

Appendix 7-D

River Facilities Dredge Management Plan





South of Embley Project

**DRAFT DREDGE MANAGEMENT PLAN
RIVER FACILITIES (CAPITAL DREDGING)**

February 2013

DRAFT

Table of Contents

1	INTRODUCTION	1
1.1	Commonwealth and State Approvals	1
2	DREDGING AND DISPOSAL DESCRIPTION	4
3	SEDIMENT CHARACTERISATION	8
4	EXISTING ENVIRONMENT	9
4.1	Embley and Hey Rivers Past and Current Uses	9
4.2	Embley and Hey Rivers Habitats	9
4.3	Embley and Hey Rivers Fauna	10
4.4	Albatross Bay Spoil Ground	12
5	POTENTIAL IMPACTS	13
5.1	Macrobenthic Infauna Impacts	13
5.2	Seagrass Habitat Impacts	13
5.3	Marine Fauna Impacts	14
5.4	Water Quality Impacts	15
5.5	Other potential marine impacts	16
6	MANAGEMENT AND MONITORING	18
6.1	Water Quality	19
6.2	Threatened Marine Mammals and Marine Turtles	20
6.3	Benthic habitats	24
6.4	Marine Pests	25
6.5	Underwater Noise	25
7	REPORTING	26
8	REFERENCES	27

Figures

Figure 1: Port, Spoil Ground and Mooring Locations	2
Figure 2: Humbug Barge Terminal	5
Figure 3: Hornibrook Ferry Terminal	6
Figure 4: Hey River Barge/Ferry Terminal	7
Figure 5: Seagrass in Embley and Hey River Estuaries	11
Figure 6: Marine Turtle and Marine Mammal Management Procedure – Dredging	23
Figure 7: Marine Turtle and Marine Mammal Management Procedure – Spoil Disposal	24

1 INTRODUCTION

The South of Embley (SoE) Project involves the construction and operation of a bauxite mine and associated processing and port facilities to be located near Boyd Point on the western side of Cape York Peninsula. The SoE Project would be developed and operated by RTA Weipa Pty Ltd, which is a wholly-owned subsidiary of Rio Tinto Aluminium Limited. A detailed description of the Project is provided in the Queensland EIS (RTA 2011), the Queensland SEIS (RTA 2012), and the Commonwealth Environmental Impact Statement (RTA 2013).

The SoE Project requires the construction and operation of a new ferry terminal and tug berths at Hornibrook Point, a roll on/roll off (RORO) barge facility at Humbug Wharf, and a new barge/ferry terminal on the western bank of the Hey River. These would be used to transport workforce, materials and equipment between Weipa and the Project. Minor capital dredging would be required in each of these areas to accommodate tug, barge and/or ferry access to the proposed terminals.

Dredged material derived from the construction of these facilities would be disposed of at the existing Albatross Bay spoil ground utilised by North Queensland Bulk Ports (NOBP) (refer **Figure 1**). The volumes of dredged material to be placed at the Albatross Bay spoil ground from capital dredging for the ferry and barge terminals are small compared to the approximately 1,000,000m³ being deposited annually by NOBP for routine maintenance dredging at the Port of Weipa.

This Dredge Management Plan (DMP) describes monitoring and management response arrangements for capital dredging and dredged material disposal associated with the development of the barge/ferry terminals and tug berths to be undertaken by RTA as part of the SoE Project.

1.1 Commonwealth and State Approvals

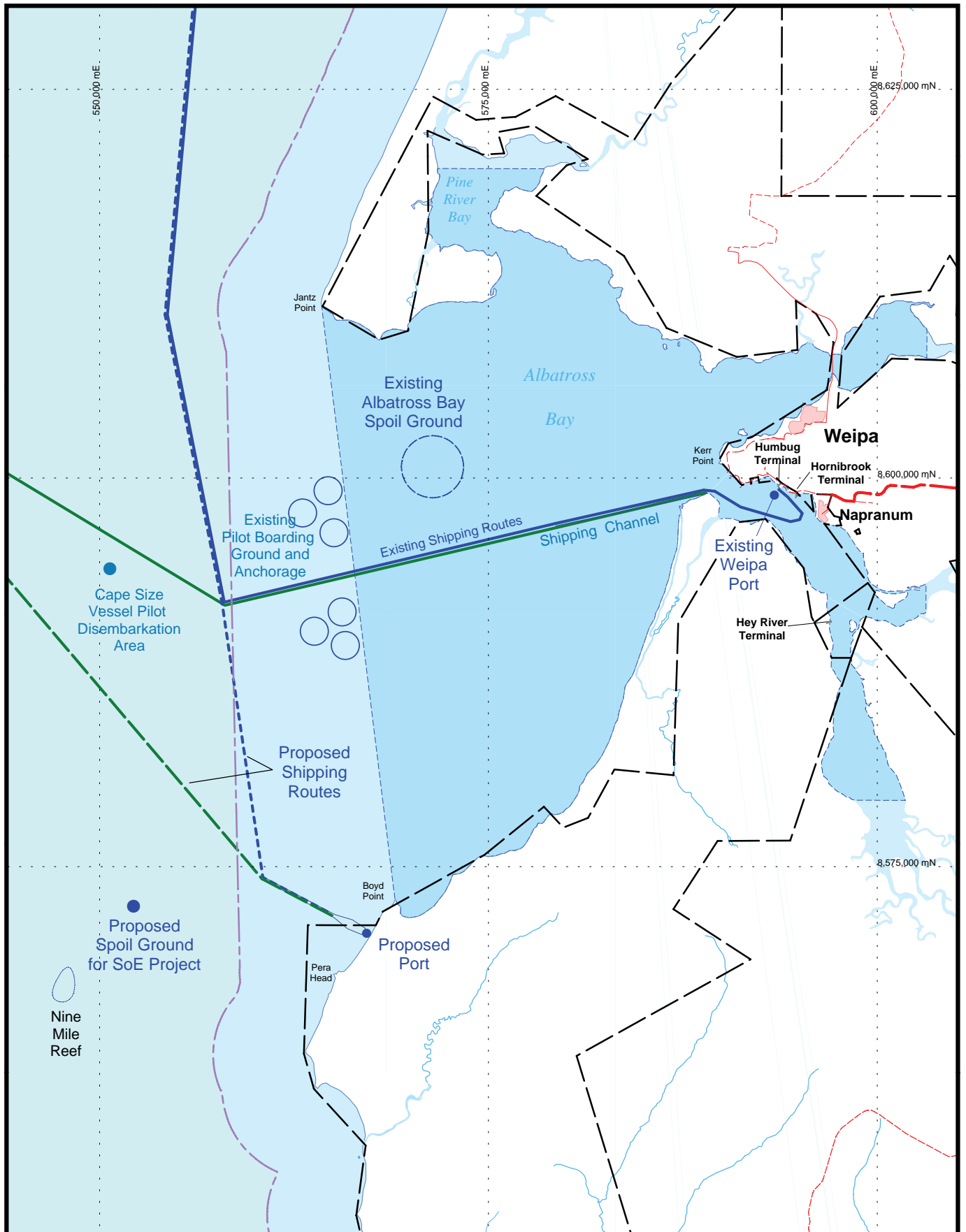
The Project was declared a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) on 29 October 2010. This decision was revoked and substituted on 16 March 2012 and new *Tailored Guidelines for the preparation of the Draft Environmental Impact Statement* (the 'Tailored EIS Guidelines') were issued in July 2012.

The Commonwealth *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) regulates the loading and dumping of spoil from dredging operations in Australian waters.

In accordance with Section 160 of the EPBC Act, the Minister has determined that an assessment under Part 8 of the EPBC Act is required in relation to the issuing of a permit under the Sea Dumping Act. DSEWPaC has advised that, for the purposes of efficiency, the Commonwealth EIS be scoped such that it meets the requirements of the Sea Dumping Act, such that one assessment is required.

RTA submitted information for the sea dumping permit application for the barge/ ferry terminals to DSEWPaC in February 2011. The application was amended with a request for exemption from further sediment sampling on 31 October 2011 and again on 27 June 2012, and exemptions were granted on 20 January 2012 and 20 July 2012 respectively.

Detailed sediment characterisation reports have been provided separately to DSEWPaC. Future maintenance dredging and spoil disposal associated with the ferry, barge and tug terminals would be subject to obtaining subsequent sea dumping permits.



Rio Tinto Alcan

- RTA Mining Lease boundary
- Locality
- Drainage
- Road/track
- Weipa Port Limits
- Coastal waters (3 nautical mile limit)
- Commonwealth Marine Area
- RTA shipping route (domestic)
- RTA shipping route (international)

South of Embley Project
Fig. 1: Port, Spoil Ground and Mooring Locations



0 5 10km

Datum/Projection: GDA94/MGA Zone 54

Date: 12/10/2012

Development Approval is required for dredging under the Coastal Protection and Management Act 1995 and Sustainable Planning Act 2009 (Qld) at the Humbug barge terminal and Hornibrook ferry terminal which are outside the mining lease. An Environmental Authority is also required under the Environmental Protection Act 1994 for dredging on the mining lease at the Hey River terminal. The Queensland Coordinator General stated conditions for these approvals requiring a Dredge Management Plan to be developed. This DMP supports the application for the Commonwealth Sea Dumping Permit and will address the conditions stated by the Queensland Coordinator General.

