data collection.
Monitoring & Reporting	Reactive (RMP) and Validation (VMP) monitoring programs as set out in this section for: - Capital dredging (marine water quality and ecology) - Tailwater management (surface waters and groundwater)

Implementation Strategies	**Responsibility**	**Timing**	**Corrective Actions**
See **Section C2.8.2.a**, which includes strategies related to: - Dredge footprint and logistics - Overflow from the TSHD - TSHD Operations at the Temporary Mooring and Pump Out - Tailwater management - Timing of the dredging - Reactive monitoring programs and corrective actions	Ports North Dredge Contractor	Implementation to occur at all times during the dredging campaign	Refer section below.

C2.8.2.a Water Quality and Ecology Mitigation Measures

A range of mitigation measures will be committed to and required to be undertaken by Ports North and its appointed 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 a nominated Expert Advisory Panel (see further description below).

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

- Dredge Footprint and 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
  - If required, use of high pressure jets on dragheads and in the hopper to loosen materials is restricted to dredging areas only.
- Overflow from the TSHD:
  - Overflow during dredging by the TSHD is limited to durations no greater than the modelled most likely 'worst case' scenario which includes an average 30 minute overflow duration per cycle.
  - Where water quality performance targets are not achieved, additional reductions in overflow can be implemented.
  - The top of overflow valves are not lowered during the transport component of the dredging cycle (dredging area to pump out mooring) 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.
- TSHD Operations at the Temporary Mooring Pump Out:
  - The dredge is stationary and moored when pumping out to limit prop wash impacts during pump out operations.
- Tailwater Management:
  - Dredged tailwater is to be managed in the Barron River DMPA site to meet the following water quality discharge performance requirements –
    - Suspended Solids (or turbidity equivalent) - Acute exceedance - 100 mg/L averaged over a 48 hr period
    - Suspended Solids (or turbidity equivalent) - Chronic exceedance - 50 mg/L averaged over a two week period
    - pH – Not less than 6.5 nor greater than 8.5 (measured daily)
    - Dissolved Oxygen – Dissolved oxygen must be >= 6 milligrams per litre (measured daily)
  - Correlations between turbidity (NTU) and suspended solids (TSS) will be investigated to develop an operational indicator of suspended solid concentration that can be field measured.
  - While both tailwater discharge points are likely acceptable based on the water quality impact assessments presented in Chapter B5 Marine Water Quality, the downstream tailwater discharge point (downstream of the proposed DMPA site in close proximity to the Captain Cook Highway bridge over the Barron River) is more preferred as it will maximize mixing and reduce salinity impacts upstream of the DMPA site in the Barron River.

  - Surface water quality and groundwater quality performance triggers are to be set for receiving water quality values potentially affected by DMPA tailwater based on the 12 months of data collected as part of the Revised Draft EIS and subsequent data collected prior to commencement of the work. The proposed process to establish trigger levels is outlined further below.

- Timing of the Dredging:
  - Capital dredging of the channel by the TSHD will be undertaken outside of the following months (October to February) based on the following reasons:
    - 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)
    - October and November are known periods of coral spawning in the region (noting that impacts to coral species and communities are not predicted as part of the project – see Chapter B7 Marine Ecology)
- Reactive Monitoring Programs and Corrective Actions
  - Develop and implement a Reactive Monitoring Programs (RMPs) with appropriate triggers and corrective actions for dredging and dredge tailwater release
  - Develop and implement a Validation Monitoring Programs (VMPs) to confirm the findings of the EIS as well as validate the CSDP has not had a significant impact on environmental values including relevant Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES).
  - These two programs are further defined in **Section C2.8.2.b** below.

C2.8.2.b Reactive Monitoring Programs (RMPs)

Capital Dredging RMP

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

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 Great Barrier Reef Marine Park Authority's (GBRMPA) Strategic Assessment. This monitoring program is proposed to be overseen by an Expert Advisory Panel or similarly named management reference group (outlined further below).

Approach and Methodology

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

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

The RMP employs a range of trigger levels for further investigation and instigation of corrective actions. Monitoring of the two components (water quality and biotic) of the RMP would be done in parallel.

A schematic of the proposed RMP and how it would function during dredging is shown on **Figure C2-5**.

