

RTA Weipa Pty Ltd

Maintenance Dredge Management Plan – Port

June 2019

RioTinto

DOCUMENT CONTROL

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Acronyms

Term	Definition
AIS	Automatic Identification System
ALS	Australian Laboratory Services
AMSA	Australian Maritime Safety Authority
BPDTAG	Boyd Port (Amrun Port) Dredging Technical Advisory Group
CCIMPE	National Consultative Committee on Introduced Marine Pest Emergencies
CHEMP	Communities, Heritage and Environmental Management Plan
CSD	Cutter Suction Dredge
CPCe	Coral point count
DAE	dilute acid extraction
DAF	Department of Agriculture and Fisheries
DAFF	Department of Agriculture, Fisheries and Forestry
DES	Queensland Department of Environment and Science
DoEE	Department of Environment and Energy
DMP	Dredge Management Plan
DSD	Western Australian Government Department of State Development
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
EIS	Environmental Impact Statement
EMS	Environmental Management System
EMP	Environmental Management Plan
EP Act	Queensland Environmental Protection Act 1994
EPBC	Environmental Protection and Biodiversity Conservation Act
EPCM	Engineering, Procurement and Construction Management
GPS	Global Positioning System
HSE	Health, Safety and Environment
IMO	International Maritime Organization
LNG	Liquefied Natural Gas
MARPOL	International Convention for the Prevention of Pollution from Ships 73/78
MDMP	Maintenance Dredge Management Plan
MEPC	Marine Environment Protection Committee
MFO	Marine Fauna Observer
mg/L	Milligrams per litre
ML	Mining Lease
MSQ	Maritime Safety Queensland
NAGD	National Assessment Guidelines for Dredging
NATPLAN	National Plan for Maritime Environmental Emergencies
NPF	Northern Prawn Fishery
NQBP	North Queensland Bulk Ports
NTU	Nephelometric turbidity units

Term	Definition
PAR	Photosynthetically active radiation
POLREP	Marine Pollution Report
PSD	Particle size distribution
QA/QC	Quality Assurance/ Quality Control
QCCAP	Queensland Coastal Contingency Action Plan
RSPCA	Royal Society for Protection of Cruelty to Animals
RPA	Regional Partnership Agreement
RTA	RTA Weipa Pty Ltd
SAP	Sampling and Analysis Plan
SDPWO	Queensland State Development and Public Works Organisation Act 1971
SEIS	State Environmental Impact Statement
Amrun	South of Embley
SOPEP	Shipboard Oil Pollution Emergency Plan
TBT	tri-butyl tin
TMR	Department of Transport and Main Roads
TSS	Total Suspended Solids
TSHD	Trailing Suction Hopper Dredge
WCCCA	Western Cape Communities Co-existence Agreement

1 INTRODUCTION

The Amrun Project (formerly South of Embley) 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 Amrun Project is being developed and operated by RTA Weipa Pty Ltd (RTA). A detailed description of the Project is provided in the Queensland Environmental Impact Statement (EIS) (RTA 2011), the Queensland SEIS (RTA 2012), and the Commonwealth EIS (RTA 2013).

The Amrun Project involves the construction and operation of a new Port facility located between Boyd Point and Pera Head (refer **Figure 1**). The marine works include construction of a jetty, wharf and ship loaders, requiring dredging for berth pockets and approach/departure channel. The current wharf and footprint of the dredge area is designed to accommodate dedicated Post Panamax Vessels, generic Panamax, smaller river class vessels and tug berth facilities for two pull tugs (**Figure 2**). Capital dredging was completed from 26 March to 09 April 2016 with removal and disposal of 202,416 m³ of marine sediments to the new Amrun Port spoil ground location indicated in **Figure 1**. Wharf construction commenced May 2017 with the Port facility becoming operational in December 2018. The Port facility is operated by RTA.

Marine fauna offset programs have been developed for Inshore Dolphins (Inshore Dolphin Offset Strategy (RTA 2015)) and Marine Turtles (Feral Pig Management Offset Strategy (RTA 2016a) and Marine Turtle Offset Plan (RTA 2016b) in accordance with the Projects Commonwealth and State Approvals.

This Maintenance Dredge Management Plan (MDMP) describes the monitoring and management arrangements for maintenance dredging and spoil disposal activities to be undertaken by RTA as part of the Amrun Port development and operation. This MDMP addresses maintenance dredging for up to three years (2018 to 2020) covering a period of one year prior to operation of the Port and the first two years of operation.

To enable the Port to be operated at design capacity upon commissioning, maintenance dredging is required. In 2018, 42,038 m³ was dredged in accordance with the MDMP. Ongoing deposition has occurred since then which was exacerbated by three cyclones over the 2018/2019 wet season. Annual maintenance dredging will thereafter be required over the next two years to actively manage further sediment deposition at the Port.

1.1 Commonwealth and State Approvals

The Project was declared a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (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 then Minister for Sustainability, Environment, Water, Population and Communities (the Minister) approved the South of Embley Bauxite Mine and Port Project (EPBC 2010/5642) with conditions on 14 May 2013.

The Commonwealth *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) regulates the loading and dumping of spoil from dredging operations in Australian waters. RTA submitted an application for a Sea Dumping Permit for Stage 1 of the Port facility (up to 6.5 million cubic metres) to Department of Environment and Energy (DoEE) October 2010 and amended it on 31 October 2011 for the realignment of the dredge channel. The Commonwealth EIS (RTA 2013) reflects a reduced initial capital dredge approval volume of 2.6 million cubic metres. A Sea Dumping Permit was granted to RTA under the Environment Protection (Sea Dumping) Act 1981 – South of Embley Bauxite Mine and Port Development (SD2010/1762) on 14 May 2013 for a period of 3 years. A 12 month extension to the Sea Dumping Permit was granted on 29 July 2015. Initial capital dredging for Amrun Port in March / April 2016 was conducted in accordance with this Sea Dumping Permit which expired on 14 May 2016. In May 2018 maintenance dredging was conducted in accordance with Sea Dumping Permit SD2017/3722, approved 13 April 2018.

Subsequent to this maintenance dredging program, RTA sought a variation to SD2017/3722 from the Commonwealth Sea Dumping Section, Assessment and Governance Branch on 13 May and 04 June 2019. This variation made allowance for an increase in dredging and disposal volume of 30,000 m³ for a revised total volume of 122,000 m³. This variation to SD2017/3722 was approved by the Commonwealth Assessments and Governance Branch on 14 June 2019.

Figure 1 Port, Spoil Ground and Mooring Locations

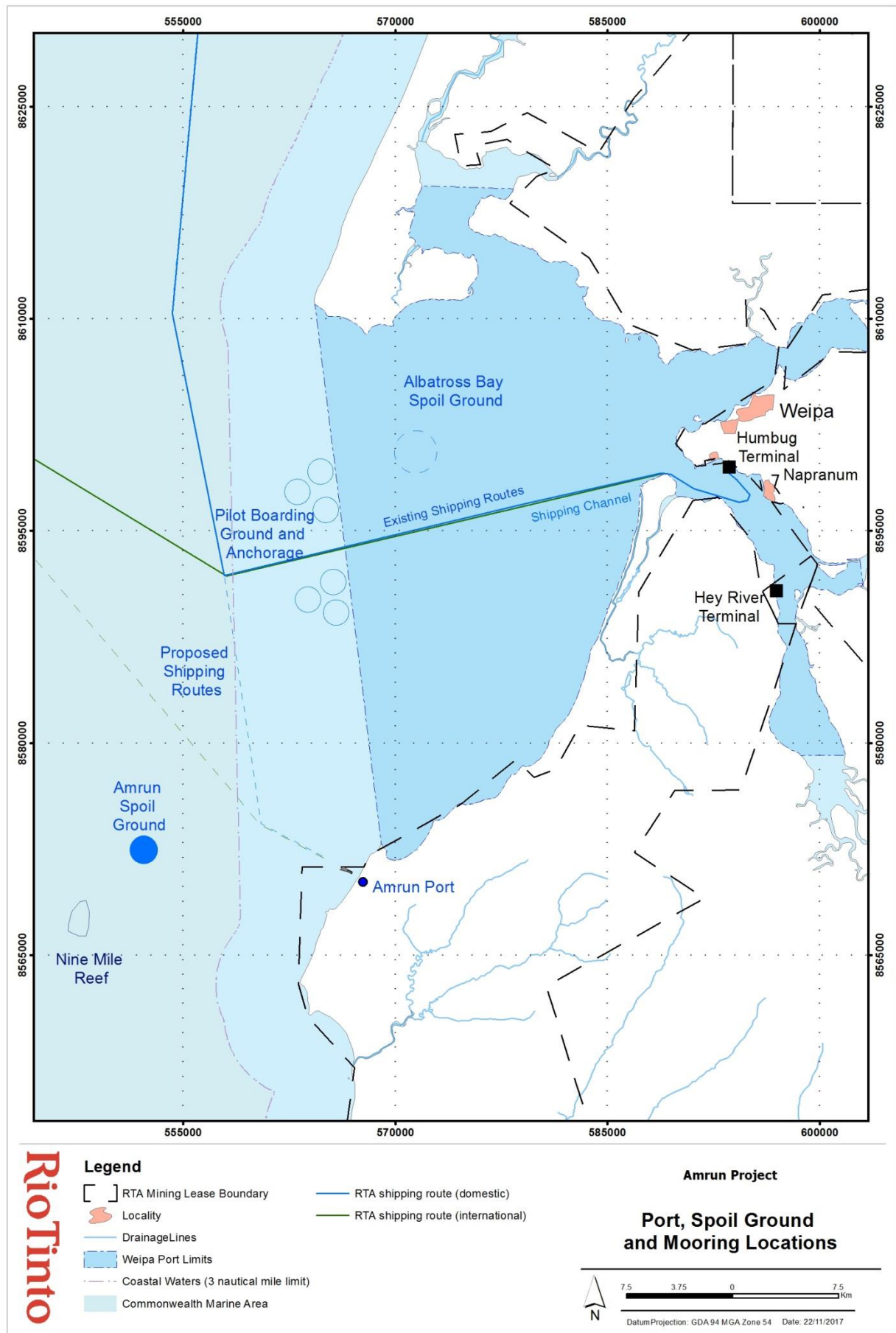
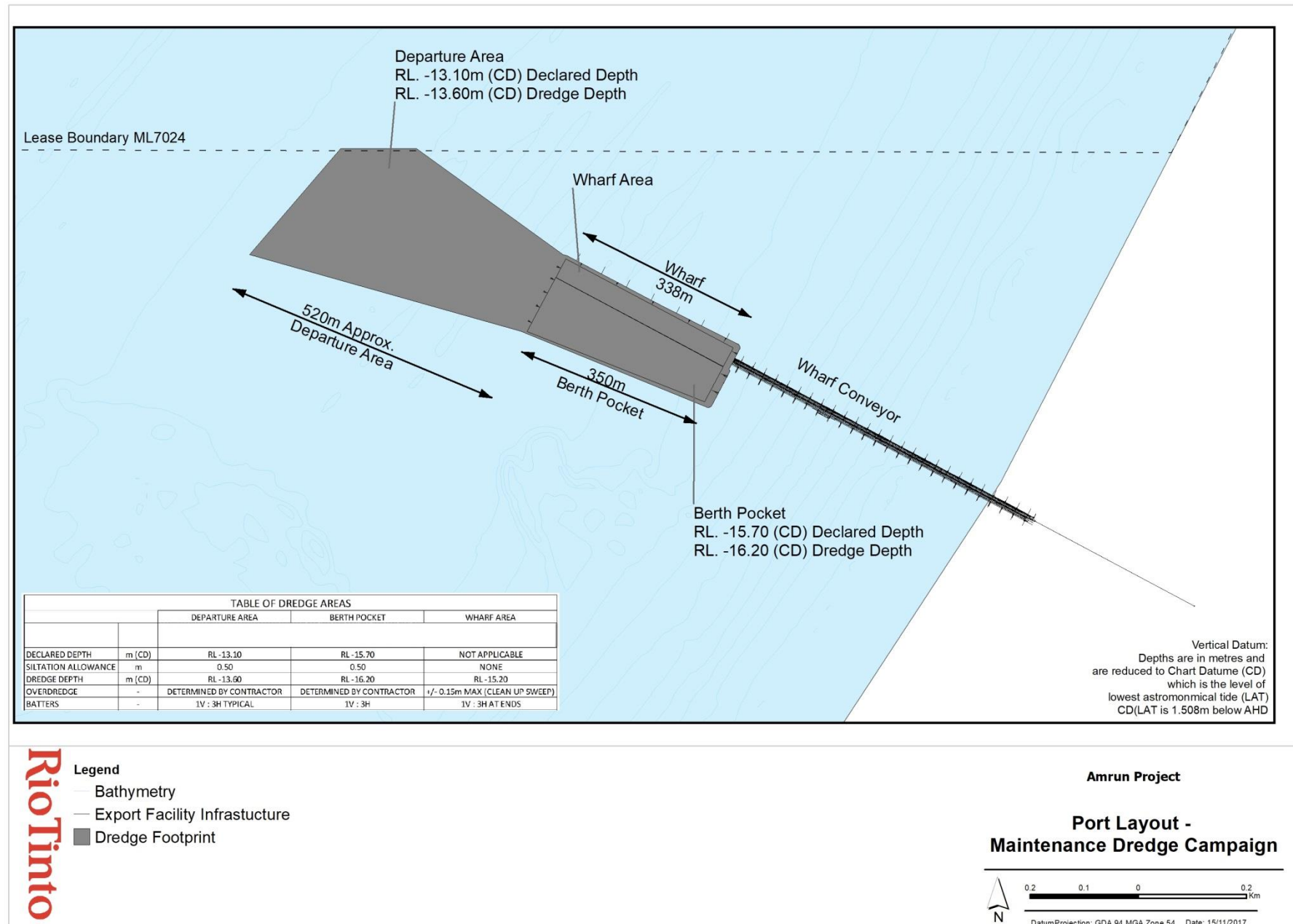


Figure 2 Port Layout – Maintenance Dredge Footprint

The Project has been declared a "significant project" for which an EIS was required pursuant to section 26(1;a) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO) Act. Following assessment of the information provided in the Queensland EIS and Supplementary Report and in consultation with the relevant referral agencies, the Queensland Coordinator-General released a report (the 'CG's Report') on 23 May 2012 (Queensland Government 2012). The CG's Report sets the framework within which other Queensland Government approvals are to be sought and the conditions for the prevention, minimisation and management of environmental impacts.

Development Approval is required for dredging under the *Coastal Protection and Management Act 1995* and *Sustainable Planning Act 2009* (Qld) for any section of the departure channel for the Port which is outside the mining lease and inside the coastal waters of Queensland. The Initial Capital Dredge footprint did not extend outside of the mining lease. An Environmental Authority (EA) (EPML00725113), required under the *Environmental Protection Act 1994* (EP Act), for the South of Embley project, including for dredging on the mining lease, was issued on 27 November 2014. Subsequent amendments to the EA were approved under the EP Act.

This DMP addresses conditions in the following Commonwealth and State approvals:

- EPBC Act approval: EPBC 2010/5642 – 14 May 2013 (Commonwealth)
- EA: EPML00725113 (Queensland Department of Environment and Heritage Protection) – latest amendment 19 March 2019.

This MDMP for dredging and disposal was submitted to DoEE in conjunction with an application for a Sea Dumping Permit for maintenance dredging between 2018 and 2020 which was approved 13 April 2018 (SD2017/37220). This MDMP provides a framework to ensure compliance with conditions of the Sea Dumping Permit (**Section 8**).

It is intended that this MDMP will be approved in conjunction with the Sea Dumping Permit and that this MDMP will be consistent with the conditions of the maintenance dredging Sea Dumping Permit.

This MDMP was reviewed by DoEE in conjunction with the Sea Dumping Permit application and comments from DoEE have been addressed within this MDMP. Maintenance dredging activities will not commence in the absence of an approved maintenance dredging Sea Dumping Permit for the authorised sea dumping volume.

1.2 Regulatory Requirements

The EPBC Act approval EPBC 2010/5642 and Environmental Authority EPML00725113 both require a Port MDMP to be prepared and submitted to the Minister for approval prior to commencing dredging operations. The Commonwealth and State approval conditions relating to maintenance dredging and spoil disposal and where they are addressed in this document are outlined in **Table 1**.

Table 1 Commonwealth and Queensland Governments Approval Conditions

Conditions	Where Addressed in this Plan
Commonwealth EPBC Act Approval Conditions (EPBC 2010/5642)	
Port and River Dredge Management Plans 16. The approval holder must submit to the Minister for approval a Maintenance Dredging Management Plan/s for all maintenance dredging activities associated with the South of Embley Project. The Maintenance Dredging Management Plan/s must be prepared in accordance with the Australian Government National Assessment Guidelines for Dredging (2009) and the department's Long Term Monitoring and Management Plan Requirements for 10 year Permits to Dump Maintenance Dredge Material at Sea (July 2012), or their most	Section 1

Conditions	Where Addressed in this Plan
<p>current versions, to avoid and mitigate impacts for the matters of national environmental significance listed at condition 14.</p> <p>The matters of national environmental significance listed at condition 14 are:</p> <ul style="list-style-type: none"> i. Commonwealth Marine Area ii. Listed turtle species iii. Listed dolphin species; and iv. Dugong (<i>Dugong dugon</i>) and Bryde's Whale (<i>Balaenoptera edeni</i>) 	
<p>17. Maintenance dredging activities cannot commence until the Maintenance Dredging Management Plan at condition 17 has been approved</p>	Section 1
<p>18. The approved Plans at condition 14 and condition 16, and or their subsequent revisions must be implemented</p>	Section 1
<p>19. The approval holder must comply with the requirements of any permit/s obtained under the Environment Protection (Sea Dumping) Act 1981, including any conditions attached to the permit/s.</p>	Section 1
<p>41. The approval holder must consult with Indigenous people in accordance with the process under the Indigenous Land use Agreement (known as the Western Cape Communities Coexistence Agreement) during preparation of management plans and strategies specified in this approval.</p>	Section 10
<p>42. The approval holder must identify employment opportunities (e.g. under an Indigenous Land and Sea Program or seed collection associated with rehabilitation activities) for Indigenous persons to facilitate the implementation of the conditions specified in this approval.</p>	Section 9
<p>59. Unless otherwise agreed in writing by the Minister the approval holder must publish, for the life of the project including decommissioning, all current approved program/s, plan/s, review/s (including Independent Peer Reviews) or strategies referred to in these conditions of approval on their website. Each of the approved program/s, plan/s or strategies (including revised versions) must be published on the approval holder's website within one (1) month of approval.</p>	Section 8.3
<p>60. Unless otherwise agreed in writing by the Minister program/s, plan/s, or strategies specified in the conditions must be independently peer reviewed prior to submission to the Minister for approval. The approval holder must nominate an Independent Peer reviewer to the Minister. The person/organisation/technical committee conducting the independent peer review must be approved by the Minister, prior to the commencement of the review. The independent peer review criteria must be agreed to by the Minister and any reviews undertaken must address the criteria to the satisfaction of the Minister.</p> <p>61. The reviews undertaken for Condition 60 must include an analysis of the effectiveness of the avoidance and mitigation measures in meeting the objectives, targets or management measures identified in the program/s, plan/s or strategies being reviewed.</p> <p>62. Unless otherwise specified in these conditions or notified in writing by the Minister, the approval holder must provide to the Minister, a copy of all advice and recommendations made by the independent peer reviewer for program/s, plan/s or strategies, and an explanation of how the advice and recommendations will be implemented, or an explanation of why the approval holder does not propose to implement certain recommendations.</p>	Section 8.5
<p>68. Within (3) months of every 12 month anniversary of commencement of the action the approval holder must publish a report on their website, for the duration of the project including decommissioning, addressing compliance with the conditions of this approval over the previous 12 months, including implementation of any management plan/s or strategies as specified in the conditions. Non-compliance with any of the conditions of this approval must be reported to the department at the same time as the compliance report is published. Within five (5) days after publication, the person taking the action must provide the Minister with a copy of the report/s.</p>	Section 8.3
<p align="center">Sea Dumping Permit (SD 2017/3722)</p>	