DRAFT

2 DREDGING AND DISPOSAL DESCRIPTION

Dredging and spoil disposal for the barge and ferry terminals is described in Section 6.5.2 of the Queensland EIS (RTA 2011), Section 2.7.3 of the Supplementary Report to the Queensland EIS (RTA 2012), and Section 3.8.2 of the Commonwealth EIS (RTA 2013). Respective dredge volumes and dredge footprint areas for the barge/ferry/tug terminals are:

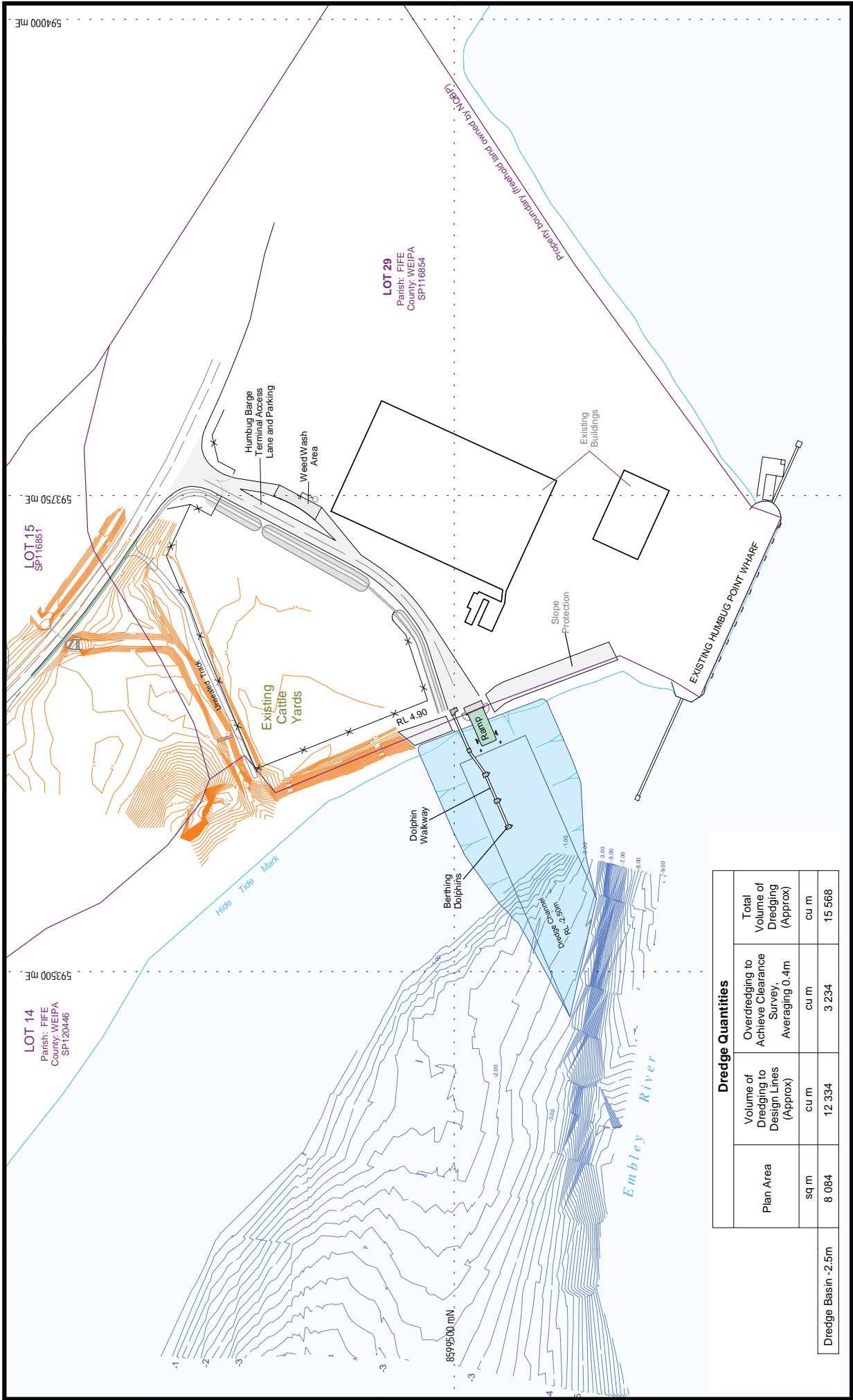
- approximately 15,600m³ to be removed from the Humbug barge terminal over an area of 8,000m² (refer **Figure 2**);
- approximately 57,600m³ to be removed from the Hornibrook ferry / tug terminal over an area of 23,300m² (refer **Figure 3**); and,
- approximately 37,380m³ to be removed from the Hey River barge / ferry terminal over an area of 25,000m² (refer **Figure 4**).

Dredging is anticipated to be undertaken using either a barge-mounted backhoe/dipper dredge, with a bucket up to approximately 13m³ or a Cutter Suction Dredger (CSD). Dredge spoil would either be transferred to a Split Hopper Barge (SHB) or redeposited and picked up using a Trailing Suction Hopper Dredger (TSHD) for transport to the Albatross Bay spoil ground. The method will be confirmed following engagement of the dredging contractor and included in the final DMP.

Alternative options for disposal of dredged material from the Embley and Hey River barge/ferry/tug terminals are presented in Section 1.6.11 of the Queensland EIS (RTA 2011) and Section 3.12 of the Commonwealth EIS (RTA 2013).

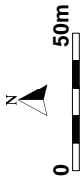
The Albatross Bay spoil ground is defined by a 2,000m radius, centred on the following coordinates:

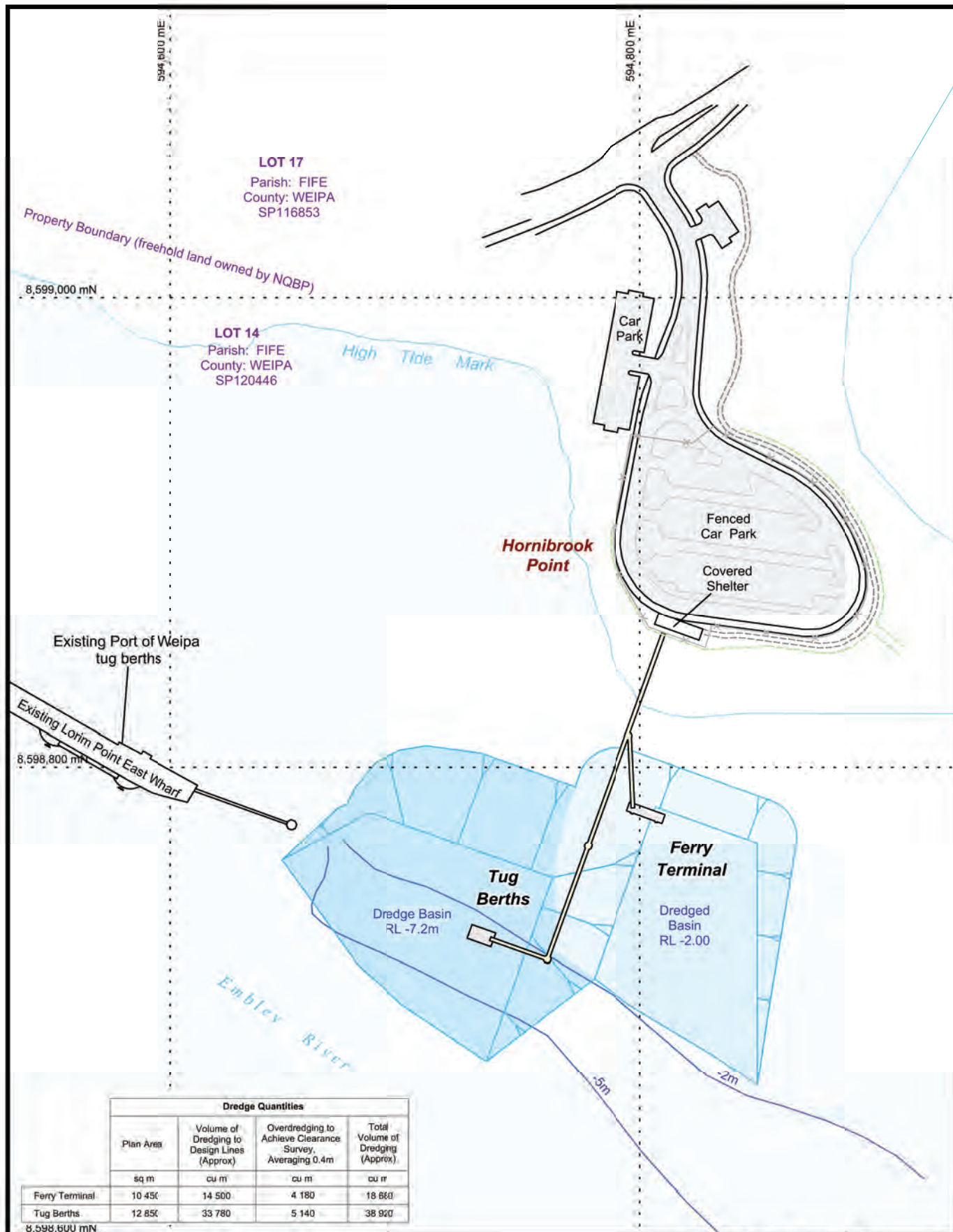
- S12° 39' 34.7" E141° 39' 24.1" (WGS84).



