FLANAGAN CONSULTING GROUP
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Ports North

CAIRNS SHIPPING DEVELOPMENT PROJECT

Revised Draft Environmental Impact Statement

Chapter A3: Project Description

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A3.1 Project Overview

A3.1.1 Project Objectives

Ports North has identified the following objectives for the CSD project:

- implementation of the project in an environmentally and socially responsible manner
- establish a viable and sustainable cruise shipping operation for Cairns to foster tourism and enable and enhance local business opportunities
- Enabling future expansion of the HMAS Cairns Navy base by relocating the existing main swing basin
- enhance market opportunities for the growing cruise shipping industry to provide economic benefits and jobs for the region and for Queensland
- provide benefits to broader port shipping operations through improved channel efficiency
- ensure that dredge material is managed and placed with the least environmental impact, no human health impacts and without cost disproportionality
- improve passenger safety by reducing the number of passengers being ferried ashore at Yorkeys Knob.

By undertaking this Revised Draft EIS, the proponent is providing an assessment of environmental, economic, and social considerations to enable an informed and balanced decision on the future of the Project by approval authorities.

A3.1.2 Project Details

A3.1.2.a Project Location

The Port of Cairns is situated on the western bank of Trinity Inlet, a mangrove-lined estuary to the east of the city of Cairns, Queensland. The Port lies on the border of the Cairns CBD. The land immediately surrounding the Port has a mix of industrial and commercial uses. There are a number of residential apartments and short term accommodation options in close proximity to the Cairns Cruise Liner Terminal. There are also a number of people who live aboard boats moored in the Inlet. East Trinity, an undeveloped environmental reserve lies opposite the Port on the eastern side of Trinity Inlet, and the fringing mangroves and distant hillslopes provide a green backdrop to the city of Cairns. The current Port of Cairns navigational channel extends into Trinity Bay, which forms part of the Coral Sea.

Refer to **Figure A3-1** which shows the project location and surrounding land uses.

A3.1.2.b Project Elements

The revised project involves upgrading the following port infrastructure to enable larger cruise ships greater than 300 m in length to berth at the Port of Cairns:

- **Marine works** to widening and deepen of the shipping channel and Crystal swing basin, and establishment of a new shipping swing basin (Smith Creek Swing Basin) upstream of the existing Main Swing Basin involving:
  - Capital Dredging works involving removal of up to 1 000 000 m^3 of dredge material consisting of up to 900 000m^3 of soft clays to be removed by a Trailer Suction Head Dredge (TSHD) and 100 000m^3 of stiff clays to be removed by a Back–Hoe Dredge (BHD).
  - Construction of a temporary pump out facility located between 2.7 and 3.7 km offshore from Yorkeys Knob.

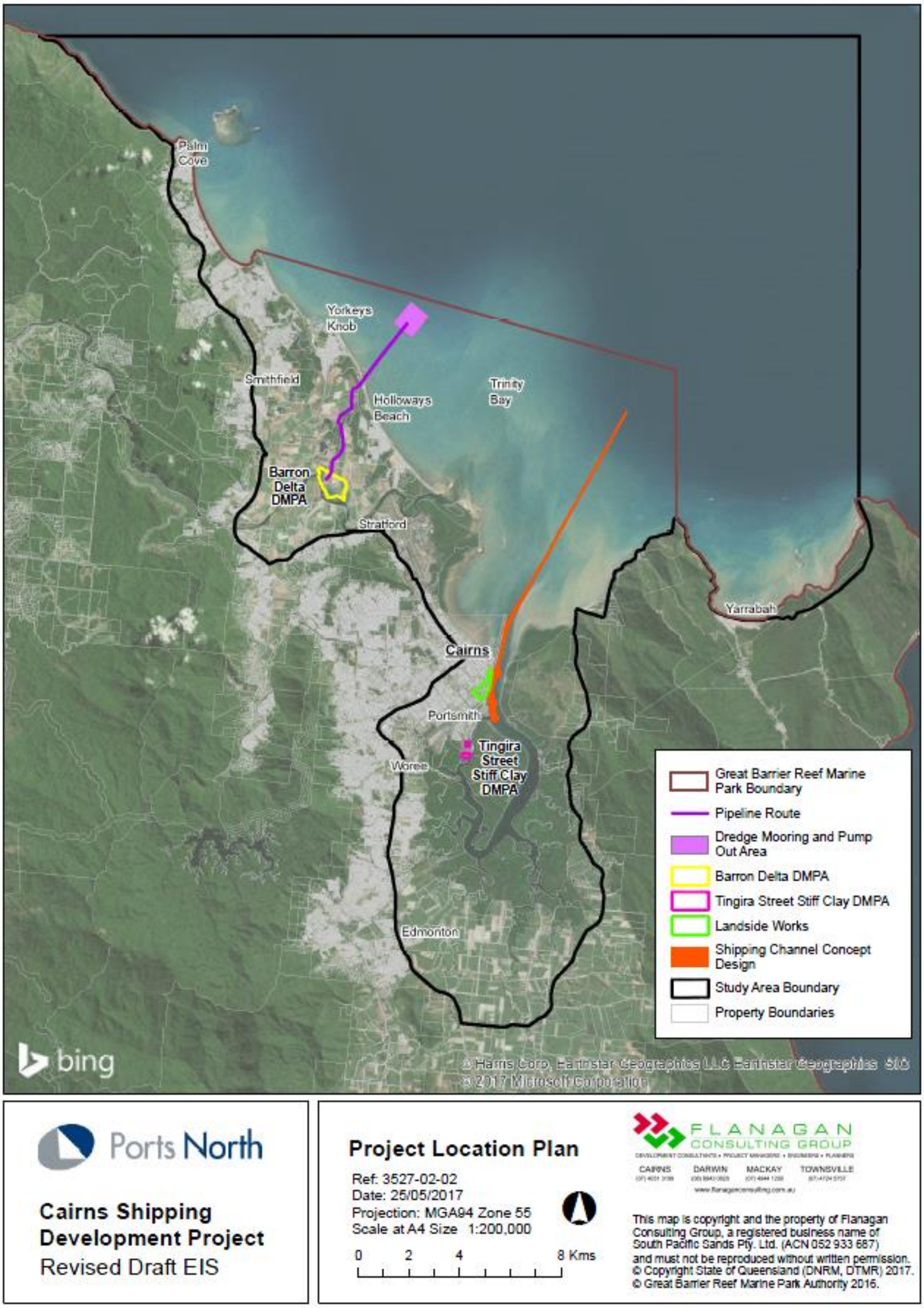

Figure A3-1 Project location plan.

- **Delivery and placement of dredged material** to land based Dredge Material Placement Areas (DMPAs) including:
  - Construction of a temporary Dredge Material delivery pipeline from the pump out facility to the soft clay DMPA on the Barron Delta.
  - Placement of soft clay dredge material at the Barron Delta DMPA located on Lot 2/RP712954 and Lot 5 on SP245573
  - Placement of stiff clay dredge material at the Tingira St DMPA established on Port Land (Lot 27/SP 218291) located at Tingira St, Portsmith
- **Ancillary infrastructure/services upgrades** including:
  - Relocation of existing and installation of new navigational aids.
  - Fender system upgrade to the existing cruise shipping wharves 1-5 to accommodate larger and heavier cruise ships. Decommissioning of Wharf 6 including retention and upgrading of key bollards and retention of representative historic elements
  - Upgrade of ship services to the cruise shipping wharves, including Intermediate Fuel Oil (IFO), potable water and fire-fighting services

Maintenance dredging including minor increases as a result of the project (2-6%) will continue to occur at the existing sea disposal site.

A3.2 Marine Works

A3.2.1 Channel, Swing Basins and Wharf Berths

The upgrade of the channel, swing basins, wharf berths includes the following elements (as shown on **Figure A3-2**):

- the extent of the widening varies over the channel, with the outer channel being widened up to 10 m to a new maximum width of 100 m and inner channel widened by 20 m up to a new width of a 110 m. The declared depth will be increased from 8.3 m to 8.8 m with a target design depth of -9.1 to -10.3 m lowest astronomical tide (LAT) to cater for the annual siltation for the outer channel
- in the bend of the channel, further widening will be carried out to a maximum width of 180 m to provide safe manoeuvring space for the cruise vessels while passing through the bend
- the Crystal Swing Basin diameter will be deepened to a declared depth of -8.8 m LAT outside the direct channel alignment
- a new Smiths Creek Swing Basin to allow for expansion capability of HMAS Cairns
- the declared depth of the berth pockets will be -9.3 m LAT, with a width of 50 m.

As per the existing approved channel the proposed design will include stable profiles for the batter slopes outside of the nominated widths stated above. The channel side slope batters extend from the proposed navigable channel bed, outwards to the natural seabed level at a typical slope of 1 on 4.

As shown in **Table A3-1**, which provides a comparison of the existing and proposed channel depth, dredge depth (inclusive of insurance), channel widths and plan areas, the project will result in an increased channel footprint of 19%.

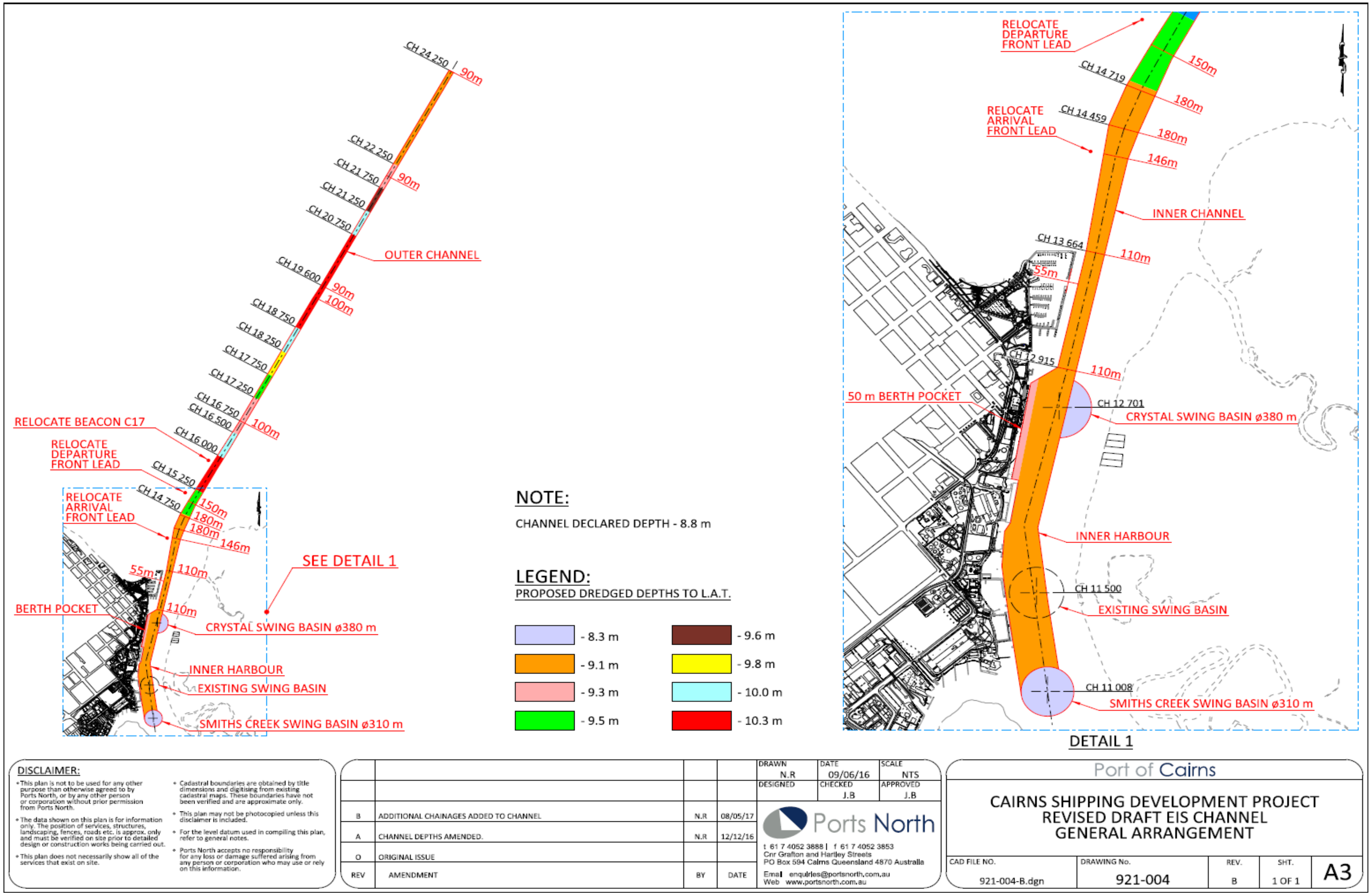

Figure A3-2 Proposed upgraded channel and swing basins.