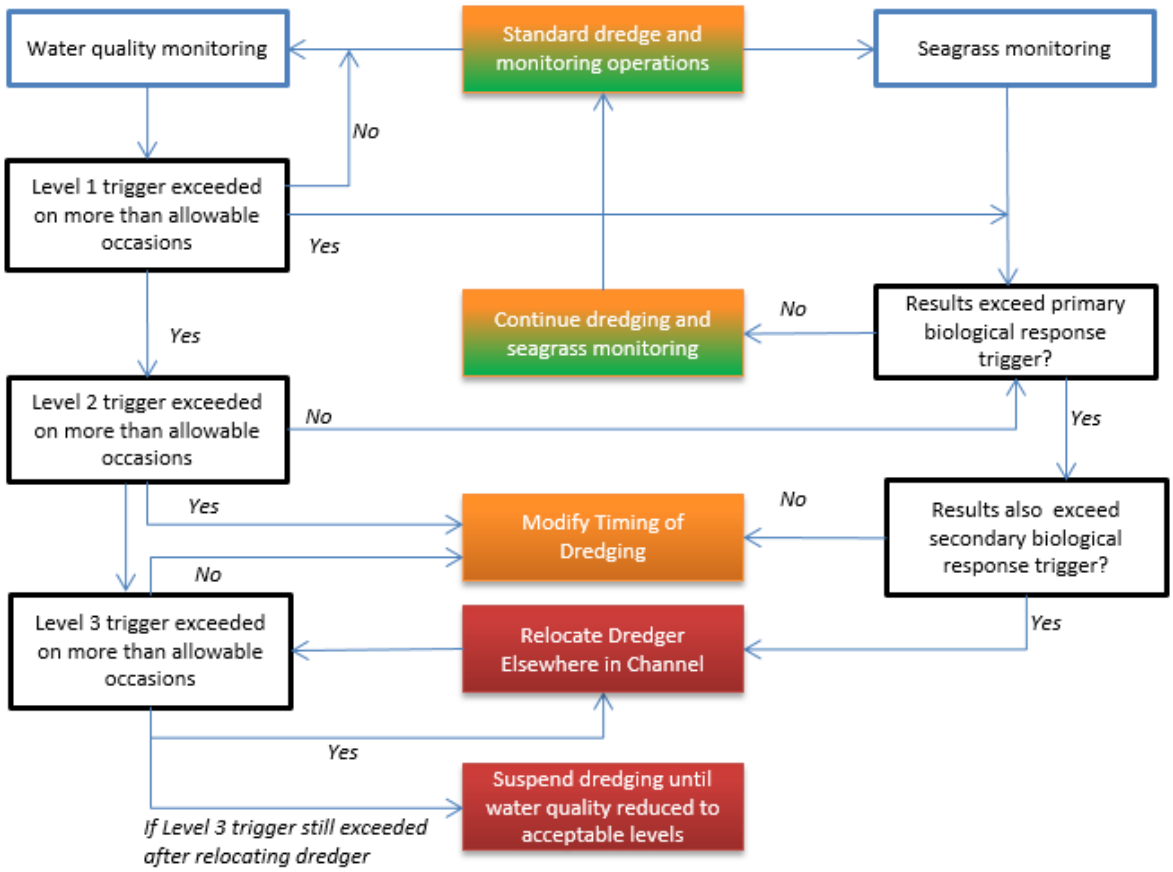

Figure C2-5 Schematic of the RMP.

As shown on **Figure C2-5**, 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(s) to assist in determining 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 change is attributable to the dredging, there is a requirement to examine seagrass monitoring data to determine if the detected water quality impacts are resulting in a biological response in sensitive receptors (seagrass). 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. 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 area 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.

Monitoring Equipment and Parameters

From a water quality perspective, 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 will also 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 JCU 'TropWATER' at a range of sites throughout Cairns Harbour, which will provide useful baseline data for the RMP and inform the establishment of applicable trigger levels.

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 provision for alerts via mobile text message or email of any exceedance under the RMP where required.

From an ecology perspective, the key ecological receptor that has high biodiversity significance that could be affected by the project is seagrass. Seagrasses can show rapid (measured in weeks) responses to increased sediment concentrations, and therefore represent excellent biological indicators.

The RMP will therefore monitor seagrass as biological indicators of changes to marine ecosystems. The specific indicators to be monitored will be determined by the Expert Advisory Panel (see below), but is expected to concentrate on seagrass cover/biomass.

In addition to pre and post dredging surveys, 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
- Identification of applicable and relevant control sites
- Allow rapid deployment of field staff and turnaround of results
- Be measurable in poor visibility noting the presence of high ambient turbidity
- 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.

Monitoring Locations

Indicative monitoring locations under the RMP are shown on **Figure C2-6** (marine sites).

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 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), 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 location of all monitoring sites are only indicative at this stage and will be confirmed by the Expert Advisory Panel. 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.