Dredge Quantities			
Plan Area	Volume of Dredging to Design Lines (Approx)	Overdredging to Achieve Clearance Survey, Averaging 0.4m	Total Volume of Dredging (Approx)
sq m	cu m	cu m	cu m
8 084	12 334	3 234	15 568
Dredge Basin -2.5m			

- NOTES**
1. VERTICAL DATUM:
Depths are in metres and are reduced to Chart Datum (CD).
Which is approximately the level of lowest Astronomical Tide (LAT).
CD (LAT) is 1.752m below AHD.
2. HORIZONTAL DATUM:
Coordinates are to MGA/GDA94 Zone 54
-  Dredged area
-  Reclaimed area





South of Embley Project

Fig. 3:
Hornibrook Ferry Terminal



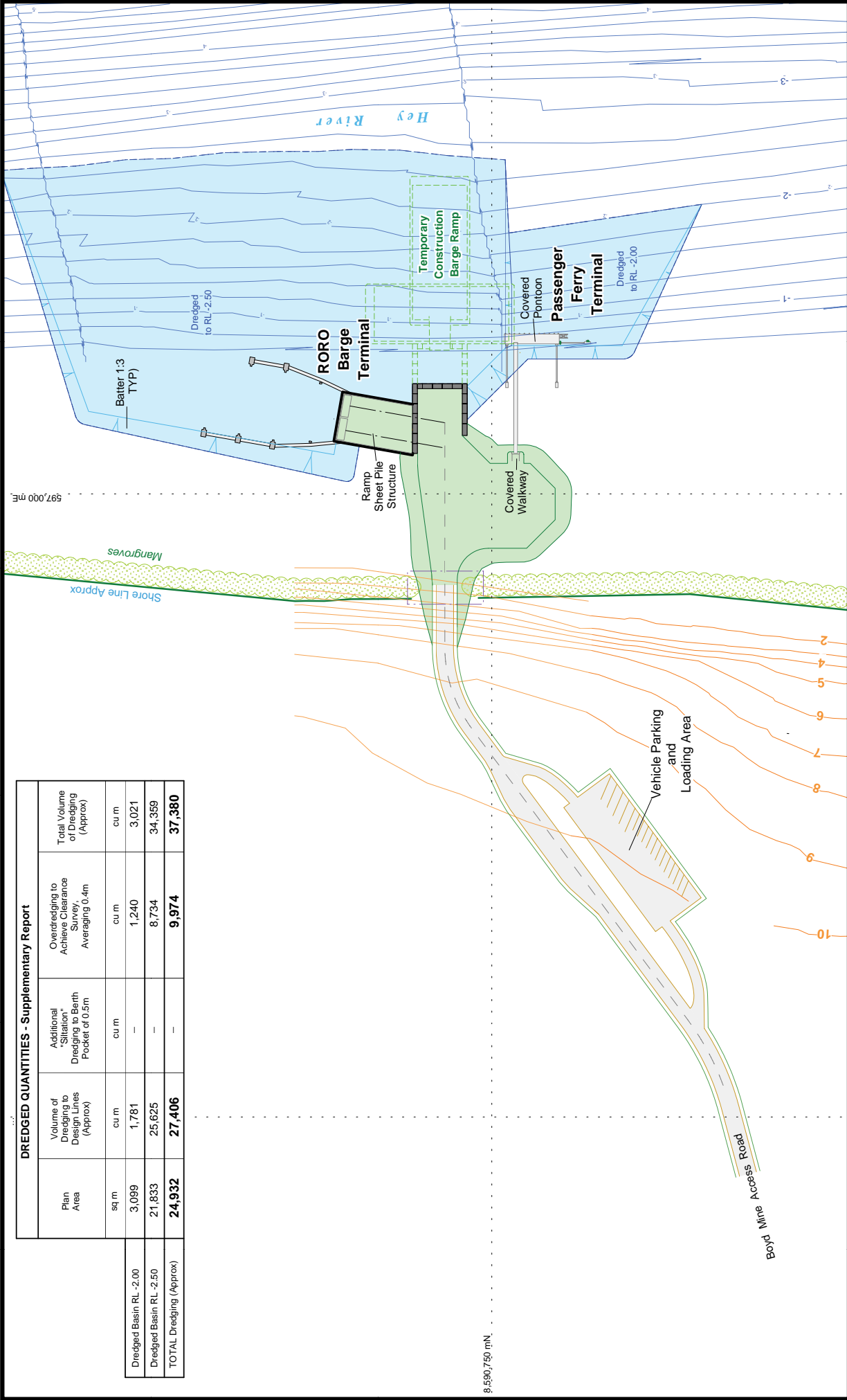
0 50m

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012

NOTES

1. VERTICAL DATUM:
Depths are in metres and are reduced to Chart Datum (CD) which is approximately the level of Lowest Astronomical Tide (LAT). CD (LAT) is 1.752m below AHD.
2. HORIZONTAL DATUM:
Coordinates are to MGA/GDA94 Zone 54.

DREDGED QUANTITIES - Supplementary Report				
Plan Area	Volume of Dredging to Design Lines (Approx)	Additional "Siltation" Dredging to Berth Pocket of 0.5m	Overdredging to Achieve Clearance Survey, Averaging 0.4m	Total Volume of Dredging (Approx)
Dredged Basin RL -2.00	3,099	1,781	1,240	3,021
Dredged Basin RL -2.50	21,833	25,625	8,734	34,359
TOTAL Dredging (Approx)	24,932	27,406	9,974	37,380



3 SEDIMENT CHARACTERISATION

Sediment sampling and analyses have been completed at the river facilities locations (Worley Parsons 2012). The assessment of dredged material is consistent with the assessment guidance described in the *National Assessment Guidelines for Dredging* (NAGD) (Commonwealth of Australia 2009), Annex 2 of the London Protocol, and the *Waste Specific Guidelines for Assessment of Dredged Material* (IMO 2000).

Sampling was undertaken at seven locations at the Hornibrook terminal, seven locations at the Hey River terminal, and six locations at the Humbug terminal. Samples were collected using a boat-deployed piston corer to dredge depth or until stiff clays were met. Cores were split into up to three horizons (0 – 0.5m; 0.5 – 1m; and >1m). Collected samples were transported under refrigerated conditions to the primary analytical laboratory (Advanced Analytical Australia - AAA) and the secondary analytical laboratory (Australian Laboratory Services-ALS) within relevant holding times. Samples were analysed for strong acid extractable metals and metalloids, polycyclic aromatic hydrocarbons, organotins, acid sulphate soils and particle size distribution.

The characterisation of sediments within the three dredge areas was completed in accordance with the approved (16 June 2009) sediment sampling and analysis plan (SAP). Subsequent to the finalisation of these sediment studies and submission of this report to DSEWPac for approval, changes were made to the alignment of the Hornibrook ferry terminal and dredge volumes for the Humbug and Hey River terminals. An application for exemption from further sediment characterisation was submitted to DSEWPac on 12 January 2012 for the Humbug and Hey River terminals and approved on 20 January 2012.

Interpretation of analytical results was made according to the *National Assessment Guidelines for Dredging* (NAGD) (Commonwealth of Australia, 2009). Based on the assessment, all contaminant means and 95% upper confidence level of the mean (95% UCL) at the Hornibrook terminal and Humbug terminal were below the relevant NAGD screening levels.

At the Hey River terminal, all contaminant means and 95% UCLs were below relevant NAGD screening levels, except for arsenic. Further testing for arsenic was undertaken using elutriate and dilute acid extraction (DAE) analysis in accordance with the contaminant assessment framework requirements of the NAGD. Results of elutriate analysis identified that arsenic would not impact water quality during disposal and required minimal dilution to achieve concentrations less than the 'low reliability' ANZECC/ARMCANZ (2000) arsenic water quality guideline levels (for AsIII and AsV). DAE results were well below screening levels and indicated that arsenic is strongly bound in sediments and therefore likely of geological origin.

An acid sulphate soils assessment was completed at each of the three proposed dredge areas. The results of the assessment, analysed using the Suspension Peroxide Oxidation-Combined Acidity and Sulfate (SPOCAS) method, identified that sulphur oxidation had not taken place in the sediment. Sediments have the potential to generate sulphuric acid but also have the capacity to neutralise some acid generation. Therefore they would not require the addition of lime to manage acid generation, if material was to be placed on land.

The results of chemical analyses identify that the material to be dredged in each of the three dredge areas is suitable for unconfined disposal at sea at the approved Albatross Bay spoil ground.

4 EXISTING ENVIRONMENT

4.1 Embley and Hey Rivers Past and Current Uses

The Port of Weipa and its approach channel were developed through capital dredging from 1961 through to 1975 (PCQ 1995). The most recent capital dredging program occurred in 2006 to widen the existing channel and maintenance dredging generally occurs on an annual basis, typically during the dry season (PCQ 2009). Currently within the Port of Weipa there are four wharves located at Lorim Point East, Lorim Point West, Humbug Wharf and Evans Landing. These wharves require maintenance dredging on a regular basis.

Hornibrook Point is an area of land adjacent to Lorim Point and was reclaimed in the 1960s using dredge spoil from the Embley River, including dredge spoil from the original capital dredging of the Lorim Point Wharf. Hornibrook Point has remained as vacant parkland. Humbug Wharf is located approximately 1.25km downstream from Hornibrook Point and is a general cargo wharf currently managed by RTA.

The proposed Hey River terminal site, south of Hey Point in the Hey River is an undeveloped area approximately 8km south of Hornibrook Point and within the boundaries of ML6024. No dredging has previously occurred within this area.

4.2 Embley and Hey Rivers Habitats

Benthic habitat surveys of estuarine areas within the Project area have been undertaken to identify and map benthic habitats. The results of the surveys are described in Section 6.3 of the Queensland EIS (RTA 2011) and Section 6.5 of the Supplementary Report (RTA 2012) with most recent information presented in Section 7.2 of the Commonwealth EIS (RTA 2013) and summarised below.

The development footprints for the Hornibrook ferry terminal and tug berths, Humbug barge terminal and Hey River barge/ferry terminal consist primarily of soft sediment habitats that contain sparse epifauna typical of soft sediments, such as seapens and tube dwelling anemones, soft corals or sponges (refer to Section 6.3.5 of the Queensland EIS (RTA 2011) and Section 1.2.9 of the Commonwealth EIS (RTA 2013)).

Seagrass beds are typically present in the more sheltered areas of Albatross Bay, including the lower reaches of the Embley and Mission Rivers and Pine River Bay (refer to Section 6.3.4 of the Queensland EIS (RTA 2011) and Section 7.2.7 of the Commonwealth EIS (RTA 2013)). The Department of Agriculture, Fisheries and Forestry (DAFF) (formerly the Department of Primary Industries and Fisheries) has been undertaking annual seagrass monitoring within the Port of Weipa since 2000. In August 2011, it was estimated there were approximately 1,031ha of seagrass in 14 meadows within the bounds of the Intensive Monitoring Area within the Embley and Hey Rivers (DAFF and NQBP 2011). There has been a steady increase in seagrass area within the IMA since the lowest recorded levels in 2008 and is the largest area recorded since 2004, although it is still significantly lower than the peak recorded in 2001. Seagrass meadows in the IMA continue to be dominated by *Enhalus acoroides*. The distribution and condition of seagrass in the Hey and Embley Rivers is described further in Section 6.3.4.2 of the Queensland EIS (RTA 2011), Section 6.5 of the Supplementary Report (RTA 2012), and Section 7.2.7.2 of the Commonwealth EIS (RTA 2013). **Figure 5** shows the seagrass meadow type and cover (aggregated patches, continuous cover or isolated patches) within the IMA during the September 2009 survey. The figure also identifies the position of the proposed barge and ferry terminal infrastructure.