TABLE A3-1 COMPARISON OF EXISTING AND CONCEPT DESIGN SPECIFICATIONS

CAIRNS SHIPPING DEVELOPMENT PROJECT — Terramodel File: 2017 Channel Widening Proposal - 100m Channel EIS Design Review 01-01-17.pro

CHANNEL PROJECT DESCRIPTION

Channel Segment (Listed North to South)	Chainage	Existing Design Declared Depth (m)	Proposed Design Declared Depth (m)	Existing Target Dredge Depth (m)	Proposed Target Dredge Depth (m)	Existing Width (m)	Proposed Width (m)	Existing Channel Plan Area (sq.m)	Proposed Channel Plan Area (sq.m)	% Area Increase
90m Outer Channel	24,250 - 19,600	8.3	8.8	9.0 - 10.0	9.1 - 10.3	90	90	418,417	418,417	0%
100m Outer Channel	19,600 - 16,750	8.3	8.8	8.8 - 10.0	9.3 - 10.3	90	90 - 100	256,500	283,750	11%
Transition to Bend	16,450 - 14,719	8.3	8.8	8.8 - 10.0	9.3 - 10.3	90 - 120	100 - 180	209,226	264,675	27%
Bend	14,719 - 14,459	8.3	8.8	8.3	9.1	120 - 150	180	34,619	46,670	35%
Transition to Inner Channel Widening	14,459 - 13,664	8.3	8.8	8.3	9.1	120 - 90	180 - 110	73,553	108,342	47%
Inner Channel Widening	13,664 - 12,915	8.3	8.8	8.3	9.1	90	110	67,618	82,400	22%
Crystal Swing Basin	12,701	6.3	8.3	6.3	8.3	380m dia	380m dia	39,015	39,015	0%
Inner Channel (Main Wharves Area)	12,915 - 11,500	8.3	8.8	8.3	9.1	90 - 195	110 - 240	221,770	259,555	17%
Existing Main Swing Basin	11,500	8.3	-	8.3	Relocated	320m dia	Relocated	80,425	Nil	Nil
New Inner Channel Extension	11,500 - 11,008	-	8.8	-	9.1	-	240	Nil	86,912	New
New Smiths Creek Swing Basin	11,008	-	8.3	-	8.3	-	310m dia	Nil	75,477	New
							Total Areas	1,401,143	1,665,213	19%

Notes:

1. All depths in metres below LAT
2. Design Declared Depth is the desired minimum depth declaration to be retailed throughout the year
3. Target Dredge Depth is the anticipated dredge depth to accommodate annual accumulation of siltation without encroaching above Design Declared Depth

A3.2.2 Capital Dredging Works

A3.2.2.a Characteristics of the Dredged Material

The characterisation of the physical and chemical properties of proposed dredged material was undertaken for the Draft EIS in accordance with a Sampling and Analysis Plan (SAP) prepared in accordance with requirements set out in the National Assessment Guidelines for Dredging (NAGD). Initial sampling took place in October 2013. Further grab samples were retrieved in November 2013. A total of 44 locations (14 inner port and 30 outer channel) were sampled in 2014 using piston and vibrocoring with supporting grab sampling in accordance with the SAP and NAGD requirements. As noted in Chapter B4 this data is considered to be representative of current conditions, given the absence of any changes in coastal processes and contaminant sources and inputs.

Additional geotechnical works in the areas of widening and deepening undertaken for this Revised Draft EIS include:

- 8 additional boreholes with the aim of recovering ‘undisturbed’ samples for assessment of undrained shear strength (by hand vane/penetrometer) plus geotechnical laboratory testing (i.e. Moisture Content, Bulk Density, Atterberg Limits and Particle Size Distribution). The boreholes were also aimed at recovering soil core for ASS testing (i.e. field screening and Chromium Suite testing
- grab sampling x 20
- 52 km of geophysics to assess depth to the soft clay/stiff clay interface.

The total volume of material to be dredged is approximately 1 000 000 m^3 consisting of 900 000 m^3 of very soft clay and 100 000 m^3 of stiff clays. The soft clays are up of approximately 320 000m^3 of Possible Acid Sulfate Soils (PASS) with the balance 580 00 m^3 self-neutralising PASS (SNP). Stiff clays have been confirmed as non-PASS.

Sands were encountered at number of inner harbour investigation locations to depths ranging from 0.2 to 0.75 m, typically underlain by very soft to soft silt/ clay at depth. Shell contents are inferred to range from about 20 to 40% of the total mass based on visual observations. The fines content (particle sizes < 75 µm) in the dredge material is expected to be greater than 90%. The depth of different classifications of material varies across the channel profile.

A3.2.2.b Dredging Methodologies

The channel will be dredged using two types of dredging plant. A Trailing Suction Hopper Dredge will be used for the soft to firm materials. A Backhoe Dredge will be used for the stiffer material. The dredging campaign will include the use of bed levelling plant to minimise dredge volumes. Alternative dredging plant and methodologies were explored but are not feasible due to operational and logistical constraints, nor where they beneficial in terms of environmental outcomes.

A3.2.2.c Soft Clay Dredging

The outer channel and parts of the inner port will be dredged using a Trailer Suction Hopper Dredge Vessel (TSHD). 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 steaming along the dredged areas. The trailing speed during dredging is in the order of 1 to 2 knots.

Examples of the TSHD vessels are shown in **Photo A3-1** and **Photo A3-2**.

Photo A3-1 Example of TSHD (TSHD *Marieke*).

Photo A3-2 Example of TSHD (TSHD *Capitan Nunez*).

For the CSD Project the size range of applicable TSHDs is determined by the existing seabed depths and turning room in the channel as well as required pumping power for the delivery to soft clay DMPA. A relatively shallow draft TSHD is required, with the ability to hold reasonably large amounts of dredged material in the hopper A medium-size TSHD of hopper capacity of about 5600 m^3 with suction pipe of 1.0 m diameter is anticipated for the soft clay dredging task. The loaded draft of a TSHD of this capacity is in the order of 6 m to 7 m. Consequently dredging has to be planned to commence at low tide at deeper areas and progress to shallow areas during high tide.

The dredging process for a TSHD involves the following sequences:

- position TSHD at the dredging area
- lower the suction pipe with draghead at the end
- dredging at draghead and hopper filling simultaneously while steaming
- when the hopper is filled to its capacity, TSHD will steam to the pump out point where the TSHD primes the delivery pipe with seawater, introduces hopper load with seawater dilution, pumps out the load and then flushes the delivery pipeline
- TSHD steams back to the dredging area.

Akuna Dredging have prepared a preliminary estimate (refer **Appendix AC)** which indicates that soft clay dredging activities (including land placement) are anticipated to take up to **12 weeks**. The TSHD will operate 24 hours per day, seven days per week.

In order to achieve full loads and minimise the number of dredging cycles and overall duration, operation of the dredge in controlled overflow mode will be required for part of the dredging campaign. Overflowing will only occur on approximately 50% of the dredge cycles. This is particularly necessary for the revised project due to the vastly reduced scale of the campaign which involves relatively shallow dredging cuts, a relatively high proportion of batter work and patchy areas of dredging between areas of the existing channel that are already at or near the required depth. Controlled overflow dredging will be required to:

- initially discharge the rest water held by the dredge after pump out and pipe flushing,
- to discharge volumes of water or very lean soil/water mix intermittently dredged between isolated pockets of high spots
- to generally to thicken up the hopper load to an optimum state
- to enable efficient dredging and reduced dredging duration.

Water quality modelling of likely best and likely worst overflow scenarios has been undertaken and it has been determined that controlled overflow will not result in water quality outcomes that would result in unacceptable ecological impact.

The controlled overflow scenarios comprise the following:

- Likely Best Case: soft silt and clay material - 10 minutes of controlled overflow dredging during approximately 50 percent of TSHD cycles with the balance of the cycles having no overflow dredging
- Likely Worst Case: soft silt and clay material - 30 minute overflow duration per cycle where the average overflow duration is calculated over a seven day period.

Controlled overflow dredging in excess of this amount is unlikely to be required or productive, however, additional mitigation and monitoring measures as outlined **Chapter C2** (Dredge Management Plan) will be employed to manage such activity and minimise potential impacts.

The average dredging production rate will be an estimated 50 000 – 80 000 m^3 (in situ) per week. The typical time it will take to dredge and pump to shore a typical load of very soft and soft clays will be 6 to 8 hours., It is anticipated that dredging of the outer channel and part of the inner port using the TSHD will require approximately 12 weeks (based on 80% utilisation) to complete dredging to the required design levels.

It may also be necessary to utilise a bed levelling tug to drag material from the shallow channel widening area on the western side of the channel into deeper channel waters to be picked up by the TSHD as well as in other areas where TSHD manoeuvring is challenged.

A3.2.2.d Stiff Clay Dredging

The firm to stiff clays in the inner port will be dredged using a Back Hoe Dredger (BHD). A BHD will be more efficient to dredge berth pockets, swing basins and other complex dredging areas. Therefore, a dredging fleet comprising BHD, barges, and tug boats is proposed for some areas of the inner port.

A BHD is a mechanical dredger, similar to an excavator which is mounted on a barge anchored by 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. When full the hopper barge will transport the dredge material to be unloaded and placed at the Stiff Clay DMPA located at Tingira St.

A medium-size backhoe dredger having installed power in the order of 700 to 1000 kW with bucket capacity of about 5 m^3 to 11 m^3 is proposed for the project. Examples of proposed BHD are shown in **Photo A3-3** and **Photo A3-4**.

Photo A3-3 Example of BHD (BHD *Machiavelli*).

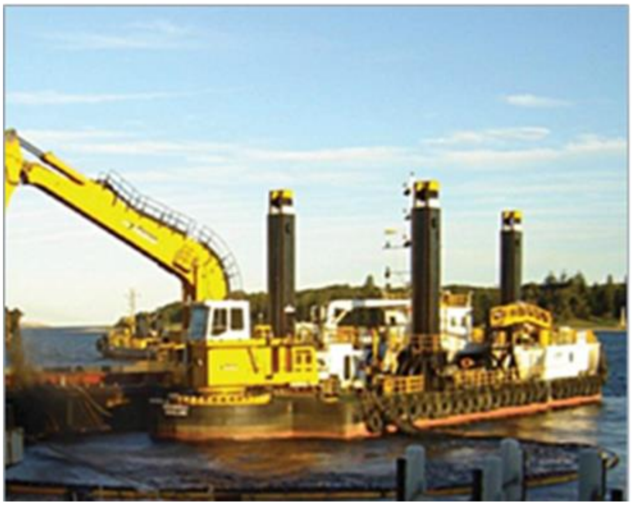

Photo A3-4 Example of BHD (BHD *Jerommeke*).

The BHD will be supported by two or three hopper barges of about 1000 m^3 capacity towed by tug boats.

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 off road haulage vehicles for short hauling then end dumping at placement site or transfer of skips to flat top haulage vehicles for dumping at placement site
- tug boat tow hopper barge back to the BHD.

The BHD will operate concurrently to the TSHD. Production rates and dredging and unloading sequences have been prepared by Ports North with input from dredging contractors and indicate a stiff clay dredging duration of **5 weeks**. Production rates in the stiff clay will be approximately 20 000 m^3 in-situ per week. The BHD process will operate 24 hrs per day, seven days per week and the sequence modelling confirmed this can be adequately maintained by two hopper barges and operate from one unloading ramp at any one time. A third hopper barge will likely be available on standby to maintain the dredging operation during any barge breakdowns or delays and a land placement site with two barge ramp and placement locations has been selected which provides further contingency to maintain operations during any unloading od placement delays.

A3.2.3 Dredge Material Delivery Pipeline and Offshore Pump Out Facility

A3.2.3.a Offshore Pump Out Facility

The dredge material pump out facility will be located between 2.7 and 3.7 km offshore from Yorkeys Knob as shown on **Figure A3-3**.

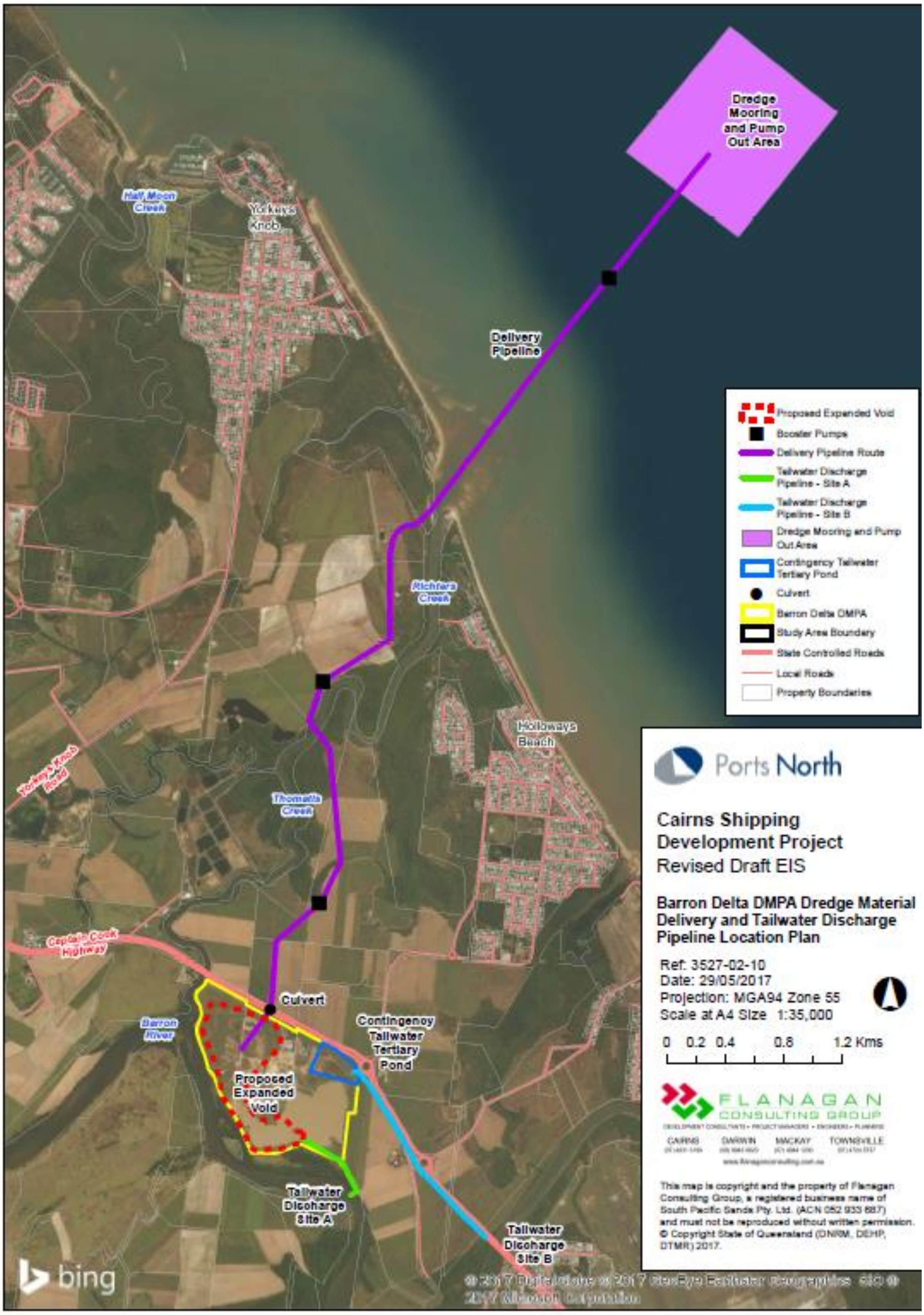

Figure A3-3 Soft clay dredge material pump out facility and pipeline route.