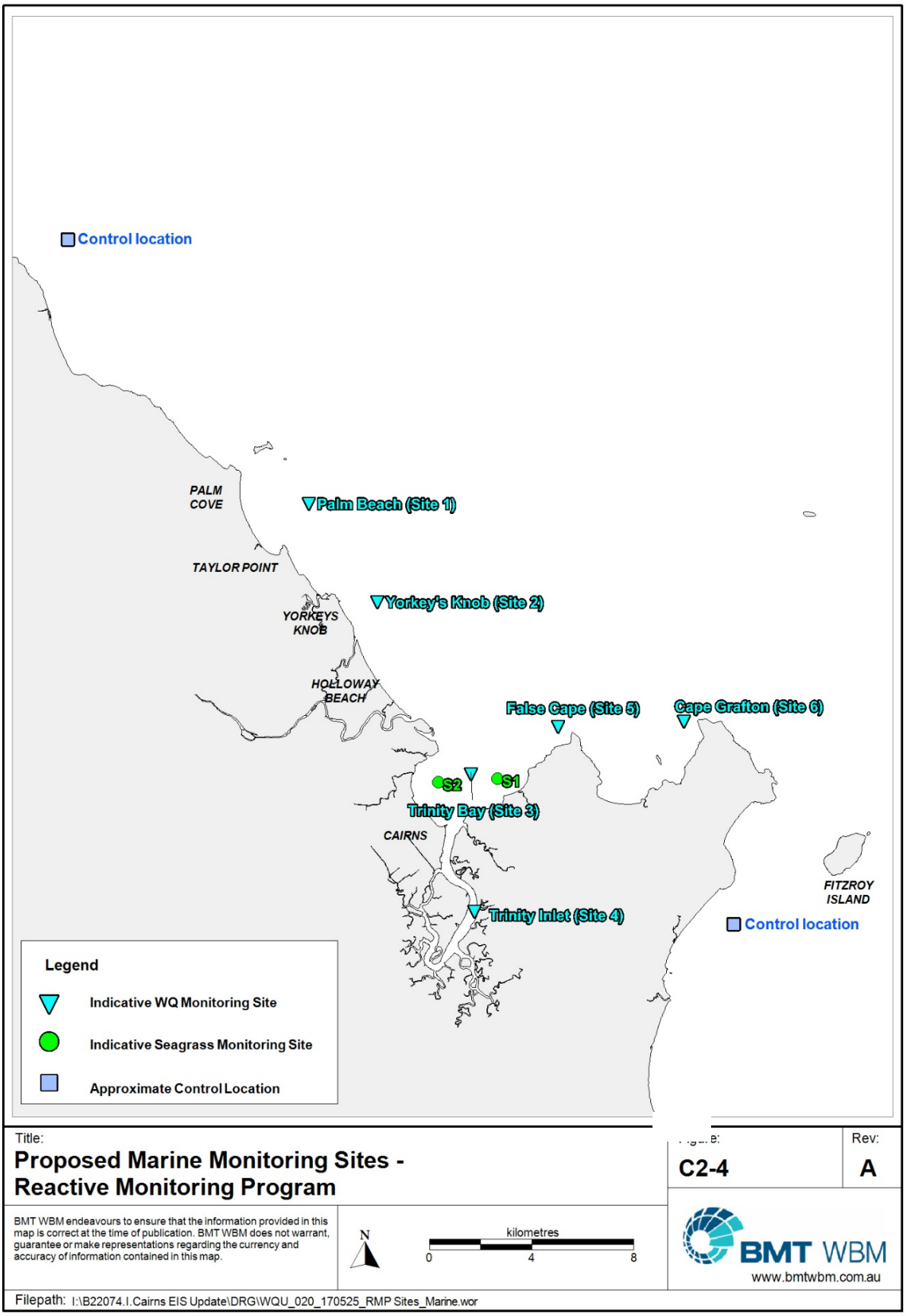

Figure C2-6 Proposed marine monitoring sites for Reactive Monitoring Program for capital dredging.

Corrective Actions for the Capital Dredging RMP

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 suspended sediments in a particular area to settle can be an important strategy to ensure seagrass and coral environments are obtaining necessary light to maintain photosynthetic processes. Dredging sensitive areas during night-time hours is also a potential mitigation assuming plume impacts are dispersing quickly.

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. 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).

Reducing Overflow Dredging

As outlined above, based on the revised draft EIS water quality modelling, overflow during dredging by the TSHD should be limited to durations no greater than the modelled most likely 'worst case' scenario which includes an average 30 minute overflow duration per cycle where the average overflow duration is calculated over a seven day period.

However, if water quality performance targets are not being achieved, additional reductions in overflow can be implemented by the dredge operator. While this will affect production of the dredge and extend the overall

duration of dredging, this strategy can be effective to reduce the extent and duration of plumes generated by dredging as well as reduce the overall amount of 'spilled' dredged material that is available for resuspension by natural wind and wave events.

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).

Tailwater Management RMP

The Tailwater Management RMP will address two potential impact issues identified in the revised draft EIS:

- the release of the supernatant dredge tailwater from the Barron River DMPA as surface water discharge (refer impact assessment and water quality modelling presented in Chapter B5, Water Quality)
- the passive release of the tailwater into surrounding groundwater through seepage from the Barron River DMPA dredge pit (refer impact assessment and hydrogeological modelling presented in **Chapter B1** (Land) and **Chapter B6** (Water Resources).

It should be noted that surface water quality and groundwater impacts are not predicted for mechanical placement of stiff material at the Tingira Street DMPA and as such are not dealt with here.

Tailwater - Surface Water Component

Indicative surface water quality monitoring locations for tailwater discharged from the Barron River DMPA are shown on **Figure C2-7** (tailwater sites).

These monitoring sites include:

- at the weir gate within the dredge placement ponds and/or tailwater pond(s) within the DMPA;
- at the return pipeline discharge point into the Barron River (WQ4 on **Figure C2-7**)
- at locations upstream and downstream of the discharge point in the receiving environment in the Barron River and Richters / Thomatis Creek systems.

These monitoring sites have been initially selected based on the locations of previous water quality data collection sites, and the outputs of water quality modelling with respect to areas potentially influenced by total suspended solids and salinity impacts from tailwater discharge.

As there are no seagrass or corals that are predicted to be affected by the proposed tailwater release, the focus of the monitoring programme will be on physical and chemical attributes of water quality. Water quality instruments capable of continuous logging of data for a range of parameters including turbidity, dissolved oxygen (DO), pH, salinity and conductivity will be deployed.

Additional, supplementary biotic monitoring of riparian vegetation communities, macroinvertebrate and fish could also be implemented as a secondary measure of detecting salinity impacts and as a possible post-project validation monitoring event. However, based on impact assessment modelling presented in Chapter B5, such impacts are unlikely to occur over the short time period and should be able to be adequately measured through water quality.

Accordingly, the RMP for tailwater management would operate with similar trigger levels to the Capital Dredging RMP but only for physico-chemical water parameters, setting out:

- Level 1 - Investigation Levels (Green) – This trigger level provides for an initial water quality assessment through comparison of monitoring data to derived triggers values and background conditions.
- Level 2 Management Response Level (Orange) – Exceedance of a level 2 trigger level means that corrective actions to control a water quality impact are needed. There are several practical mitigation measures and corrective actions that can be employed to manage tailwater impacts including:
- Installation of baffles and silt curtains in sedimentation ponds to reduce suspended solid concentrations;
- Use of flocculants and similar agents to reduce suspended solid concentrations;
- Use of lime and similar agents to raise/lower pH and reduce acidity/alkalinity;
- Aerating surface waters if algal blooms or other nutrient related blooms are detected;
- Discharging on outgoing tides to reduce salinity ingress upstream; and
- Increasing retention time in the DMPA prior to discharge to induce greater settlement of suspended solids and/or allow receiving water quality to return to background conditions
- A Level 3 Compliance Level (Red) – whereby dredge tailwater would not be permitted to be released from the site until relevant discharge and/or receiving water quality performance targets can be met.