Conditions	Where Addressed in this Plan
1 Except so far as the contrary intention appears, terms used in the conditions to this permit have the same meaning as such terms in the Act.	Noted
2 RTA must ensure that no more than 122,000 cubic metres (in-situ) of material derived from maintenance dredging of the Amrun berth pocket and departure channel as specified in Figure 2 of the Application, is loaded and dumped.	Section 2.6 and 7.1
3 RTA must only dump within the disposal site.	Section 2.6 and 7.1
4 RTA must ensure that each load of dredged material is dumped so that the dumped material is evenly distributed over the whole disposal site.	Section 2.6 and 7.1
5 RTA must establish by GPS that, prior to dumping, the vessel is within the disposal site	Section 2.6 and 7.1
6 RTA must undertake visual and satellite disposal plume monitoring to measure and record the extent of the disposal plume, to inform the ongoing management of maintenance dredge disposal.	Section 7.2.2
7 For 20 minutes prior to the commencement of the dumping activities, RTA must ensure that a check is undertaken, using binoculars from a high observation platform, for marine species within the monitoring zone.	Section 7.4.3
8 If any marine species are sighted in the monitoring zone, RTA must not commence dumping activities until either 20 minutes after the last marine species is observed in the monitoring zone, or the vessel has moved to another area of the disposal site where it can maintain a minimum distance of 300 metres between the vessel and any marine species.	Section 7.4.3
9 If, at any time during the course of the dumping activities, an environmental incident occurs or an environmental risk is identified, all reasonable measures must be taken immediately by RT A to minimise or mitigate the risk or the impact. RT A must provide a report on the environmental incident or environmental risk to the Department within 48 hours, with details of the incident or risk, the measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.	Section 8.2 and Section 8.4
10 RTA must document any incidents involving the dumping activities that result in injury or death to any marine species. The date, time and nature of each incident and the species involved, if known, must be recorded, and the incident is to be reported to the Department within 48 hours.	Section 8.4
11 RTA must ensure that all persons engaged in the dumping activities under this permit, including the owner(s) and person(s) in charge of the vessel, comply with this permit and the requirements of the Act. The fulfilment of these conditions remains the responsibility of RTA.	Section 8.7
12 If requested by the Department, RTA must provide access for at least two nominees of the Department to witness, inspect, examine and/or audit any part of the operations, including any dumping activities or monitoring activities, the vessel or any other equipment, or any documented records. RT A must provide all reasonable assistance to the nominees of the Department for carrying out their duties.	Section 8.4
13 RTA must make and retain records comprising either weekly plotting sheets or a certified extract of the ship's log which detail: a) the dates and times of when each dumping run commenced and finished; b) the position (as determined by GPS) of the dumping vessel at the beginning and end of each dumping run, including the path of each dumping run; c) the volume of dredged material (in-situ cubic metres) dumped and quantity in dry tonnes for the specified operational period and compared to the total amount permitted under the permit on a daily basis; d) the person(s) undertaking the marine species observation required in Condition 7 and any marine species observed within the monitoring zone for each run, including the date, time and approximate distance from the vessel, and any action taken to comply with Condition 8; e) the person(s) undertaking the dredge plume monitoring required in Condition 6, the outcomes of the dredge plume monitoring for each run including the date, time and extent of the plume;	Section 7

Conditions	Where Addressed in this Plan
f) the person(s) responsible for the operation of the vessel at any time during dumping activities.	
14 RTA must retain the records required by Conditions 10, 13 and 16 for verification and audit purposes.	Section 8.3
15 RTA must ensure that a bathymetric survey of the disposal site is undertaken by a suitably qualified person: a) prior to the commencement of dumping activities under this permit; and b). within 1 month of the completion of all dumping activities authorised under this permit.	Section 2.3, 2.4 and 7
16 Within 2 months of the final bathymetric survey being undertaken, RTA must provide a digital copy of each of the bathymetric surveys to the Australian Hydrographic Office.	Section 8.4
17 RTA must provide a report on the bathymetry to the Department within 2 months of the final bathymetric survey being undertaken. The report must include a chart showing the change in sea floor bathymetry as a result of dumping activities and include written commentary on the volumes of dumped material that appear to have been retained within the disposal site.	Section 8.4
18 To facilitate annual reporting to the International Maritime Organization, RTA must report to the Department by 31 January each year, including on the day of the expiry of the permit or completion of all dumping activities under this permit, information at Appendix 2 to this permit, or in a format as approved by the Department from time to time.	Section 8.4
Queensland Government Environmental Authority Conditions (EPML00725113)	
(J1) In carrying out dredging activities, the release of contaminants (including any release caused by extraction of material from the bed and banks of waters) must: (a) only occur from the permitted areas identified in the plan(s) referred to in Condition (J22). (b) only occur in accordance with conditions of this environmental authority. (c) be carried out taking all practical measures necessary to minimise the concentration of suspended solids released during the loading of the vessel.	Section 7.9, Table 16
(J5) The administering authority must be advised in writing at least (5) business days prior to the date of commencement of a capital or maintenance dredging campaigns.	Section 7
(J6) The administering authority must be advised in writing within ten (10) days following completion of the capital or maintenance dredging campaigns.	Section 7
(J7) All persons engaged in the conduct of dredging activities including but not limited to employees and contract staff must be: (a) trained in the procedures and practices necessary to: i. comply with the conditions of this environmental authority; and ii. prevent environmental harm during normal operation and emergencies, or (b) under the close supervision of a trained person.	Section 8.7
(J8) Any dredging activities must 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: (a) Trailing Suction Hopper Dredge that is equipped, at a minimum, with: i. below keel discharge of tail waters via an anti-turbidity control valve; ii. on-board systems for determining solids to water ratio or density of dredged material; iii. electronic positioning and depth control system for defining the location and depth of dredging activities; and iv. dredge heads 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 or drag heads) prior to and during operation.	Section 7

Conditions	Where Addressed in this Plan
<p>(b) Cutter Suction Dredge that is equipped, at a minimum, with:</p> <ul style="list-style-type: none"> i. electronic positioning and depth control system for defining the location and depth of dredging activities ii. a system or process to ensure the delivery system integrity is maintained at all times; and systems for determining solids to water ratio or density of dredged material during operations iii. dredge heads 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 or drag heads prior to and during operation. <p>(c) Grab Dredge that is equipped, as a minimum, with:</p> <ul style="list-style-type: none"> i. electronic positioning system for defining the location and depth of dredge activities. 	
<p>(J9) Where trailer suction dredging is carried out, an effective turtle exclusion device must be fitted to the dredge head. Evidence that this device has been installed and used on the dredge for the entire period of the dredging activity must be provided to the administering authority on request.</p>	Section 7
<p>(J11) Dredging can only be carried out when the final dredge management plans are approved by the administering authority</p>	Section 1
<p>(J12) All dredging must be undertaken in accordance with a dredge management plan/s (DMP/s) based on the draft DMP/s in the Supplementary Report to the EIS approved by DEHP prior to dredging commencing</p>	Section 1
<p>(J15) The long term maintenance Dredge Management Plans for Amrun Port must be consistent with the conditions of this environmental authority and must:</p> <ul style="list-style-type: none"> (a) consider results of modelling, or alternative assessment methodology as agreed with the administering authority, to: <ul style="list-style-type: none"> i. estimate sediment plumes that may be generated by maintenance dredging and spoil disposal operations for Amrun Port; ii. provide risk estimates relevant to sensitive receptors that are based on the key water quality parameters, specifically increases in turbidity, sedimentation rates, and reduction in photosynthetically active radiation (PAR), for the key Concern Sites(i.e. where sensitive receptors are situated); and iii. define the zones of Influence of the dredging and spoil disposal sediment plumes. (b) implement a water quality monitoring program, as informed by previous dredging campaigns in consultation with the BPDTAG in accordance with condition (J31). (c) in considering the maintenance dredging schedule consider any potential adverse effects on: <ul style="list-style-type: none"> i. coral spawning; and ii. marine turtle nesting. (d) include reporting to and review by the BPDTAG in accordance with condition (J31). 	<p>Section 6.1</p> <p>Section 7.2</p> <p>Section 7.2</p> <p>Section 7.4</p> <p>Section 8.3</p>
<p>(J18) The administering authority and the Department of Agriculture, Fisheries and Forestry must be consulted during preparation of all final Dredge Management plan</p>	Section 7
<p>(J20) All dredging activities must be undertaken in accordance with the relevant approved final dredge management plan</p>	Section 1
<p>(J24) Unless otherwise authorised, dredge spoil must not be disposed of on the mining lease</p>	Section 7
<p>(J25) Dredge spoil must not be disposed of on land unless otherwise authorised</p>	Section 7
<p>(J26) Dredging activities must not start until provision has been made to lawfully place or dispose of the dredge spoil material. Evidence of applicable approvals must be made available to the administering authority on request</p>	Section 7
<p>(J27) The transport of dredge material must be carried out such that the dredge material is kept wet at all times</p>	Section 7.2

Conditions	Where Addressed in this Plan
(J30) The holder of this environmental authority must establish a Amrun Port Dredging Technical Advisory Group (BPDTAG) which must include a representative from the Administering authority and the Department of Agriculture Fisheries and Forestry (DAFF) for dredging at Amrun Port	Section 7
(J31) The holder of this environmental authority must report to the BPDTAG on proposed dredging activities for Amrun Port and implementation of the DMP including monitoring results, management triggers and response actions.	Section 7
(J36) Mobile dredging operations: (a) Must not commence if dugong turtle or cetaceans are observed within 300 m of the dredge (b) When underway, must alter the course if dugongs, turtles or cetaceans are observed within 50m of the dredge head	Section 7.4
(J37) Stationary dredging operations: (a) Must not commence if dugong turtle or cetaceans are observed within 300 m of the dredge (b) When underway, must alter the course if dugongs, turtles or cetaceans are observed within 50m of the dredge head	N/A
(J38) Daily monitoring for impacted turtles must be undertaken at the dredge and at the shoreline down current from the dredging operations. If monitoring indicates more than two (2) turtles are killed within a 24 hour period as a result of dredging. The dredge must relocate from the area until an incident investigation has been carried out and relevant preventative measures implemented	Section 7.4
(J39) Operating procedures must be developed prior to the commencement of dredging activities that minimise the risk of turtle capture by the dredge head and the risk from all activities of injury to marine species of conservation significance	Section 7.4
(J40) The administering authority must be immediately notified of any turtle captures by the dredge or injury to any marine species of conservation significance	Section 7.4
(J41) all reasonable and practicable measures must be undertaken to minimise the impact of dredging activities on marine fauna	Section 7.4

DoEE developed the *National Assessment Guidelines for Dredging (2009)* and the *Long Term Monitoring and Management Plan Requirements for 10 year Permits to Dump Maintenance Dredge Material at Sea (July 2012)*. These guidelines respectively identify the assessment and permitting process for Sea Dumping Permit applications and information requirements for long term maintenance dredge management plans to be approved under the Sea Dumping Act. This MDMP has been prepared in accordance with these guidelines as documented throughout the MDMP.

The Queensland Government developed the *Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports* (the 'Strategy') with the aim to provide a framework for sustainable, leading practice management of maintenance dredging at ports in the Great Barrier Reef World Heritage Area (GBRWHA). Although the scope of the strategy does not extend to Ports outside of the GBR, the broad principles of the Strategy have been considered for Amrun Port maintenance dredging. **Table 2** below demonstrates how this MDMP generally aligns with the leading practice elements of the Strategy.

Table 2 Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports

	Principle	Amrun Port Alignment
1	<p>Long-term Maintenance Dredging Management Plans</p> <p>GBRWHA ports will develop Long-term Maintenance Dredging Management Plans (LTMDMPs) consistent with the framework outlined in this document that:</p> <ul style="list-style-type: none"> • contribute to maintaining and enhancing the OUV of the GBR • are based on the best available science • utilise the principles of ecologically sustainable development • ensure continued efficient operation of the port • are developed in consultation with key stakeholders. GBRWHA ports will publish their LMDMPs. 	This MDMP is a precursor to a LTMDMP as described in Section 2.2.
2	<p>Developing the knowledge base for maintenance dredging activities</p> <p>LTMDMPs for GBRWHA ports will be based on an understanding, using the best science available, of sediment transport processes and environmental values relevant to maintenance dredging activities.</p>	<p>Section 2.2, 2.3 and 2.4.</p> <p>Environmental Values are described in Section 5.</p>
3	<p>Avoiding or minimising the need for maintenance dredging</p> <p>GBRWHA ports will include future maintenance dredging requirements in port infrastructure planning to ensure relevant environmental values and potential impacts are properly understood, and to assist in minimising the need for maintenance dredging.</p>	Section 2.3.
4	<p>Volume limits</p> <p>Maintenance dredging will be limited to that required to maintain the approved dimensions of port infrastructure to ensure efficient shipping access and the optimisation of port operations (i.e. will not be used to increase channel or berth footprints or depth).</p>	Section 2.4.
5	<p>An increase in channel or berth dredging areas and depths will only occur as a result of approved capital dredging following assessment of implications of future maintenance dredging needs and disposal options (as per existing approval processes).</p>	Section 2.4.
6	<p>Beneficial reuse</p> <p>GBRWHA ports will:</p> <ul style="list-style-type: none"> • ensure that LTMDMPs include an assessment of beneficial reuse options for dredge material management to determine if viable opportunities exist • seek to beneficially reuse material where viable options are available, in accordance with existing regulatory requirements and the comparative analysis outlined in this document • continue to assess the latest scientific, technological and other factors which may render previously unsuitable practices suitable or viable for beneficial reuse • work with relevant Queensland and Australian government agencies and scientific organisations to conduct an examination and, where appropriate, a pilot program to evaluate different treatment and reuse options for managing dredged material consistent with the requirements of WQA15. 	Section 2.5.
7	At sea placement of dredge material	

	Principle	Amrun Port Alignment
	<p>Applications to place material at sea will continue to abide by existing National Assessment Guidelines for Dredging (NAGD) 2009 (or any subsequent versions) and regulatory processes, including an assessment of:</p> <ul style="list-style-type: none"> • all feasible alternative disposal options • sediment quality at both loading and placement sites in accordance with relevant regulation and guidelines to prevent toxic material being placed at sea • how the sites may be impacted, with consideration of the marine environment and other uses of the area • monitoring and management measures to control or mitigate impacts. 	<p>Section 2.5</p> <p>Section 4.2</p> <p>Section 6</p> <p>Section 7</p>
8	<p>Comparative analysis</p> <p>GBRWHA ports will undertake a consultative comparative risk based analysis process encompassing environmental, economic, technical, operational and societal issues to determine the most suitable solution(s) for management of maintenance dredging material using a repeatable and structured methodology. Information and results of the comparative analysis process will be published in the LTMDMP.</p>	Section 2
9	<p>Dredging equipment and operational approaches</p> <p>As part of the risk-assessment for maintenance dredging, GBRWHA ports must provide rationale for the type of dredger chosen for each annual maintenance dredging program, with regard to the equipment's ability to undertake the necessary works, implement best practice environmental management measures, its technical and operational capabilities, and its cost-effectiveness.</p>	Section 2.6
10	Any new or alternative vessels or methods considered or proposed should result in environmental performance that is equal to, or better than, current equipment or methods used.	Section 2.6
11	<p>Environmental windows</p> <p>Prior to any maintenance dredging GBRWHA ports will identify and apply environmental windows supported by an evidence based risk assessment. Particular consideration must be given to periods of coral spawning, seagrass recruitment, turtle breeding and periods immediately following severe weather events.</p>	Section 5 and Section 6
12	Cumulative impacts, offsets and providing net benefits LTMDMPs will take into account any Reef 2050 Plan policy developments in relation to cumulative impacts, offsetting impacts and providing net benefits.	<p>Cumulative Impacts Section 6.9</p> <p>Offsets and net benefits Section 5.4</p> <p>The Reef 2050 Plan does not apply to Amrun Port.</p>
13	<p>Monitoring</p> <p>Appropriate monitoring programs for maintenance dredging activities at GBRWHA ports will be:</p> <ul style="list-style-type: none"> • determined by a risk assessment process • informed by ongoing port and regional monitoring programs • activity and port-specific • focused on environmental values and activities of higher risk or that are indicative of broader ecosystem health. 	Section 7.
14	Adaptive management	Section 7 and Section 8.

	Principle	Amrun Port Alignment
	GBRWHA ports will apply adaptive management strategies and continual improvement processes to ensure that leading practice management is maintained. This will involve monitoring the effectiveness of strategies put in place and assessing potential benefits from altering or applying new management measures.	
15	Reporting Maintenance dredging, monitoring and reporting programs by GBRWHA ports will be available for inclusion in the Integrated Monitoring and Reporting Program for the Reef 2050 Plan (Action GA15).	Section 8.4.
16	GBRWHA ports will provide mechanisms for stakeholders to access data and information from monitoring programs.	Section 8.4.
17	Review	Not Applicable – this principle is solely about review of the Strategy.

2 DREDGING AND SPOIL DISPOSAL DESCRIPTION

2.1 Location

The Port site is 40 km south of Weipa between Boyd Point and Pera Head on RTA mining lease ML7024 (**Figure 1**) and there are no other developments near the port site (nearest is the Port of Weipa, situated approximately 40 km north). The spoil ground is approximately 17 km offshore from the Port near the 25 m depth contour (**Figure 1**). The spoil ground is defined by a 1,000 m radius within the Commonwealth marine area, centred on the WGS84 coordinates: S12°54'46.3" E141°28'52.7".

2.2 Maintenance Dredging and Approval Strategy

The natural coastal processes at the Amrun Port result in sediment transport along the open coast line in the vicinity of the Port (RTA, 2012) and it is anticipated that the deeper Port dredge footprint will act as a natural accumulation point for sediments.

Based on historical dredging requirements for the Port of Weipa, where the departure channel extends from the Embley River into the coastal waters of Albatross Bay, it is anticipated that frequent sediment removal (likely annually) would be required for safe continued operations at the Amrun Port.

The current understanding of maintenance dredge requirements of the Amrun Port are limited. The dataset of sediment accumulation is currently based over three wet seasons since initial capital dredging in 2016, specifically 2016/2017; 2017/2018; 2018/2019.

The bathymetric survey conducted post wet season 2017 recorded a sedimentation infill volume of 19,570 m³ with the 2018 and 2019 maintenance dredging program requiring 42,038 m³ and around 79,000m³ respectively.

The 2018/2019 wet season was characterised by three extreme weather events:

- Severe tropical cyclone Owen (November/December 2018);
- Tropical cyclone Penny (December 2018/January 2019);
- Tropical cyclone Trevor (March, 2019).

With this experience and continued uncertainty with regards to deposition over the 2019/2020 wet season, without maintenance dredging the Port would become operationally constrained.

Given the high likelihood of annual sediment removal RTAs current intention is to apply for a long term Sea Dumping Permit in conjunction with the North Queensland Bulk Ports (NQBP) long term Sea Dumping Permit for the Port of Weipa commencing 2020.

It is acknowledged that a significantly improved knowledge base of sediment movements and accumulation and social, environmental and economic aspects will drive the long term dredging strategy for the Port. This MDMP is therefore seen as an interim plan prior to the development of a LTMDMP for the Port. The data collection and analysis requirements for the long term Sea Dumping Permit application and associated LTMDMP are documented in this MDMP, along with the management and monitoring requirements to facilitate the immediate maintenance dredging requirements for the safe and efficient operation of the Port between 2018 and 2020.

As an interim plan this MDMP is based on the current best available science and utilises the principles of ecologically sustainable development in line with the Project approval and regulatory requirements. The knowledge base for this MDMP is developed from numerous studies, research and monitoring at the Port site including:

- studies of the Port area during the Project environmental impact assessments;
- research during development of the initial capital DMP;
- monitoring programs implemented during the initial capital dredge campaign (e.g. water quality and coral health monitoring);
- monitoring programs implemented since Project commencement (e.g. inshore dolphin offset strategy and marine turtle monitoring);
- contemporary research to identify the current best practice dredge management and monitoring requirements as applicable to the maintenance dredging activity and the Port environment.

Consultation on the development of this MDMP has been conducted with the Boyd Port Dredging Technical Advisory Group (BPD TAG) prior to approval by DoEE and Department of Environment and Heritage Protection (DES). Comments made by the BPD TAG and how these have been addressed and revised in the MDMP have been provided to the Minister. Consultation on the implementation of this MDMP will be conducted with the BPD TAG in accordance with the EA and EPBC Act approval requirements. As a precursor to the LTMDMP, consultation during the implementation of this MDMP will include consultation on the development of the LTMDMP and will meet the requirements of the GBRWHA maintenance dredging strategy.