The pump out facility will involve a temporary mooring that will facilitate the connection of the TSHD via its bow coupling to a floating section of the dredged material pipeline (refer **Photo A3-5** and **Photo A3-6**).

Photo A3-5 TSHD connection to floating pipeline.

Photo A3-6 Booster pump.

The type of mooring used 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 (RHM). 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 RHM.

A3.3 Dredge Material Delivery and Placement

A3.3.1.a Dredge Material Delivery Pipeline – Soft Clay Dredging

The dredge material delivery pipeline route is shown on **Figure A3-3**. The route selected was preferred on the basis of least direct and indirect impacts to terrestrial and marine vegetation (clearing), farming operations, visual amenity and community infrastructure. The dredge material delivery pipeline from the offshore pump out facility is anticipated to consist of approximately 7.5 km of a 1 m diameter steel pipe (the final length will depend on the location of the pump out facility). The marine section of the pipeline will be submerged, whilst the landward section will be constructed above ground and suspended on low (<0.5 m) earthen plinths.

The submerged pipeline is typically not anchored, as it filled with seawater and / or dredged material at all times and holds its position on the seafloor through its self-weight. A riser which is a small section of flexible line will be used to bring the submerged pipe to the surface for connection to a floating line / connection point at the seaward end. A small section of floating pipeline (e.g. up to 50 m) may be used to connect the riser pipe to the TSHD depending on the type of mooring. A small pontoon/buoy anchored to the seafloor will be used to provide access to the surface end of the riser and to maintain its position.

Due to the location of the Barron Delta DMPA the TSHD alone will not have the capacity to pump the dredge material to the Barron Delta DMPA and consequently up to three booster stations may be required. These could include one floating booster station. The actual numbers of booster stations required will be subject to the available dredgers power capacity. Booster stations will be placed in cleared grassland areas or cane headlands in consultation with landowners, to minimise interference with farming operations. It may be necessary to locate the boosters within earthen acoustic bunds to ameliorate noise.

Some land based booster stations may 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 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 or tank can be established to recycle the water in a closed system to minimise demand and avoid releases to the environment.

The pipeline will make landfall immediately north of the mouth of Richters Creek and is anticipated to utilise an existing clearing through a mangrove community to connect with the first booster station. It will then traverse grasslands/fallow cane land to an upstream crossing of Richters Creek located at the narrowest section of fringing mangroves. It will then traverse fallow cane lands and cane headlands as much as possible Crossing of the Captain Cook Highway to the DMPA will utilise existing drainage culverts. Flexible riser piping will be necessary to pass over the earthen bund around the DMPA. The riser will then connect to lateral piping via a manifold and a number of spigots terminating in diffusers to assist in even placement of the material in the DMPA.

A3.3.2 Dredge Material Placement Areas (DMPA)

A3.3.2.a Soft Clay DMPA

The Barron Delta DMPA is located on Lot 2/RP712954 and Lot 5 on SP245573 which is flat land in the Barron Delta which contains an operating sand quarry and waste disposal and processing facility operated by Northern Sands. The location of the Barron Delta DMPA is shown on **Figure A3-1**.

The operation will consist of underwater placement of soft clay dredge material within the quarry void created by sand extraction operations. A conceptual diagram of the DMPA operation is shown on **Figure A3-4**.

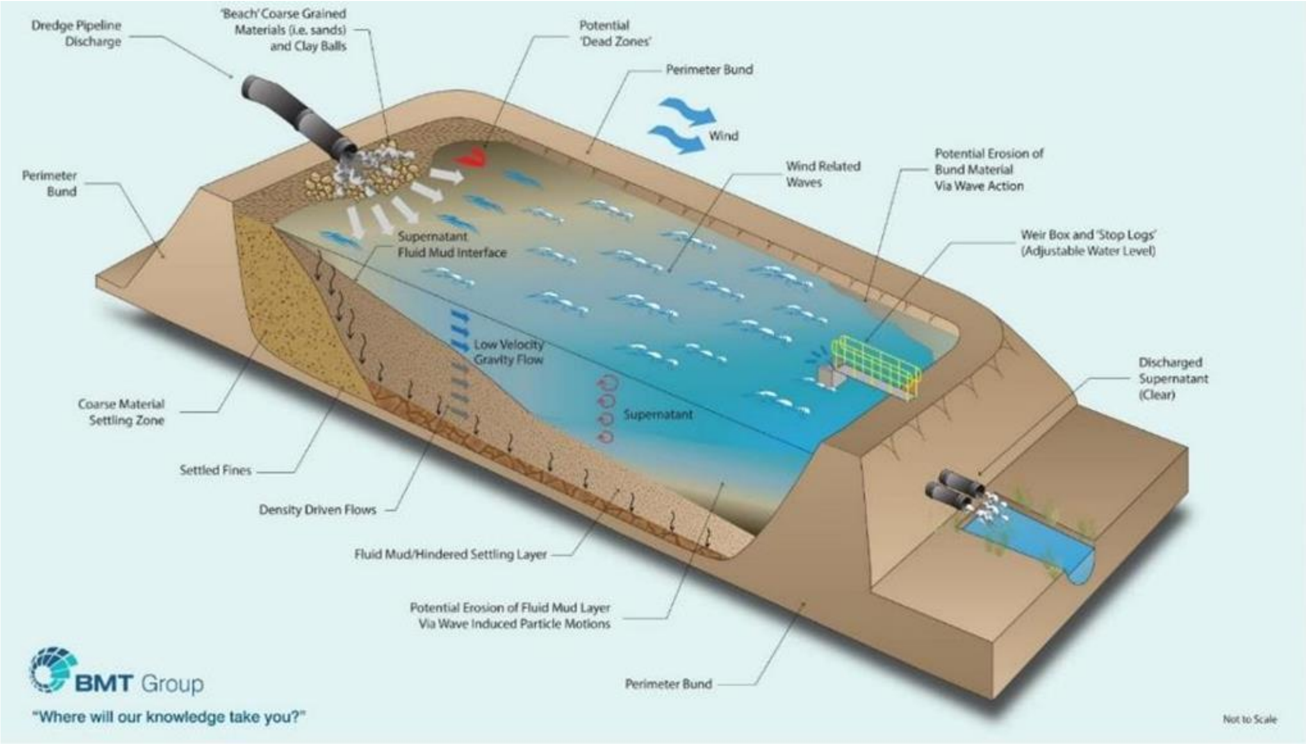

Figure A3-4 DMPA conceptual diagram.

The existing void at Northern Sands is being progressively enlarged to the north as part of 'business as usual' quarry expansion plans. The sand extraction may be expedited to provide a void of sufficient capacity below natural ground level to accommodate the settled soft clay after extraction of the water used for material transport (pumping) and supernatant as a consequence of material consolidation.

During placement, the 900 000 m^3 of soft clay dredge material will 'bulk up' to a larger volume. Investigations by BMT - JFA (refer **Appendix AD**) indicate that the Bulking Factor could vary over a range from 2.4 to 2.9.

Ports North's experience with dredging soft clay material as part of previous capital dredging and maintenance dredging campaigns indicates that a bulking factor at lower than lower bound (2.4) predicted by the BMT - JFA investigation could be anticipated. For the purposes of developing the concept design of the DMPA and impact assessment a conservative top range Bulking Factor of 2.9 has been adopted. As part of project design and development PN will undertake further investigations, testing and modelling to refine the Bulking Factor to be used for the final design of the DMPA.

The adopted Bulking Factor (2.9) indicates a pre-consolidation volume of approximately 2 600 000 m^3 will be require to accommodate the bulked up 900 000 m^3 (in-situ measure) of soft clay material at the end of the dredging campaign. An additional volume of approximately 15% of the placed material volume, approximately 400 000 m^3, will be required for water management to give a total DMPA containment volume required of approximately 3 000 000 m^3.

In order to provide sufficient containment capacity, the capacity of sand extraction void that will be provided to accept the placed material will be augmented through the construction of surrounding earth bunds up to a level of 7.5 m Australian Height Datum (AHD) with a 300mm freeboard allowance. The bunds will also have the collateral benefit of provided flood immunity for low frequency event with exceedance probabilities much lower than the 1% Annual Exceedance Probability (AEP) (100 year ARI) event which has a peak flood level at this location of 5.8 m AHD. The bunds will also remove the risk of remobilisation of the placed dredged material for all but the extremely low probability flood events. Refer **Chapter B17** (Hazard and Risk) and **Appendix AE**.

The concept design for the Barron Delta DMPA is shown on **Figure A3-5**

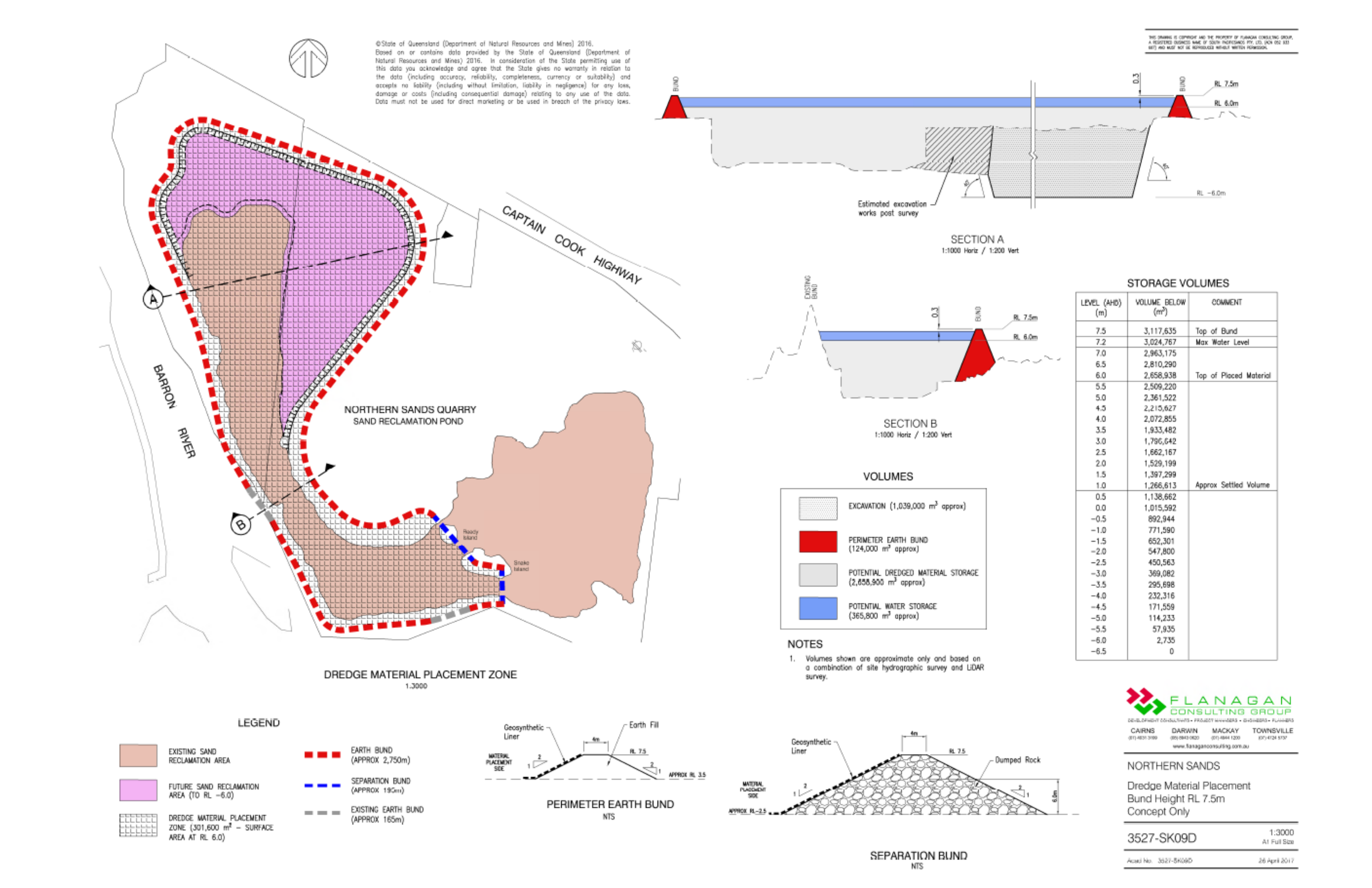

Figure A3-5 Barron Delta DMPA concept design.