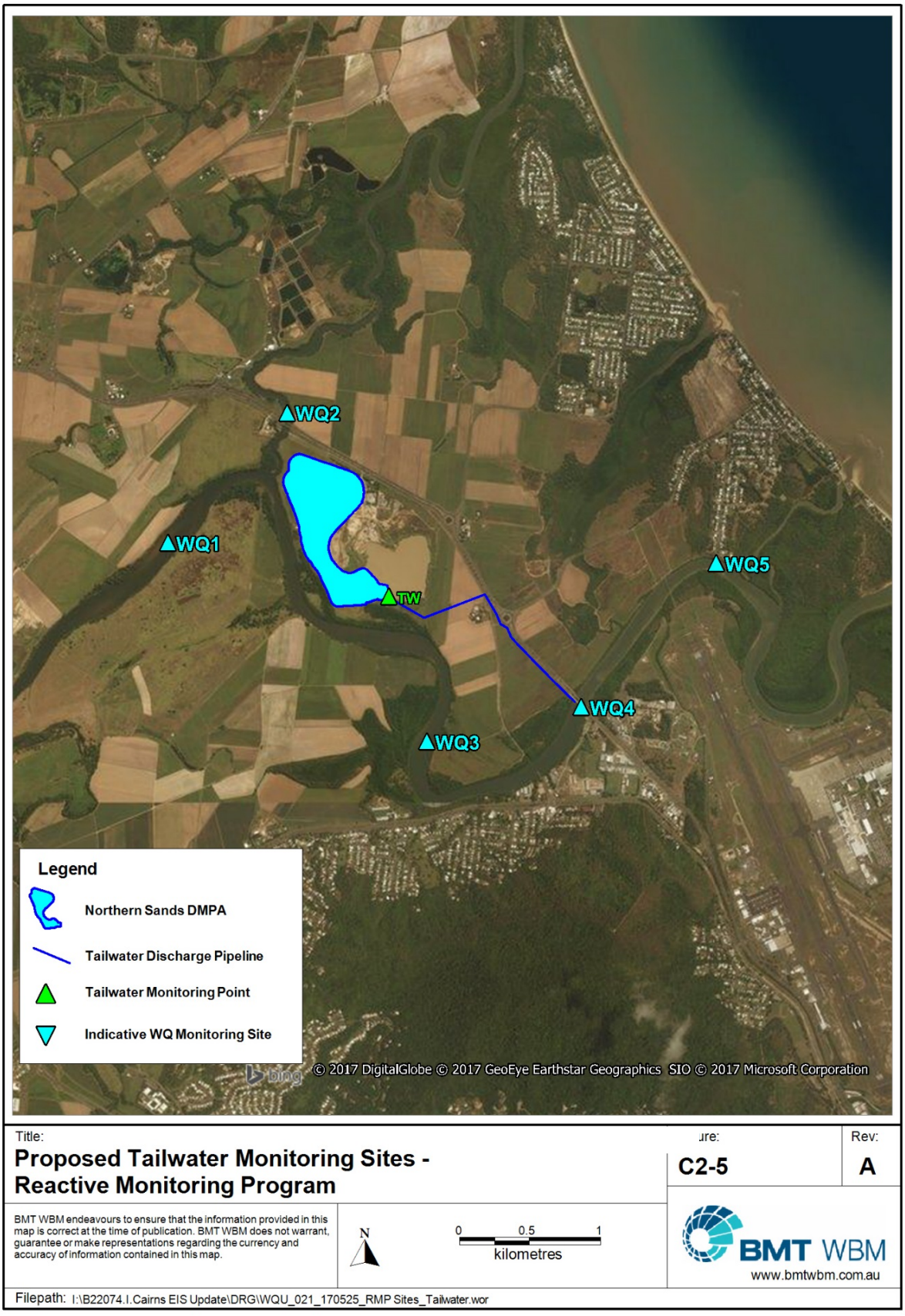

Figure C2-7 Proposed surface water monitoring sites for Reactive Monitoring Program for tailwater.

Tailwater – Groundwater Component

Risks associated with potential impacts related to groundwater are assessed to be predominantly low, with a likely minor impact on water quality in the upper unconfined aquifer leading to a moderate risk. With reference to the modelling discussed in **Chapter B1** (Land) and **Chapter B6** (Water Resources) and **Appendix AK** (Groundwater Impact Assessment – Northern Sands), these impacts are likely to be limited to a distance of 80 m to 120 m from the placement area.

The primary mitigation for managing saline intrusion into groundwater as will be to limit the water level in the lake until sufficient dredged material has been placed in the lake to create a low permeability barrier between the saline water in the lake, and the surrounding aquifer.

Groundwater monitoring will be carried out to assess changes in water level and water quality parameters, to assess whether such changes are within the expected range. The proposed groundwater monitoring network will make use of some of the existing monitoring bores at the site, and will also include additional bores located around the perimeter of the lake. The location of the existing and proposed monitoring bores is illustrated on **Figure C2-8**.

The groundwater monitoring network will be used to collect both groundwater level and water quality data prior to, during, and after placement of dredged material. Pressure/electrical conductivity transducers will be installed in selected bores to enable near real time monitoring of groundwater level, electrical conductivity and pH and to allow a greater understanding of the natural variability of these parameters. Trigger levels for water level and water quality parameters will be set relative to background values established through the pre-dredging period, and based on the predicted changes in water level and salinity.

Details of the proposed monitoring and sampling for different phases of the program are summarised in **Table C2-4**.