2.3 Dredge Minimisation

To fully determine maintenance dredging requirements for the Amrun Port it is recognised that further studies are required to determine where sediments accumulate in the Port and the source of sediment. Further monitoring and analysis, likely including post wet season, pre-dredging and post-dredging bathymetric surveys, water quality monitoring, bathymetric model development and development of a sediment budget for the Port, will be conducted over the term of this MDMP to better quantify the volume and rates of sediment accumulation. The further studies will form the basis of the long term Sea Dumping Permit application for the Port to be submitted in late 2019.

The studies will also assess any engineered or technological solutions which can be implemented at the Port to minimise the accumulation of sediments and subsequent maintenance dredging requirements. Options have been explored with NQBP, as an experienced local Port operator, and there are currently no feasible technological or engineered solutions which could be implemented at the Port prior to Port operation in 2019.

As much as possible, Amrun Port will work with NQBP to conduct studies in conjunction with the Port of Weipa in preparation for their next long term sea dumping permit to be obtained by 2020. Working with NQBP will ensure any synergies between the two operations are realised, as well as to leverage off NQBP's existing best practice framework for sound long term maintenance

dredging strategies which aligns with the *Maintenance Dredge Strategy for Great Barrier Reef World Heritage Area Ports* (DTMR, 2016).

Although further studies will be conducted prior to and during the initial year of the Amrun Port operation, RTA will manage maintenance dredging activities to avoid dredging as much as possible. As identified above, post wet season and pre and post dredging bathymetric surveys will be conducted to accurately quantify sediment accumulation at the Port. Prior to conducting maintenance dredging activities RTA will seek to optimise the Port operation through non-dredging sediment management methods such as bed levelling. Maintenance dredging will then be used where essential to ensure Port operations are not constrained through to the subsequent dry season.

2.4 Proposed Volumes of Dredging and Spoil Disposal

This MDMP and associated Sea Dumping Permit application has been prepared based on a maximum volume of 122,000 m³ of material to be dredged from the Amrun Port berth pocket and departure channel during the three year term of this MDMP (**Figure 2**).

The volume to be dredged each year will be assessed with pre-dredging bathymetric surveys. Those volumes dredged will be limited to that required to maintain the safe operation of the Port.

Bathymetric surveys completed in mid-2017 that were compared to the mid 2016 surveys (immediately post-capital dredging) recorded small volumes of sedimentation with an infill volume of 19,570 m³. The volume dredged in 2018 to remove the first two years of infilling was 42,038 m³.

As noted previously, there is the potential for significant variability between wet seasons with respect to sediment movement and Port deposition. This variance between 2018 and 2019 is characterised by bathymetric surveys in March 2019 where around 80,000m³ requires dredging.

To manage this variability as much as possible, the Sea Dumping Permit volume authorises 122,000m³ providing contingency should the area be impacted by cyclones. In contrast, this volume is around 4.7% of the 2,600,000 m³ initially approved for the Amrun spoil ground.

After the 2019 dredge program is implemented, a residual volume of around 80,000m³ will remain authorised under the Sea Dumping Permit to accommodate the final year of this interim MDMP in 2020.

Management and monitoring actions to be implemented to manage the volume and extent of dredge material are identified in **Section 7.1**.

2.5 Disposal Options

Dredge spoil disposal options, including options for beneficial use and recycling were considered as Project alternatives in the Queensland EIS (RTA 2011) and Commonwealth EIS (RTA 2013). A more extensive qualitative analysis considering social, economic, environmental, approvals and technical feasibility for a broader range of alternatives considered within the NAGD (Commonwealth of Australia, 2009) and the *Maintenance Dredge Strategy for Great Barrier Reef World Heritage Area Ports* and associated technical supporting document (DTMR, 2016, Mocke, *et al*, 2016) has been conducted and is presented in **Table 3**. The analysis has considered the NAGD (Commonwealth of Australia, 2009) and *Maintenance Dredge Strategy for Great Barrier Reef World Heritage Area Ports* (DTMR, 2016) positions that there is an order of precedence for options with the preference to either beneficially reuse the material, or dispose of the material on land rather than return the material to the marine environment.

A detailed quantitative analysis of beneficial reuse options is not able to be conducted at present based on the limited dataset of sediment accumulation since initial capital dredging in 2016. However further analysis, likely including characterisation of engineering properties of the spoil, long term options feasibility, comprehensive social, economic and environmental cost/benefit analysis, will be conducted during the term of this plan and form a basis for the long term Sea Dumping Permit application for the Port.

The qualitative review of disposal alternatives at Amrun Port identified constraints which are predominantly consistent with the review of opportunities for maintenance dredged material in the GBRWHA ports including (DTMR, 2017):

- a. *the predominance of silts and clays within the maintenance dredging areas (which have poor engineering qualities for reuse)*
- b. *the volume of material involved is too small and infrequent, and supply is too inconsistent*
- c. *coastal environmental impacts*
- d. *the unavailability of large areas of nearby land for dewatering of the sediments*
- e. *additional permitting processes (separate to sea disposal)*
- f. *the economic impacts of the prolonged operation time for pumping to land and additional processing required.*

Table 3 Dredge Spoil Disposal Options

Disposal Option	Feasibility (Cost/Benefit)
Disposal at Approved Capital Dredge Program Spoil Ground	<p>Feasible</p> <p>Sediments have been assessed as suitable for sea disposal (Section 4.2).</p> <p>Deep ocean disposal of marine sediments is likely to present a lower risk to the marine environment than land disposal would present to the terrestrial environment.</p>
Reuse for Beach Nourishment	<p>Not Feasible: Poor environmental outcome.</p> <p>The re-use of material for beach nourishment or coastal land reclamation on the beaches adjacent to the Port is not considered appropriate given that the beach area is a known nesting area for marine turtles. Placement of dredged material on the beach would impact marine turtles' ability to nest and may reduce the viability of nests through constant inundation of water through dewatering. Peer-reviewed literature documents negative impacts on marine turtles from beach nourishment activities (RTA, 2011).</p> <p>Disposal of dredge spoil on land and on the mining lease is not approved within the EA.</p>
Land and/or Habitat Creation; Habitat Restoration	<p>Not Feasible: Not economically and technically viable.</p> <p>There is no recognised habitat need or habitat restoration need within the vicinity of the Port.</p> <p>The USACE (2015) identified that energy conditions will largely influence the feasibility of establishing a stable substrate or the necessity of protection structures for land and habitat creation. Using the material for offshore land creation in the vicinity of the Port would require the construction of a large containment facility suitable for the high energy tropical coastal environment at the Port which would be cost prohibitive.</p>
Removal of Hazardous Constituents and off-Site Recycling/Beneficial Use	<p>Not Currently Feasible: Not economically viable.</p> <p>Although there are no hazardous materials to be removed, beneficial reuse opportunities do not currently exist within close proximity to the Port. Dredged material would need to be transported to Weipa or Aurukun for off-site use. This would require the material to be barged twice the distance than the proposed new spoil ground which is cost prohibitive. No current off-site beneficial uses have been identified in Weipa or Aurukun to quantify the economic, social and environmental impacts. Potential beneficial use opportunities will be considered within further studies undertaken prior to the initial long term Sea Dumping Permit for the Port.</p>
Land Disposal (on-lease)	<p>Not Feasible: Poor environmental outcome and not economically viable.</p> <p>If the material was pumped ashore, the dewatering process could adversely affect a shallow, low-yield aquifer via infiltration of saline seepage through the porous coastal soils and underlying bauxite. The shallow aquifer currently sustains baseflow in surface streams in the area and the baseflow has very low salinity levels. Saline seepage from the marine sediment could adversely impact water quality of the groundwater and fresh surface water environments.</p> <p>Disposal on land would require the construction of a containment facility which is cost prohibitive. Construction of the containment facility would be subject to approvals and the</p>

Disposal Option	Feasibility (Cost/Benefit)
	<p>approval and construction timeframe would prevent commencement of dredging activities for some months following approval, which would likely not be feasible for the first year of maintenance dredging.</p> <p>The revegetation of a large elevated emplacement of marine sediments would pose difficulties and would be likely to require long-term maintenance.</p> <p>Disposal of dredge spoil on land and on the mining lease is not approved within the EA. Given the poor environmental outcome EA amendment for land disposal would be unlikely.</p>
<p>Tailings Storage Facility (TSF) Disposal</p>	<p>Not Feasible: Not compatible with mining process (not economically viable) and poor environmental outcome.</p> <p>Process water within the TSF is recovered and recycled within the bauxite beneficiation plant and sea water within the dredge spoil would be of unsuitable quality for recycling.</p> <p>As identified for Land Disposal environmental outcomes of disposal within the TSF could adversely impact water quality of the groundwater and fresh surface water environments.</p> <p>Disposal of dredge spoil on land and on the mining lease is not approved within the EA. Given that the disposal option is incompatible with the TSF design and operation RTW would not seek to amend the EA for this purpose.</p>
<p>Soil enhancement (agriculture, forestry, mine rehabilitation)</p>	<p>Not Feasible: Incompatible with approvals schedule, poor environmental outcome and not economically viable.</p> <p>There are no current agricultural or forestry uses within the vicinity of the Port.</p> <p>To develop soils suitable for mine rehabilitation, dredge spoils would need to be pumped to land to be dewatered within a containment facility. As identified for Land Disposal the dewatering process could adversely impact water quality of the groundwater and fresh surface water environments and construction and maintenance of the containment facility would be cost prohibitive. The marine sediments from Amrun Port maintenance dredging have a high silt and clay content which are unlikely to be suitable for topsoil within the mining rehabilitation. Conversion of the soils from marine sediments would require a significant amount of amelioration to develop suitable organic and nutrient levels which would be cost prohibitive for the small quantities of material to be dredged.</p> <p>Disposal of dredge spoil on land and on the mining lease is not approved within the EA. Given the poor environmental outcome EA amendment for land disposal would be unlikely prior to the initial 2018 maintenance dredge requirements. Further studies are required to quantify the potential spoil quantities and potential social, environmental and economic costs/benefits. The further studies will be undertaken prior to the initial long term Sea Dumping Permit for the Port.</p>
<p>Construction material</p>	<p>Not Feasible: Not technically viable and poor environmental outcome.</p> <p>The maintenance dredge material is predominantly comprised of fine silts which are not currently suitable for construction purposes within the vicinity of the Port.</p> <p>Use of dredge spoil for construction material would require the construction of a large containment facility to dewater the spoil. As identified for Land Disposal the dewatering process could adversely impact water quality of the groundwater fresh surface water environments.</p> <p>Disposal of dredge spoil on land and on the mining lease is not approved within the EA. Given the poor environmental outcome EA amendment for land disposal would be unlikely.</p>
<p>Aquaculture</p>	<p>Not Feasible: Not economically and technically viable.</p> <p>There are no current aquaculture uses within the vicinity of the Port.</p> <p>As identified for Land Creation use of dredge spoil for aquaculture would require the construction of a large containment facility suitable for the high energy tropical coastal environment at the Port which would be cost prohibitive.</p>
<p>Fisheries Improvements</p>	<p>Not Currently feasible: Incompatible with approvals schedule and poor environmental outcome.</p> <p>Unconfined shallow water disposal of dredge material for fisheries habitat creation is likely to have increased risk of impacts to reefal habitats which are present along the coastline in the vicinity of the Port. Deep ocean disposal of marine sediments is likely to present a lower risk to the marine environment than shallow water disposal.</p>

Disposal Option	Feasibility (Cost/Benefit)
	Assessment of impacts for shallow water disposal would require further detailed analysis based on increased knowledge of sediment accumulation rates and expected dredge quantities. This study would not be completed prior to the initial 2018 maintenance dredge requirements. The further studies will be undertaken prior to the initial long term maintenance Sea Dumping Permit for the Port.
Sustainable Relocation	<p>Not Currently feasible: Incompatible with approvals schedule, environmental outcome unable to be quantified.</p> <p>Sustainable relocation of dredge spoil to maintain and/or supplement natural sediment movements and coastal processes may be a feasible outcome for long term dredge spoil disposal at the Port.</p> <p>Disposal of dredge spoil on the mining lease is not approved within the EA. Further detailed analysis based on increased knowledge of sediment accumulation rates and expected dredge quantities would be required to support an EA amendment for on lease ocean disposal adjacent to the Port site. This study and approval amendment would not be obtained prior to the initial 2018 maintenance dredge requirements. The further studies will be undertaken prior to the initial long term maintenance Sea Dumping Permit for the Port.</p>

2.6 Dredging and Spoil Disposal Methodology and Equipment

Dredging and disposal method is to be conducted primarily by the Trailing Suction Hopper Dredge (TSHD) 'Brisbane'. The TSHD 'Brisbane' uses suction tubes (up to 2) driven by powerful pumps to remove sediment from the seabed. The sediment is placed in the vessel's own cargo hopper. The 'Brisbane' is fitted with a "green valve" allowing overflow discharge during loading to occur below keel level of the vessel (at 5 m depth). Full environmental controls implemented on the 'Brisbane' are identified in **Section 7.1**. New methods are not proposed within the MDMP. Should the 'Brisbane' be unavailable and an alternate dredge be required, it would support similar levels of environmental controls to the Brisbane.

Once the vessel is filled with dredged material the vessel would then relocate to the spoil ground for marine disposal. The volume of each load of dredged material will be logged and will be dumped so that the material is distributed evenly over the area of the disposal site. Prior to dumping the vessel will establish by GPS that it is inside the disposal site before commencing dumping.

Upon entering the designated area for disposal, the vessel would slow whilst material is being placed. A minimum steaming speed is required to maximise agitation within the hopper to clear the dredged material, which would not otherwise be effected if the dredge were to remain stationary. Once the vessel has been emptied and cleared of dredged material the vessel would return to the dredge site to collect the next load. Disposal for a TSHD was considered in the EIS and turbidity plume modelling was completed. **Table 4** summarises the typical dredge cycle of the 'Brisbane'.

Table 4 Typical TSHD 'Brisbane' dredge cycle

Activity		Duration (Minutes)
Dredging	Dredging without overflowing	15
	Dredging with overflowing	45
Travelling	Travel to offshore spoil ground	60
Disposal	Positioning at disposal site	5
	Dumping	10
	Cleaning at disposal site	5
Travelling	Return journey to the dredge site	60
Total		200

Post dredging bed levelling operations may be necessary to remove any peaks or troughs generated from dredging operations to enable safe passage. Bed levelling produces minimal to no plume shifting previously dredged material and are not expected to result in the release of contaminants in excess of the NAGD guidelines, given sediment characterisation in the port area has shown that the sediments are clean for offshore disposal. Bed levelling is approved in the separate Amrun Project Construction Marine and Shipping Management Plan and Marine Works Environmental Management Plan.

2.7 Schedule

Dredging at the Port of Weipa and Amrun Port is scheduled to be conducted during the dry season (typically May to September) due to safety concerns with dredging during the cyclone season.

The first maintenance dredge campaign for Amrun Port was completed in May 2018 with 42,038 m³ removed for sea disposal over a period of 4 days. Current bathymetry as of March 2019 indicates that around 80,000 m³ requires disposal in 2019. Based on the cycle time presented in **Table 5** it is anticipated that the 2019 campaign will require around 7.5 days to complete.

Subject to availability of the 'Brisbane' and following receipt of relevant approvals, the anticipated dredging schedule for the duration of the Sea Dumping Permit is detailed in **Table 5**. This timeframe does not allow for any delays that may occur due to breakdowns or stand-downs for adverse weather conditions. If dredging activity is delayed due to breakdown or weather then dredging activity would be ceased and dredge sediment plumes would not be generated during this time.

Table 5 Amrun Port likely maintenance dredge schedule

Year	Typical window	Estimated quantity of dredge material (m ³)	Average quantity per dredge cycle (m ³)	Number of dredge cycles (3h 20m per cycle)	Estimated total campaign duration (days)
2018	Dry season	38,000 ¹	1,500	25	3.5 ²
2019	Dry season	80,000	1,500	57	7.5
2020	Dry season	80,000	1,500	57	7.5

Emergency dredging may be required outside of these timeframes if Port operation is constrained by large scale sediment deposition from cyclone or flooding events and therefore RTA have no control over timing of emergency dredging. Advice would be provided to DoEE and DES about requirements for emergency dredging if and when they arise and emergency dredging approval processes will be dependent on the Sea Dumping Permit.

3 ENVIRONMENTAL RISK

Activities carried out for maintenance dredging operations can pose considerable risk to the marine environment. Accordingly environmental risk is considered throughout the document. This was developed specifically for the maintenance dredge management plan based on the management practices outlined in the Leading Practice sustainable development for the mining industry risk assessment and risk management handbook (LPSPD 2016). The risk assessment approach was based on the following:

- Identification of hazards
- Assessment of likelihood and consequence of the hazard
- Assignment of a risk rating (inherent risk)
- Consideration of mitigation measures
- Reassessment of the risk rating, by re-evaluating the consequence and likelihood criteria, given the influence of the mitigation measure (residual risk)

A summary of the criteria used to determine consequence and likelihood of each potential impact is described in **Table 6** and **Table 7** respectively. Consequences levels are assessed based on impacts to ecosystem function, communities or species based on the impact (eg reef is habitat communities, while impacts on megafauna are species). The risks were assessed as low, moderate, high and critical with the risk assessment matrix in **Table 8**. An initial risk assessment was completed based off already existing legislative controls (e.g. legislation) and is presented in **Section 6.9**. The assessment was then repeated, following consideration of all mitigation measures and safeguards (**Section 7.10**). The cumulative effect of multiple dredging campaigns were also considered with stricter management methods and reviews to be implemented in the event ongoing impact would occur.

¹ Actual dredge volume was 42,038 m³

² Actual duration of dredging was 4 days

Table 6 Consequence Descriptions

Consequence levels	Negligible	Minor	Moderate	Major	High
	Minimal if any impact)	Low level impact for some communities or high impacts for a small number of individuals	High level impact for some communities or moderate impact for communities on a regional scale	High level of impact for communities on a regional scale	High level of impact Gulf of Carpentaria wide
Ecosystem function	Alteration or disturbance within natural variability. Ecosystem interactions may have changed but it is unlikely that there would be any detectable change outside natural variation or occurrence	Measurable change to the ecosystem components without a major change in function (no loss of species or introduction of new species that affects function), Recovery in less than 1 year	Measurable changes to ecosystem components without major change in function (no loss of species or introduction of new species that affects function), Recovery in 1-2 years	Measurable changes to ecosystem components with a major change in function Recovery in 3-10 years	Long term and possible irreversible damage to one or more ecosystems functions. Recovery if at all is greater than 10 years
Habitat communities / assemblages	Alteration or disturbance within natural variability. Less than 1% area is affected or removed	1 – 5% of area affected in major way or removed. Re-establishment in a year	5-30% of area affected in major way or removed. Re-establishment 1-2 years	30-90% of area affected in major way or removed. Re-establishment 3-10 years	Greater than 90% of the area affected in a major way or removed. Reestablishment is at all is greater than 10 years.
Species	Population size or behaviour may change but unlikely to be any detectable change outside natural variation	Detectable change to population size and behaviour. No detectable impact on population breeding or dynamics and recover in less than a year	Detectable change to population size and behaviour. No detectable impact on population breeding or dynamics and recover in 1-2 years	Detectable change to population size and behaviour. No detectable impact on population breeding or dynamics and recover in 3-10 years	Local extinctions are imminent/immediate or population no longer viable. Recover if at all greater than 10 years.

Table 7 Likelihood Descriptions

Likelihood	Description
A – Almost certain	Recurring event during life of the project – occurs multiple times a years (more than twice)
B – Likely	May occur frequently during the project – 1 to 2 times per year
C – Possible	May occur during life of project – 1 -10 years
D – Unlikely	Event that is unlikely to occur in the life time of project – 10 -100 year event
E - Rare	Event that is very unlikely to occur during the life time of a project - 100 year event

Table 8 Risk Assessment Matrix

Likelihood	Consequence				
	Negligible	Minor	Moderate	Major	High
A – almost certain	Moderate	High	Critical	Critical	Critical
B – likely	Moderate	High	High	Critical	Critical
C – Possible	Low	Moderate	High	Critical	Critical
D – Unlikely	Low	Low	Moderate	High	Critical
E - Rare	Low	Low	Moderate	High	High

4 SEDIMENT CHARACTERISATION

4.1 Capital Dredging Sediment Characterisation

Sediment sampling and analyses has been previously completed at the Port facility location (Worley Parsons 2012) prior to initial capital dredging. The assessment of dredged material was consistent with the assessment guidance described in 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). The sampling was conducted in accordance with approved sampling and analysis plans (SAP). Sampling was completed in October 2007, June 2009 and June 2010. Sediment characterisation reports were supplied to DoEE (then Department of Sustainability, Environment, Water, Population and Communities) in February 2008 and December 2010 and March 2012.