Habitat surveys during July 2009 and February 2012 did not find the presence of seagrass within the footprints of the Humbug terminal. However, visual inspection during early May 2010 coinciding with peak spring tides, did reveal isolated patches of *E. acoroides* in good condition within and adjacent to the proposed dredge footprint of the Humbug terminal at low tide. This observation is consistent with recent survey data prepared by DAFF (DAFF and NQBP 2011) (refer **Figure 5**).

Drop camera video surveys undertaken of the sub-tidal banks at Hornibrook Point in 2009 and grab sampling conducted February 2012 indicate that the Hornibrook terminal dredge footprint does not contain seagrass, however, aggregated patches of *E. acoroides* seagrass may be located adjacent to it. This is consistent with most recent mapping prepared by DAFF (DAFF and NQBP 2011) (refer **Figure 5**).

Seagrass monitoring between 2000 and 2009 (Chartrand and Rasheed 2009; McKenna and Rasheed 2010) in the vicinity of the Hey River terminal location occasionally reports a very thin patch of isolated seagrass. Drop camera surveys undertaken over the Hey River terminal dredge footprint in October 2007, November 2008 and June 2009 did not record any seagrass. Grab surveys conducted in February 2012 also did not find any seagrass within, or adjacent to, the Hey River terminal dredge area. However, it is possible that seasonally variable seagrasses were absent (e.g. *Halophila ovalis*). Overall though, it is considered that if any seagrasses do occur at the proposed terminal site from time to time, they are likely to contribute minimally to primary productivity in the area.

4.3 Embley and Hey Rivers Fauna

Threatened and migratory marine species that occur or potentially occur in the Project area are described in Section 6.6.1 of the Queensland EIS (RTA 2011). In the Commonwealth EIS (RTA 2013) Section 7.1.1 describes threatened estuarine and marine species, Section 9.1.1 describes migratory marine species, and Section 10.4.3 addresses other marine species in the Commonwealth Marine Area.

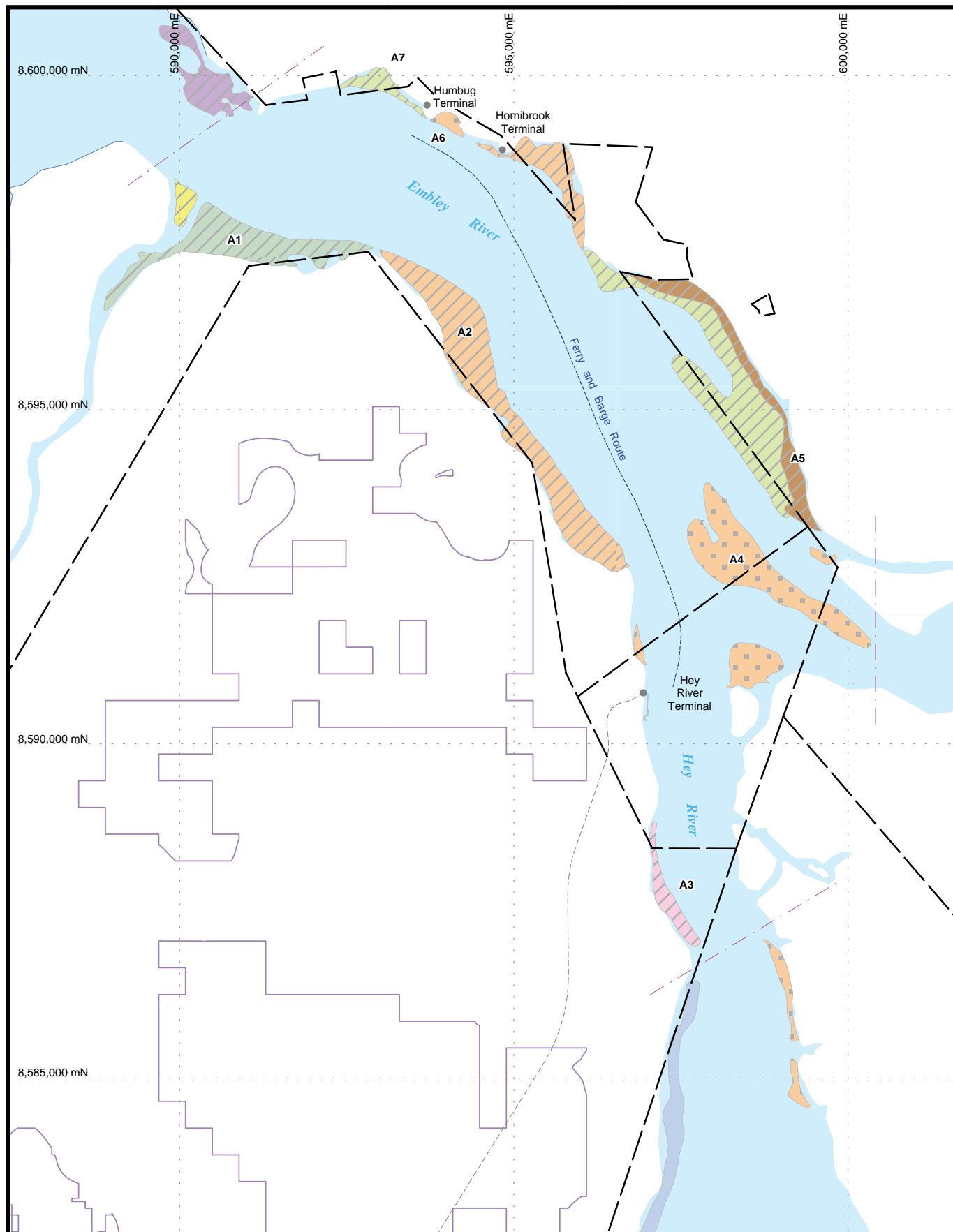
Threatened marine turtle species assessed as likely to occur in the Hey and Embley Rivers include:

- Loggerhead Turtle (*Caretta caretta*) (EPBC Act Endangered and Migratory and *Nature Conservation Act 1992* (Qld) (NC Act) Endangered);
- Olive Ridley Turtle (*Lepidochelys olivacea*) (EPBC Act Endangered and Migratory and NC Act Endangered);
- Flatback Turtle (*Natator depressus*) (EPBC Act Vulnerable and Migratory and NC Act Vulnerable); and,
- Green Turtle (*Chelonia mydas*) (EPBC Act Vulnerable and Migratory and NC Act Vulnerable).

No marine turtles were observed in the Embley and Hey Rivers during field studies for the Project. However foraging areas for the above marine turtle species can include seagrass meadows and unvegetated sand or mud areas, and these species of marine turtle are considered likely to occur in the Hey and Embley Rivers.

Migratory marine fauna species that are assessed as likely or known to occur in the Embley and Hey Rivers include:

- Indo-Pacific Humpback Dolphin (*Sousa chinensis*) (EPBC Migratory and NC Act Near Threatened);
- Australian Snubfin Dolphin (*Orcaella heinsohni*) (EPBC Migratory and NC Act Near Threatened); and,
- Dugong (*Dugong dugon*) (EPBC Migratory and NC Act Vulnerable).



RioTinto Alcan

- RTA Mining Lease boundary
- Mining Years 14- 40
- Intensive monitoring area boundary

Seagrass Cover

- ▨ Aggregated patches
- Continuous cover
- Isolated patches

Community Type

- *Enhalus acoroides*
- *Enhalus acoroides* with mixed species
- *Halodule uninervis* (narrow)
- *Halodule uninervis* (narrow) with *Enhalus acoroides*
- *Halodule uninervis* (narrow) with mixed species
- *Thalassia hemprichii*
- *Thalassia hemprichii* with mixed species
- *Halophila ovalis* with mixed species

South of Embley Project

Fig. 5: Seagrass in Embley and Hey River Estuaries



0 2km

Datum/Projection: GDA94/MGA Zone 54 Date: 12/10/2012

Source: North Qld Bulk ports and State of Qld through the Department of Agriculture, Fisheries and Forestry (2011)

Indo-Pacific Humpback Dolphins were observed in the Embley and Hey Rivers during field studies, however, the other species outlined above are considered likely to occur in this area because they are often associated with tidal riverine and estuarine systems. The Indo-Pacific Humpback Dolphins sightings were not within seagrass beds.

Dugongs are known to occur in low densities in Albatross Bay and are closely associated with the seagrass beds in the Embley River estuary. However, no Dugongs were incidentally observed associating with these seagrass beds during marine field surveys for the Project. Dugongs prefer seagrasses that are early or 'pioneer' species, particularly species of the genera *Halophila* and *Halodule* (DEWHA 2010). The long, strap-like seagrass *E. acoroides*, which dominates the seagrass beds of the Embley and Hey Rivers, is not a preferred species in Dugong's diet.

Sea snakes are known to occur in the Embley and Hey Rivers. No species of sea snake are listed as threatened under the EPBC Act or the NC Act. However, all species of sea snake are listed as marine species under the EPBC Act. The North Marine Bioregional Plan identifies sea snakes as a conservation value and a priority for conservation effort in the North Marine Region (DSEWPac 2012).

4.4 Albatross Bay Spoil Ground

The approved Albatross Bay spoil ground was commissioned in 1998 and since that time has received capital and maintenance dredging material from operations within the Port of Weipa. Before any material is placed at the Albatross Bay spoil ground, the spoil must be proven to be suitable for placement at sea using the NAGD assessment framework.