Bunds will be constructed using in-situ soils which will be designed and placed under Registered Professional Engineer Queensland (RPEQ) supervision in accordance with site environmental permits, acid sulfate soil management guidelines, erosion and sediment control plans and geotechnical assessments.

The DMPA will have a total bunded placement area of approximately 30 ha. The placement of dredge material in the DMPA will be separated from ongoing sand extraction to the south by a lined rock wall.

Dredged material will be delivered into the DMPA as a slurry through the dredged material pipeline. Diffuser and spreader devices attached to the delivery pipe discharge will be fitted to assist in spreading the material, minimise disturbance of placed material and enhance overall settlement rates. Coarser materials together with non-friable clay 'balls' that may form in the pipeline will drop out of suspension closer to the dredged material discharge location more quickly than the finer fractions which will take longer to settle out of suspension.

The soft clays will be placed underwater, with the PASS materials dredged and placed first followed by the SNP. At completion of placement of 320 000 m^3 of PASS material the bulked up volume will occupy the void space below RL 0.0m AHD water levels will be managed to ensure that at least 1.5 m of water cover is maintained at all times to prevent exposure to the air and hence oxidation. At the completion of the PASS material placement, this material will be covered with the 580 000 m^3 of SNP materials which will form a permanent cap to ensure the PASS materials are not exposed to the air and the possibility of oxidation is removed.

Dredge slurry will be pumped into the Barron Delta DMPA void in pulses as the TSHD completes circuits over the dredging campaign. As the void fills with the dredge material slurry, solids will settle and commence consolidation on the floor of the void leaving turbid supernatant waters which will gradually clarify prior to discharge via a system of weir boxes with sliding gates. The weir boxes will be used to control the water depth through which the slurry is deposited and to control draw off water to achieve optimal clarification rates and tail water quality. Further detailed design and placement modelling may identify the need for a separate Tailwater Treatment Pond of approximately 9 ha to further improve water quality (suspended solids) prior to discharge. If required, this pond will be constructed on site from insitu soils to a height of approximately 1.3 m (allowing 0.3 m freeboard).

The DMPA weir boxes (and/or tailwater treatment pond weir boxes if required) will be connected to a discharge pipeline to convey tailwaters to the Barron River, once they have met the adopted water quality discharge standards. Discharge from the tailwater pipeline will occur through a diffuser suspended above the bed of the Barron River.

The potential tailwater discharge locations are shown on **Figure A3-3**. Site A is adjacent to the DMPA site and Site B is at the Captain Cook Highway bridge crossing of the Barron River.

A3.3.2.b Stiff Clay DMPA

The stiff clay DMPA is to be located on Lot 27/SP 218291 which is previously reclaimed Port land at the southern end of Tingira Street, Portsmith. The location of the Tingira Street DMPA is shown on **Figure A3-6**.

The site is located on the southern boundary of an industrial area within Strategic Port Land, abutting Smiths Creek to the east and a mangrove system to the west. Material will be barged to the Tingira Street DMPA where it will be transferred by crane or excavators to heavy vehicles for short hauling to each placement area. The stiff clay dredge material will be placed as engineered fill over previously placed dredged material and general fill. This represents beneficial reuse of the stiff clay dredge material to improve the suitability of the area for future port activities. The height of placement will correspond to surcharge loading requirements for consolidating the underlying soft soils to the standard required for the intended port use of the land within a 1-2 year timeframe. Once consolidation is complete, the upper layer (above final land design level) will be stripped off and relocated to an adjacent area as part of a continuous land improvement program.

A concept design for the Tingira Street DMPA is shown on **Figure A3-6**.

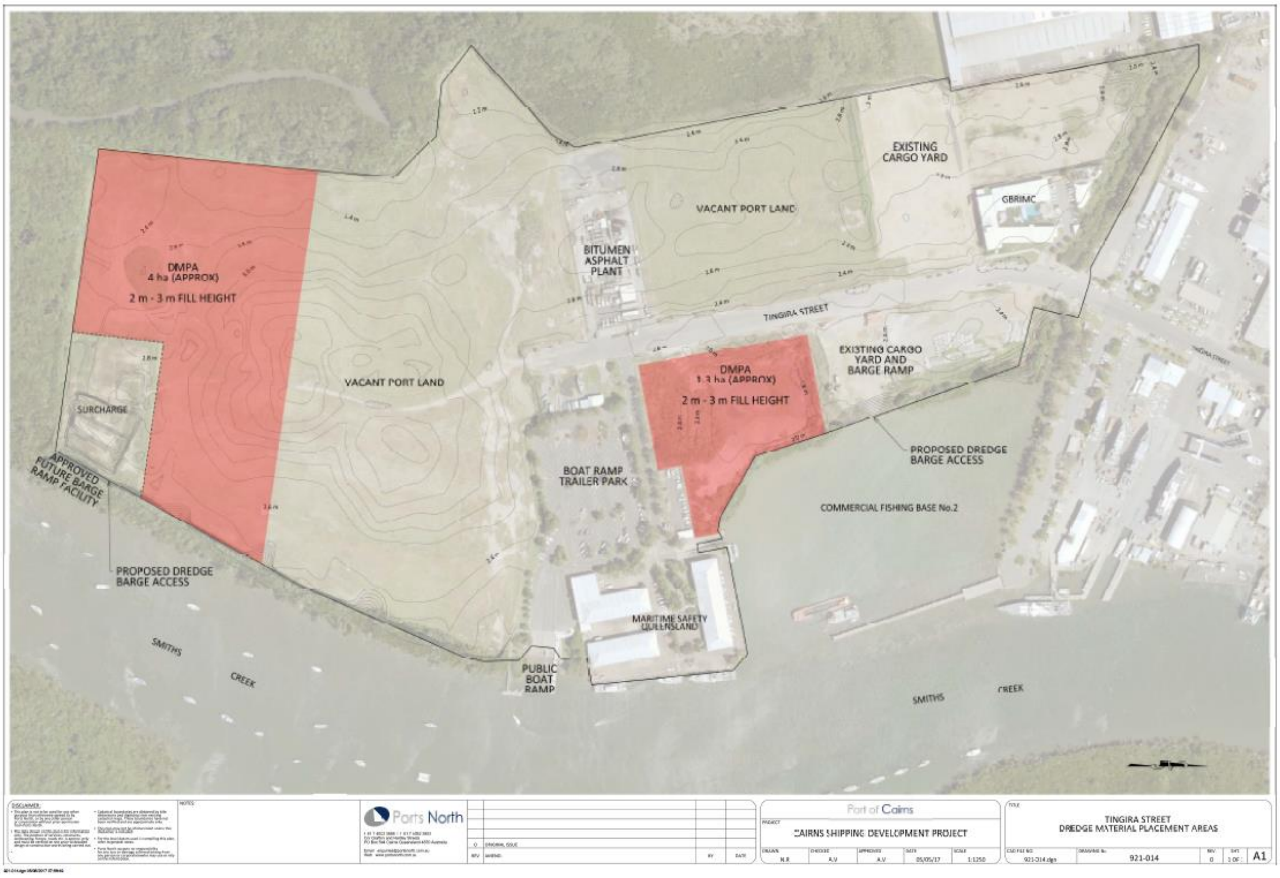

Figure A3-6 Stiff Clay DMPA, Tingira Street Portsmith.

The Tingira Street DMPA will consist of the following elements:

- Two land parcels with a total area of approximately 5.3 ha each serviced by a barge landing ramp. The northern barge loading ramp is existing while the southern ramp has been approved and is yet to be constructed. Only partial construction of the southern ramp will be required for the barge transfer operation.
- Temporary barge mooring piles may be necessary at each barge landing ramp or the use of a moored spudded barge.

Placed material to a depth of approximately 2-3m incorporating a self-draining surface with geotechnically stable batters and appropriate erosion and sediment control, as identified in **Chapter C1** (Construction Environmental Management Plan).

A3.4 Ancillary Infrastructure and Services Upgrades

A3.4.1 Navigational Aids

Some existing navigation aids will need to be relocated as part of the project and a number of new navigation aids will also be required, as identified in consultation with MSQ. These changes are summarised in **Table A3-2**.

Marker buoys are required to demarcate the Crystal and Smiths Creek swing basins. Marker buoys will be held by weights at the bottom. The numbers of marker buoys required at each location will be confirmed by the RHM during detailed design.

Further details on aids to navigation are provided in **Chapter C4** (Maritime Operations Management Plan).

TABLE A3-2 NAVIGATIONAL AIDS REQUIREMENTS

LOCATION / REFERENCE	STATUS	TYPE	DESCRIPTION
New arrival sector light in inner harbour	New	Fixed Structure	New sector light (PEL) on Sugar Shed.
Beacon 17	Existing	Fixed Structure	Move beacon to 100m outside of new channel toe line.
Arrival front lead	Existing	Fixed structure	Move front lead to new location.
Arrival sector light	Existing	Fixed structure	Remain on Pier.
Departure front lead	Existing	Fixed structure	Relocate from current location.
Departure sector light	Existing	Fixed structure	New sector light at position of departure rear lead beacon.
Channel entrance	New	Fixed structure	New beacons at port and starboard side.
Weather stations on beacons C2 and C20	New	Fixed structure	New weather stations to provide wind data for Pilots.

A3.4.2 Wharves and Berths

Wharves 1-5 at the Port of Cairns are currently available for passenger vessels, forming a continuous quayline of 460 m (see **Figure A3-7**). The wharves are 5 m above LAT and 1.5 m above Highest Astronomical Tide (HAT), with berth design depths of -8.4 m (LAT). The wharf apron width, adjacent to the terminal, is 8.0 m wide and the wharf deck width at wharves 4 and 5 is 27 m. Wharves 1-5 were built between 1911 and 1925 and are heritage listed under the *Queensland Heritage Act 1992*. See Chapter B13 (Cultural Heritage).

Currently, Wharves 1-3 are predominately used for berthing cruise vessels and are serviced by the international CCLT, located within Shed 3 of the Port's heritage listed wharf sheds. Berth information is shown in **Table A3-3**.

TABLE A3-3 BERTH INFORMATION

BERTH	DESIGN DEPTH (m) (BELOW LAT)	BERTH FACE (m)	WHARF HEIGHT (m) (ABOVE LAT)
Wharves 1-6	8.4	595	5
Wharf 7	9.3	250	5
Wharf 8	10.0		5
Wharf 10	9.3	20	4.8
Wharf 12	10.5	190	5.0

Source: Department of Transport and Main Roads (2015) p32.

The existing wharves 1 to 5 are at capacity in terms of allowable berthing and mooring loads to the existing heritage listed wharf structure. Both the existing fendering and existing wharf structure were upgraded to their maximum potential in 2010 as part of the Cairns Cruise Liner Terminal (CCLT) project. In order to allow larger cruise ships to berth and also to provide long-term protection of these culturally important wharves, additional independent structures will need to be incorporated into the wharves. The wharf upgrade has been designed so that landside work is minimised to limit disturbance of the heritage-listed wharf. A structural assessment of Wharf 6 (**Appendix AE)** concluded that Wharf 6 is in very poor structural condition and is beyond any practical repair. The deterioration of the structural members has resulted in a structure that could fail catastrophically and endanger users and equipment, does not comply with current Australian Standards, and has exceeded its design life.

To cater for the projected increase in ship arrivals it will be necessary to rebuild Wharf 6 which will allow for berthing of two mega class ship simultaneously as shown on **Figure A3-7**.