TABLE C2-4 GROUNDWATER MONITORING

Monitoring Phase	Parameter	Sampling Frequency
12 months[1] prior to placement of dredged material	Water Level	Hourly (data logger) and manually during monthly sampling events
	Electrical Conductivity and pH	Hourly (data logger) and monthly during sampling events
	Field physicochemical parameters (EC, pH, DO, Redox, Temp)	Monthly during sampling events
	Major Ions	Monthly
	Metals (Total / Dissolved)	Monthly
During placement of dredged material	Water Level	Hourly (data logger) and manually during monthly sampling events
	Electrical Conductivity and pH	Hourly (data logger) and monthly during sampling events
	Field physicochemical parameters (EC, pH, DO, Redox, Temp)	Weekly during sampling events
	Major Ions	Weekly
	**Metals (Total / Dissolved)	Weekly
24 months after placement of dredged material[2]	Water Level	Hourly (data logger) and manually during monthly sampling events
	Electrical Conductivity and pH	Hourly (data logger) and monthly during sampling events
	Field physicochemical parameters (EC, pH, DO, Redox Temp)	Monthly during sampling events
	Major Ions	Monthly
	**Metals (Total / Dissolved)	Monthly

**The need for on-going metal analysis will be assessed based on background concentrations and exceedances observed during filling. pH will be systematically monitoring and should pH values show a decrease to below 6, them metals testing would be recommenced.

A more detailed monitoring plan and approach to establishment of baseline values and trigger values will be developed in the detailed design phase.

[1] The duration of pre-work monitoring will be determined based on the adequacy of the baseline data set.

[2] The duration of post-work monitoring will be determined based on periodic review of results and the need for any corrective actions, noting a full 24 months of monitoring may not be required if the risk of impacts are considered negligible following an initial period.

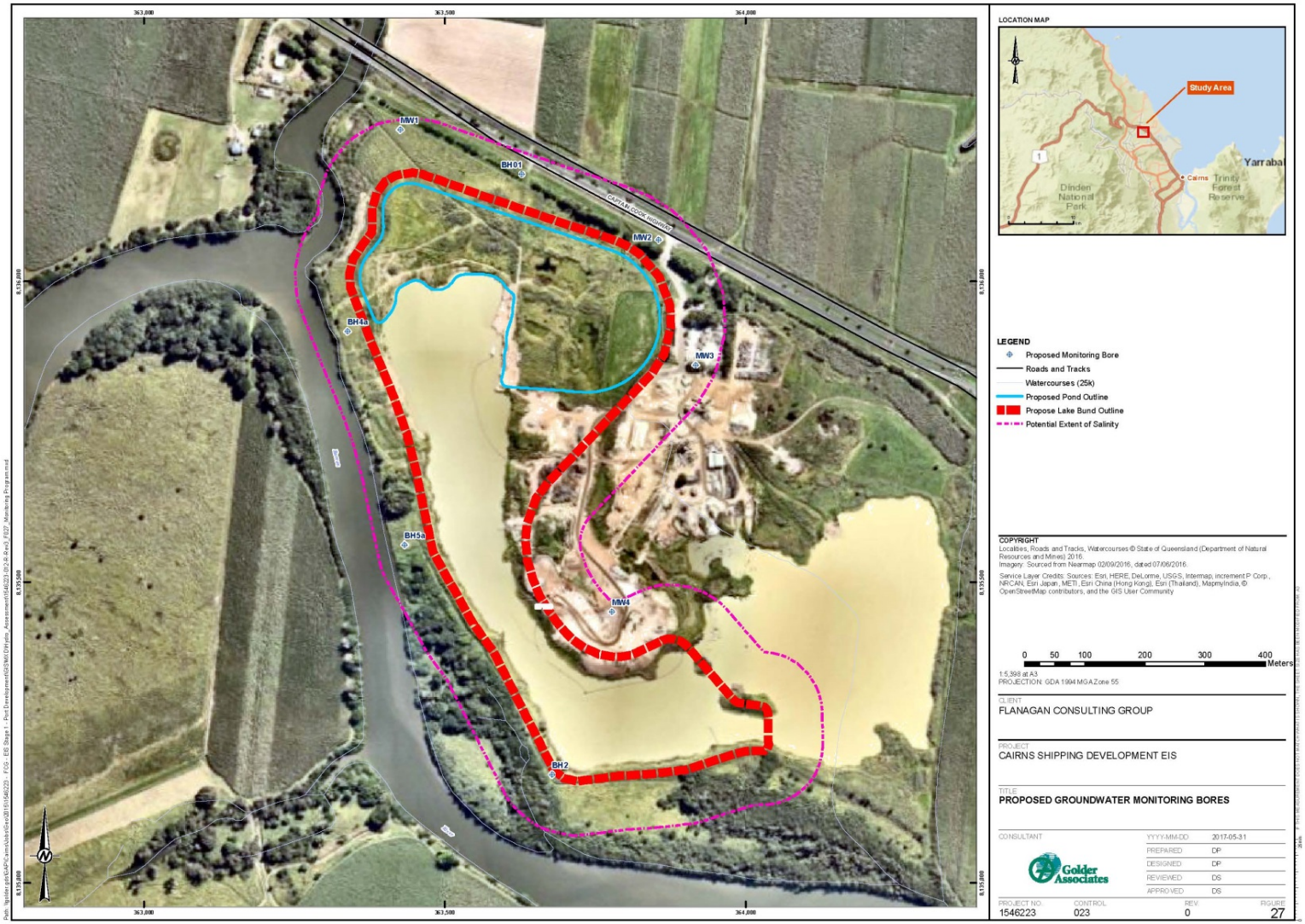

Figure C2-8 Proposed groundwater monitoring bores.

C2.8.2.c Establishing Trigger Values for the RMPs

The level of data collection and modelling investigations undertaken as part of the revised draft EIS are robust and in accordance with all relevant guidelines including the data collection and modelling guidelines including the 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 environmental values.

A summary of data collected to support the project (over the period covering the previous draft EIS up to the current revised draft EIS) are summarised in **Table C2-5**.