The sediment sampling was conducted across the full Port dredge footprint which was designed to accommodate Cape size vessels, loaded to a draft of up to 18.1 m requiring up to 6.5 million cubic metres of dredging to achieve the necessary under keel clearance. The current wharf design and footprint of the dredge area at the Port site to accommodate dedicated Post Panamax Vessels, generic Panamax, smaller river class vessels and tug berth facilities for two pull tugs is a much smaller component of the full port design.

The number of locations sampled within the full Port dredging area was determined with regard to the volume of 'potentially contaminated' sediments (i.e. sediments that could contain contaminants above background) within the dredge footprint. For capital dredging projects this is typically based on the volume of material within the top 1 m of sediment over the dredge area. Previous surveys in the area have identified that there is a thin silt surface layer of 0.1-0.5 m overlying firm clays. As anthropogenic contaminants would not likely be able to penetrate the stiff underlying clays the depth of 'potentially contaminated' material was limited conservatively to 0.5 m. Given the previously proposed dredge footprint of 1,460,062 m² for 6.5 million cubic metres, this equated to a volume of 730,031 m³ of 'potentially contaminated' material for which Table 6 of the *National Assessment Guidelines for Dredging* (NAGD; Commonwealth of Australia, 2009) required a minimum of 17 sample locations, based on halving the number of sampling locations due to the known "clean" status of the site. The sampling program exceeded this criterion, collecting sediments at 20 locations. Sampling was also completed at the spoil ground to provide background concentrations prior to disposal activities. Seven sample locations were randomly selected in accordance with the minimum requirements of the NAGD. Samples were only collected for the surface sediments (0 - 0.1 m).

According to the approved SAP, sample material for laboratory analyses was to be taken from the following horizon depths 0.0-0.5 m; 0.5-1.0 m; 1.0-2.0 m; 2.0-3.0 m, and 3.0-4.0 m. Refusal of the vibracore on stiff substrate limited the number of horizons submitted for laboratory analyses to one, 0.0–0.5 m. Samples within the dredge area were collected using a boat deployed

vibracorer; with an internal diameter of 50 mm and an internal barrel length of 4 m. At each location, one to three vibracores were taken to obtain the necessary sample volume for chemical and physical analysis. In the event that vibracore penetration into the sediments was limited, a stainless steel van-Veen grab sampler was deployed to collect additional surface material. Sediments within the Amrun spoil ground were collected using the van-Veen grab sampler.

Sediment samples were transported under refrigerated conditions to the primary NATA accredited laboratory Australia Laboratory Services (ALS) and to the secondary NATA accredited analytical laboratory Advanced Analytical Australia (AAA), within relevant holding times. All sediments were analysed for particle size distribution (PSD), moisture content, metals and metalloids (Ag, Al, As, Cd, Cu, Co, Cr, Fe, Mn, Pb, Hg, Ni, Sb, Se, V and Zn), TPH, PAHs and organotins.

Study results showed that inshore sediments were characterised as being dominated by silt and clay fractions (84%). At a distance of approximately 4km from shore, the sediments become dominated by the sand fraction (66%). The depth of unconsolidated surface silts overlaying consolidated clays is on average 0.25 m thick (range 0.05 – 0.54 m).

Utilising the assessment framework provided in the NAGD (Commonwealth of Australia, 2009) the analytical results for all contaminants and their 95% UCLs of the mean were found to be below the relevant NAGD screening levels. Individual samples were below respective NAGD screening levels in all three surveys except for:

- In 2007 sampling antimony exceeded at two locations (SOE1 – upper and lower horizon and SOE4 – upper horizon)
- In 2007 nickel exceeded at two locations (SOE1 – upper and lower horizon and SOE4 – upper horizon)

In addition, elutriate and dilute acid extraction (DAE) analyses were conducted in parallel with the screening level assessment for each sample collected within the Port dredge area. DAE analysis showed that all metals and metalloids tested were below NAGD screening levels at each sampling location. Results indicated the contaminants were not readily bioavailable and sediments are acceptable for unconfined disposal at sea.

Based on the assessment completed, dredged material was considered chemically suitable for unconfined disposal at sea.

4.2 Maintenance Dredging Sediment Characterisation

The sediments accumulating within the previously dredged Port berthing area and departure channel will be periodically dredged to maintain safe passage for vessels.

Sediment sampling and analyses was completed at the Port facility location in September 2017. The assessment of dredged material was consistent with the assessment guidance described in the NAGD and was conducted in accordance with the approved SAP (RTA, 2017c). The sediment characterisation report has been submitted to DoEE with the Sea Dumping Permit application following approval of the SAP.

Based on Appendix D of the NAGD, the dredging program was rated as a medium sized project (50,000 to 500,000 m³). Based on previous results, there was no known contamination and sediments at the site were not expected to vary significantly over the dredge footprint. The dredge footprint was therefore treated as one area.

Sediments were sampled from 17 locations in the Port berth area and departure channel. The minimum number of sampling locations for 92,000 m³ dredge volume was 17 (based on Table 6 of the NAGD). The substrate in the dredge footprint was known to be comprised of hard clays, which were likely to result in refusal of a vibracorer at very shallow depths (0.2 – 0.5 m). Based on this knowledge and data collected from the capital dredge campaign, sediments were collected using a grab sampler. Sampling was also completed at the previously approved spoil ground (4 locations), to provide new information on sediment characteristics after capital dredge spoil disposal at the site.

Sediment samples were transported under refrigerated conditions to the primary NATA accredited laboratory Australia Laboratory Services (ALS) and to the secondary NATA accredited analytical laboratory (SGS) within relevant holding times. All sediment samples were analysed for total organic carbon (TOC), PSD, moisture content, total petroleum hydrocarbons (TPH), Polycyclic aromatic hydrocarbons (PAH), organotin compounds (TBT), benzene, toluene, ethylbenzene and xylene (BTEX), total metals and metalloids (Ag, Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Sb and Zn). Bioavailable metals (dilute acid extraction, DAE) and metalloids were analysed for all samples.

Analytical results showed that sediments in the dredge footprint were dominated by silt (57%) and clay fractions (28%), with only 14% of sediments comprised of sand, and 1% gravel. Sediments from the spoil ground were dominated by sand (43%) with 24% silt, 27% clay and 6% gravel. Moisture content in sediments from within the dredge footprint was high (61%) compared to the spoil ground (34%).

Exceedances of the NAGD screening level were recorded for total recoverable Nickel in multiple sediment samples (11 samples from the dredge footprint, 3 samples from the spoil ground). The 95% UCL for Nickel was 46 mg/kg, however, the 95% UCL for Ni in sediments by dilute acid extraction (DAE) was 2.9 mg/kg (well below the NAGD Table 2 guideline value of 21 mg/kg). This shows that the bioavailability of Ni in sediments within the dredge footprint is very low.

Based on the assessment completed all metal(loid)s 95%UCL were less than the corresponding screening levels except for Ni, however Ni in sediments by DAE was substantially less than screening levels, accordingly dredged material is considered chemically suitable for unconfined disposal at sea.

This sediment characterisation (conducted September 2017) is anticipated to be representative of sediment for the duration of this MDMP and associated Sea Dumping Permit. If there is a release of contaminants to the marine environment during Port operations the sediment characterisation will be reviewed to determine if resampling of sediment is required.

5 EXISTING ENVIRONMENT

5.1 Past and Current Uses

The Port is located in a remote and previously undeveloped area and as such there are few, if any, pre-existing potential contaminant sources either from shipping activity or land use. The Port construction commenced with the capital dredge program in March 2016, and Port construction commenced May 2017. The Amrun Mine Infrastructure Area construction commenced in March 2016 on land adjacent to the Port site. Mining extraction activities and operation of the Mine Infrastructure Area will likely commence in late 2018. Water release points from the MIA within the site water management system are licenced through the EA (EPML00725113) and include sediment control structures at each release point. The licenced release points do not discharge directly to coastal waters or the marine environment. No contamination of the marine environment is expected due to operation of the Amrun Mine Infrastructure Area or extraction activities.

No anthropogenic contaminants were recorded in the sediments to be dredged during sediment characterisation for the capital dredge program in 2010 or maintenance dredge program in September 2017 and concentrations represented natural background levels. There have been no environmental incidents at the Port facility since construction commenced and no releases from the Mine Infrastructure Area.

The spoil ground was only previously used for the disposal of dredged spoil from the Amrun Port capital dredge program. Approximately 202,416 m³ of material was disposed at the designated approved spoil ground during the capital dredging campaign.

5.2 Water Quality

Background water quality has been collated from numerous deployed logger investigations undertaken within the proposed dredge and disposal footprint since 2007. Key monitored parameters have included turbidity (NTU) and photosynthetically active radiation (PAR). A summary of these programs is presented within **Table 9** with monitoring locations shown in **Figure 3**. Consolidated monitoring locations established during baseline investigations and applied to the capital dredging monitoring program have been implemented since 2015. These locations supported the 2016 capital dredging campaign.

Table 9 Implementation of data logger monitoring (2007-2016)

Parameter	Location	Wet season (Nov 2007- March 2008)	Dry season June-Sept 2010	Wet season Feb 12 – April 12	Dry season Sept-Nov 2015	Wet season Dec 2015 - March 2016	Dry season Mar-May 2016
Turbidity	Amrun Port area	x	x	x	x	x	x
	Disposal ground	x	x		x	x	x
PAR	Amrun Port area				x	x	x
	Disposal ground				x	x	x

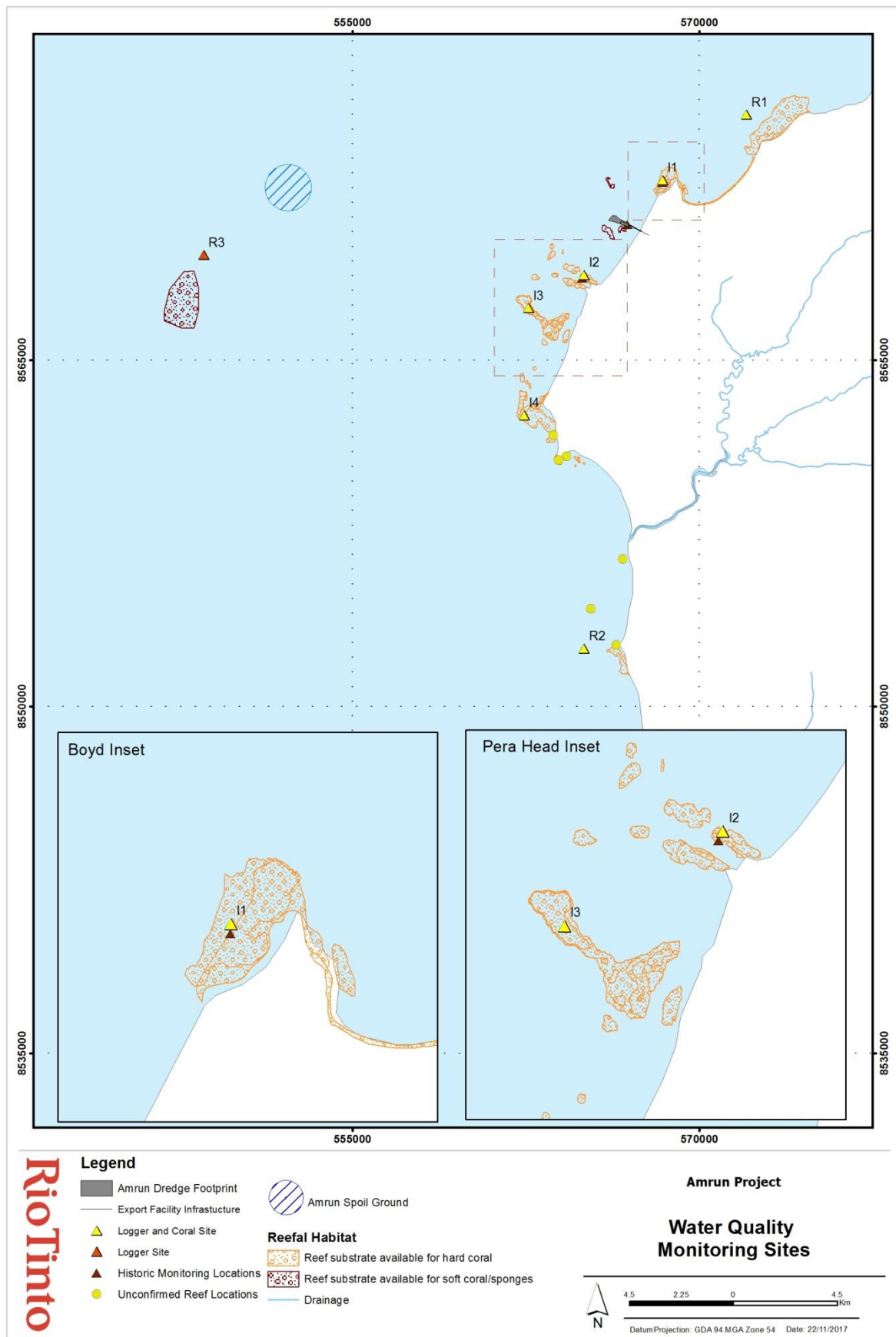
Figure 3 Capital Dredge Campaign Water Quality Monitoring Locations

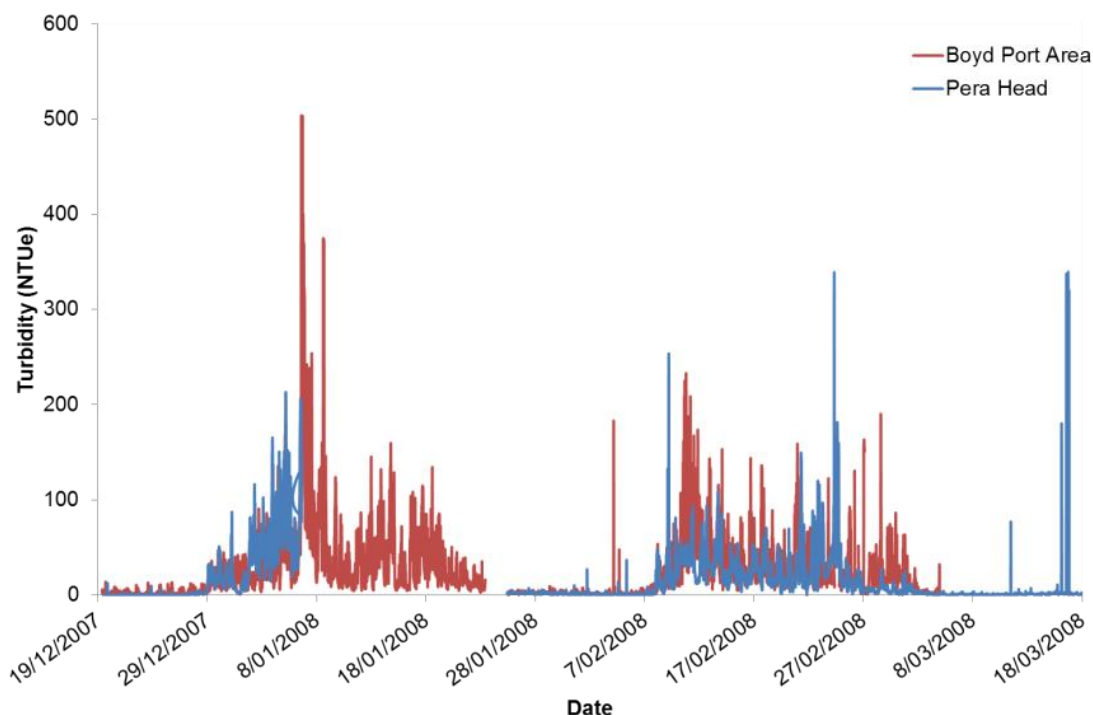
Table 10 presents a summary of background turbidity data collected during 2007 - 2008. This data included the Amrun Port, Pera Head and Boyd Point. Median turbidity concentrations remain higher during the wet season with elevated concentrations driven by ambient events (eg storms). **Figure 4** demonstrates the occurrence of such events as recorded from Pera Head and Amrun Port during the 2007-2008 wet season. The wet season events observed during this period describe elevations in ambient turbidity rising from <5 NTU before the events and exceeding ~200 NTU during the events. The duration of these events exceeded 20 days and report median turbidity concentrations in the order of 30-40 NTU.

Table 10 Summary of Background Water Quality, Turbidity (NTU) near the Amrun Port and Spoil Ground (2007-2008)

Location	Season	Parameter	Median	80 th Percentile	95 th Percentile	Min	Max
Amrun Port area	Wet	Turbidity	14.2	39.7	88.4	<0.1	503
	Dry	Turbidity	5.7	11	20.8	<0.1	79
Pera Head	Wet	Turbidity	2.2	25.9	64.1	<0.1	339
	Dry	Turbidity	1.2	2.1	3.5	<0.1	22
Boyd Point	Wet	Turbidity	14	39	*	0.2	225
	Dry	Turbidity	2.4	*	*	<0.1	103

* not reported.

Figure 4 Background Wet Season Turbidity (NTU) – December 2007 to March 2008



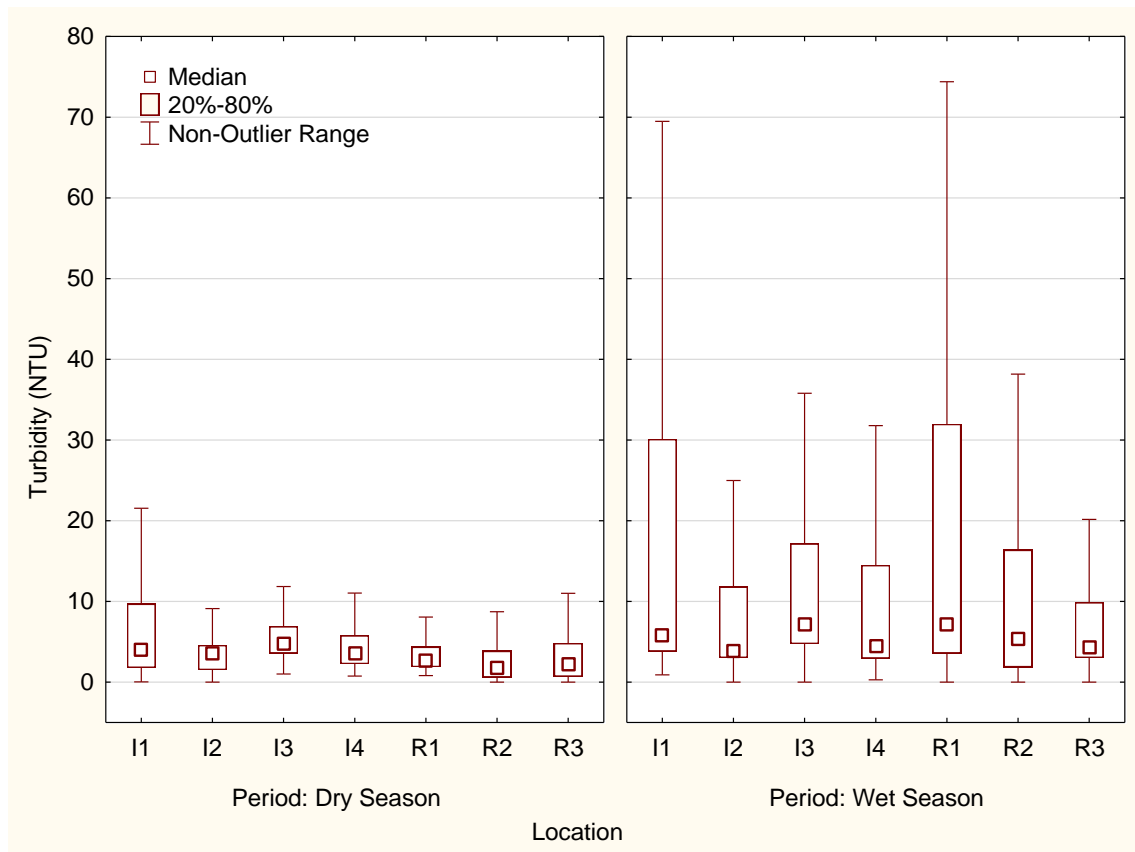
Prior to conduct of the capital dredging campaign RTA implemented a pre-construction monitoring program from August 2015 through to May, 2016 (**Table 11**). This data compares favourably to the 2007-2008 data, demonstrating increase in median turbidity during the wet season. Median

dry season turbidity's range between 1.7 to 4.8 NTU, increasing during the wet season at 3.9 to 7.1 NTU. The influence of episodic event driven elevations is further demonstrated within **Figure 5** which outlines a distinct increase in the 80th percentile from each monitoring location during the wet season, ranging from 10 to 32 NTU.