The footprint for the Albatross Bay spoil ground has been confirmed as consisting primarily of soft sediment habitats that contain sparse epifauna typical of soft sediments, such as seapens and tube dwelling anemones, soft corals or sponges (refer Section 7.2.7 of the Commonwealth EIS (RTA 2013) and Section 6.3.5 of the Queensland EIS (RTA 2011)). The Albatross Bay spoil ground does not contain, and is not close to any, reef communities, and also contains no seagrass beds, and is not shallow in nature.

The Indo-Pacific Humpback Dolphin and Australian Snubfin Dolphin are possibly transient in the footprint of the Albatross Bay spoil ground, however, this spoil ground does not represent preferred habitat. The Albatross Bay spoil ground does not contain preferred habitat for Bryde's Whale (*Balaenoptera edeni*) (EPBC Act Migratory), however, the recording of the species from tropical inshore waters suggests it is possible the species may occur sporadically in the vicinity of the spoil ground footprint. Dugong may migrate through the Albatross spoil ground area between feeding grounds, however it is more likely that the species would migrate through shallower waters.

It is unlikely that the Green Turtle, Hawksbill Turtle, Flatback Turtle and Olive Ridley Turtle would occur in the Albatross Bay spoil ground area, due to lack of preferred habitat. However, they may transit the site.

The Leatherback Turtle (*Dermochelys coriacea*) is likely to occur sporadically in the vicinity of the Albatross Bay spoil ground, using it for foraging. However, Leatherback Turtles are rarely found in Queensland, so any presence would be sporadic. The Loggerhead Turtle species is also likely to be transient in the vicinity of the Albatross Bay spoil ground and use it for foraging or resting.

Sea snakes are known to occur in Albatross Bay and may be transient in the area of the Albatross Bay spoil ground.

5 POTENTIAL IMPACTS

5.1 Macrobenthic Infauna Impacts

Impacts on Macrobenthic infaunal assemblages are described in Section 10.4.2 of the Commonwealth EIS (RTA 2013) and Section 6.9.4.4 of the Queensland EIS (RTA 2011) and summarised below.

Macrobenthic infaunal assemblages are likely to be affected at the Hey and Embley River dredging sites and the Albatross Bay spoil ground as a result of physical disturbance of sedimentary habitats from dredging, creation of a turbidity plume, and subsequent deposition and re-suspension of fine sediments. However, macrobenthic infaunal assemblages can recover over time from the impacts of dredging and spoil disposal. Recovery of the macrobenthic assemblage from spoil deposition at the Albatross Bay spoil ground is considered to be rapid (GHD 2005).

Despite the potentially significant local impact on the infaunal assemblage, impacts pose a low risk on a regional scale. Therefore, no macrobenthic infauna monitoring is proposed.

5.2 Seagrass Habitat Impacts

The potential impacts of dredging on seagrass habitat at the barge and ferry terminals is described in Section 6.9.3.3 of the Queensland EIS (RTA 2011) and Section 6.5 of the Supplementary Report (RTA 2012). Potential impacts of dredging on seagrass habitat are summarised below and are based upon most recent information in Section 7.3.5.1 of the Commonwealth EIS (RTA 2013) in relation to marine turtles, Section 9.4.4.1 in relation to Dugong, and Section 10.4.3.1 in relation to sea snakes.

Seagrasses persist in the naturally turbid environment in the Port of Weipa (Carter *et al* 2012). Maintenance and capital dredging has occurred in the Port of Weipa for many years with current maintenance volumes 10 times the proposed total capital dredging program for the Project in the river.

In an assessment of the changes in seagrass meadows in the Port of Weipa, McKenna and Rasheed (2010) concluded: "The most likely drivers of seagrass change in Weipa are related to regional and local climate conditions rather than anthropogenic or port related factors. Low rainfall and a reduction in associated runoff, high air temperatures and greater exposure to more intense solar irradiation were all likely to have contributed to the low densities recorded in the past and may have contributed to a loss of natural resilience in these meadows".

Erftemeijer and Lewis (2006) have reviewed the available literature on the impacts of dredging on seagrasses, including, peer-reviewed scientific literature, grey literature in the form of EIA, consultancy and technical reports and additional information obtained from internet sources. The review highlights a number of important factors in relation to duration, frequency and magnitude of turbidity impacts that are relevant to the seagrass meadows in the Embley River.

1. For seagrasses, the critical threshold for turbidity and sedimentation, as well as the duration that seagrasses can survive periods of high turbidity or excessive sedimentation vary greatly among species.
2. Larger, slow-growing climax species with substantial carbohydrate reserves, such as *E. acoroides* which is the dominant species in the seagrass meadows of the Embley River (McKeena and Rasheed, 2010) show greater resilience to such events than smaller opportunistic species.

3. Turbidity changes induced by dredging will only result in adverse environmental effects when the turbidity generated is significantly larger than the natural variation of turbidity and sedimentation rates in the area. The seagrass meadows in the Port of Weipa (including the Embley and Hey Rivers) are continually exposed to naturally high and variable turbidity (Carter *et al*, 2012).

4. Erftemeijer and Lewis (2006) state that “*Laboratory experiments have shown that some seagrasses can survive in light intensities below their minimum requirements for periods ranging from a few weeks to several months. The survival period of seagrass below its minimum light requirement is shorter in smaller species with low carbohydrate storage capacity than in larger species. It is clear that species with larger below-ground biomass are better adapted to longer periods of sub-minimal light.*”

Dredging is likely to take only one to two weeks at the Humbug terminal, two to four weeks at the Hey River terminal and three to five weeks at the Hornibrook terminal, and involve only minor dredge volumes. The minor scale and short duration of dredging, may cause a very short-term and transient above average elevation of turbidity over seagrass meadows in the Hey/Embley River, however, it is expected that these elevations will be within the long term background range for the area and short-lived when compared to the frequent and naturally occurring elevated turbidity in the Embley and Hey Rivers and estuary. It is unlikely that sediment loads would be generated over the aggregated *E. acoroides* patches adjacent to the proposed infrastructure at concentrations that would approach critical levels. Further, any reduction in light levels would be short-term and the structurally large *E. acoroides*, with large below ground biomass, would have the capacity to store substantial carbohydrate reserves to provide resilience to the predicted low impact.

The very short duration, small volume dredging campaign is expected to have a negligible impact on seagrass. Despite this assessment, the Queensland Coordinator General has provided stated conditions requiring a three day pause in dredging after 14 consecutive days dredging at each terminal.

RTA have entered into a data sharing agreement with NQBP to enable access to the PAR monitoring data in seagrass meadows during the dredging campaign as detailed in **Section 6.1**.

5.3 Marine Fauna Impacts

Marine fauna impacts are described in Section 6.9.4 of the Queensland EIS (RTA 2011), Section 6.3 of the Supplementary Report (RTA 2012) and Sections 7, 9 and 10 of the Commonwealth EIS (RTA 2013). Marine fauna impacts are summarised below and are based upon most recent information in Section 7.3.5.1 (marine turtles), Section 7.4.5.1 (threatened sawfish and Speartooth Shark), Section 9.3.5.1 (Estuarine Crocodile), Section 9.4.4.1 (Dugong), Section 9.5.4.1 (Australian Snubfin and Indo-pacific Humpback Dolphin) and Section 10.4.3.1 (sea snakes) of the Commonwealth EIS (RTA 2013).

Given the minor scale and short duration of dredging at each of the Embley and Hey River dredge sites, it is unlikely that Dugong and marine turtle foraging areas would be significantly affected by turbidity plumes from barge/ferry terminal dredging. Therefore no additional seagrass or water quality monitoring is proposed.

The proposed dredging activities within the Hey and Embley Rivers would result in negligible impacts on fisheries values or habitat essential to the Estuarine Crocodile, threatened sawfish or the Speartooth Shark.

It is considered unlikely that sea snakes that may inhabit the Embley and Hey Rivers and estuary would be impacted by dredging for the river facilities. It is expected that turbidity will remain within the background range and the small area of dredging will not result in the removal of any significant habitat of potential sea snake prey species. Additionally, the capital dredging campaign will be of short duration (maximum of 11 weeks across three sites) with no dredging in seagrass meadows, resulting in negligible entrainment compared to the ongoing impact of the trawl fishery in the North Marine Region. Bucket type dredges, such as those to be potentially used for Embley and Hey River dredging activities, do not pose an entrainment hazard to marine mammals or marine turtles. Slow moving displacement vessels like barges are not considered a vessel strike risk to marine mammals or marine turtles during dredging and spoil disposal activities. The potential for vessel strike on dolphins would be less than for Dugongs and whales overall due to their greater mobility and ability to quicker respond to disturbances.

Dredging activities using a TSHD may impact marine fauna directly through injury or mortality through accidental intake and entrainment as the trailing draghead moves along the seabed. The use of fauna exclusion devices on the TSHD dragheads would minimise the potential for entrainment of Estuarine Crocodiles, marine mammals or marine turtles. Entrainment by CSDs is less likely due to the slow rate of movement during dredging.

Important foraging habitat for Dugongs and marine turtles is not present within the proposed dredge footprints, minimising the risk that the species would be in the path of the dredge. However, in the event of entrainment, serious injury or mortality to the animal would be likely. The high mobility and manoeuvrability of Australian Snubfin and Indo-Pacific Humpback Dolphins means the species are not at risk of entrainment in dredging equipment, which would be slow moving and highly audible to these animals. Mitigation measures for prevention of entrainment are detailed in **Section 6.2** below.

5.4 Water Quality Impacts

The potential impacts of barge and ferry terminal dredging and disposal activities on water quality are described in Section 6.9.2 of the Queensland EIS (RTA 2011). Potential impacts are summarised below and are based upon most recent information in Section 7.3.5.1 (marine turtles), Section 7.4.5.1 (threatened sawfish and Speartooth Shark), Section 9.4.4.1 (Dugong) and Section 9.5.4.1 (Australian Snubfin and Indo-Pacific Humpback Dolphin) of the Commonwealth EIS (RTA 2013).