TABLE C2-5 BASELINE DATA COLLECTION

RMP Elements	Coastal (ADCP) Data	Surface Water Quality Data	Groundwater Data	Marine Ecology Data
Relevant EIS Chapter	Chapter B3	Chapter B5	Chapter B1, B6	Chapter B7
Capital Dredge RMP	12 + months collected at multiple locations from the previous EIS in Trinity Inlet and Trinity Bay	12 + months collected at multiple locations from previous EIS in Trinity Inlet and Trinity Bay Additional water quality data was collected at Double Island (nearest sensitive receptor to the pump out area)	n/a	Winter and summer surveys and data has been collected (includes seagrass sampling by JCU Trop Water in 2015/6) Additional data collected along the Northern Beaches and in the proximity of the pump out location and pipeline alignment
Tailwater Management RMP	6+ months collected at Barron River Use of existing AQUIS EIS project coastal data set and calibrated model	Use of existing data set from the Aquis EIS project Additional 9 months[#] of baseline data collected in Barron River and Thomatis / Richters Creek	12+ months of groundwater level and quality data from bores within or adjacent to the Northern Sands DMPA site	Winter and summer marine ecology and riparian vegetation data has been collected in the Barron River Use of Aquis EIS project ecology data on the Barron River (prepared by FRC environmental)

[#] The remaining 3 months of water quality data for the Barron River precinct is being collected in parallel with the finalisation of the draft EIS

Final water quality and ecological trigger values to support the RMP are not proposed to be set within the revised draft EIS as they will be agreed as part of the detailed approvals phase (as part of the State's approval process for ERA 16) should the EIS be approved. The final triggers will also be augmented by further baseline monitoring just prior to commencement of dredging. The final water quality and ecological trigger values will also be reviewed for input by scientific experts as part of the Expert Advisory Panel.

That said, 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, the data from the control sites will be assessed to see if the exceedance at the compliance monitoring sites is naturally occurring or attributable to the dredging or tailwater management activity.

C2.8.2.d Expert Advisory Panel

It is proposed that the RMPs 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 the project appointed by 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
- Commonwealth Department of Environment and Energy and/or GBRMPA
- Queensland Department of Environment and Heritage Protection (or successor in title)
- Queensland Department of Agriculture and Fisheries (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 and marine plants, 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
- 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.

C2.8.2.e Validation Monitoring Programs (VMPs)

This section conceptually outlines the Validation Monitoring Programs (VMP). The VMPs will also be reviewed by the Expert Advisory Panel.

Capital Dredge 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 the TSHD and BHD 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
- BHD dredging in the inner port and inner channel

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.

Biological Validation

The Validation Monitoring Program (VMP) will monitor seagrass and corals as biological indicators of changes to marine ecosystems as well as macroinvertebrate communities. Negligible impacts are expected to other ecological receptors (i.e. fish, prawns, mangroves etc.), and for this reason, will not be monitored in the VMP.

The EIS predicts that benthic macroinvertebrate communities within and directly adjacent to the dredging area 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 placement activities.

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 carried out by JCU and understanding of presence of reliable meadows suitable for such monitoring.

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.

Tailwater Management Validation

The Tailwater Management VMP will seek to validate the following modelled predictions in the revised draft EIS as follows:

- Modelled extent and concentrations of TSS (and corresponding NTU values) from tailwater discharge in the Barron River and Thomatis / Richters Creek system.
- Modelled extent and concentrations of salinity from tailwater discharge in the Barron River and Thomatis / Richters Creek system.
- Modelled groundwater seepage and associated salinity that may extend radially from the DMPA into surrounding lands and waters, particularly in the early stages of dredge material placement at the Barron River DMPA.
- Confirmation of the reduction in groundwater seepage from the Barron River DMPA as a result of reduced permeability/smothering effects of the placed dredge clays.
- Confirmation of impact predictions for surface and groundwater at the Tingira Street DMPA.

C2.8.1 Marine Megafauna

This section outlines requirements that are to be met associated with the management of potential interactions between dredge equipment and marine megafauna. These are documented in **Chapter B7** (Marine Ecology). Management of underwater noise from marine piling and other construction activities associated with the CSDP are addressed in **Chapter C1** (Construction Environmental Management Plan).

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 are to include the provision for standing-by until marine mammals pass, and/or altering course to provide a 300m exclusion zone to such fauna. Dredging operations shall be amended where these fauna are observed within the 300m caution zone 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	

C2.8.2 Marine Sediment Quality

This section outlines requirements that are to be met associated with marine 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** (Marine 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
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 prior to placement.

C2.8.3 Dredge Pipeline – Terrestrial and Aquatic Ecology

This section outlines requirements that are to be met associated with installation and operation of the dredge pipeline and associated impacts on terrestrial and aquatic ecology at or near the beach and along the pipeline alignment to the Northern Sands DMPA. These impacts and mitigations are documented in **Chapter B8** (Terrestrial Ecology).