Table 11 Summary of background turbidity (2015-2016)

Location	Season	Parameter	Mean	Median	80 th Percentile	95 th Percentile	Min	Max
I1	Wet	Turbidity	20.3	5.8	30.1	88.6	0.9	224
	Dry	Turbidity	10.2	4.0	9.7	46	0.04	225
I2	Wet	Turbidity	9.8	3.9	11.8	42.6	0	192
	Dry	Turbidity	3.8	3.6	4.6	5.6	0	25.6
I3	Wet	Turbidity	16	7.1	17.2	69.2	0	222
	Dry	Turbidity	6.6	4.8	6.9	10.7	1	222
I4	Wet	Turbidity	12.3	4.5	14.5	54.7	0.3	208
	Dry	Turbidity	4.0	3.5	5.8	7.8	0.7	22.4
R1	Wet	Turbidity	20.4	7.1	32.0	82.1	0	223
	Dry	Turbidity	3.5	2.6	4.4	7.1	0.8	169
R2	Wet	Turbidity	12.7	5.4	16.9	50.8	0	222
	Dry	Turbidity	2.6	1.7	3.8	5.7	0	29.7
R3	Wet	Turbidity	14.6	4.4	9.9	81.6	0	224
	Dry	Turbidity	4.4	2.2	4.8	4.8	0	198

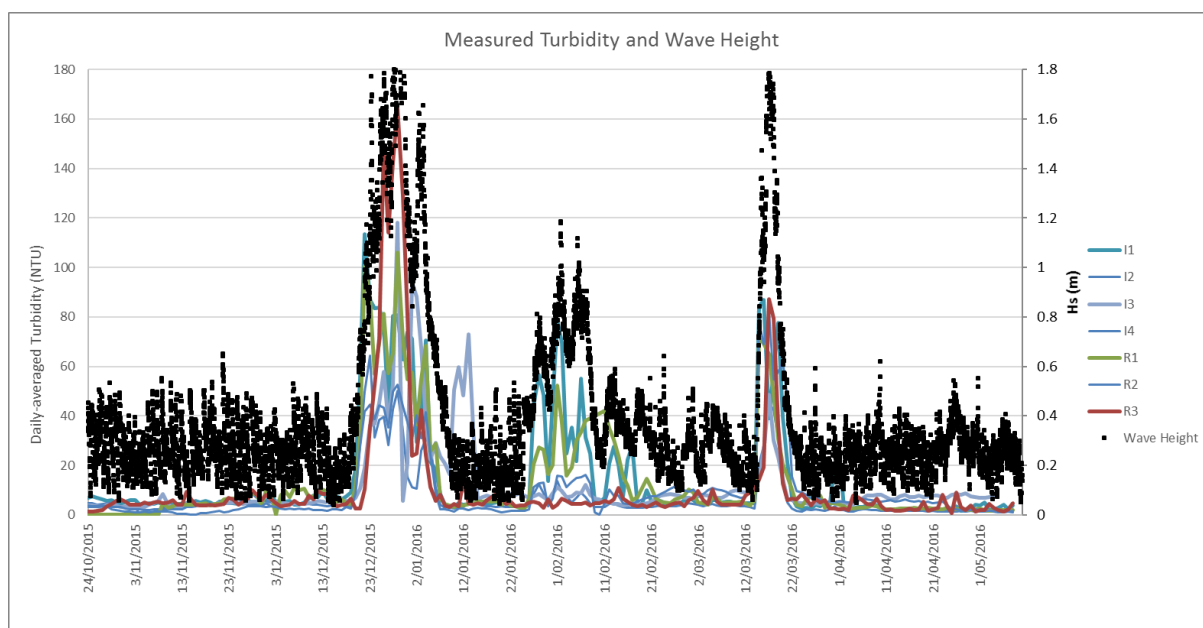
Note: Dredge period excluded.

Figure 5 Turbidity – non outlier plot (2015 – 2016)

Note: excludes the dredging period

To further explain these increases, mean daily turbidity data has been calculated from each monitoring location and presented as a time series. This plot incorporates significant wave height (Hs) obtained from Albatross Bay over the same period (DSITI, 2017). A strong temporal correlation is observed between elevations in turbidity and the increases in significant wave height (**Figure 6**). From this investigation, as significant wave height approaches 0.5m sediments begin to mobilise elevating ambient turbidity. Whilst the occurrence of such conditions are typically associated with the monsoon/wet season, these events can occur throughout the year. Again, this data outlines ambient events leading to elevated turbidity ranging from 10 days to over 20 days.

Figure 6 Mean daily turbidity and significant wave height (October 2015 to May 2016).



Note: Turbidity from impact and reference monitoring locations; significant wave height (Hs) recorded from Albatross Bay

Despite its offshore location and increased depth range, the 2015-2016 data also indicates that natural processes can readily mobilise sediments at the disposal ground (R3) (**Figure 6**). Increases in turbidity at R3 are observed from two of the three wave event periods. Whilst wave heights remained above 0.5m for the second wave event, water depths appear to have precluded fines mobilisation. The inshore monitoring locations all responded with increasing turbidity.

In the build-up to the 2016 capital dredging program the study area experienced a significant swell and wave event between March 15 and 22. This event followed the passage of a tropical low through the southern Gulf over this same period (March 15-18). This weather system resulted in residual swell which impacted the Weipa region between March 14-22, increasing Hs from ~0.1m to over 2.0m (DSITI, 2017). Turbidity increased markedly during this event (**Figure 6**).

PAR data was also collected from September 2015 to May 2016. The relationship between turbidity and PAR was examined for both the dry and wet season. A statistically significant exponential relationship ($p < 0.05$) was identified with PAR decreasing as turbidity increased (RTA 2017b).

5.3 Marine Habitats

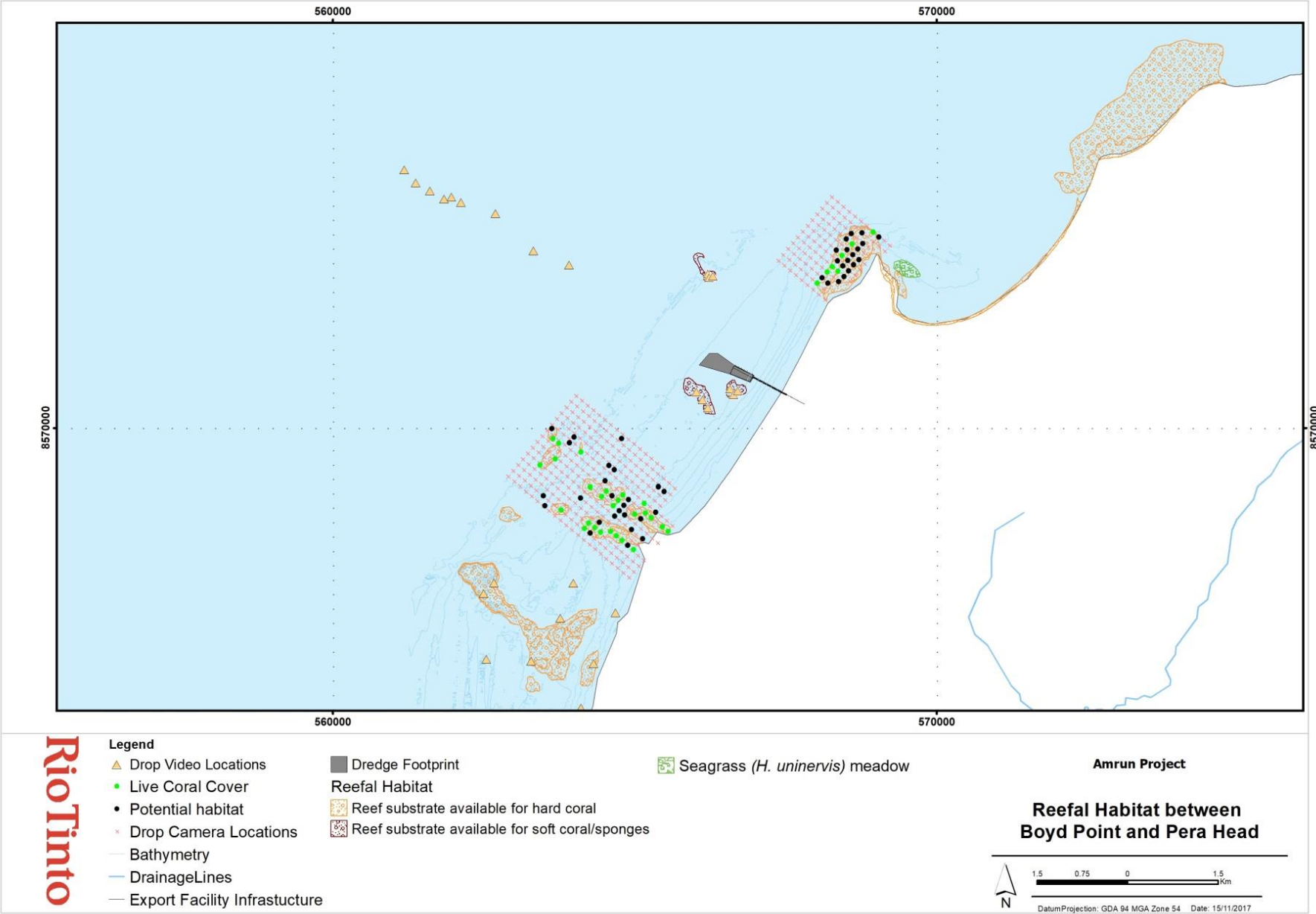
The Amrun dredging and spoil disposal sites sit within the Gulf of Carpentaria which has a number of tropical and near shore environments including near shore fringing reef communities, seagrass and open sandy substrate and associated sparse macrobenthic communities. Baseline assessments for key areas that will be impacted have been completed (RTA 2011; RTA 2012; Worley Parsons 2016b).

5.3.1 Reef

Near-shore fringing reef communities in the vicinity of the Port area occur at Boyd Point, Pera Head and between Pera Head and Thud Point (**Figure 7**). These Coastal turbid-zone reefs include low profile reefs comprising of soft coral and sponge assemblages and rocky reefs containing hard corals. The reef systems between Boyd Point and Thud Point may be considered of high importance in a regional context due to the resources they support that are of conservation,

cultural, commercial and recreational importance. Surveys for the area were completed during the baseline assessment for the EIS (2007 – 2008 and 2010) and impact monitoring (2016). All surveys recorded reefs in the area consisted of outcrops of hard coral primarily forming over ironstone formations.

Figure 7 Reefal Habitat Between Boyd Point and Pera Head



Baseline surveys identified that substrate available for reefal colonisation in the baseline survey was estimated to cover an area of approximately 49ha at Boyd Bay and 72 ha at Pera Head (**Table 12**) of which approximately 4.2 and 6.2% of that is covered in hard coral cover. All surveys identified that hard coral cover is of a depauperate and patchy nature. Reefs are dominated by small to medium sized colonies of corals of the families *Dendrophylliidae*, *Faviidae* and *Poritidae*. The genera and species in these three families are typical of hard corals that grow in environments that experience extremes in turbidity and sedimentation (K. Anthony, pers comm; Erftemeijer *et al.*, 2012). Drop camera and video surveys completed for the area are shown in **Figure 7**.

Table 12 Inshore Reef Areas and Extent of Dominant Benthic Assemblages

Location	Total estimated substrate available for reefal colonisation (ha)	Estimated % Hard coral cover	Estimated Total Hard Coral (ha)	Estimated % Soft coral cover	Estimated Total Soft Coral (ha)	Estimated % Sponge cover	Estimated Total Sponges (ha)
Boyd Point	49	4.2%	2.1	2.7%	1.3	2.1%	1.0
Port area (between Boyd Point to Pera Head) ¹	23	0%	0	1.0%	0.2	1.8%	0.4
Pera Head	72	6.2%	4.5	6.3%	4.5	3.7%	2.7
South from Pera Head to Thud Point (inferred) ²	274	6.2%	16.9	6.3%	17.2	3.7%	10.2

1 The estimate of reefal area available, and estimates of live cover for the Port area was based on a review of only six video transects (with limited resolution). Refer Section 6.1.2 of the Queensland EIS (RTA 2011) for details.

2 The estimated reefal area available for colonisation south from Pera Head to Thud Point was inferred from analysis of aerial photographs. As there is no direct data on live cover from this area, the estimates are based on the maximum percentage cover from the areas where data was available.

Coral monitoring surveys were completed in February, May and June 2016 at six locations (I1 to I4 and R1 and R2) (**Figure 3**):

- Survey 1: 24 and 25 February 2016 (pre-dredge)
- Survey 2: 19 May 2016 (1 month post capital dredging)
- Survey 3: 18 June 2016 (2 months post capital dredging) (Advisian, 2016b).

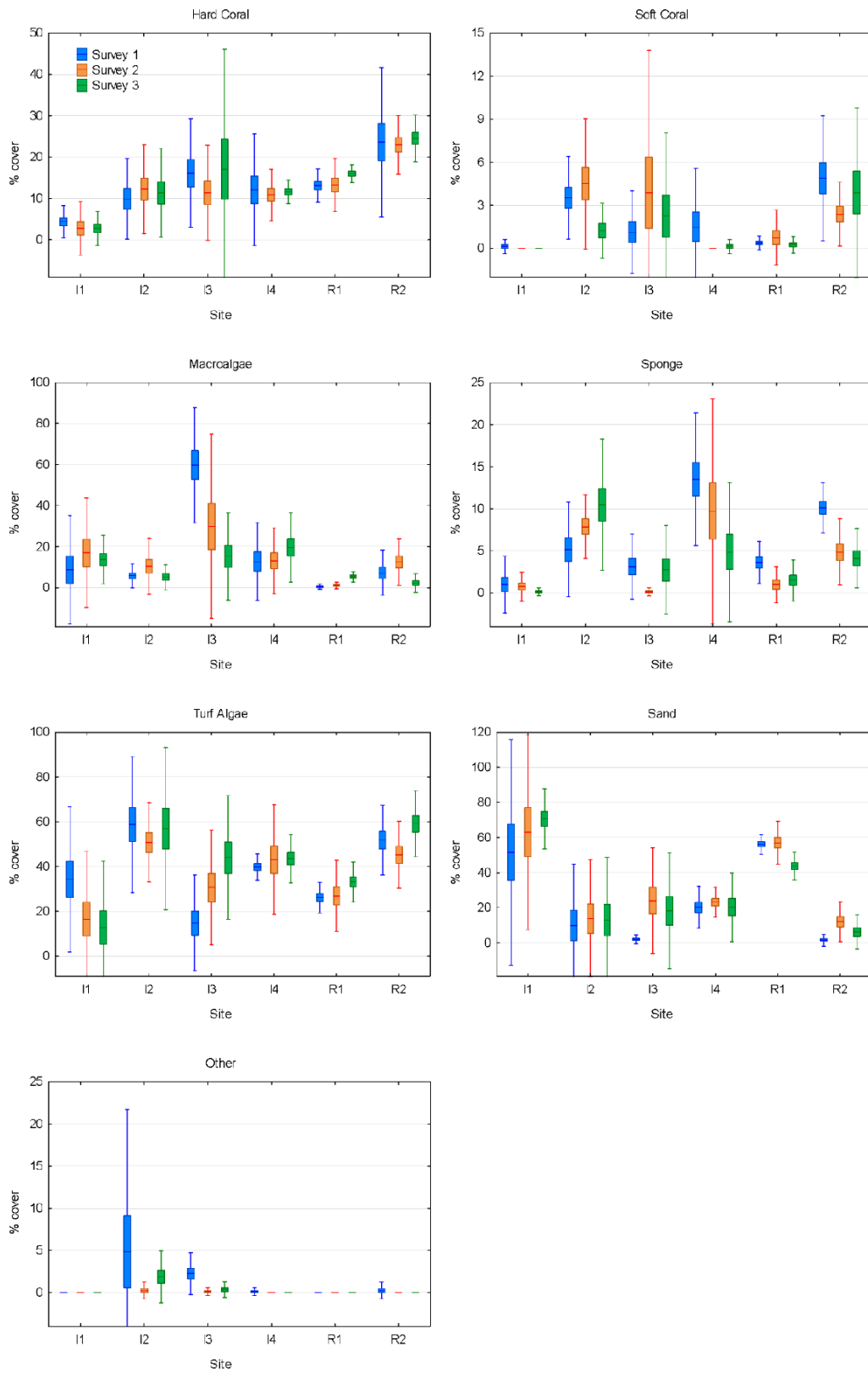
The seabed at all monitoring locations was dominated by sand, turf algae or macroalgae or combinations of these three groups.

The dominant hard corals found at each site were from the genera *Turbinaria spp* and *Porites spp* and from the *Faviidae* family; all are typically found in turbid inshore environments. The growth forms of the hard coral community differed at each site but were primarily dominated by encrusting, foliose and massive growth forms, also typical of growth forms found at inshore reefs. Branching *Acropora* colonies were occasionally found at sites I3 and R2.

Results are illustrated in **Figure 8** to **Figure 10**. Hard and soft coral bleaching was observed during all surveys and at all sites. The highest coral bleaching was recorded at the reference site R2. No sign of sediment were observed on any species of coral except *Turbinaria spp*. corals

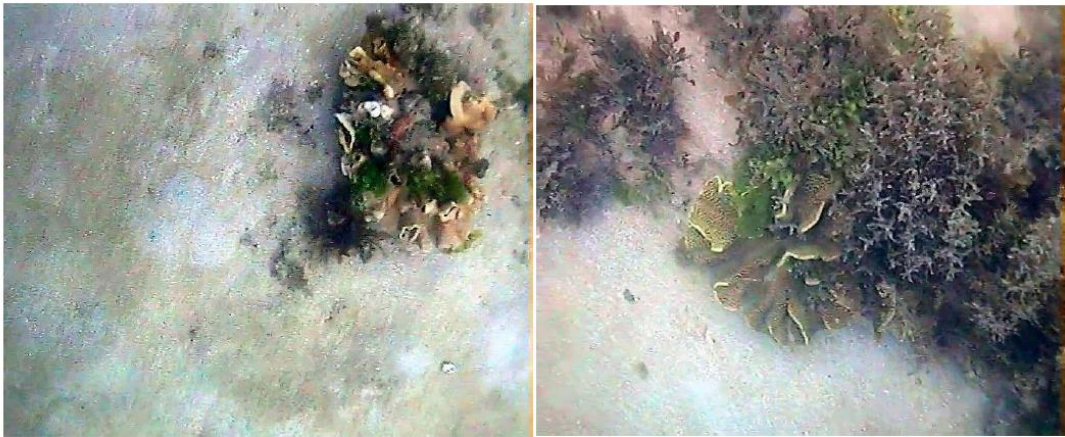
which is typical for species with a cup (or foliose) shaped growth form. No signs of mucous were observed. Analysis of the results found no statistical difference (or change) in the hard coral cover at each site across the three surveys. While low levels of coral bleaching was recorded this was observed to be higher at reference locations. Additionally no sediment were observed on corals (with the exception of turbinaria) which is typical of coral colonies impacted by dredging operations. Accordingly capital dredging was not considered to be causal factor of bleaching events. The temporal (February 2016 to June 2016) and spatial (all sites of concern and reference sites) scale of the coral bleaching recorded made it highly unlikely that the bleaching was in any way caused or exacerbated by the capital dredge-related activities. The bleaching appeared to be related to the wider sustained elevations of sea temperatures which were observed across northern tropical waters between February and April 2016 (BOM 2016); which was responsible for wide scale coral bleaching observed in the Northern GBR.