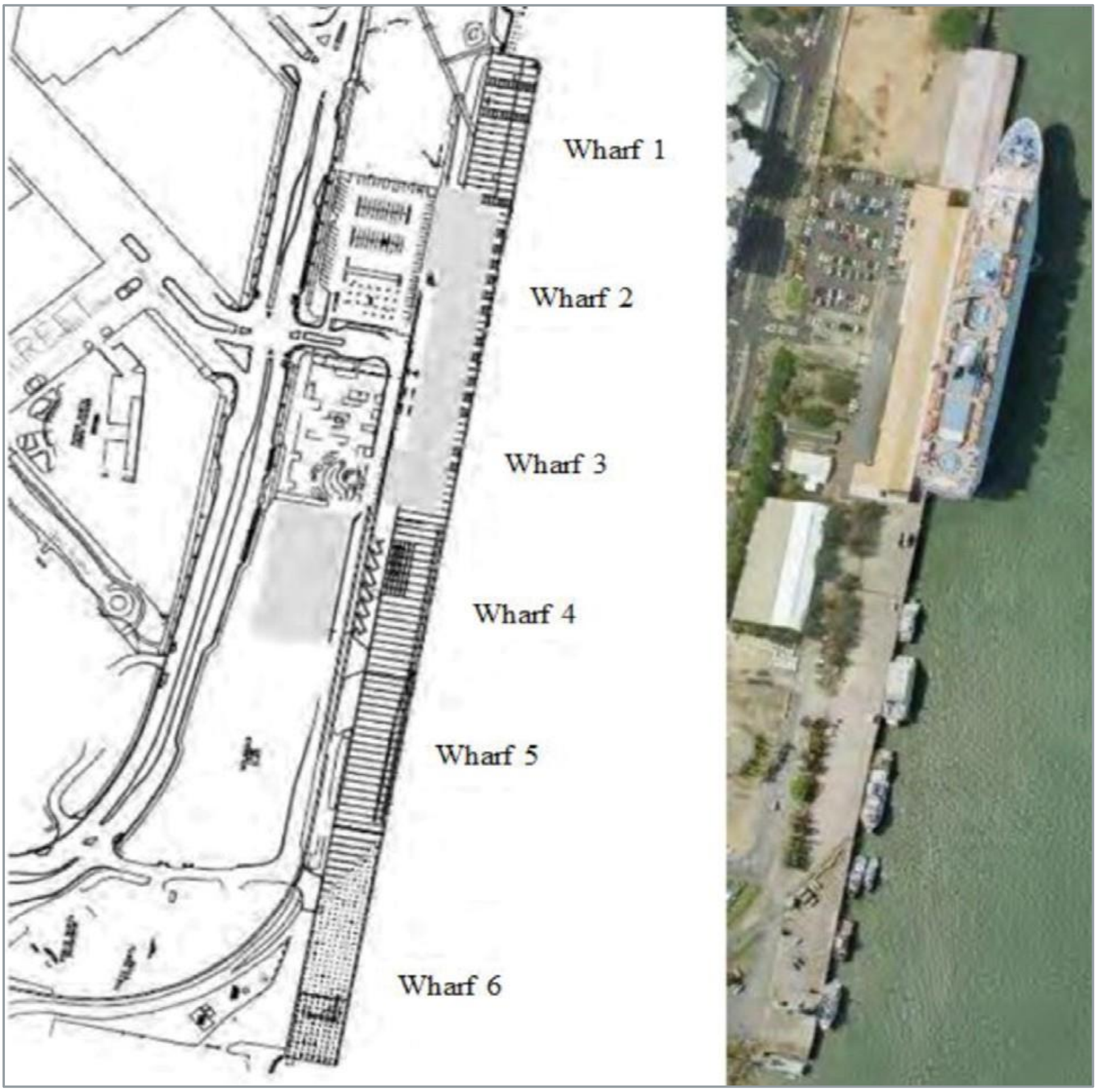

Figure A3-7 Plan and aerial photo with cruise ship at port.

It will include the installation of a new independent berthing and mooring structures (known as ‘dolphins’) to protect the heritage listed wharves, as shown on **Figure A3-8** and **Figure A3-9**.

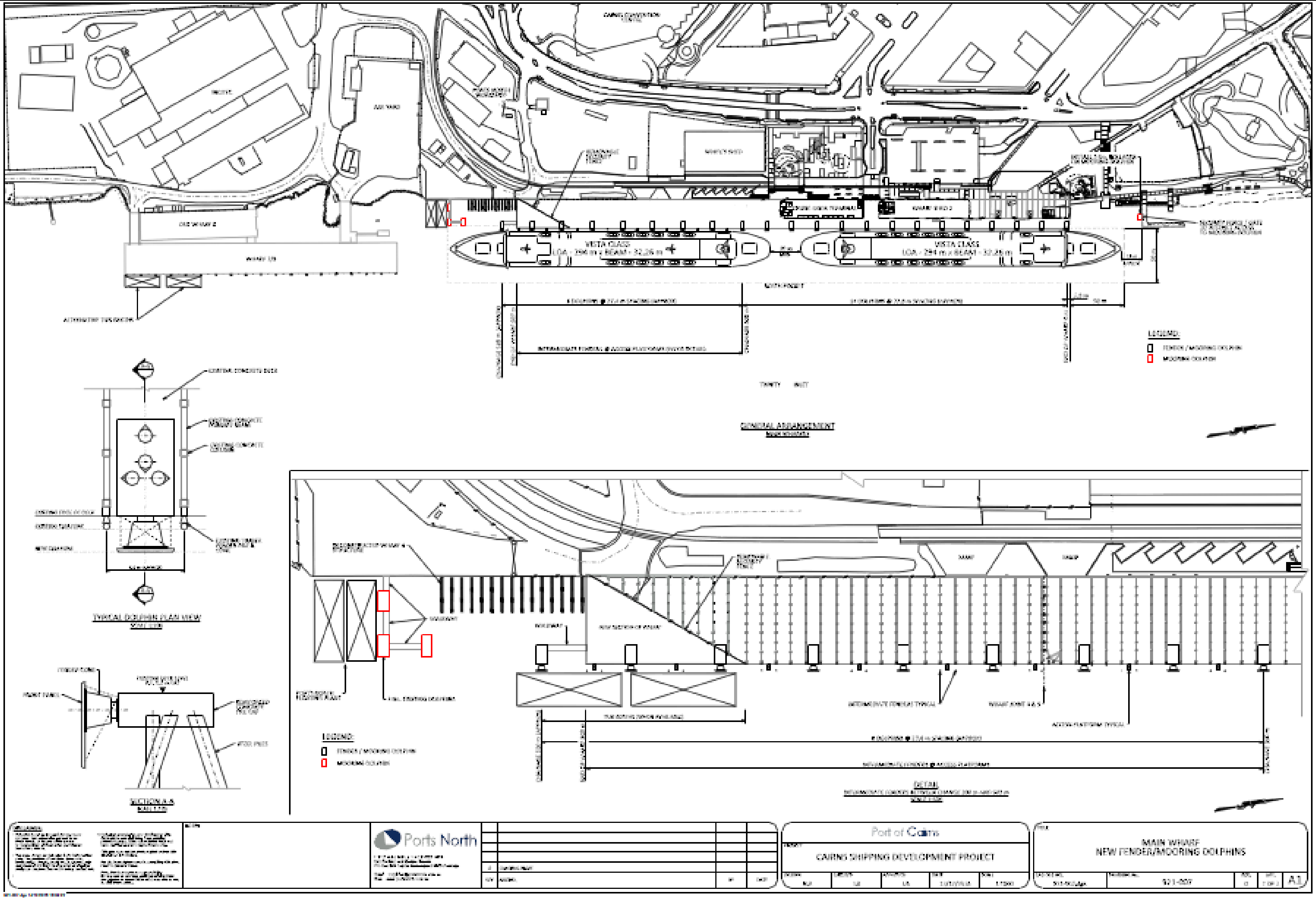

Figure A3-8 The wharf design – berthing structure every five piles.

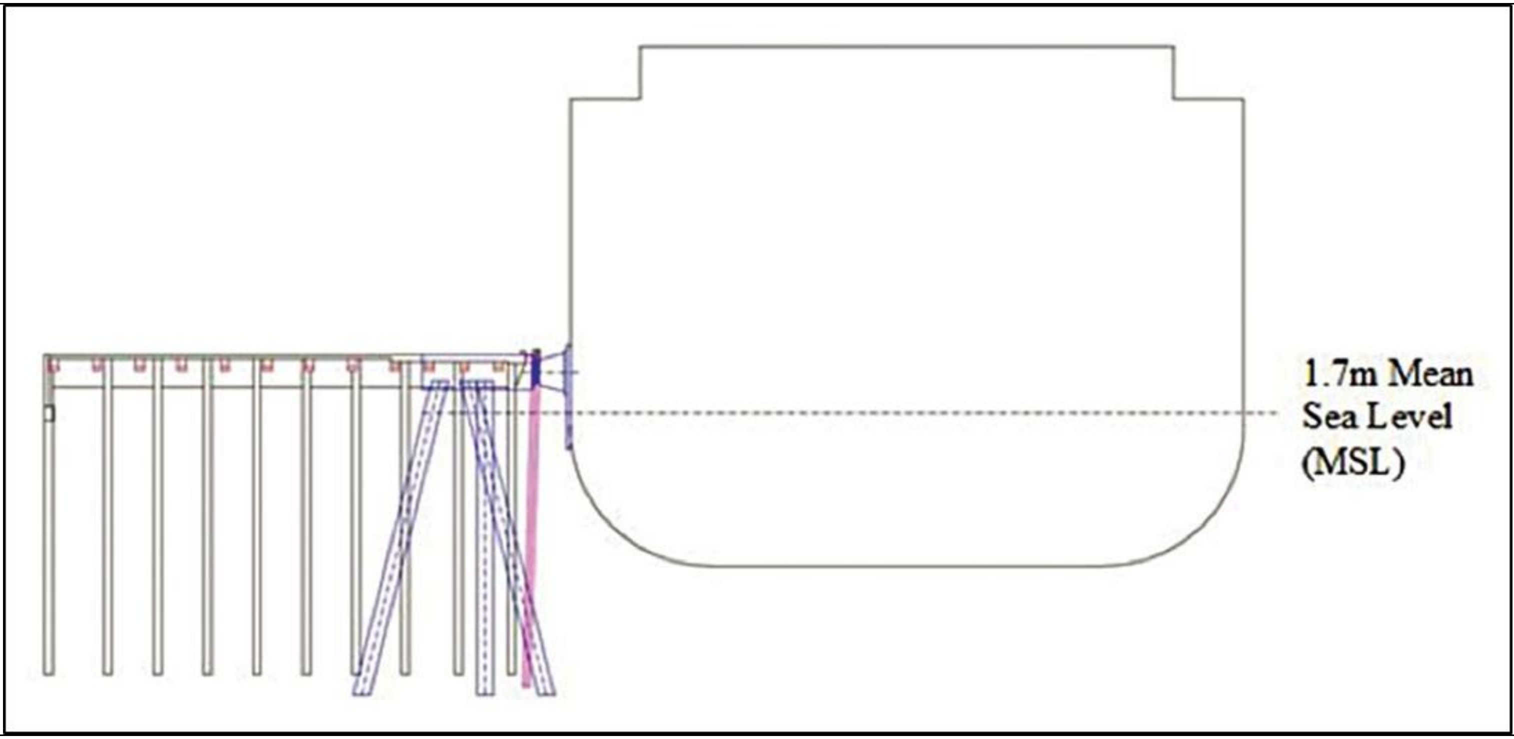

Figure A3-9 Typical section showing berthing structure and berthed design vessel.

A3.4.2.a Cairns Cruise Liner Terminal

The Wharf Shed 3 building was originally constructed in 1912 to service the wharf, and has since been heritage listed. The adaptive reuse of the shed in 2010 has been designed to operate as a Cruise Liner Terminal (passenger terminal building) as well as a function and exhibition space (see **Photo A3-7**). The floor space is approximately 930 m^2.

The terminal has been designed for cruise ships berthing in transit and home port arrangements. Whilst the design service levels set the minimum design passengers as 600 for home porting and 1800 for transit operation, based on practical experience and site testing, the facility can cater for 3100 transit passengers at one time. Therefore, the terminal can effectively cater for transit passengers for the mega class vessels and for home porting vessels with greater than 600 passengers. Overflow can be catered for via the adjacent undercover breezeway and the Wharf 4 deck using marquees, if required.

The facility will be able to accommodate increases in transit passengers associated with this project, and as such, no upgrades are proposed.

Photo A3-7 Landward view of the CCLT (Shed 3).

A3.4.2.b Transportation and Access

Wharves 1 to 5 exist parallel to Wharf Street in the CBD. Vehicular access to the CCLT is provided via a driveway at the intersection with Lake Street and Wharf Street. A car park is provided in front of Shed 2, with bus and taxi access also provided along the face of the CCLT on port land. As cruise ship passengers do not have their own means of vehicular transport, most passengers utilise tours, buses and taxis to experience the city.

The majority of pedestrians entering and exiting the port building use the existing shared area linking the Port Terminal to Wharf Street via the park. The other major link to the north provides access to the boardwalk and the Esplanade, however, this link is not used as much.

The Northern Coast Rail Line runs through the port area, dissecting the Strategic Port Land (SPL). The rail line is part of TMR's regional freight and passenger network.

Infrastructure upgrades are not warranted to cater for future increased vehicular and pedestrian traffic; however, a more streamlined operation will be required to fully utilise the existing facilities.

A3.4.2.c Fuel

Quantities of marine diesel fuel (also called Marine Gas Oil or MGO) over 30 000 litres can be supplied to vessels at Wharf 10. A bunkering barge service is available if required. There is no direct fuel line to the cruise shipping wharves.

Intermediate Fuel Oil (IFO) which is a blend of heavy fuel oil and distillate is also used in marine diesel engines however it is not currently available and supplied in Cairns. An existing fuel farm lies immediately to the west of the cruise ship wharfs (see **Figure A3-10**).