Dredging

Analysis of the sediments to be dredged from the proposed barge/ferry terminals have not identified any constituents present at levels of environmental concern that would persist in the water column during dredging or sea disposal at the Albatross Bay spoil ground. Proposed works within the Embley River and Hey River are likely to generate turbidity concentrations that fall within the natural turbidity range (Worley Parsons 2012). Dredging operations within the river facilities would be of short duration and any impacts from underwater noise generated by dredging would be temporary. Dredging would be conducted for a maximum of fourteen consecutive days with a pause of three days between dredging periods at each site.

Spoil Disposal

GHD (2005) has previously carried out an impact assessment in relation to capital dredging of the shipping channel and placement of the material at the Albatross Bay spoil ground. GHD (2005) concluded that the impacts on sensitive areas, such as seagrass meadows to the north-east, from migration of material would be low because the material is predicted to migrate south towards the South Channel. The material to be dredged from the barge/ferry terminals

has physical characteristics similar to the Weipa shipping channel (South Channel) sediments. The combined volume of material to be dredged from the Embley and Hey River dredge areas is very small (<10%) compared to routine maintenance dredging at the Port of Weipa. It is concluded that the potential for impact on sensitive habitats from disposal of dredged material from the barge and ferry terminal at the Albatross Bay spoil ground is very low.

Water quality monitoring proposed for dredging activities in the Hey and Embley River are detailed in **Section 6.1** below.

5.5 Other potential marine impacts

Fish Assemblages and Fisheries

Although fish species are able to move away from any local areas affected by a disturbance (e.g. dredging and dredge spoil deposition), physical disturbance to the dredge sites, deposition of spoil, and the re-suspension of disturbed and deposited sediment may have impacts of minor magnitude on sharks and rays, including sawfishes, and bony fishes at the proposed ferry and barge terminals and Albatross bay spoil ground (Section 10.4 of the Commonwealth EIS (RTA 2013) and Section 6.9.4.5 of the Queensland EIS (RTA 2011)).

Marine Pests

Under the Port of Weipa Long Term Environment Management Plan for Dredging and Dumping Activities (SKM 2009), which has been approved by DSEWPac, the Port of Weipa is considered a low risk port for marine pests.

Marine pest species may be introduced through the following mechanisms:

- use of dredgers at the river facilities as a result of hull fouling; and/or,
- disposal of spoil material from capital dredging through pests originating in-situ or introduced by the dredger.

Capital dredging for the proposed river facilities may require the services of internationally sourced dredgers.

NQBP currently manages the Port of Weipa and carries out maintenance dredging and spoil disposal at the existing Albatross Bay spoil ground. Surveys for introduced marine pests have been undertaken since 1999 in accordance with methodologies established by the Centre for Research on Introduced Marine Pest Species (NQBP 2011). Surveys have been modified to also target the Black-striped Mussel since its detection at the Port of Darwin in 1999 and 2000 and also the Asian Green Mussel in 2006. No introduced marine pests have been recorded to date at the Port of Weipa (NQBP 2011).

Underwater Noise

Dredging is at the lower end of the scale with regards to emitted sound pressure levels in aquatic environments (CEDA 2011 in Section 15.3.2 of RTA 2012b). The main noise anticipated during dredging operations will be the noise from TSHD and CSD, which are reported to create higher underwater noise than the noise associated with grab dredgers (CEDA 2011, Nedwell and Howell 2004).

It is unlikely that underwater noise from dredging operations would cause injury to cetaceans, based on the assessment of continuous noise impacts from Southall *et al.* (2007) (CEDA 2011). Comparison between species hearing thresholds indicates that injury to other listed threatened estuarine and marine fauna and non-avian migratory species from dredging operations would be unlikely.

Underwater noise has the potential to impact listed threatened estuarine and marine fauna and non-avian migratory species feeding, transiting, or nesting (marine turtles) in the vicinity of dredging operations. There may be some behavioural responses for some species to avoid the area of dredging operations although this is expected only at close range to the source (Nedwell *et al.* 2003). There is also a possibility that many species may become habituated to the noise and remain within the vicinity (Smolowitz and Weeks 2006).

As behavioural impacts from underwater noise would be temporary and only occur at close range to the dredge operations the potential unmitigated impacts to listed threatened estuarine and marine fauna and non-avian migratory species would be negligible from dredging operations in the Hey and Embley River estuaries.

DRAFT

6 MANAGEMENT AND MONITORING

Dredging and disposal will be undertaken in accordance with the conditions of the Queensland Coordinator General's report (and any subsequent conditions imposed through the Environmental Authority and Development Approval) and the Commonwealth Sea Dumping Permit. RTA will report on implementation of the Dredge Management Plan(s) for the river facilities to the NQBP Technical Advisory and Consultative Committee for the Port of Weipa.

RTA will submit plans for dredging activities, certified by a Registered Professional Engineer of Queensland, to EHP prior to commencement of dredging. Dredging activities will be confined to the removal of capital dredge material at the location shown on the plan(s). Prior to the commencement of capital dredging, hydrographic surveys of the bed levels of the area to be dredged will be completed. Dredge spoil must not be disposed of into Queensland waters that are within the limits of the State unless otherwise authorised. Dredge spoil material will not be disposed of into Australian waters, the sea or on land unless otherwise authorised.

Dredging activities will not start until provision has been made to lawfully place or dispose of the dredge spoil material. Evidence of applicable approvals will be made available to the relevant regulatory authority on request.

EHP will be advised in writing at least (5) business days prior to the date of commencement of a capital dredging campaign and within ten (10) days following completion of the capital campaign.

Dredging activities will be conducted using equipment that is in survey and registered and, in relation to environmental performance, is equal to or superior to the following equipment:

- Trailing Suction Hopper Dredger that is equipped, at a minimum, with:
 - below keel discharge of tail waters via an anti-turbidity control ("green") valve;
 - systems for determining solids to water ratio or density of dredged material;
 - electronic positioning and depth control system for defining the location and depth of dredging activities; and,
 - dragheads capable of, and where appropriate, depth control and fitted with marine wildlife protection or fauna exclusion devices (e.g. turtle deflector, deflector plates, tickler chains on dredge heads) prior to and during operation.
- Cutter Suction Dredger that is equipped, at a minimum, with:
 - electronic positioning and depth control system for defining the location and depth of dredging activities;
 - a system or process to ensure the delivery system integrity is maintained at all times;
 - systems for determining solids to water ratio or density of dredged material during operations; and,
 - cutter heads with depth control and where appropriate or required fitted with marine wildlife protection or fauna exclusion devices prior to and during operation.
- Grab Dredger that is equipped, as a minimum, with electronic positioning system for defining the location and depth of dredging activities.

Where a TSHD is used, evidence that the wildlife protection or fauna exclusion devices have been installed on the dredge will be provided to EHP on request.

RTA will:

- install all measures, plant and equipment necessary to ensure compliance with the conditions of relevant approvals;
- maintain and calibrate such measures, plant and equipment in an efficient condition and keep records of the maintenance; and,
- operate such measures, plant and equipment in an efficient manner.

All persons engaged in the conduct of dredging activities including but not limited to employees and contract staff will be:

- trained in the procedures and practices necessary to:
 - comply with the conditions of the relevant regulatory approvals; and,
 - prevent environmental harm during normal operation and emergencies, or,
- under the close supervision of a trained person.

6.1 Water Quality

Background

The generation of dredge-induced turbidity plumes generally results from the suspension of fine sedimentary material during construction, dredging and spoil disposal activities. These impacts have the potential to impact the benthic foraging habitats and foraging behaviour of threatened and migratory marine species.

Management Measures

A range of measures can be implemented to manage water quality impacts.

General Management Measures

In carrying out the dredging activity, the release of contaminants (including any release caused by extraction of material from the bed of waters) will:

- only occur from the permitted areas specified on approved plans;
- be suitable for unconfined ocean disposal when assessed in accordance with the National Assessment Guidelines for Dredging;
- not produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter or other objectionable matter; and,
- be carried out taking all practical measures necessary to minimise the concentration of suspended solids released during the loading and pump-out of the vessel.

The following mitigation measures would be implemented, if the applicable methods are used, to reduce the impacts on water quality related to the creation of a turbidity plume from dredging and offshore spoil disposal activities:

- mechanical devices, such as turbidity-reducing valves in the overflow on the TSHD would be used;
- hopper doors would be kept in good condition to minimise loss of sediment during transport;
- the TSHD would be equipped with below keel discharge of tail waters via an anti-turbidity control ("green") valve;
- track plots would be provided by the dredging company to demonstrate that no dredging occurs outside the designated areas;
- accurate positioning systems would be used on dredges to ensure direct impacts are restricted to the approved dredging areas;

- accurate positioning of vessels to ensure disposal of spoil is within the footprint of the spoil disposal ground;
- safest and shortest sailing routes to and from the relevant spoil disposal ground would be selected to minimise the impact of propeller wash; and,
- current and forecasted meteorological and oceanographic information, would be considered in the daily work plan.

The transportation of dredge material will be carried out such that the dredge material is kept wet at all times.

Dredge-specific Management Measures

Dredging campaigns at the Hey River terminal, Humbug terminal and Hornibrook ferry/tug berth sites will not occur for longer than 14 consecutive days at each site. Dredging at any one of these sites may extend over a longer time period, provided there is a pause in dredging of at least three days between periods of dredging at each site, or, where turbidity monitoring is employed, turbidity levels have not increased significantly above background levels.

The three day pause in dredging after 14 consecutive days dredging is a Queensland Coordinator General's Condition recommended by the Queensland Government seagrass monitoring group responsible for the long term seagrass monitoring programs at Weipa and other sites around the Queensland coast.

Water Quality Monitoring

The current water quality monitoring program implemented by NQBP within the Embley and Hey River Estuaries will be utilised to monitor water quality in the vicinity of capital dredging activities in the Hey and Embley Rivers. The NQBP program utilises Photosynthetically Active Radiation (PAR) in monitoring impacts on seagrass meadows.