Figure 8 Reef monitoring results, showing percentage cover of the broad benthic groups at each site for each survey

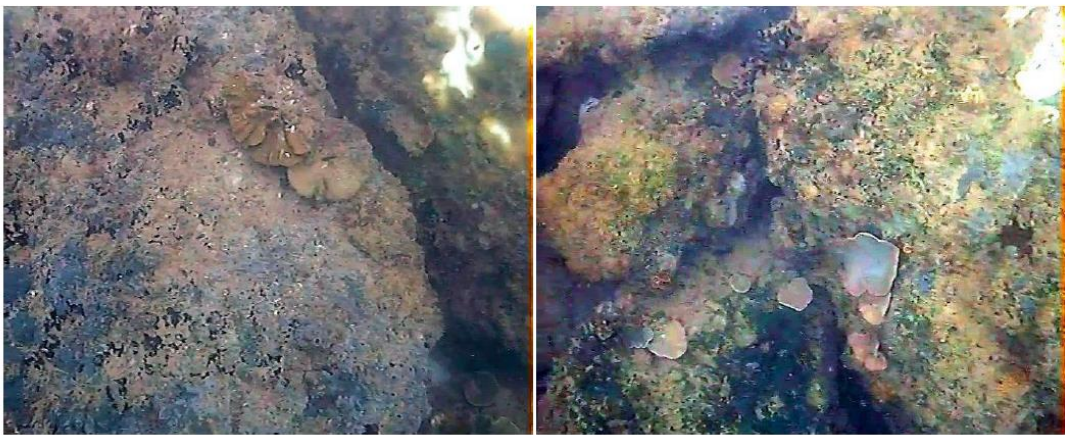


Source: Advisian, (2016b)

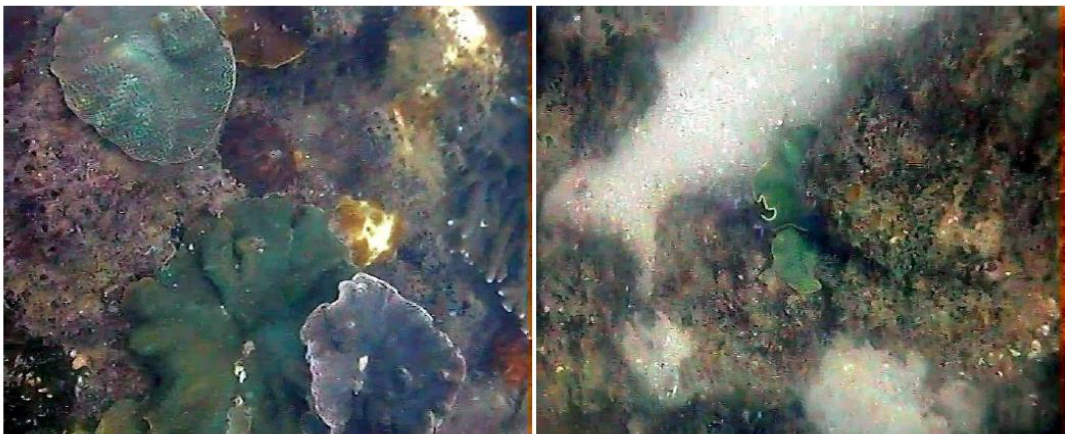
Figure 9 Examples of typical benthic communities at sites I1, I2 and I3



Typical benthic community found at Concern **Site I1** – large patches of sand with occasional hard corals and macroalgae



Typical benthic community found at Concern **Site I2** – large boulders covered in turf algae, sponges and macroalgae with occasional hard corals



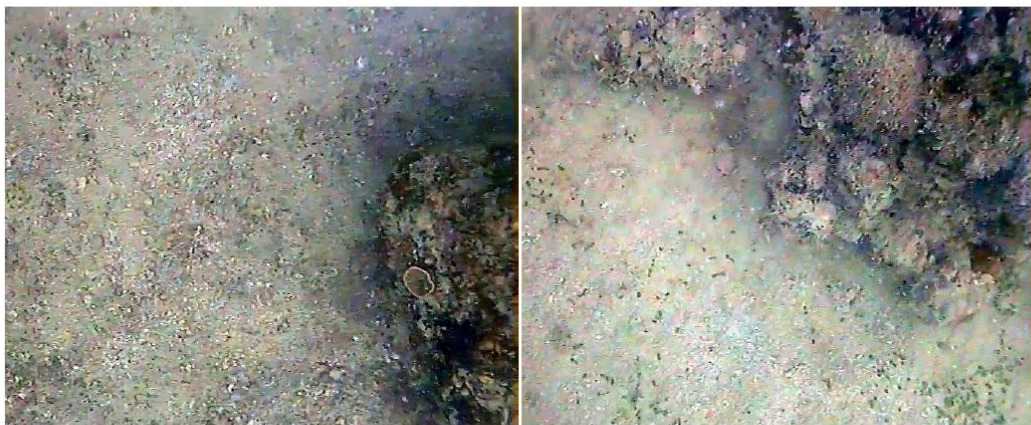
Typical benthic community found at Concern **Site I3** – undulating hard substrate covered in turf algae, sponge, hard corals and macroalgae, occasional patches of sand in the channels between hard substrate.

Source: Advisian, (2016b)

Figure 10 Examples of typical benthic communities at sites I4, R1 and R2



Typical benthic community found at Concern **Site I4** – low relief undulating hard substrate covered in turf algae, sponge, hard corals and macroalgae, occasional patches of sand in the channels between hard substrate.



Typical benthic community found at Concern **Site R1** – large patches of sand with occasional hard corals and macroalgae growing on small patches of low relief hard substrate



Typical benthic community found at Concern **Site R2** – low relief undulating hard substrate covered in turf algae, sponge, hard corals and macroalgae, occasional patches of sand in the channels between hard substrate. Some areas of high hard coral cover.

Source: Advisian, (2016b)

There is a paucity of information on coral spawning in the Gulf of Carpentaria and timing for spawning events is unknown. The most probable spawning period for eastern Gulf of Carpentaria corals is October – November when water temperatures are rising (pers. Comms Prof. Andrew Baird, JCU 13 Nov 2017; Keith *et al* 2013).

There are currently no clearly defined universal turbidity or sedimentation trigger levels associated with corals. Ongoing studies, data and other available literature show nearshore corals reefs are adapted to relatively high turbidity rates and sedimentation (Erftemeijer *et al*. 2012). Larcombe

et al., (2001) reported that nearshore coral reefs can withstand suspended sediments and sedimentation rates within the ranges of 15 to >40 mg/L and 5 to 120 mg/cm²/day, respectively. Similarly, corals on nearshore reefs at James Price Point in Western Australia are exposed to turbidity and sedimentation rates of <5 to >25 NTU and 16.5 to 87.4 mg/cm²/day, respectively (DSD, 2010).

Erftemeijer *et al.* (2012) reviewed the available published literature, including peer-reviewed scientific literature, "grey" literature in the form of environmental impact assessments, consultancy and technical reports, and additional information obtained from members of Working Group 15 of the Environmental Commission of the World Association for Waterborne Transport Infrastructure, on the sensitivity of corals to turbidity and sedimentation. This review concluded that the sensitivity of a coral reef to dredging impacts depends on its resilience and ambient conditions normally experienced. The review presents a range of data that shows corals that are naturally exposed to high and variable background conditions of turbidity and sedimentation will show higher tolerances to increases in turbidity and sedimentation caused by dredging. "Coastal turbid-zone reefs" occur in water with turbidity over 100 NTU (approximately 220 mg/L suspended solids) often resulting from wave-induced resuspension. Many coral species and reefs survive sedimentation rates as high as 100 mg/cm²/day for several days to weeks without any major negative effects with some nearshore reefs experiencing sedimentation rates well over 200 mg/cm²/day. Nearshore fringing reefs in the Great Barrier Reef region have long term mean sedimentation rates of 50-110 mg/cm²/day (Erftemeijer *et al.* 2012).

Specific studies on some of the more common species found on the reefs near the Amrun study area show the following:

- *Turbinaria mesenterina* –
 - Adapted to very high sediment loads (up to 100 mg cm⁻²) due to an ability to rapidly clear sediment and utilise sediment as an energy and nutrient source. The high concentrations of suspended particulate matter on near shore reefs represent a significant food source for a range of coral species contributing to significantly higher lipid stores in near shore coral species (Sofonia and Anthony, 2008).
- *Acropora millepora*-
 - Flores *et al.* (2012) exposed *A. millepora* to 0,1, 3, 10, 30 and 100 mg/L suspended sediment for 12 weeks. All coral fragments survived the treatment from 1- 30 mg/L with 11% mortality recorded in the 100 mg/L treatment. No mortality was recorded until at least 4 weeks.
- *Motipora aequituberculata* (similar to hard foliaceous coral like *Turbinaria mesenterina*)
 - Flores *et al.* (2012) exposed *A. millepora* to 0,1, 3, 10, 30 and 100 mg/L suspended sediment for 12 weeks. All coral fragments survived the treatment from 1- 10 mg/L. with 11% mortality recorded in the 100 mg/L treatment. No mortality was recorded until at least 4 weeks.
- *Favidaae* - Antwertinger (2011) investigated the effect of light and suspended particulate matter on the growth of two favid species, *Goniastrea aspera* and *Platygyra sinensis*, in a turbid, macrotidal estuary, Darwin Harbour. The fringing reefs of Darwin Harbour would be considered harsh environments for coral growth with annual average sea surface temperature of 29°C, often reaching 32°C in the wet season, and turbidity >80 NTU. These fringing reefs also receive high levels of freshwater and sediment runoff during the wet season monsoon. The growth characteristics, average annual extension, average annual density and average annual calcification, of the two favid species, *G. aspera* and *P. sinensis*, were similar to those from open water reef systems with very low turbidity, including Heron Island on the Great Barrier Reef. This result showed these species are well adapted to the extreme fringing reef environment which is attributed to the fact that favids are efficient heterotrophs when light limited as a result of high turbidity (Anthony, 1999; Anthony, 2000; Anthony and Fabricius 2000).

- *Sponges* – sponges can also be used to interpret results of impacts to the reef. Recent studies by Pienda (2016) completed of impacts laboratory pulse exposure to 25 or 500 mg/L suspended sediment did not result in mortality.
- *Coral spawning* Recent studies by Ricardo *et al* (2016) identified potential impact on spawn buoyancy with 5 m reef experiencing a 10 % reduction in buoyancy at 106 mg/L.

5.3.2 Seagrass

A small area of seagrass has been recorded adjacent to the Boyd Bay beach (north of Boyd Point) consisting of *Halophila decipiens* and *Halophila uninervis* (McKenzie and Yoshida 2009). A small area of *Halodule uninervis* was confirmed in 2017 when completing surveys for the Amrun moorings.

No seagrass has been found within the Boyd Point to Pera Head area with physical conditions, sediment and prevailing bathymetry unlikely to support seagrass in the proposed Port.

5.3.3 Open substrate

The vast majority of the bay consists of open sandy and muddy substrates with occasional macroinvertebrates (RTA 2011; RTA 2012). The development footprints for the Port area and spoil ground have been confirmed through field inspections that consist primarily of soft open substrate that contain sparse epifaunal organisms such as sea pens and polychaetes which are common in the Gulf of Carpentaria (Post *et al* 2006).

5.4 Marine Megafauna and Significant Species

Section 6.6 of the Queensland EIS (RTA 2011), Section 6.3 of the Supplementary Report to the EIS (RTA 2012), and Sections 4, 7 and 9 of the Commonwealth EIS (RTA 2013) provide a detailed assessment of the threatened and migratory marine species that occur or potentially occur in the Project area.

A number of threatened and migratory species are transient and/or forage and/or nest in the Port area (Commonwealth EIS; RTA 2013). Section 4.4.2.3, Table 4-5 and Table 7-7 of the EIS details the likelihood of threatened species occurring in the Project area and Table 4-7 details the likelihood of non-avian migratory species occurring. In summary:

- Dugongs occur along the Western Cape and may traverse coastal waters in the vicinity of the Port while moving between seagrass meadows. There are no seagrass meadows within the Port footprint (**Figure 7**) ((Commonwealth EIS (RTA 2013): Section 9.4.1 and Table 9-9).
- Australian Snubfin and Indo-Pacific Humpback Dolphins are known to occur in the vicinity of the Port (Commonwealth EIS (RTA 2013): Sections 9.5.1.1, 9.5.1.2, and 9.6.1, Table 9-15; GHD 2015; BPM 2017).
- Bryde's Whale may occur in the vicinity of the Port and other coastal areas offshore. A potential recent sighting was recorded in the offshore area (19 September), with photo ID to be confirmed.
- Green Turtles are known to occur in the area with nesting recently recorded (Guinea, 2014). Preferred foraging habitats include sea grass beds (nearest beds located at Boyd Bay) however they may also forage at reef habitats at Boyd Point, Pera Head and between Pera Head and Thud Point.
- Hawksbill Turtles are known to occur in the area and may forage on reef areas at Boyd Point, Pera Head and between Pera Head and Thud Point. They are also known to nest on the beach in the vicinity of the Amrun Port site (Commonwealth EIS (RTA 2013): Section 7.3.2.2, Guinea, 2014, Pendoley Environmental 2017).

- Flatback Turtles are known to occur in the area and may forage in the shallow rocky reef areas and sedimentary habitats around the Amrun Port and are known to nest on the beach in the vicinity of the Amrun Port site (Commonwealth EIS (RTA 2013): Section 7.3.2.3); (Guinea, 2014; Pendoley Environmental 2017);
- Olive Ridley Turtles are known to occur in the area and may forage in the shallow coastal unvegetated habitats around the Amrun Port area. Nesting has been recorded in the vicinity of the Amrun Port site (Guinea, 2014, Pendoley Environmental 2017).
- Leatherback Turtles may forage in the area but are principally oceanic (Commonwealth EIS (RTA 2013): Section 7.3.2.6).
- Loggerhead Turtles may be transient in the area and may forage in the reef areas (Commonwealth EIS (RTA 2013): Section 7.3.2.4).

Marine fauna offset programs have been developed for Inshore Dolphins (Inshore Dolphin Offset Strategy (RTA 2015)) and Marine Turtles (Feral Pig Management Offset Strategy (RTA 2016a)) and Marine Turtle Offset Plan (RTA 2016b) in accordance with the Projects Commonwealth and State Approvals. The offset programs include survey and monitoring for these species within the Project area and findings to date have been included within the species descriptions above and have been considered in development of management and monitoring requirements within **Section 7.4** of this MDMP.

5.4.1 Inshore dolphins

Limitations on information regarding the status of inshore dolphins along Western Cape York led to the development of an offset program involving inshore dolphin monitoring over a period of thirteen years, commencing in 2014 (GHD, 2015), the second survey in 2016 (BPM, 2017) and the third survey in 2017 (unpublished). The program aims to provide a better understanding of the distribution, habitat use and abundance of Australian snubfin *Orcaella heinsohni* and Australian humpback dolphins *Sousa sahulensis* within the vicinity of the Amrun project area. The research also contributes towards the 'co-ordinated research framework to assess the national conservation status of Australian snubfin dolphins (*Orcaella heinsohni*) and other tropical inshore dolphins' (the National Inshore Dolphin Strategy). The research based offset program is consistent with the Threat Abatement and Recovery actions as identified by both DES and DoEE.

Inshore dolphin survey results from 2014, 2016 and 2017 identified:

- Australian humpback dolphins and Indo-Pacific Bottlenose Dolphins were recorded in within the vicinity of the Port on each survey
- Australian snubfin dolphins were recorded north of Boyd Bay 2016 and 2017.
- Australian humpback dolphins and inshore bottlenose dolphins were found over a range of depths from shore out to 25 metres (limit of survey) with an average depth of 9.1 m and 9.8 m respectively.
- Australian snubfin dolphins were sighted on considerably less occasions and were sighted in shallower waters ranging from 2.5 to 10.4m.

The 2014 inshore dolphin survey found that the Weipa and Boyd Bay/Thud Point sites should be considered regional hotspots for both Australian humpback and Indo-Pacific bottlenose dolphins, where encounter rates in both sites were five to forty times higher than the highest encounter rates from other regions studied in Northern Australia. The Inshore Dolphin Offset Strategy will continue with surveys to be conducted in 2018 and 2019 and one additional survey within 10 years of bauxite shipping from the Port.

5.4.2 Marine Turtles

Marine turtle nesting monitoring was completed between February and October 2013 (Guinea, 2014), September 2016 (Pendoley Environmental, 2017) and August 2017 (Pendoley 2017) within the peak nesting period for the region as identified in the 2013 surveys. The primary objective of

the monitoring was to obtain sufficient data to detect long-term trends in turtle nest predation by feral pigs. Marine turtle nesting habitat in proximity to the Amrun project was assessed, including all accessible nesting beaches on the Amrun Project mining lease north (approximately 27 km of nesting beach) and south (approximately 32 km of nesting beach) of the Port.

Four nesting turtle species have been identified to date including flatback (*Natator depressus*), hawksbill (*Eretmochelys imbricate*), olive ridley (*Lepidochelys olivacea*) and green (*Chelonia mydas*) turtles. Surveys to date have confirmed low density turtle nesting occurs on the beaches between Winda Winda Creek and Ina Creek (RTA 2013, Guinea 2014, Pendoley Environmental 2017 and unpublished data).

The *Recovery Plan for Marine Turtles in Australia 2017 – 2027* was released in July 2017 (Commonwealth of Australia 2017). The long-term recovery objective for marine turtles is to minimise anthropogenic threats to allow for the conservation status of marine turtles to improve so that they can be removed from the EPBC Act threatened species list. All six of Australia's threatened or endangered turtle species may occur near Amrun Port with the four confirmed nesting species identified above.

The recovery plan has identified nesting and interesting (up to 20km seaward of nesting habitat) habitat critical to the survival of marine turtles for each turtle species. The beaches adjacent to the Port are regarded as habitat critical to the survival of two turtle species, Olive Ridley Turtles (Western Cape York genetic stock) and Flatback Turtles (Arafura Sea genetic stock).

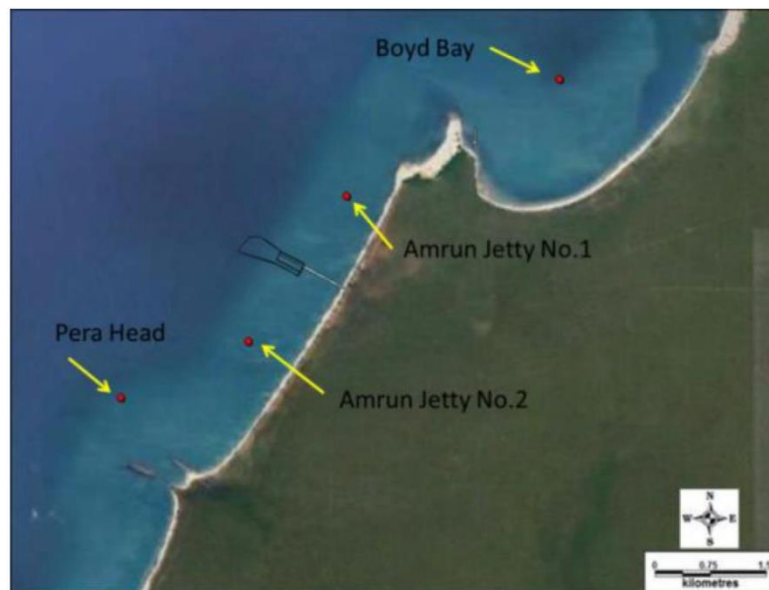
5.5 Marine Pests

Marine pests are marine biota that are translocated into waters outside their natural geographic range and subsequently settle, survive and spread. Translocation and survival of these species in new areas can cause irreversible impacts to the local ecosystem by competing with and/or predating on native species, as well as introducing disease. The consequences include a combination of environmental, social and economic impacts.

A historical marine pests study at the Port of Weipa was completed in October 1999 by the CRC Reef Research Centre and James Cook University (Hoedt *et al.*, 2001). No marine pests were detected during this survey. Larval settlement plates have been used to monitor marine pests since 2000 at the Port of Weipa. The plates target the black striped mussel since its detection at the Port of Darwin in 1999 and 2000, as well as the Asian green mussel since its detection in Cairns in 2006. NQBP currently manages the Port of Weipa and carries out maintenance dredging and spoil disposal at the existing Albatross Bay spoil ground. No incursions of marine pests have been recorded at the Port of Weipa using settlement monitoring plates (NQBP, pers comms).

Prior to capital dredging for development of the Amrun Port site, a baseline marine pest survey was completed at the Weipa Port and at the Amrun Port from 16 to 21 December 2015 (Biofouling Solutions, 2016). The objective of the survey was to identify the presence of any established marine pest populations listed on the National Monitoring Strategy Target Species List (NMTSL). No marine pests on the restricted NMTSL were detected in the Weipa Port area or the Amrun Port area during the 2015 baseline survey.