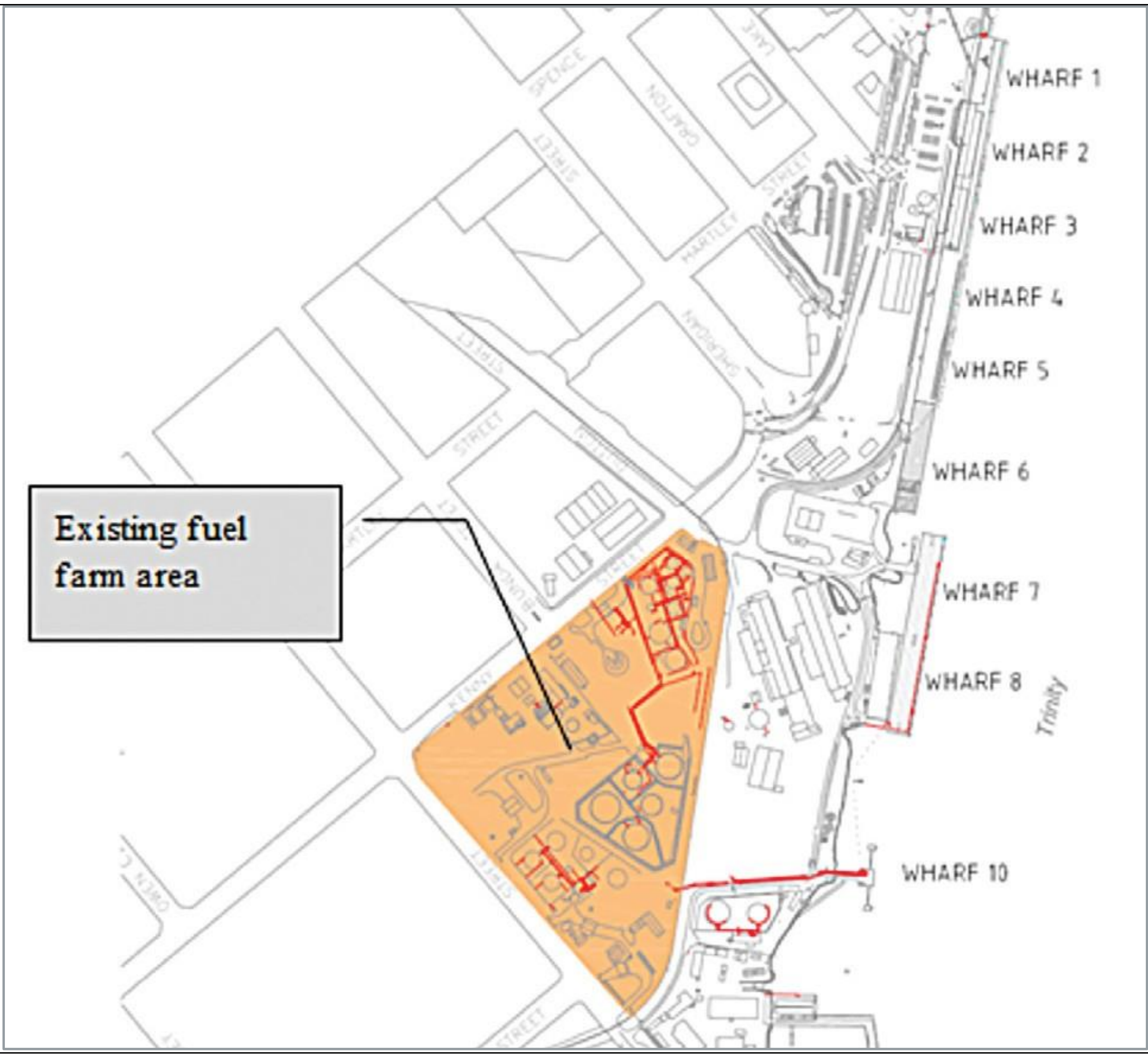

Figure A3-10 Existing fuel farm and fuel lines.

Cruise ships utilise HFO, IFO, or MGO (diesel) fuels, however the industry is moving away from HFO fuels to lower sulfur fuels such as IFO and MGO. HFO and IFO fuels are currently not stored in Cairns. Typically no transit cruise ship bunkering occurs currently in Cairns port.

Cruise ship home porting bunkering does occur for 9-10 home port departures per year of approximately 500 t of diesel fuel per visit via a dedicated barge. Natural growth and projected CSDP project delivered growth may potentially result in 20 homeporting bunkering operations at 500 t per ship and a total of 128 transit operations at 100 t per ship resulting in a potential maximum total volume of 22 800 t per year. Currently there is are no bunkering facilities at Wharves 1-6; it is therefore proposed to extend the existing fuel line from wharves 7 and 8 to Wharf 3 to cater for this demand (refer **Figure A3-11**).

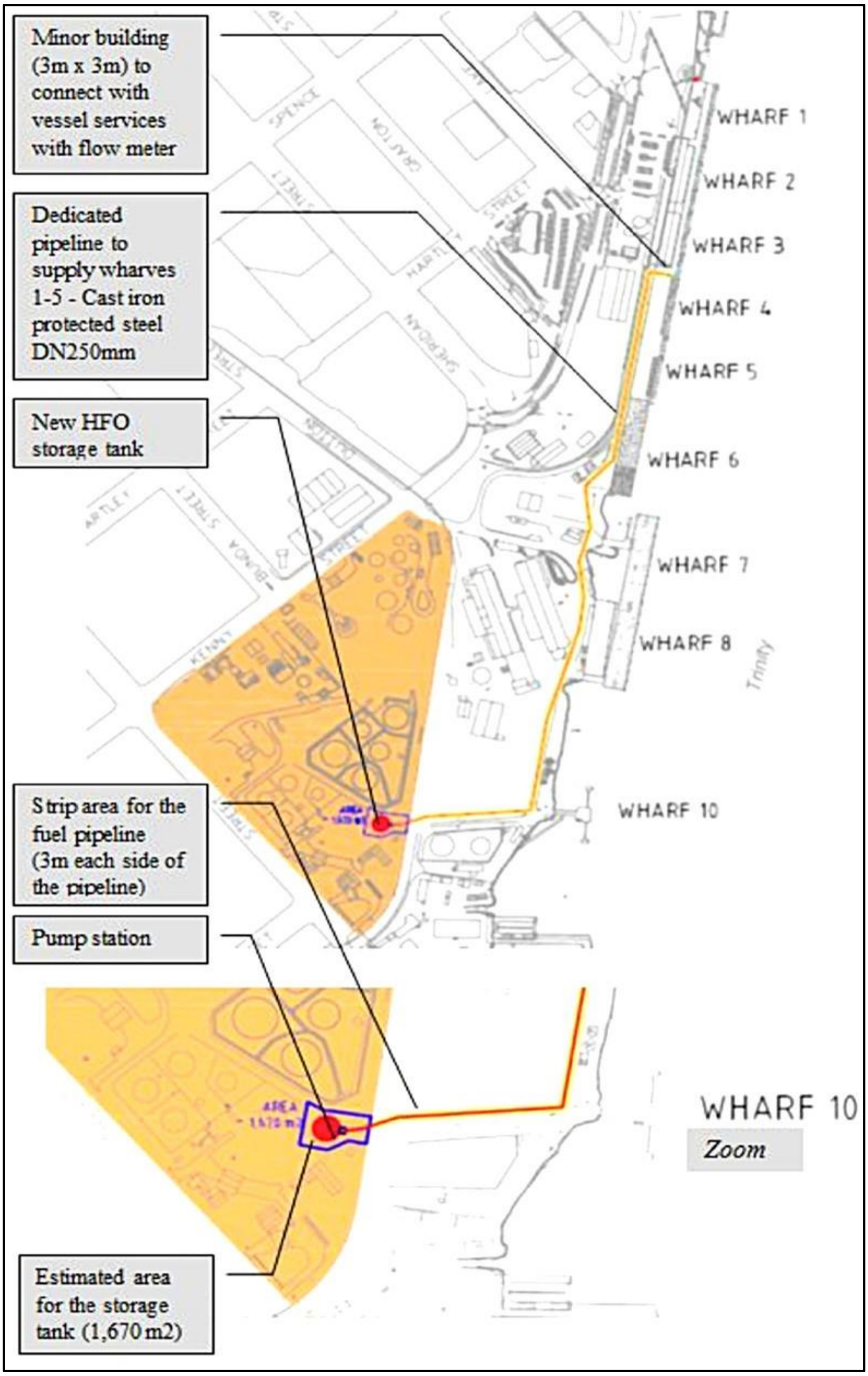

Figure A3-11 Proposed IFO supply infrastructure.

An additional IFO storage tank(s) will be required within the existing fuel farm. The exact design and size of the IFO supply will be finalised during detailed design and subject to commercial negotiations between fuel suppliers and cruise companies. The fuel farm area is currently leased to three major petroleum suppliers; therefore, the exact location for the new storage tank would involve future agreement between Ports North and the successful fuel IFO supplier. IFO to wharves shall be provided via a dedicated pipeline and a pump station. The concept design has identified that a one kilometre long 250 mm pipeline will be required between the storage tank and Wharf 3. It is expected the pipeline will be buried or installed under the wharf to assist with mitigating the risk of damage, corrosion and fire. Construction and installation would be via trenching and piping construction methods.

A storage area at the wharves would also be required and a small building near Wharf 3 will be constructed to allow the connection of the onshore services with the vessel fuel services

The location of the storage tank shown in **Figure A3-11** is indicative only and will be subject to negotiation between Ports North and the operator. The exact pump station characteristics and location will be determined during future detailed design and subsequent approvals processes.

A3.4.2.d Water

The potable water supply was upgraded as part of the recent Foreshore Redevelopment Project in 2012. The current design is shown on **Figure A3-12**.

The existing potable water pipeline along the face of wharves 1 and 5 would be replaced due to the wharf structural upgrade (see **Figure A3-12**).

A3.4.2.e Fire Fighting Services

The existing firefighting infrastructure is connected to the potable water main and allows the supply of water to the dedicated external fire main. This includes the fire protection system for the CCLT.

The firefighting services were upgraded as part of the recent Foreshore Redevelopment project in 2012. The current design is shown on **Figure A3-13**. The system is designed to protect all landside assets.

Three new fire hydrant pillars are proposed to be installed along the face of Wharves 1 to 3 at even spaces. The pillars will be connected back under the wharf to the existing dedicated fire main running along the back of the wharf (see **Figure A3-13**). Also, the current ‘dead end’ to the fire main at the northern end would be extended and connected to the existing fire main at the Marina.

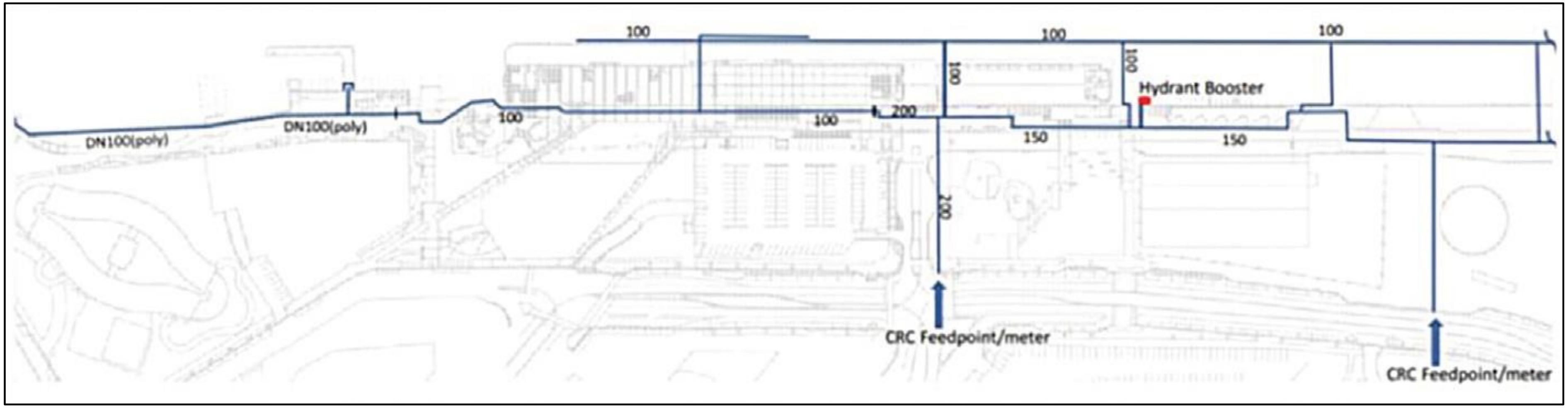

Figure A3-12 Schematic existing potable water supply services.

This figure is not to scale.

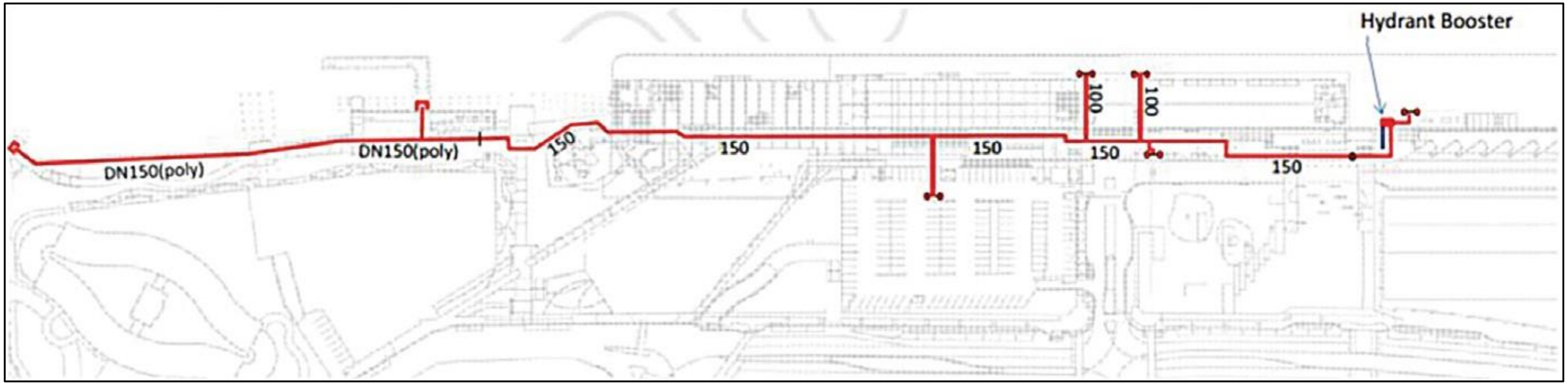

Figure A3-13 Schematic design of fire services.