Objective	To protect environmental values of terrestrial and aquatic ecology that may be affected by the temporary dredge pipeline installation and operations
Potential Impacts	Impacts to terrestrial flora and fauna habitats including protected plants and animals Impacts to aquatic flora and fauna habitats including marine plants such as mangroves and saltmarsh
Performance Criteria	Impacts are avoided, minimised or otherwise reduced to an acceptable level. Disturbed areas are fully remediated and restored following the completion of the works
Monitoring & Reporting	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
As part of the detailed design phase, undertake detailed planning and flora survey to consider further minimisation of vegetation clearing along the pipeline route	Dredge contractor	Prior to undertaking the works	Ensure provision is made to allow these additional surveys and investigations to occur and be considered as part of the detailed design phase
Implement the following standard measures to protect flora and fauna • Standard soil and water management (i.e. an Erosion and Sedimentation Control Plan will be prepared to guide all earthworks). • Standard measures to avoid injuries to fauna species during construction such as the covering of holes / cavities overnight, and/ or provision of ladders to enable fauna to escape the hole should they fall, together with standard responses (e.g. contact details and arrangements). • Site inductions (during construction, commissioning and operation, all staff should undertake an environmental site induction which canvasses the flora and fauna values of the site, and actions to minimise impacts). • Implement controls for the management of fuel oils or similar hazardous material associated with equipment and operation (including booster pumps)	Dredge contractor	During installation and operation	Ensure contractor plans address terrestrial ecology issues as outlined in this element If erosion and sediment control measures are ineffective and/or an unintentional release of contaminant occurs, review of procedures and rectify immediately.
Ant Plant Due to the high frequency of occurrence of *M. beccarii* (Ant plant) within the mangroves associated with Richters Creek pipeline crossing and *Melaleuca* wetland areas, it is unlikely that clearing of this species can be completely avoided. As a mitigation measure, it is recommended that any individuals that are to be directly impacted are translocated to suitable nearby habitat.	Dredge contractor (Flora and Fauna Contractor)	Prior to undertaking the works and during installation	Ensure the contractor undertakes survey prior to carrying out the works Implement and undertake monitoring to determine the success of this mitigation measure

Implementation Strategies	Responsibility	Timing	Corrective Action
Beach Stone Curlew Due to the likely presence of breeding *E. magnirostris* (Beach stone-curlew) at the mouth of Richters Creek, construction work should be planned so that the construction of this section of the delivery pipeline is completed outside of the breeding season for this species (September to February). Ensure the original landform and soil profile is in place when construction is completed, to ensure that habitat quality and soil stability are encouraged.	Dredge contractor	Prior to undertaking the works As part of de-mobilisation works	Ensure contractor does not operate during breeding season (as far as practicable) Ensure the landform is restored as part of the decommissioning phase of the works
Spectacled Flying Fox To minimise impacts on *P. conspicillatus* (Spectacled flying fox), any new fences should have a plain wire as a top strand, rather than barbed wire to reduce the risk of entanglement. This mitigation will reduce the consequence and likelihood of risk of impact on this species. The night works proposed at the Northern Sands project area may have a temporary impact on the foraging behaviour of this species. Although this impact is likely to be minor to negligible, it is recommended that, if possible, works should be completed outside of the flying fox breeding season (October to December) where practicable to minimise any impact due to changes in foraging effort on breeding success.	Dredge contractor	During installation	Ensure the contractor has implemented the required action and audit where necessary as part of site supervision Minimise operations during breeding season (if possible)
Rehabilitation of all areas of natural vegetation, beach and landforms that are to be cleared or modified for the construction of the inlet and tailwater pipelines. This includes all associated site preparation.	Dredge contractor	As part of de-mobilisation works	Ensure the landform and vegetation is restored as part of the decommissioning phase of the works

C2.8.4 Dredge Pipeline – Erosion and Sediment Control

This section outlines requirements that are to be met associated with installation and operation of the dredge pipeline along the beach and foreshore, along the terrestrial pipeline alignment corridor, across Richters Creek and into the Northern Sands DMPA. It related to matters in **Chapter B1** (Land), **Chapter B5** (Marine Water Quality) and **Chapter B3** (Coastal Processes).

Objective	To minimise the release of sediments or other contaminants into waters from the installation and operation of the dredge pipeline (note that leaks or other incidents are addressed in **Section C2.8.12**) To avoid or otherwise minimise impacts on coastal processes from installation and operation of the dredge pipeline
Potential Impacts	Release of sediment, wastes, degreasers or wash down materials into the environment. Localised impacts on coastal processes from the pipeline including scour, erosion and/or accretion
Performance Criteria	Application of best practice erosion and sediment controls (ESC) Regular inspection of ESC measures and devices No inappropriate use of degreasers, fuels, oils or wash down in sensitive environments.
Monitoring & Reporting	Visual inspection for sedimentation and any discharge or contamination of waters, particularly after rain events Visual monitoring of beach processes and any associated erosion or accretion as a result of the pipeline Notification and response to any spills or contaminants releases

Implementation Strategies	Responsibility	Timing	Corrective Action
Assess and implement appropriate erosion and sediment controls along the pipeline route, and at the crossing of Richters Creek to minimise erosion of soils and associated impacts on water quality.	Dredge contractor	During installation and operation	Ensure the contractor has implemented the required action and audit where necessary as part of site supervision
Undertake appropriate ASS investigation of the pipeline alignment and manage any excavation or filling in accordance with an ASS management plan	Dredge contractor	Prior to works as part of detailed design phase During installation and operation	Ensure the contractor has implemented the required action and audit where necessary as part of site supervision
Implement controls for the management of fuel oils or similar hazardous material associated with equipment and operation (including booster pumps)	Dredge contractor	During installation and operation	Ensure the contractor has implemented the required action and audit where necessary as part of site supervision If an unintentional release of contaminant occurs, review of procedures and rectify immediately.
Monitor and take corrective actions if the pipeline is having observable adverse impacts on coastal morphology (erosion, accretion, etc.). This should also include appropriate scour protection at the tailwater discharge point into the Barron River.	Dredge contractor	During installation and operation	Ensure the contractor has implemented the required action and audit where necessary as part of site supervision
Rehabilitation of all areas of natural vegetation, beach and landforms that are to be cleared for the construction of the inlet and tailwater pipelines. This includes all associated site preparation.	Dredge contractor	As part of de-mobilisation works	Ensure the landform and vegetation is restored as part of the decommissioning phase of the works