In February 2016, a marine pest settlement plate monitoring program was implemented (Biofouling Solutions, 2017). The settlement plates were used to target eight marine pests, including two high priority mussels. Monitoring has been conducted quarterly at four sampling locations situated approximately 150 m north and south of the designated jetty alignment, in Boyd Bay and northwest of Pera Head (**Figure 11**).

Figure 11 Marine pest settlement plate monitoring locations

One individual specimen of an Asian green mussel *P. viridis* was found at the Amrun Jetty No. 2 site during the May 2017 monitoring event. As per the *Biosecurity Act 2014*, Act RTA notified the Department of Agriculture Fisheries (DAF). The specimen was confirmed as AGM by the Curator of Molluscs at the Museum and Art Gallery of the Northern Territory.

RTA have worked closely with DAF to assist with the investigation to potentially identify the causal vessel or and with the investigation and surveillance to delimit the area of the incursion. Since identification of *P. Viridis*, surveillance methods including beach walks, ROV, infrastructure inspections, vessel inspections, plankton tows and continuation of settlement plate monitoring have been implemented, with no additional marine pest specimens identified in the area.

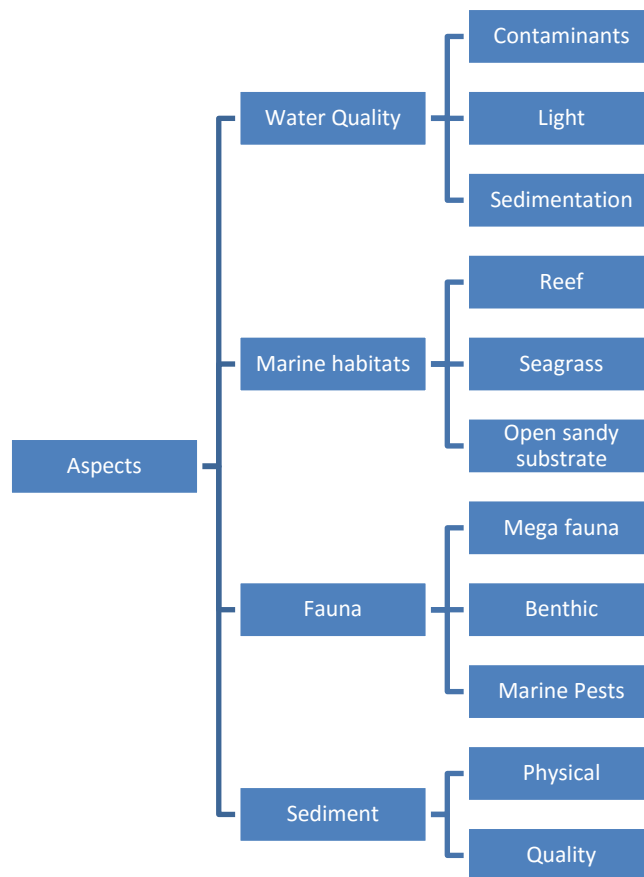
It is unknown how the mussel arrived in Australia and is not thought to be associated with any project vessels. Biosecurity Queensland commended RTA for the proactive measures implemented in accordance with the *Biosecurity Act 2014* and continues to work closely with Rio Tinto and NQBP while they maintain an AGM surveillance program.

6 POTENTIAL IMPACTS

The environmental impacts associated with maintenance dredging activities are expected to be smaller than those predicted for the 2.6 Mm³ (RTA 2013) and observed for capital dredging operations in 2016 (202,416 m³). Maintenance dredging in 2018 was approximately 42,038m³ within the first year of this MDMP with around 80,000 m³ required in 2019. This volume is anticipated to be removed over 7.5 days and would be less than 3% of the originally proposed capital dredge volume.

The closest port is located approximately 40km away, no port related shipping or dredging impacts from Weipa Port are expected to impact on the local ecosystem and fauna. Operations on site are not permitted to dispose to waterbodies and appropriate erosion and sediment must be in place around site.

The aspects that may be potentially impacted by maintenance dredging or disposal activities are summarised in **Figure 12**. The impact of dredging on each of these aspects will be risk assessed based on previous observations of the capital dredging program, similar dredging operations and appropriate literature.

Figure 12 Potential Impacts

6.1 Water Quality

At the Amrun Port and spoil ground locations, dredging and disposal operations will create a turbidity plume with associated sedimentation as material is disturbed on the seabed or released through the water column. The release and removal has the potential to impact water quality of the local environment through:

- Dispersal of contaminants;
- Reduction in light for flora and fauna communities; and
- Sedimentation smothering local flora and fauna communities.

Dredging and disposal operations are of a short duration likely less than 8.5 days and therefore any water quality impacts would be temporary (short-term). Impacts associated with maintenance dredging are expected to be of a shorter duration than those experienced naturally in the wet season where background water quality monitoring for the capital dredge program measured elevated sediment levels for up to 20 days, with turbidity levels exceeding 200 NTU. Background monitoring did not monitor during a cyclone event which may elevate sediment levels for an even longer period. Given the expected program duration is well within the natural variability measured during background monitoring a contingency plan if maintenance dredging timeframes are longer than anticipated is not required.

Dredge modelling was previously completed for the capital dredging campaign which aimed to remove and dispose of 2.6 Mm³ over 24 weeks. Modelling was completed for typical tidal conditions during the dry season using 3-dimensional numerical models of hydrodynamic and coastal processes (Worley Parsons 2013; in Commonwealth EIS (RTA 2013), Appendix 7-A) for TSS and sedimentation. Modelling considered a scenario where a Cutter-Suction Dredge (CSD) operated to loosen sediments in conjunction with a TSHD which removed the loosened sediments. The proposed maintenance dredging is a maximum of 3.5% of the anticipated capital dredge

volume with similar material, within the top 1m of deposited sediments to be dredged (**Table 13**). Accordingly dredge plume modelling from the capital program is considered to provide a suitable prediction of the extent of any impacts that may occur during maintenance dredging activities.

Table 13 Particle Size Distribution of Capital and Maintenance Dredge Sediments

Material	Capital dredging (Average % of layer 1 and 2)	Maintenance dredging
Clay (<0.0002 mm)	28	28
Silt (0.06 – 0.0002 mm)	43	57
Fine sand (0.2-0.06 mm)	15	14

6.1.1 Port Area

Contaminants

Analysis of the sediments to be dredged have not identified any contaminants present at levels that would cause environmental concern, accordingly consequences associated with transporting contaminants are negligible.

Light

Turbidity will be generated in the dredge footprint for approximately 1 hour during the anticipated three hour dredge cycle limiting the spatial and temporal extent of the plume.

Water quality monitoring of turbidity and PAR during the capital dredge campaign identified that the two parameters are directly correlated, where decreases in PAR coincided with increases in turbidity (RTA 2017b). Potential impacts to the light environment from the dredging operation are therefore assessed on the basis of elevated turbidity and associated TSS. At the Port area a relationship has been previously developed where TSS was calculated based on a calibration coefficient where 1.5 mg/L TSS equalled 1 NTUe (NTU equivalent measured on James Cook University loggers). Although this coefficient may vary depending on sediment types it can be used in the impact assessment for comparison purposes.

Dispersion plume modelling for the capital dredge campaign predicted that the 80th percentile of TSS would be 5 and 7.5 mg/L (approximately 3.3 NTUe and 5 NTUe) above background at Boyd Point and Pera Head, respectively, for a scenario where CSD and TSHD vessels were operating concurrently. Predictions found that periods of elevated TSS concentrations generally coincided with the TSHD and CSD operating in the inshore area while dredging the top layer of sediments (which had a higher content of fines).

Capital dredging was conducted by a CSD operating continuously with three split hopper barges. During the capital dredge spoil disposal, sediment plumes did not extend to Pera Head or Boyd Bay with no increases in turbidity recorded on the telemetered water quality logger located near these sites. Sediment plumes during the capital dredge campaign were monitored through visual observation from the dredge, satellite imagery and water quality loggers. Sediment plume observations during the capital dredge campaign observed a much smaller plume than predicted by modelling. The plume was predominately localized around the vessel to the south east of the dredge and dissipating within 500m. Images of the plume are provided in **Figure 13**. No plume was observed on MODIS imagery during the monitoring indicating plumes were localized around the dredge and not intense enough to be differentiated from the background water quality. Near-field turbidity plume monitoring was also conducted throughout the campaign using an Acoustic Doppler Current Profiler (ADCP) to determine the turbidity concentrations throughout the water

column. The largest plume recorded dissipated to background levels within 800 m of the vessels throughout the entirety of the water column.

Figure 13 Capital Dredge Program Plume Observations



28/03/2016



29/03/2016 within 100 m of vessel



29/03/2016



30/03/2016



02/04/2016



04/04/2016

The above background turbidity concentrations recorded in 2016 during the capital dredging resulted in incremental increases in turbidity and minor impacts on water quality in the immediate vicinity around the dredge. The plume extent and concentration was well below those anticipated by the model predictions with turbidity at background levels within 800 m and no water quality impacts were recorded at any of the water quality monitoring locations. The plume was not observed at Boyd Point or Pera Head as anticipated by the plume modelling.

Given sediment plume dispersal from the CSD operating alone was much less than the combined CSD and TSHD operation modelled, it is assumed that the majority of modelled sediment dispersal was generated from the TSHD. This is expected with studies indicating plumes produced by TSHD are generally greater than other forms of dredging (Chevron 2014, SKM 2012, CEE 2012). The modelled sediment plume from the capital dredge campaign is therefore potentially representative of the intensity and extent of sediment plume from the TSHD to be used for maintenance dredging. The duration of impact during maintenance dredging is however anticipated to be much less than that modelled for the capital dredge campaign (duration modelled 24 weeks and 2.6 million cubic metres).

Given much reduced duration the elevated sediment plumes are expected to be of a shorter duration than natural storm events which may elevate sediment levels for up to 20 days with

turbidity exceeding 200 NTU (median 30 to 40 NTU) (**Section 5.2**). Elevated sediment levels from maintenance dredging are therefore considered to have negligible consequences on the light environment in the vicinity of the Port and spoil ground.

Sedimentation

The 2016 capital dredge plume sedimentation model predictions near the reef areas immediately offshore from Pera Head showed the median above background deposition as less than 2.0 mg/cm²/day under the CSD and TSHD scenario. The highest deposition rates (in excess of 7.5 mg/cm²/day above background for the CSD and TSHD), were predicted to occur in the immediate vicinity (within 500 m) of the dredge footprint. These predictions were consistent with turbidity monitoring that was completed during the capital dredge campaign, where sediment plumes were contained within 800 m of the dredgers. Elevated sedimentation is expected to be negligible compared to the background rates at Pera Head of 17 mg/cm²/day and 63 mg/cm²/day in the dry and wet seasons.

A pre-and post-dredging coral health monitoring program was implemented in 2016 to provide a quantitative measure of coral health (percent bleaching and/or mortality). The coral health monitoring program was designed to identify and measure changes in coral health that were attributable to initial capital dredging activities, through comparison to changes occurring naturally in corals at the reference sites.

Results of the coral monitoring program (previously described in **Section 5.3**) did not find any visible signs of stress or sedimentation on coral colonies at any of the survey locations associated with dredging activities after completion of the capital dredging campaign (Advisian, 2016b). No statistical difference (or change) could be found between coral cover before and after the 202,416 m³ dredging.

As previously described in the water quality trigger report for capital dredging (Advisian, 2016a) and the coral monitoring report (Advisian, 2016b), dominant reefal communities in the Boyd Point and Pera Head area are known to survive prolonged periods (weeks) of exposure without any major negative effects. Some nearshore reefs are known to experience sedimentation rates well over 200 mg/cm²/day (Erftemeijer *et al.* 2012). Consequences on reefal communities during the maintenance dredging campaign at areas surrounding the Port area are therefore anticipated to be negligible.

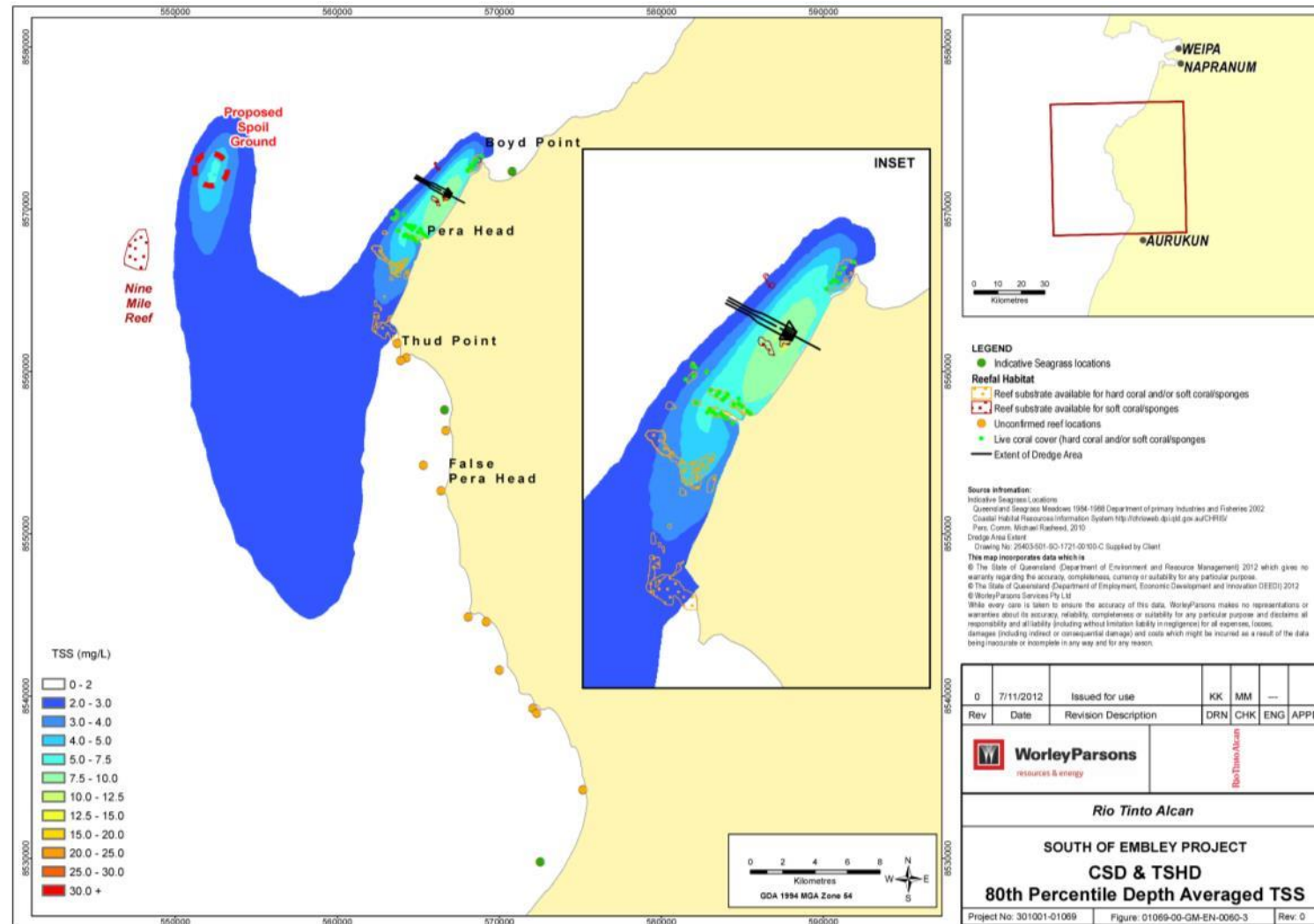
Zone of Influence

A potential zone of influence has been defined to delineate the potential area within which sediment plumes may disperse. The zone of influence is used as a basis for impact assessment and delineation of a zone of impact from the maintenance dredging activities. It is expected that the zone of influence would be much greater than the zone of impact.

A conservative zone of influence for the maintenance dredge campaign is considered to be equivalent to that of the modelled plume for the capital dredge campaign as shown in **Figure 14** and **Figure 15** for TSS and sediment deposition respectively. The actual plume expected from maintenance dredging activities is likely to be less extensive than predicted for the capital dredge campaign due to the reduced duration of dredging.

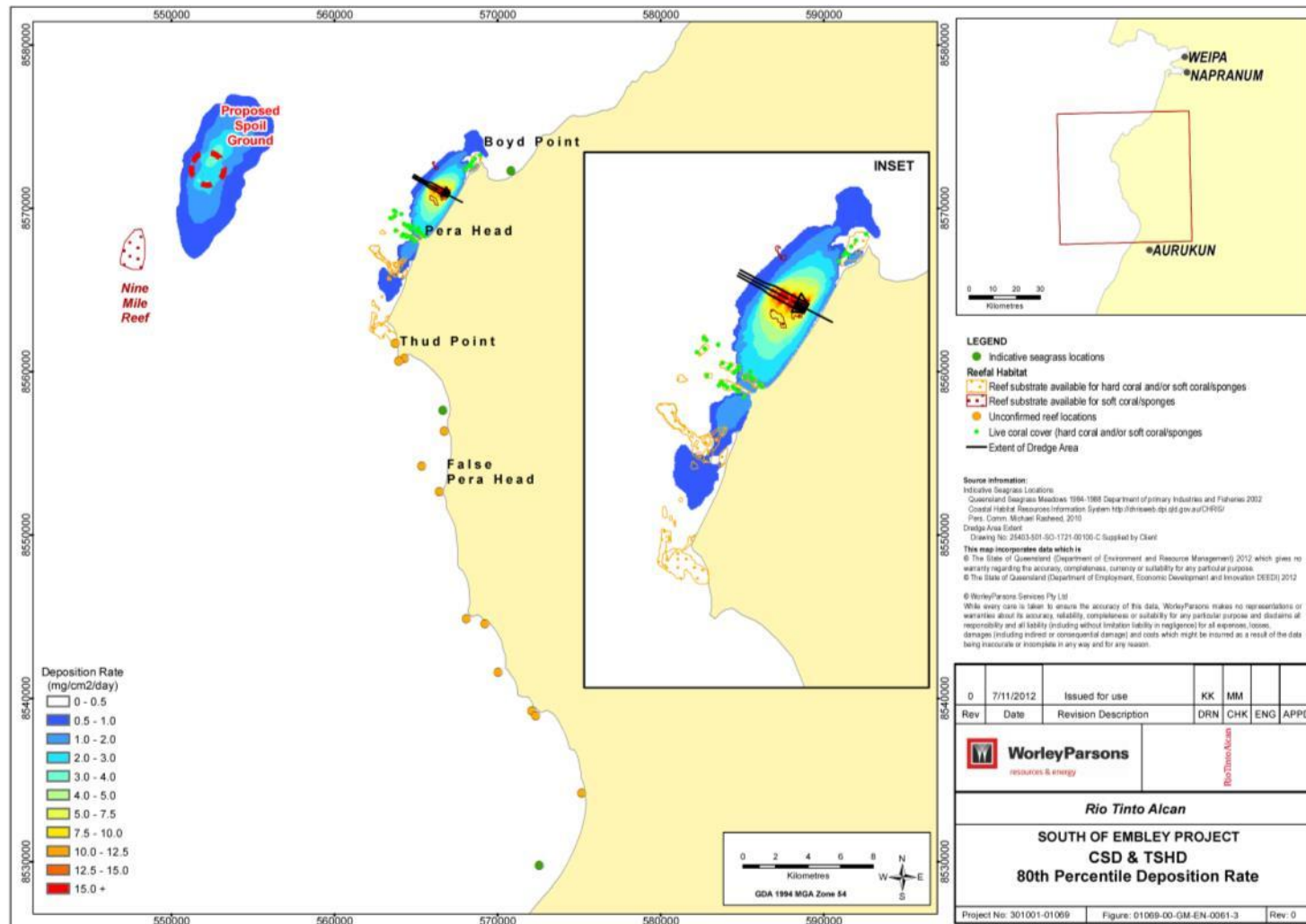
Management and monitoring measures for the impacts from dredging and spoil disposal activities are provided in **Section 7.2**.

Figure 14 CSD & TSHD 80th Percentile Depth Averaged TSS*



* Modelling presented is for 2.6 million cubic metres capital dredge campaign over 24 weeks

Figure 15 CSD & TSHD 80th Percentile Deposition Rate*



* Modelling presented is for 2.6 million cubic metres capital dredge campaign over 24 weeks

6.1.2 Amrun Spoil Ground

Contaminants

The risk of introduction of contaminants to the spoil ground is determined to be negligible and is not anticipated to cause contamination of water, benthic habitats or sediments on the basis of sediment sampling results from the dredge footprint, and the designation of dredged sediments as clean for offshore disposal. Consequences associated with contaminants are considered to be negligible.