This figure is not to scale.

A3.4.2.f Electricity

Electricity is connected to all wharves with both single-phase power and three-phase power available at most berths on arrangement with the Seaport Operations Office.

Electrical supply to services (e.g. lighting) was also recently upgraded during the Foreshore upgrade in 2012.

A3.4.2.g Sewage and Waste

General garbage, incinerator ash and recyclables generated on cruise ships are currently disposed of at the Port of Cairns via agreements with appropriately qualified and licenced waste contractors. When ships book into the port, the required waste facilities (timing and capacity) are identified by the ship's agent and waste contractors are then engaged to collect the waste when the ship arrives. All waste is transported to a suitable licenced facility. Recording of waste volumes/masses and types is the responsibility of waste contractors. Quarantine waste services are arranged through Ports North who engage approved contractors to collect the waste and transfer it to an approved receiving facility. The packaging, transport and treatment of quarantine waste are conducted in accordance with Department of Agriculture (DOA) requirements.

Waste generated or deposited at the CCLT in waste receptacles is managed via agreements with appropriately qualified and licenced waste contractors. General waste bins are provided throughout the terminal and are collected regularly. All waste is transported to a suitable licenced facility.

Whilst the discharge of sewage is allowed to sea under the *Transport Operations (Marine Pollution) Act 1995* (TOMPA), the discharge of sewage into the Port of Cairns does not occur due to its proximity the GBRMP. The discharge of both greywater and sewage at sea is prohibited under the MARPOL[1] for ships and vessels greater than 100 gross tonnage and/ or carrying more than 15 persons unless appropriately treated. Sewage tanker truck services are provided for cruise ships and other vessels berthing at the Port of Cairns. Each tanker uses a vacuum method for obtaining the sewage from vessels. The trucks transfer waste to one of the Cairns Regional Council's (CRC) Pollution Control Plants. This can be a 24-hour operation for the duration of the ship's stay. Recording of waste volumes/masses and types is the responsibility of waste contractors.

The port has an existing sewerage reticulation network that is connected to CRC's sewer main in Wharf Street (**Figure A3-14**).

[1] MARPOL 73/78 is the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978. ('MARPOL' is short for marine pollution and 73/78 short for the years 1973 and 1978.) MARPOL 73/78 is one of the most important international marine environmental conventions.

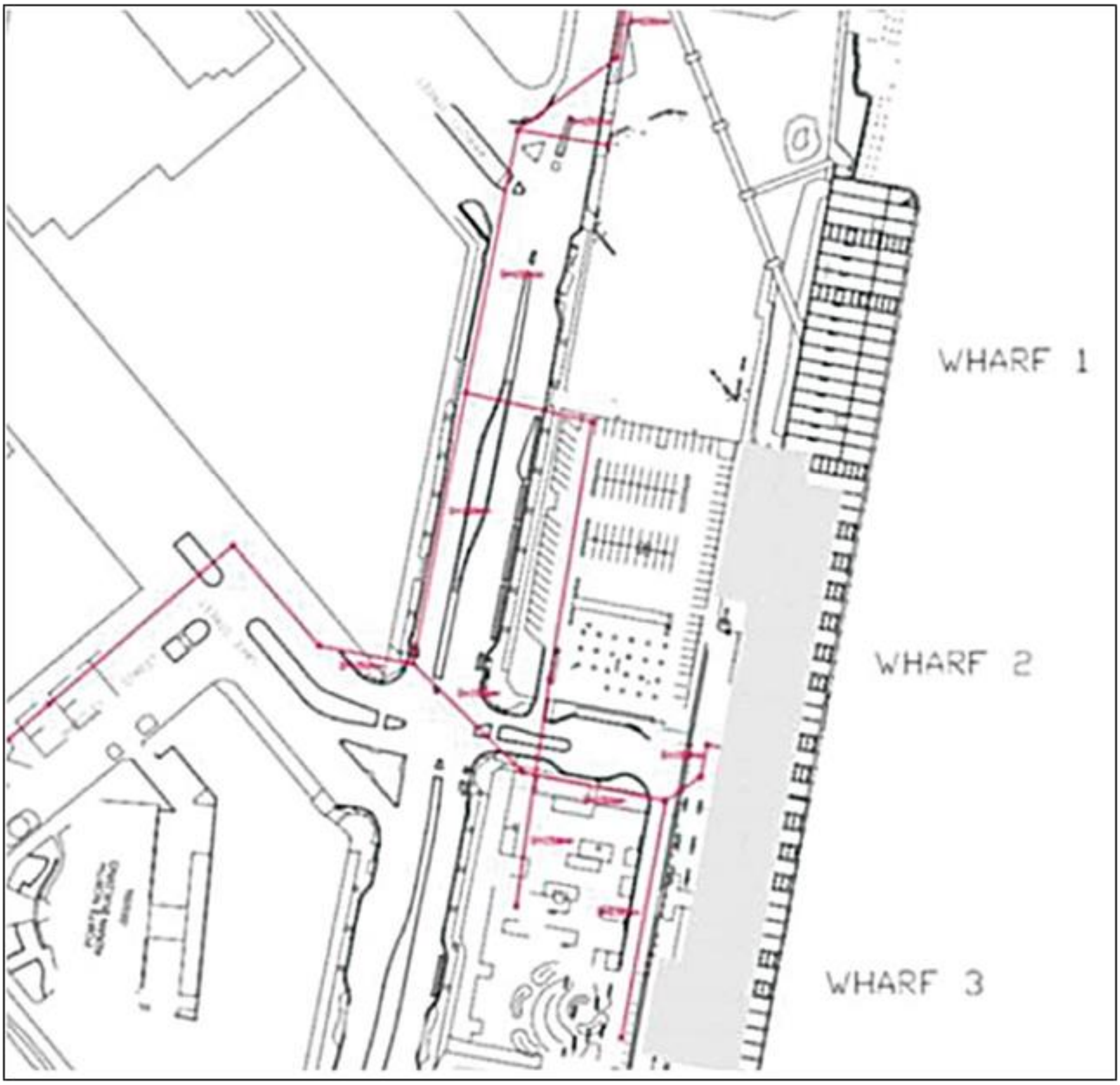

Figure A3-14 Existing sewerage services.

Although the current use of tanker trucks for sewage removal may be adequate for the future situation, the proposal is to include an option for the potential future introduction of a more robust system of direct discharge into the CRC's sewerage reticulation system.

The system upgrade is to provide a tank which will buffer the discharge flows of large cruise ships (which can pump up to 15 litres per second (L/s) to that of the limited capacity of council's infrastructure to accept these (which is 7 L/s).

For this reason, two connections to the existing sewerage system are required:

- one connection in the Wharf 3 area which allows a discharge of up to 7 L/s (limited use to vessels that comply with the required discharge flow) into council's reticulation
- one connection in the Wharf 1 area that allows a discharge greater than 7 L/s. For this connection, a 150 millimetre (mm) diameter sewer line will discharge sewage to a storage facility and a submersible pumping station will limit the sewage discharge in the CRC's reticulation system to 7 L/s.

Figure A3-15 shows the sewerage infrastructure proposed as described above.

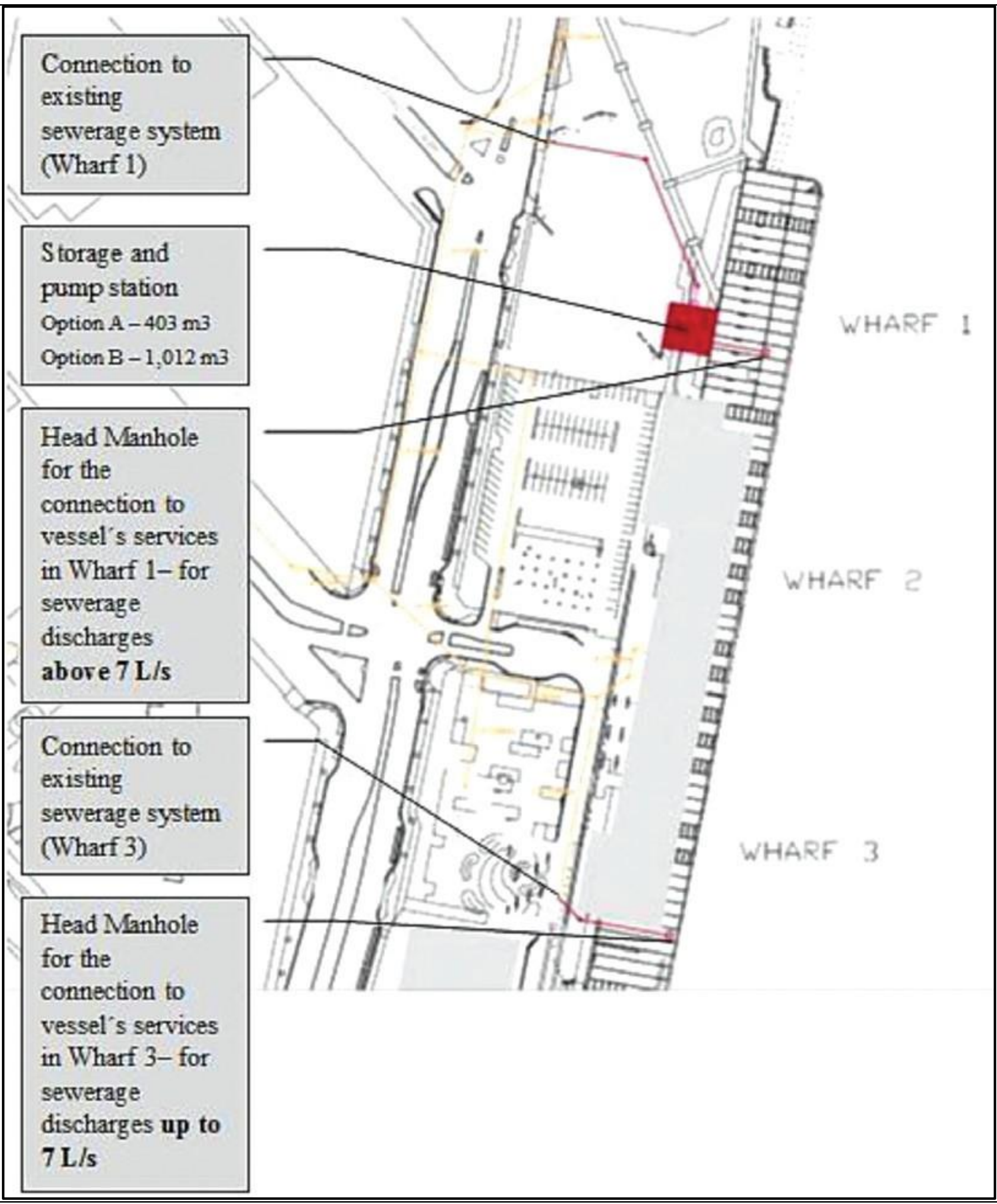

Figure A3-15 Proposed sewerage infrastructure.

A3.4.2.h Customs and Quarantine

Customs services are provided within the CCLT building for ships that are embarking or disembarking international passengers from the wharves.

Quarantine and inspection services are arranged through the DOA for ships and passengers at the wharves as well as for ships and passengers arriving by tender at Yorkeys Knob. These services are provided on a fees and expenses basis and are arranged by the cruise shipping companies and their agents. DOA officials board the vessel prior to disembarking passengers to provide the appropriate clearances. Scanning and searches can be carried out in the terminal, or at temporary facilities where required.

A3.4.2.i Security

The Port of Cairns is a Regulated Port under the *Maritime Transport Security and Off Shore Facilities Act 2003*.

A security plan for the port is in place and there are specific requirements for all port users to comply with this plan.

Security fencing is erected around the wharf when cruise ships are calling at the Port of Cairns. Access is restricted to persons having business on board or as bona fide visitors.

There is no security plan covering passenger transfer operations at Yorkeys Knob. When at anchor the cruise ship is responsible for its own security arrangements.

A3.5 Project Timing

It is anticipated that the soft clay dredging campaign will be undertaken by a TSHD with a hopper capacity of 5600 m^3 when full steaming to a temporary pump out facility off Yorkeys Knob. This campaign will have a duration of up to **12 weeks**.

It is anticipated that the stiff clay dredging campaign will be undertaken by a BHD and the dredge material transported by barge to the Stiff Clay DMPA at Tingira Street, Portsmith. This campaign will have a duration of **5 weeks**.

The durations of the two dredging campaigns are not cumulative and they will be conducted concurrently. These durations do not include dredge vessel mobilisation and demobilisation. Subject to receipt of necessary approvals and funding it is proposed to conduct dredging in the period **May – September 2019**. The timing for the commencement of dredging with be dependent on weather conditions and dredging plant capability and availability.

Construction works for the temporary offshore pump out facility and the dredge material delivery pipeline will be timed to ensure that the facilities are available at the commencement of the dredging campaign. Pump out facility construction and pipeline delivery, fabrication and installation is anticipated to take **6 weeks**. Demobilisation of the temporary facilities is anticipated to take **4-6 weeks** following completion of the dredging campaign.

Construction of containment facilities at the Barron Delta DMPA will commence immediately following achievement of Project approvals and funding confirmation to ensure that the DMPA is available to receive soft clay dredge material at the start of the dredging campaign.

The estimated construction period for the wharf upgrade is **12 months**. Commencement of the wharf and services subgrades will commence following receipt of project approvals and funding confirmation. Construction will likely precede the dredging campaign and be timed to ensure completion and commissioning occurs coincident with the availability of expanded channel capacity to the larger cruise ships.