C2.8.5 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	

C2.8.6 Marine Pest Incursion Management

This section outlines requirements that are to be met by the dredge contractor associated with hull fouling and 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 and Water Resources (DAWR) 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 DAWR 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 de-ballasting 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 de-ballasting 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 DAWR 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 DAWR and Australian Quarantine regulations • Hull inspections to be carried out if requested by DAWR for attached marine pests. Works to not commence until ships and plant certified as free of marine pests to DAWR standards.	Dredge contractor	At all times during dredging operations and carriage	
Leaving Port of Cairns: • When leaving the port of operations, all relevant DAFF rules pertaining to hull fouling and ballast water management are complied with.	Dredge contractor	Upon completion of all dredge operations	

C2.8.7 Vessel Waste Management

This section outlines requirements to manage wastes generated from or incidental to the dredging operations. It is separated into three categories: (i) Solid waste and garbage, (ii) Sewage, and (iii) Hazardous waste.

C2.8.7.a 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	

C2.8.7.b 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	

C2.8.7.c 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	

C2.8.8 Fuel Management

This section outlines requirements that are to be met associated with the bunkering of fuel by the dredge vessel and booster pumps 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. To ensure management of fuel provision and storage to booster pumps is 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 the *Emergency Planning and Procedures* element (refer **Section C2.8.12** below)
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	
Fuel storage and management for dredge booster pumps is in accordance with best practice standards	Dredge contractor	As required	

C2.8.9 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 the public from dredging, dredge pump out and the operation of booster pumps
Performance Criteria	There are no or minimal 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 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	
Noise sensitive receptors should be informed of any out-of-hours construction works in advance (preferably at least one weeks' notice, except for emergency works) of works occurring	Dredge contractor	At all times	
Ensure that the following measures are implemented in relation to the **dredge booster pumps** – • The pumps are sited as far as practicable away from sensitive noise receptors • Enclose the pumps with an acoustically robust enclosure including internal acoustic absorption. • Fitting industrial mufflers • Selection of alternative (quieter) or over-specified equipment (allowing lower operating speeds for the same throughput) plant • The pumps are enclosed as far as practicable to reduce and/or muffle noise impacts during operations • Planned maintenance, refuelling, and similar activities occur outside of sensitive night time noise periods	Dredge contractor	At all times	
Ensure that the following measures are implemented in relation to the **tailwater pumps** – • Enclose the pumps with an acoustically robust enclosure including internal acoustic absorption • Installation of temporary noise barriers or earth bunding • Locating the pump further away from receptors • Using smaller pumps in series • Selection of alternative (quieter) or over-specified equipment (allowing lower operating speeds for the same throughput) plant	Dredge contractor	At all times	

Implementation Strategies	Responsibility	Timing	Corrective Action
Ensure that the following measures are implemented in relation to the **pipeline construction and decommissioning** – • Selection of the quietest available plant (excavator and dozers) which is suitable for performing the construction and decommissioning work • Communication with stakeholders should be undertaken prior to and during pipeline construction and decommissioning work. A pipeline construction and decommissioning plan should be developed, determining where noise generating activity will occur along the length of the pipeline route, when this work will occur and the likely duration of the work	Dredge contractor	At all times	
The contractor staff are aware of noise requirements within relevant permits and/or approvals.	Dredge contractor	At all times	

C2.8.10 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 or minimal complaints lodged from the public or port users about air quality associated with dredge operations including booster pump 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	

C2.8.11 Landscape and Lighting

This section outlines requirements that are to be met with regard to landscape and lighting requirements.

Objective	To protect the landscape and visual values of the locality during construction and operation of the dredging and pipeline
Potential Impacts	Temporary impacts on landscape and visual amenity values from dredge construction and operation
Performance Criteria	There are no or minimal complaints lodged from the public or port users about landscape and visual amenity issues Engagement with community where complaints have been lodged
Monitoring & Reporting	Review of site construction details and plant location as part of site supervision including the potential to screen plant from public view Following installation, review of light spillage from construction activities (mooring, pipeline, boosters) on sensitive receptors

Implementation Strategies	**Responsibility**	**Timing**	**Corrective Action**
Implement the following measures: • Directed lighting will be used at wharf construction site and the DMPAs to minimise glare and light spill. • Lighting of compounds and works sites will be restricted to agreed hours and in accordance with safe navigation requirements • Regular maintenance of site hoarding and perimeter site areas will be undertaken, including the prompt removal of graffiti. • Where feasible, construction plant, materials & machinery will be screened behind fencing or located to minimise visual impacts. • A community engagement program to manage amenity impacts at the delivery pipeline landfall site at the mouth of Richters Creek (southern part of Yorkeys Beach).	Dredge contractor	At all times	Ensure the contractor has implemented the required action and audit where necessary as part of site supervision

C2.8.12 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 that are also addressed in **Chapter C3** (Vessel Transport Management Plan).

Objective	To identify and reduce the potential for an environmental incident before it occurs so as to prevent damage to the surrounding environment and the public.
Potential Impacts	Environmental incidents, including release of contaminants, such as oils and fuels, into the environment Pipeline blow outs or leakage resulting in saltwater intruding into terrestrial environments
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 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
A risk assessment regarding potential environmental incidents that could occur during the dredge operation (dredging, mooring, pumping, pipeline operations) 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	Review and endorsement of the risk assessment as part of the contractor management plans
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	Review and endorsement of the management plans as part of the contractor engagement If an incident occurs, review procedures and rectify immediately Implement contingency and/or clean-up procedures as set out in relevant plans
A management plan is prepared for terrestrial pipeline operations that addresses: • Pipeline leakage or blow out and prospective leakage into the terrestrial environment • Booster pump fuel leaks and/or storage of fuels in hazard areas (avoiding areas prone to flood or storm surge)	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	

C2.9 Additional References

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