The NQBP seagrass monitoring program includes continuous temperature and PAR monitoring, every 15 mins, at three sites within seagrass meadows in the Embley and Hey Rivers (Carter *et al.* 2012). There are no trigger values or control sites as such as there is long term seagrass monitoring data (annual since 2000) which allows a before and after approach using seagrass species composition, areas and biomass.

Monitoring results will be maintained by NQBP and provided to RTA under a data sharing agreement. Results will be made available to EHP upon request.

6.2 Threatened Marine Mammals and Marine Turtles

Background

The marine fauna of potential concern during dredging and spoil disposal activities at the river facilities are marine turtles and migratory species including the Indo-Pacific Humpback Dolphin, Australian Snubfin Dolphin, and Dugong. An assessment of "significance of impact" from dredging activities to threatened and migratory fauna likely or known to occur in the Project area is detailed in Section 6.9.5 of Queensland EIS (RTA 2011) and, based upon most recent information, in the Commonwealth EIS (RTA 2013) in Section 7.3.6.5 in relation to marine turtles, Section 9.4.5.4 in relation to Dugong and Section 9.5.5.4 in relation to the Australian Snubfin and Indo-Pacific Humpback Dolphins.

The objective of the marine mammal and marine turtle management program is to detect and minimise any avoidable impacts on marine mammals and marine turtles resulting from the dredging and spoil disposal activities.

All reasonable and practicable measures will be taken to minimise the impact of dredging activities on marine fauna.

Management Measures

Section 6.9.4 of the Queensland EIS (RTA 2011) and Sections 7 and 9 of the Commonwealth EIS (RTA 2013) provides details of potential impacts on marine fauna and proposed management measures. The following are the range of management measures for identified potential impacts on marine mammals and marine turtles which would be implemented for dredging and spoil disposal, if applicable methods are utilised, following the processes shown in **Figure 6** and **Figure 7** respectively:

Disturbance from Vessel Activities (boat strikes)

- The TSHD will have dragheads capable of depth control, and where appropriate, fitted with marine wildlife protection or fauna exclusion devices (e.g. turtle deflector, deflector plates, tickler chains on dragheads prior to and during operation). Evidence that this device has been installed on the dredge will be provided to the administering authority on request.
- Prior to the commencement of dredging and spoil disposal activities, selected crew from the dredge vessel will be trained as Marine Fauna Observers (MFOs) in marine turtle and marine mammal behaviour and the actions to be taken in the event of marine fauna sightings, injury or mortality.
- During daylight hours, operators of specified vessels will be required to maintain a MFO on watch during marine operations and vessel movements. If marine fauna are spotted, the vessel will adjust speed and direction to avoid impacting the animal, if this is possible.
- A log will be maintained on all vessels detailing marine mammal and marine turtle sightings.
- Mobile dredging operations:
 - must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge; or,
 - where underway, must alter course if Dugongs, marine turtles, or cetaceans are likely to be struck or captured.
- Stationary dredging operations:
 - must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge; or,
 - must cease if Dugongs, marine turtles or cetaceans are observed within 50 metres of the dredge head.
- Marine turtle monitoring will be carried out as follows:
 - daily monitoring for impacted turtles will be undertaken at the dredge and at the shoreline down-current from the dredging operation; and,
 - if monitoring indicates that more than two marine turtles are killed within a 24 hour period as a result of dredging, the dredge will relocate from the area until an incident investigation has been carried out and relevant preventative actions implemented.
- Operating procedures that minimise the risk of marine turtle capture by the dredge head, and the risk from all activities of injury to marine species of conservation significance, will be developed prior to the commencement of dredging activities.
- EHP is to be immediately notified of any marine turtle captured by the dredge or injury to any marine species of conservation significance.

- The dredging and spoil disposal marine turtle and marine mammal management procedures flowcharts are shown in **Figure 6** and **Figure 7** respectively.

Water Quality

- Water quality (and therefore its potential impacts on marine turtles and mammals) will be managed through the water quality management process presented in **Section 6.1**.

Impacts from Artificial Lighting

- Light levels from the dredging works will be minimised to those lights that are necessary for the safe operation of the vessels.

Adaptive Management

Background

This section details the incident response strategy to be implemented during dredging and spoil disposal activities. Adaptive management responses that relate to marine turtle incidents (injury or mortality) associated with dredging and spoil disposal activities will follow an incident investigation and action process aligned with a series of tiered response principles.

In the event of marine turtle injury or mortality, attributed to the dredging and/or spoil disposal activities, RTA will undertake an investigation. The investigation will inform the implementation of three trigger levels to guide the management response.

Management Trigger Levels

Level 1

An injured or dead marine turtle is found and is attributable to dredging and/or spoil disposal activities:

Should it be determined that current management measures were not being followed, appropriate action will be taken to correct this deficiency. If management measures were being followed, an increased level of “off dredge” observation for further injured or dead marine turtles will be implemented over the following week. For example, additional monitoring of beaches as appropriate.

Level 2

Three injured or dead marine turtles attributable to dredging and/or spoil disposal activities are found per seven day period, or six per 28 day period.

RTA will undertake a review of current management measures to identify alternative or additional practicable management measures that could be undertaken. At the same time interim management measures will be implemented to prevent possible sources of harm, where practicable, to reduce the risks of further marine turtle injury or mortality.

Level 3

Four injured or dead marine turtles attributable to dredging and/or spoil disposal activities are found per seven day period, or nine per 28 day period.

Immediate action will be taken to implement alternative and/or additional management measures to prevent likely sources of harm, including temporary relocation or suspension of activities. A review of management measures will be undertaken by RTA to identify longer-term alternative or additional management measures to reduce the risks of further marine turtle injury or mortality.

Figure 6: Marine Turtle and Marine Mammal Management Procedure – Dredging

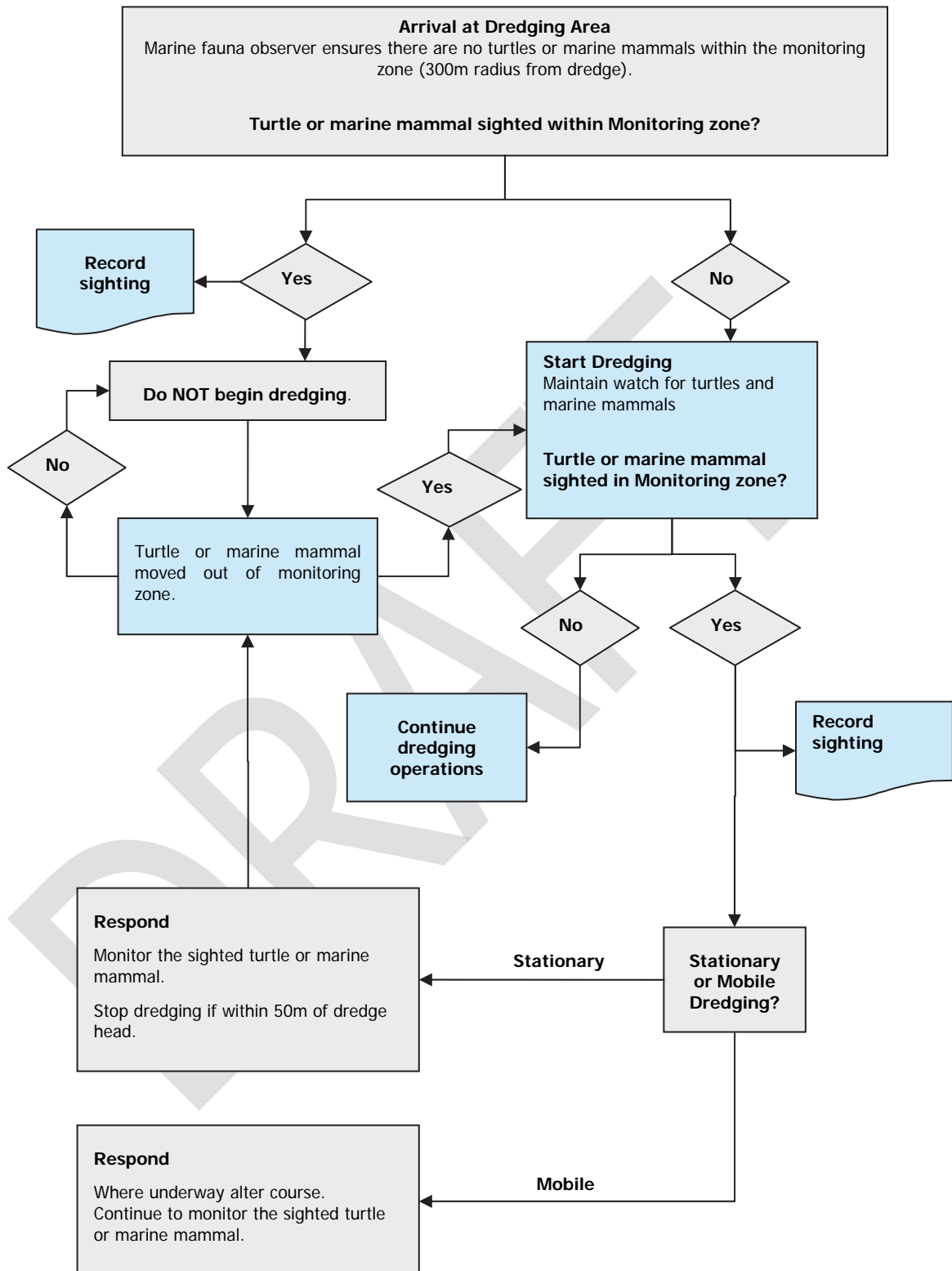
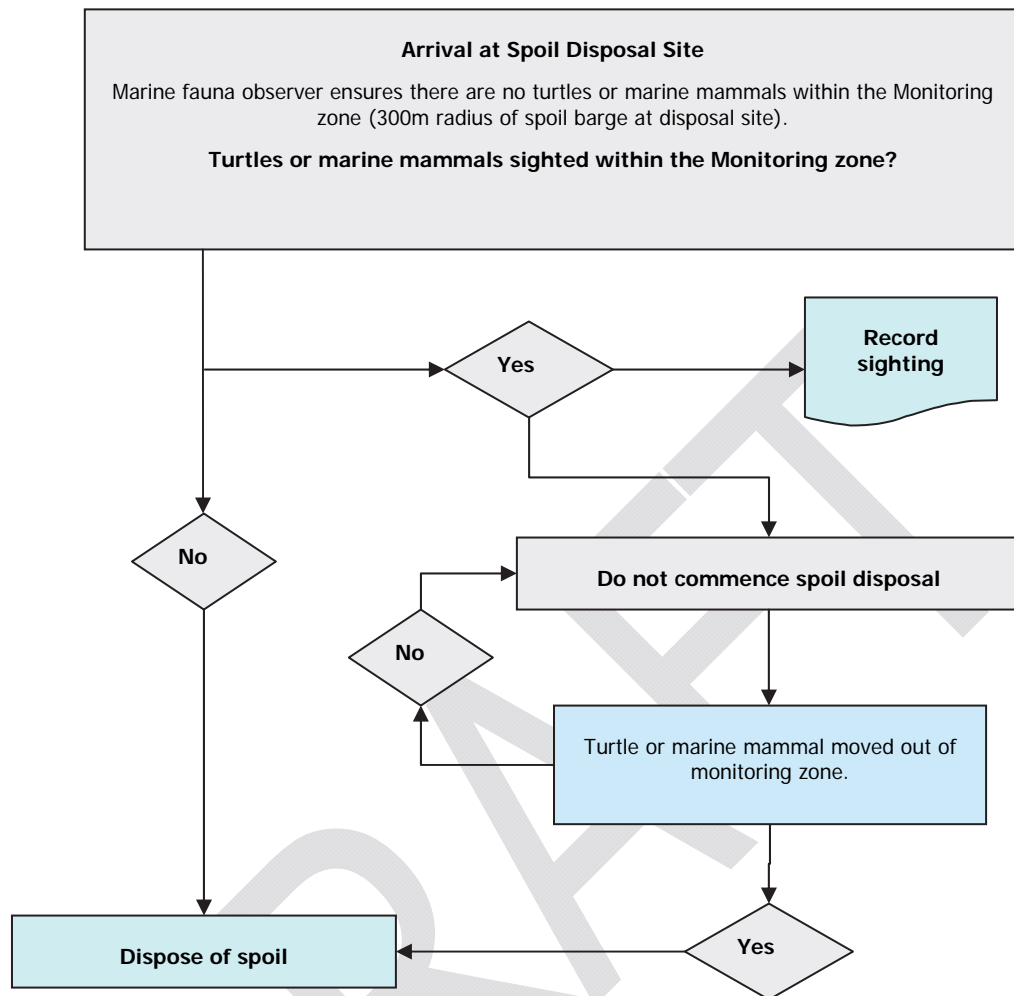