Cruise ships will be able to utilise the upgraded channel, wharf, and services upgrade upgrades which are anticipated to be completed by **late 2019**.

A3.6 Environmental Impact Mitigation and Management

Environmental impact avoidance, minimisation, mitigation and management involves a broad range of studies of existing environmental values and constraints which have been used to inform impact mitigation design strategies. Environmental impacts of the design concepts have been assessed using a formal risk assessment process from which a range of environmental impact mitigation and management recommendations are proposed. The environmental risks have been assessed, assuming that standard best management practice and project specific management measures are adopted. Of the 349 risks identified, residual risks following implementation of proposed management and mitigation measures are rated extreme(0), high(0), medium (8), low (122), negligible (208) and beneficial (11) risks, with the majority of all risks being temporary and reversible.

Management measures to mitigate these risks are identified in the following management plans:

C1 Construction Management Plan

C2 Dredge Management Plan

C3 Vessel Transport Management Plan

C4 Maritime Operations Management Plan

Low and negligible residual risks are assessed as being able to be adequately managed by standard best practice management measures For impacts with a risk rating of medium or higher, specific impact mitigation and management strategies have been developed. These residual risks are presented in **Table A3-4**, including a summary of recommended management strategies and the Revised Draft EIS document locations where these strategies are presented in more detail.

TABLE A3-4 MEDIUM RESIDUAL RISK ENVIRONMENTAL MANAGEMENT

CHAPTER	SUMMARY OF RESIDUAL IMPACT	RESIDUAL RISK WITH MITIGATION IN PLACE	MITIGATION AND MANAGEMENT	
			CHAPTER LOCATION	STRATEGY SUMMARY
B3 Coastal Processes	Increase of approximately 2-6% to annual siltation and maintenance dredging requirements	Medium	B3.4.2	The current maintenance Dredging and Disposal Permit(including dredge quantity limit)remains applicable to June 2020. The increased maintenance dredging requirements will be addressed in the future application for a new permit and supporting Management Plan developed in accordance with relevant guidelines.
B6 Water Resources	Lateral migration of saline water away from the dredge placement area causing impacts on water quality in the upper unconfined aquifer.	Medium	B6.6.3 CEMP (C2.8.1)	Develop detailed monitoring and intervention strategy during detailed design and approval phase Management of Tailwater depth to reduce head pressure on surface aquifer
B8 Terrestrial Ecology	Loss of colonising marine plants on previously reclaimed land at Tingira Street DMPA	Medium		Mitigation not possible. Colonising marine plants were always temporary because DMPA area is designated as Industrial Land in Ports North Land Use Plan
B8 Terrestrial Ecology	Loss of small area of low value semi tidal wetland habitat on previously reclaimed land at Tingira Street DMPA	Medium	B8.6.3.d	Mitigation not possible. Wetland value was always temporary because DMPA area is designated as Industrial Land in Ports North Land Use Plan
B9 Socio-Economic	Decreased number of ship arrivals in Yorkeys Knob in the short term affecting income to Boat Club	Medium	B9.2.7.d	Impact is short term and offset by predicted reversal by 2031 with net increase in arrivals and consequent increase in income potential for the club
B9 Socio-Economic	Decreased number of ship arrivals in Yorkeys Knob in the short term affecting business and tourism operators	Medium	B9.2.6	Impact is short term and offset by predicted reversal by 2031 with net increase in arrivals and consequent increase in income potential for local business and tourism operators
B9 Socio-Economic	Minor and reversible loss of character of coastal area from establishment of pipeline and laydown areas	Medium	B9.2.8	Impacts are temporary and reversible in nature. Screening and fencing to be installed around laydown areas
B12 Landscape and Visual	Visual intrusion of the delivery pipeline and associated infrastructure	Medium	B1.6.4.b CEMP (C2.8.12)	Impacts are temporary and reversible in nature. Development of 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. Use of appropriate fencing and screening of laydown areas and low impact lighting of laydown area, best practice environmental management

In order to achieve the impact avoidance, minimisation, mitigation and management Ports North proposes to implement the management measures outlined in **Table A3-5**.

TABLE A3-5 ENVIRONMENTAL MANAGEMENT STRATEGIES

CHAPTER	ENVIRONMENTAL MANAGEMENT STRATEGIES
B1 Land	Conduct ongoing and timely communications with relevant state and local government authorities, business operators, port tenants, residents, and the boating community regarding the potential impacts, including disruption to commercial operations, recreational activities, and traffic conditions.
	Adopt a minimum setback from the perimeter of Tingira Street DMPA and a batter profile to achieve the required factor of safety against instability of proposed profile
	Conduct community engagement to inform the public of the pipeline works, prepare them for the short term intrusion, and reassure them that full restoration of the area be undertaken
B2 Nature Conservation Areas	Manage dredging procedures at the DMPA to limit water quality impacts from TSHD dredging and tailwater discharge into the Barron River within acceptable limits
	Conduct reactive monitoring programs for water quality and seagrass as well as tailwater and groundwater impacts from placement at the Northern Sands DMPA
	Convene an Expert Advisory Panel or Management group to oversee the reactive monitoring program and review effectiveness of water quality and ecological trigger values and response plans
	Undertake validation monitoring programs for seagrass, corals, dredge plumes and other impact predictions from the Draft EIS
	Seek an approval of a Fish Habitat Area 'exchange' to accomodate a 9.2ha encroachment of proposed channel widening into the FHA area
B3 Coastal Processes	Direct the dredge contractor to manually bypass excessive build-up of beach sand material from one side of the pipeline to the other to maintain coastal processes, should it be necessary
	Ensure that future updates to the LTDSDMP (also a LTMMP) for Cairns include consideration of relocation of maintenance DMPA to the preferred Option 1A area, as components of the application for and resolution of future Marine Park and Sea Dumping Permit process through consultation with the Technical Advisory Committee (TACC) and the GBRMPA.
B4 Marine Sediment Quality	Revise fuel handling and spill response procedures in the Port's operational procedures to minimise the potential future risk to sediment quality from refueling activities associated with the provision of IFO at the port.
B5 Marine Water Quality	Develop and implement a reactive water quality monitoring program for the project
	Develop appropriate management controls to ensure that tailwater discharge complies with specified water quality criteria.
	Ensure implementation of the Megafauna Management Strategy provided in the Dredge Management Plan (Chapter 2)
B6 Water Resources	Conduct geotechnical investigations along the alignment of the wall to identify unsuitable foundation materials for the wall, engineering design to take into account foundation materials, and oversight of construction to ensure that the construction is adapted where necessary to ground conditions encountered on site.
	Ensure that water level in the lake is minimised 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
B7 Marine Ecology	Conduct seagrass surveys within the channel footprint prior to capital dredging to confirm whether there are any potential direct impacts on seagrass

	Conduct a bathymetry survey of the channel and surrounds progressively and upon completion of dredging to minimise over-dredging and confirm final depths at the completion of the capital dredging campaigns
	Conduct a post dredging seagrass monitoring program (and soft sediment benthos monitoring) to identify any changes to communities as a result of the capital dredging program
	Ensure that capital dredging not be carried out in late spring and summer (November to February) to minimise potential impacts on marine ecological system functions.
	Ensure TSHD sailing routes are optimised to minimise the generation of propeller wash
B8 Terrestrial Ecology	Conduct a weed monitoring program to record the abundance of the weed species within the Northern Sands DMPA project area and Tingira Street DMPA; should the monitoring record an increase in abundance or spread of the key weed species, this should trigger the requirement for a weed control program.
	Ensure that any M. beccarii (Ant plant) individuals that are to be directly impacted by pipeline installation and decommissioning works are translocated to suitable nearby habitat and monitored to determine success of translocation
	Ensure any new fences should have a plain wire as a top strand, rather than barbed wire to reduce the risk of entanglement to minimise impacts on P. conspicillatus (Spectacled flying fox)
	Ensure that the threat abatement actions listed in the DEHP SPRING database will be implemented, should E. magnirostris (Beach Stone Curlew) be recorded as breeding at the Richters Creek mouth area
B9 Socioeconomic	Ensure that where feasible, construction plant, materials & machinery should be screened behind fencing or located to minimise visual impacts
	Appropriate site security, fencing and signage should be utilised to mitigate any threats to public safety and wellbeing from pipeline construction/dismantling and dredging operations
	Pre works consultation should take place with the Holloways Beach Environmental Education Centre to ascertain peak usage times in which works may be able to be amended if required
	A 'Submerged Pipeline' sign should be erected on the bank of Richters Creek for the period of the pipeline with depth information to mitigate any potential danger to boat users
	Ongoing liaison should take place with the Holloways Beach Environmental Education Centre to enhance the potential for future involvement of the centre in learning and monitoring opportunities
B10 Noise	Program dredging in the vicinity of CityPort during night-time hours, where practicable
	Consult with users of boat moorings near construction areas within the channel and near the wharf to manage the potential for noise impacts to these receptors
	Conduct a detailed noise assessment of the booster pump stations, pump out locations once the location and number of pump stations has been defined by the contractor, and the actual pump stations have been selected to determine if compliance with the construction noise limits be achieved
	Limit piling activities to the typical construction hours (6:30 am to 6:30 pm, Monday to Saturday) unless approval is obtained from DEHP/local authority based on "sufficient grounds" to justify construction outside these hours.
B11 Air	Ensure that the backhoe dredge and tugs will use marine diesel fuel to minimise particulate emissions
	Conduct a survey of cruise ship fuel consumption and fuel type, whilst berthed at the wharf to assist in impact prediction and management planning
	Ensure that cruise ships that do not have scrubbers on engines are required to use 0.5% sulfur fuel oil, IFO, or marine diesel whilst berthed at the wharf in accordance with AMSA regulations by 1 January 2020

	Conduct scheduled monitoring of PM2.5 and NO2 concentrations at a location representative of the apartments on Wharf Street between Lake and Abbott Streets to inform revisions of impact modelling, mitigation and management planning
	Ensure that mobile cranes are to be fitted with SCR emission control technology
	Ensure that wharf construction dust management is to include regular visual plume monitoring which inform use of high pressure water sprays during truck loading
B12 Landscape	Ensure that lighting of compounds and works sites be restricted to agreed hours and in accordance with a Construction Environmental Management Plan
	Ensure that, where feasible, construction plant, materials & machinery be screened behind fencing or located to minimise visual impacts.
	Ensure that directed lighting be used at wharf construction site and the DMPAs to minimise glare and light spill
	Ensure that directed lighting be used at wharf construction site and the DMPAs to minimise glare and light spill.
	Ensure that if impacts from light from construction compounds and cruise ships become a concern to wharf street residents, suitable management options are developed in consultation with cruise ship operators as and when the need arises.
B13 Cultural Heritage	Ensure that an appropriately qualified marine archaeologist be contacted immediately if items of possible marine heritage are found during channel hydrographic surveys
	Engage a qualified archaeologist to monitor further works in this area should the proposed fuel line installation works encounter evidence of the old Malay town Ensure appropriate hold points and other measures are included for such occurrences in contractors Construction Management Plan
B14 Transport	Provision of a traffic controller on the shared pedestrian area at the Cairns Cruise Liner Terminal during heavy pedestrian movements to increase safety and give buses and taxis priority when required.
	Will need to manage access to and from Holloways Beach and Yorkeys Knob Road with traffic controllers and temporary pavement widening for safe access to the lay down sites.
B15 Waste	Ensure that construction waste be managed in accordance with best practice management procedures outlined in the Contractors Environmental Management Plan.
	Continue to work with booking agencies to promote opportunities to improve waste management for cruise ship generated wastes.
	Provide information on likely flow volumes, trunk connection points and a network analysis to CRC to aid in the assessment of impacts to their existing infrastructure prior to finalisation of landside sewage reticulation design
	Ensure that Internationally recognised signs (e.g. ISO signage) be used to aid international visitors and crew to meet AMSA and DOAWR requirements for their waste and to prevent mixing
B16 GHG	Develop an ongoing GHG emissions inventory for the construction stage to monitor, report and identify opportunities to reduce emissions. Implement reduction strategies as appropriate.
	Minimise project GHG emissions through the PN Environmental Management System
B17 Hazard and Risk	Manage project hazard and risks through implementation of the PN Risk Management and Internal Control Policy and Risk Management Framework
	Follow a safety in design process be followed in accordance with the Australian Safety and Compensation Council's Guidance on the Principles of Safe Design for Work (2006).
	Implement Health and Safety Management Plans for all project phases in line with the Health and Safety Policy
	Implement a Traffic Management Plan for construction, operations and decommissioning to reduce risks associated with road transport.

	Implement the Vessel Traffic Management Plan (Chapter C3) contains mitigation and management measures designed to reduce impacts from the dredging campaign
	Implement the Maritime Operations Management Plan(chapter C4) to reduce the potential for negative impacts on the environment, vessel safety and operational efficiency with the changes in maritime operational activities (operational shipping) as a result of the project.
	Implement the current Emergency Management Plan as well as associated plans and procedures to reflect hazards and risks associated with the project prior to the commencement of operations
	Conduct a magnetometer survey in order to reduce this risk and the associated likelihood of UXO impacts during the dredging program
B 18 Cumulative Impacts	Manage any cumulative impacts through regular auditing of the dredge contractors CEMP and implementation of the following management plans: • Construction Environmental Management Plan • Dredge Management Plan • Vessel Transport Management Plan Maritime Operation Management Plan