Figure 7: Marine Turtle and Marine Mammal Management Procedure – Spoil Disposal



Following the implementation of management action or actions associated with an event, the effectiveness of the process and actions taken shall be reviewed periodically. The results of the review will guide adaptive management decisions and further actions as required.

6.3 Benthic habitats

For any dredging works requiring the removal or damage of marine plants as defined under the *Fisheries Act 1994* (Fisheries Act), RTAW must gain the approval of DAFF (FQ) prior to those marine works commencing. Surveys identifying the extent of seagrass that will be disturbed, both temporarily and permanently will be lodged with DAFF (FQ).

RTAW shall enter into a Deed of Agreement with the chief executive, managing the Fisheries Act, or his/her delegate, within three months of the final investment decision, to ensure that all impacts to marine plants and tidal lands on the mining lease are offset in a way that is mutually acceptable to DAFF (FQ) and the proponent, and is in line with Fisheries Queensland Policy, *FHMOP 005 Mitigation and compensation for activities and works causing marine fish habitat loss*, and the information sheet, *Offset Measures for Marine Fish Habitats*.

6.4 Marine Pests

Dredgers sourced for capital dredging will be subject to a biofouling risk assessment in accordance with the *National Biofouling Guidance for Non-trading Vessels* (Commonwealth of Australia 2008) prior to deployment to site.

6.5 Underwater Noise

The following mitigation measures will be implemented to reduce the impacts on listed threatened estuarine and marine fauna and non-avian migratory species related to underwater noise associated with dredging activities and offshore spoil disposal:

- all vessels would operate in accordance with appropriate industry and equipment noise and vibration standards;
- regular maintenance of vessels would be conducted to the manufacturers' specifications; and,
- where possible, leaving engines, thrusters and auxiliary plants in stand-by or running mode unnecessarily would be avoided.

With the implementation of these mitigation measures, residual impacts to listed threatened estuarine and marine fauna and non-avian migratory species in the vicinity of the Project from underwater noise associated with dredging activities and offshore spoil disposal will be negligible.

7 REPORTING

RTAW will report on the implementation of the final DMP for the River Facilities to the NQBP Technical Advisory and Consultative Committee for the Port of Weipa.

A monthly monitoring report will be prepared by RTAW and submitted to EHP throughout the period that initial capital dredging and spoil disposal works are being undertaken. This report will include:

- a summary of results of all monitoring required by the environmental authority and dredge management plan, with raw data provided in an electronic format appendix (i.e. spreadsheet);
- an evaluation and explanation of the data from these monitoring programs;
- a daily summary of dredge movements (specifying the boundaries of the dredged area by GPS coordinates and disposal activity);
- details of marine turtle or other marine fauna captures by the dredge and species involved;
- details of any complaints received including investigations undertaken, conclusions formed and action taken;
- a summary of significant equipment failures or events that have potential environmental management consequences;
- an outline of corrective actions that will or have been taken to minimise or reduce environmental harm;
- the quantity (volume in cubic metres) and location of dredging material removed and disposed of; and,
- different details and frequency of reporting as agreed to by EHP.

8 REFERENCES

- ANZECC/ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Strategy. Australian and New Zealand Environment Conservation Council and Agricultural Resource Management Council of Australia and New Zealand, Canberra.
- Carter, A.B., McKenna, S.A. and Rasheed, M.A. (2012). Port of Weipa Long-term seagrass monitoring 2000 -2011. DEEDI Publication, Fisheries North, Cairns. 32pp.
- CEDA (2011). Underwater Sound In Relation to Dredging. CEDA Position Paper, 7 November 2011
- Chartrand, K.M. and Rasheed, M. A. (2009). Port of Weipa Long term seagrass monitoring, 2000 - 2008. DPI&F Publication PR09-4201 (DPI&F, Cairns), 26 pp.
- Commonwealth of Australia (2009). National Assessment Guidelines for Dredging. Commonwealth of Australia, Canberra, 2009.
- DAFF (2011) *Australian Ballast Water Management Requirements*. Department of Agriculture, Fisheries and Forestry.
- DAFF and NQBP (2011). Monitoring data from Port of Weipa seagrass monitoring. Data source: North Queensland Bulk Ports and State of Queensland through the Department of Agriculture, Fisheries and Forestry.
- DSEWPaC. (2012). Marine bioregional plan for the North Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999.
- Erftemeijer, P.L.A. and Lewis III, R.R.R. (2006). Environmental impacts of dredging on seagrasses: A review. *Marine Pollution Bulletin*, 52, 1553 -1572.
- GHD (2005). Port of Weipa Capital Dredging: Draft Environmental Impact Statement. Report prepared by GHD for Ports Corporation Queensland. March 2005.
- IMO (2000). Specific Guidelines for Assessment of Dredged Material. Adopted by the 22nd Consultative Meeting of Contracting Parties to the London Convention 1972 by resolution LC.22/5 (2000)18-22 September 2000. International Maritime Organisation.
- IMO (2004). *International Convention for the Control and Management of Ships' Ballast Water and Sediments*. International Maritime Organisation.
- McKenna, S.A. and Rasheed, M.A. (2010). Port of Weipa Long Term Seagrass Monitoring, September 2009. DEEDI Publication. Fisheries Queensland. Cairns, 25 pp.
- Nedwell, J., Langworthy, J., and Howell, D. (2003) Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore windfarms, and comparison with background noise. Report for COWRIE, Southampton, UK
- Nedwell, J., and Howell, D. (2004). A review of offshore windfarm related underwater noise sources. Report No. 544 R 0308 Oct 2004.
- NQBP (2011). Port of Weipa – Long Term Environmental Management Plan. Maintenance Dredging. 8 July 2011. O'Hara, J. and J.R. Wilcox, 1990. Avoidance responses of Loggerhead turtles, *Caretta caretta*, to low frequency sound. *Copeia* 2: 564 – 567.
- PCQ (1995). Port of Weipa Strategic Plan. Ports Corporation of Queensland, Brisbane.
- PCQ (2009). Port of Weipa - Environmental Management Plan. Draft for Public Comment. Ports Corporation of Queensland. February 2009.
- RTA (2011). Environmental Impact Statement for South of Embley Project. Rio Tinto Alcan.
- RTA (2012). South of Embley Project Supplementary Report to the Environmental Impact Statement.
- RTA (2013). South of Embley Project Commonwealth Environmental Impact Statement.

SKM (2009). Port of Weipa Long Term Environment Management Plan for Dredging and Dumping Activities. Report prepared by Sinclair Knight Merz for North Queensland Bulk Ports. 31 August 2009.

Smolowitz, R. and Weeks, M. (2006). Turtle-Scallop Dredge Interaction Study 2005 Field Season. Coonamesett Farm, East Falmouth, Massachusetts, USA 02536 Spotila, J.R., R.D. Reina,

Worley Parsons (2012). Sediment Characterisation Report – South of Embley Project Barge/Ferry Terminals. Report for Rio Tinto Alcan.

DRAFT