Light

Dispersion plume modelling for the capital dredge campaign predicted that sediment plume would not extend over Nine Mile Reef located approximately 6km south-west from the spoil ground. Predictions found that the highest periods of elevated TSS generally coincided with the TSHD disposal (**Figure 14**). During the capital dredge spoil disposal, sediment plumes did not extend to nine mile reef with no increases in turbidity recorded on the telemetered water quality logger located near the site. Consequences associated with reduction in light in the vicinity of the spoil ground are considered to be negligible.

Sedimentation

The maintenance dredge spoil disposal would inevitably result in smothering of any benthic organisms which have established at the spoil ground since the capital dredging campaign, due to burial by dredged material. Macrobenthic organisms can recover over time from impacts of spoil disposals. Recovery at the Albatross Bay spoil ground is considered rapid (GHD 2005) and due to the close proximity and similar nature of the areas it is likely to extend to the Amrun disposal ground. The impacts of this are likely to be negligible, given the recent deposition of relatively small volumes (202,416 m³) of spoil material across a large area, and the sparse occurrence of epibenthic organisms that were previously known to inhabit the site. Regionally the consequences to microbenthic assemblages is negligible.

Dredge plume modelling from the capital dredge campaign (for 2.6 Mm³ of material) indicated that deposition rates above background (0.5 to 2 mg/cm²/day) would not extend beyond 4 km outside the spoil ground area. The increase in deposition outside the Amrun spoil ground area was negligible compared to the mean background rates in the area of 47 mg/cm²/day and 31 mg/cm²/day for dry and wet season, respectively. Consequences associated with dredging plume are expected to be negligible.

Management and monitoring measures for the impacts from dredging and spoil disposal activities are provided in **Section 7.2**.

6.2 Marine Habitats

As identified in **Section 5.3**, the marine habitats in the area are dominated by open sandy substrate and nearshore and offshore reefs comprising of sparse turbidity tolerant species.

The sparse macrobenthic organisms that reside in the open sandy substrates within the zone of influence are likely to be temporarily impacted by an increase in deposition. The environments experience natural increases in turbidity and sedimentation associated with storms and run off in the wet season of greater duration and intensity than expected from maintenance dredging and accordingly the impacts are expected to be negligible to low. In the event that sediment plume from maintenance dredging extends to nearby inshore or offshore reefs at Pera Head, Boyd Point or Nine Mile Reef it is important to note the reefs in questions are able to withstand prolonged periods (weeks) of elevated turbidity and increased sedimentation much greater than expected from the maintenance dredging.

A pre-and post-dredging inshore coral health monitoring program was implemented in 2016 to provide a quantitative measure of coral health (percent bleaching and/or mortality). The coral health monitoring program was designed to identify and measure changes in coral health that were attributable to initial capital dredging activities, which were greater than changes occurring naturally in corals at the reference sites.

Results of the coral monitoring program (previously described in **Section 5.3**) did not find any visible signs of stress or sedimentation on coral colonies at any of the survey locations associated with dredging activities after completion of the capital dredging campaign (Advisian, 2016b). No statistical difference (or change) could be found between coral cover before and after the 202,416 m³ dredging.

Given the short duration of the dredging program, and that the coral species present at reefal habitat in the vicinity of the Port and spoil are known to have a high tolerance to sedimentation, impacts on reefal communities during the maintenance dredging campaign at areas surrounding the dredging and spoil disposal sites are therefore anticipated to be negligible.

The most probable spawning period for eastern Gulf of Carpentaria corals is October – November when water temperatures are rising (pers. comm. Prof. Andrew Baird, JCU 13 Nov 2017; Keith *et al* 2013). Maintenance dredging is expected to be conducted during the dry season, between March and September, outside of this period.

A small area of seagrass *Halodule uninervis* has previously been recorded in Boyd Bay. While the plume is not expected to extend towards the seagrass beds it is important to note the seagrass in question is sediment tolerant. As identified in Collier *et al* (2016) *H. uninervis* can experience reduced light conditions for over 4 weeks in tropical waters without significant shoot loss. Previous modelling and previous monitoring do not anticipate any plume extending into Boyd Bay and no impacts on seagrass are anticipated.

6.3 Marine Pests

The marine pest risk associated with the maintenance dredging operations is primarily associated with movement of new vessels in the area, which could introduce marine pests and with the removal and relocation of dredge spoil, which could potentially disperse or translocate any introduced marine pests to the spoil ground. The introduction or translocation of marine pests may impact on other marine species and/or habitats in the area through competition and/or predation.

Sources of biosecurity risk arising from dredging can simplistically be conceptualised in relation to a 'chain of events' occurring in three main stages involving the transport and introduction of marine pests from other areas (primary introduction), subsequent establishment, and secondary spread from the point of first introduction. Marine pest species may be introduced through the following primary introduction mechanisms:

- Dredge area: Use of vessels, including dredges, at the Port site as a result of hull fouling or ballast water; and/or,
- Spoil ground: Disposal of spoil material from dredging through pests introduced by the dredger or other vessels (both Project, 3rd party commercial or recreational vessels).

The introduction of marine pests could potentially result in adverse changes to the local ecology and biodiversity of the environment. To minimise this risk, the Amrun Project requires all vessels to undergo a rigorous risk assessment process prior to mobilisation. Targeted marine pest surveys have been completed during development of the Port, including a baseline marine pest survey outlined in **Section 5.5** (Biofouling Solutions, 2016) and ongoing marine pest settlement plate monitoring (RTA, 2017a). The risk assessment process is outlined in **Section 7.5**.

No marine pest species are known to have established within the footprint of the Port, at the approved spoil ground or within the Port of Weipa. Detection of a single Asian green mussel (*P. viridis*) on a marine pest settlement plate south of the dredge footprint occurred in May 2017 as part of the Amrun marine pest monitoring program however there has been no further detection in subsequent months (**Section 5.5**).

The risk of resuspension or translocation of marine pests from dredge spoil is considered to be low, particularly given the sediment composition which is comprised primarily of fine silts and clay.

Prior to mobilisation the vessel will undergo a marine pest risk assessment as outlined in **Section 7.5**. Maintenance dredging for the Port will use the 'Brisbane' TSHD dredger, which operates in

Queensland waters and is likely to be low risk as it is operational in waters where no marine pests of concern are known to occur.

Consequences associated with the unmitigated introduction of marine pests would be considered high. Management and monitoring measures to reduce the likelihood of occurrence and reduce the risk associated with marine pest introduction from the maintenance dredge program are detailed in **Section 7.5**.

6.4 Marine Megafauna and Significant Species

As identified in **Section 5.4**, a number of marine megafauna species are known to occur in the area. Potential impacts to marine fauna from vessels and vessel movements during maintenance dredging are identified below,:

1. *Vessel strike*. During the short maintenance dredging operation only a very small number of vessel movements will be required. Collisions between marine fauna and vessels associated with dredging are unlikely to occur. While they are possible the likelihood of collision is influenced by factors such as location, species, vessel speed and depth (Todd *et al.* 2015). Vessels associated with dredging operations are likely to be moving at slower speeds (allowing for observation of marine fauna to occur and for evasive action to be taken in most instances) and will occur in mostly deeper waters in the project area reducing the risk of vessel strike. Inshore dolphin and marine turtle species which frequent the Port area are highly mobile within deeper waters and would be able to temporarily move from the slow moving vessels to avoid collision. Accordingly the consequences associated with vessel strike from dredging operations are considered negligible.
2. *Area avoidance*. Area avoidance is unlikely for any of the listed species with dredging operations unlikely to increase vessel traffic to levels high enough to result in area avoidance. All listed species have been previously recorded in busy ports throughout Australian waters and recent dolphin surveys have not recorded a reduction in megafauna with the increased traffic associated with the Port development. Accordingly the consequences associated with area avoidance is negligible
3. *Turtle entrainment*. Turtle entrainment during dredging operations is unlikely to occur. While there is potential for entrainment when using a TSHD, management methods require dredge heads to be fitted with fauna exclusion devices. Exclusion devices have been found to be effective to minimise any impacts on turtles (API 2010; Dickerson et al 2004). Accordingly the consequences associated with turtle entrainment is negligible
4. *Nesting and hatchling disorientation*. artificial lighting has the potential to disorientate nesting females and turtles hatchlings. The beach area between Boyd Point and Pera Head is a low density marine turtle nesting beach, with 0.29 marine turtle nests per kilometre per day recorded during the peak August – September period (Guinea, 2014). Marine turtle nesting surveys in September 2016 recorded between 0.13 marine turtle nests per kilometre per day (Pendoley, 2017) and surveys in September 2017 recorded 0.18 marine turtle nests per kilometre per day (unpublished data). Altered light regimes from dredging operations would only eventuate during dredging campaigns, and so would be short term (expected to be less than 8.5 days). Given the relatively low level of lighting required for dredging operations, avoidance of peak turtle nesting periods identified from baseline monitoring (August/September) is not considered necessary. It should be noted that dredging activities of the Port of Weipa are typically scheduled before this peak period with dredging expected to occur in May 2018. Accordingly consequences associated with lighting are considered minor.
5. *Marine pollution*. It is unlikely marine pollution (waste or spills) will impact marine fauna due to the implementation of thorough management procedures, which are required for all vessels operating on the project. All vessels must comply with the relevant legislation and the additional management methods outlined in this Plan (**Section 7.8**). Accordingly the consequence associated with marine pollution from dredging activities is negligible.

The sediment plumes and/or sedimentation from the proposed Port maintenance dredging could potentially impact these species as identified below:

1. *Avoidance of foraging areas:* It is unlikely sediment plumes will impact marine fauna as sediment plumes from dredging and disposal are less significant than those generated from storms and strong winds (**Section 6.1**), in which dolphins, marine turtles and dugong would normally swim. The species in question occur in naturally turbid environments and accordingly are not likely to be adversely affected by localised and short term increases in turbidity (DSD, 2010, Bayliss and Freeland, 1989; Marsh *et al*, 2008).
2. *Loss of foraging habitat, in particular reef areas at Boyd Point, Pera Head and Thud Point:* As discussed in **Section 6.2** foraging habitat (eg reefs at Boyd Point and Pera Head and seagrass in Boyd Bay) are unlikely to be impacted as the turbidity plumes in the immediate area are expected to be within natural turbidity levels for the area. Additionally the species found within the near shore areas are known to have high turbidity and sedimentation rate thresholds (Larcombe *et al* 2001, Sofonia and Anthony, 2008; Erftemeijer *et al*. 2012; Advisian, 2016a, Advisian, 2016b).
3. *Reduction in marine turtle nesting:* The beach area between Boyd Point and Pera Head is a low density marine turtle nesting beach, with 0.29 marine turtle nests per kilometre per day recorded during the peak August – September period (Guinea, 2014). Marine turtle nesting surveys in September 2016 recorded between 0.13 marine turtle nests per kilometre per day (Pendoley, 2017) and surveys in September 2017 recorded 0.18 marine turtle nests per kilometre per day (unpublished data). Turtles nesting were still observed throughout the entirety of the capital dredge program indicating sediment plumes are unlikely to prevent marine turtles from coming ashore to nest.

The *Recovery Plan for Marine Turtles in Australia* (Commonwealth of Australia 2017) has identified Olive Ridley Turtles as a priority for management action on the basis that they are in decline or likely to be in decline due to multiple, continuing threats occurring on a substantial scale. This species has only small nesting aggregations in Australia, which have been affected by up to 90 per cent nest predation at some beaches for multiple decades. In addition, they are likely to be heavily impacted by ghost nets in the Arafura-Timor Seas and the Gulf of Carpentaria. Other key threats to the Olive Ridley Turtles are identified as climate change and variability and domestic fisheries bycatch. The maintenance dredging campaign will not increase the key threat to Olive Ridley Turtles.

The Flatback Turtles nesting in the Project area are not identified in the recovery plan as a priority species for management action however the nesting beaches are identified as habitat critical to the survival of the genetic stock. Key threats to this species are identified as marine debris entanglement (ghost nets), climate change and variability, terrestrial predation and indigenous egg collection. The maintenance dredging campaign will not increase the key threats to Flatback Turtles.

The recovery plan identified a number of other key threats which are relevant during the dredging campaign including:

- Marine debris ingestion;
- Chemical discharge;
- Light pollution;
- Dredging;
- Vessel disturbance; and
- Noise interference.

Overarching actions have been developed to address the key threats to turtle species, and those which are applicable during the dredging campaign include:

- Reduce the impacts from marine debris;
- Minimise chemical and terrestrial discharge;
- Minimise light pollution; and
- Address the impacts of coastal development/infrastructure and dredging and trawling.

The key threats are consistent with the potential impacts to marine turtles as identified above. The dredging activity is not anticipated to impact ongoing biologically important behaviours for marine turtle stocks within the vicinity of the Port and the recovery of marine turtle stocks and the functionality of their habitat is not likely to be adversely affected by the maintenance dredging activities. The dredging activity is therefore considered to be consistent with the overarching action to address the impacts of dredging within the *Recovery Plan for Marine Turtles in Australia* (Commonwealth of Australia, 2017). The consequences associated with dredging and disposal activities on marine megafauna are considered to be negligible.

Management and monitoring requirements to address each of these threats, considerate of the overarching actions, are identified in **Section 7.4, Section 7.6, Section 7.7 and Section 7.8.**

Marine fauna offset programs for Inshore Dolphins (RTA 2015) and Marine Turtles (RTA 2016a) and (RTA 2016b) were developed to offset the impacts of the South of Embley Project, which include the potential impacts from maintenance dredging activities. The Feral Pig Management Offset Strategy and Marine Turtle Offset Plan include feral pig control activities on all accessible nesting beaches on the Amrun Project mining lease north (approximately 27 km of nesting beach) and south (approximately 32 km of nesting beach) of the Port, as an offset commitment for impacts to marine turtles. The offset program will continue during 2018 and in subsequent years. The offset program will directly address terrestrial predation which is a key threat to nesting turtles and monitoring program will directly contribute to the measure of success for the Olive Ridley Turtles which is to understand the trends in nesting turtle abundance for this stock.

6.5 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, rays and bony fishes at the Amrun Port facility and the spoil ground.

The Project area is included in the area where the Northern Prawn Fishery (NPF), the Gulf of Carpentaria Commercial Inshore Finfish Fishery and the Gulf of Carpentaria Commercial Line Fishery operate. Recreational fishers and guided fishing tour operators also utilise the Project area including the "Three Mile" recreational fishing area. There would be a temporary impact on fish assemblages in the vicinity of the Port and spoil ground due to turbidity generated by maintenance dredging, however following dredging activities the animals would return to the area, accordingly the consequences associated are considered negligible.

6.6 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 2013). The main noise anticipated during dredging operations would be the noise from the TSHD.

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 of 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) and for short duration. Management measures for underwater noise are outlined in **Section 7.6.** Consequences associated with underwater noise are considered to be negligible.

6.7 Physical Disturbance

Dredging activities will result in direct physical disturbance of the seabed with removal of sediments and associated habitats. This is an unavoidable impact of dredging activities. The consequence associated with this is expected to be negligible. Sediments are considered clean for unconfined ocean disposal and accordingly no contamination is likely and the consequences

are considered negligible. Management measures for physical disturbance are outlined in **Section 7.9**.

6.8 Marine Pollution

Shipping activities associated with dredging have the potential to introduce marine pollution into the environment. It is unlikely marine pollution will impact the local environment due to the implementation of thorough management procedures, which are required for all vessels operating on the project. All vessels must comply with the relevant legislation and the additional management methods outlined in this Plan (**Section 7.7**). Based on the vessel and activity the consequences associated with a marine pollution spill would be considered moderate. Management measures associated with Marine Pollution are outlined in **Section 7.8**.

6.9 Cumulative Impacts

Cumulative impacts from the maintenance dredging operation and other natural events or operations within the region could impact reef, seagrass and marine megafauna. Potential cumulative stressors and the likelihood of impact are summarised in the **Table 14** below.

Table 14 Cumulative Impacts

Stressor	Current known status in area	Potential to impact	Cumulative impact likely
Intense weather (eg cyclone)	Dredging would be required during the 2018 dry season to ensure safe dredging operation. If dredging was to occur during the wet season, the short duration of the program would not elevate the naturally high turbidity levels for extended periods of time.	Reef Seagrass	No
Other dredging	The next closest dredge program is annual Weipa program which is 40km north and the sediment plume from either operation would not disperse to the same sensitive habitats. The same vessel will complete operations and no displacement for marine fauna is anticipated for Amrun operations.	Reef Seagrass Megafauna	No
Port operations and other shipping	Construction operations associated with development of the Port are scheduled to be complete by February 2018. Shipping operations will be limited to a small number of movements per day in the channel with dredging operations likely to bring two additional vessels to the area. Inshore dolphin and marine turtle species which frequent the area have continued to use the Port area during the much busier construction period and accordingly additional vessel movements in the area are unlikely to result in behavioural changes for local species	Megafauna	No

6.10 Summary of Potential Impacts – Risk Assessment

A summary of the potential impacts of the initial risk without any additional management measures is summarised in **Table 15** below.

Table 15 Potential Impacts Risk Assessment

Aspect	Consequence	Likelihood	Risk	Comment
Water quality – contaminants – in zone of influence	Negligible	Rare	Low	
Water quality light – in zone of influence	Negligible	Likely	Moderate	There will be a light reduction in the zone of influence. The management measures in Section 7.1 and Section 7.2 will provide mitigation of potential impacts through minimising the extent of the zone of influence.
Water quality – sedimentation – in zone of influence	Negligible	Likely	Moderate	Sedimentation will occur in the zone of influence. The management measures in Section 7.1 and Section 7.2 will provide mitigation of potential impacts through minimising the extent of the zone of influence.
Water quality – contaminants – sensitive habitats	Negligible	Rare	Low	
Water quality light – sensitive habitats	Negligible	Unlikely	Low	In the event plumes extended to the sensitive habitats concentrations will be within natural variation in concentration and duration (days).
Water quality – sedimentation – in sensitive habitats	Negligible	Unlikely	Low	In the event plumes extended to the sensitive habitats concentrations will be within natural variation in concentration and duration (days).
Marine habitats – reef	Negligible	Unlikely	Low	
Marine habitats – seagrass	Negligible	Unlikely	Low	
Marine habitats – open substrate – zone of influence	Negligible	Likely	Moderate	Open substrate will be impacted in the zone of influence, however the impact will be within natural variation in intensity and duration. The management measures in Section 7.1 and Section 7.2 will provide mitigation of potential impacts through minimising the extent of the zone of influence.
Marine habitats – open substrate	Negligible	Unlikely	Low	
Marine pests – ecosystem change	High	Unlikely	Critical	Introduction of marine pests while unlikely would have a significant impact on the environment. Accordingly additional management actions have been identified in Section 7.5 to enable early detection and reduce risk of translocating any specimens to the area.
Megafauna – vessel strike	Negligible	Unlikely	Low	
Megafauna – vessel avoidance	Negligible	Rare	Low	

Aspect	Consequence	Likelihood	Risk	Comment
Megafauna entrainment –	Negligible	Possible	Low	Even in the event a small number of turtles were entrained this would still not result in a detectable change in population size.
Megafauna – nesting and hatchling disorientation	Minor	Possible	Moderate	The potential for hatchling disorientation if lighting impacts were unmitigated may result in a detectable change in population size during the dredging campaigns. Accordingly additional management actions have been identified in Section 7.4 to minimise likelihood and severity of potential impacts upon turtle hatchlings.
Megafauna - pollution	Negligible	Possible	Low	
Megafauna – loss of foraging habitat due to dredge plume	Negligible	Rare	Low	
Megafauna – avoidance of foraging habitat due to dredge plume	Negligible	Rare	Low	
Megafauna – reduction in nesting due to dredge plume	Negligible	Rare	Low	
Fish assemblage – avoidance	Negligible	Unlikely	Low	
Underwater noise – dredging operations on megafauna	Negligible	Unlikely	Low	
Physical disturbance – benthic habitats	Negligible	Almost certain	Moderate	This is unavoidable in the dredge footprint but will impact less than 1% of the bay and is approved for direct disturbance. The management measures in Section 7.9 will provide mitigation of potential impacts through minimising the extent of the zone of impact.
Marine pollution - waste	Negligible	Possible	Low	
Marine pollution - spills	Moderate	Possible	High	Shipping activities associated with dredging have the potential to spill hydrocarbons; however the thorough management measures identified in Section 7.7 and Section 7.8 will minimise the likelihood and severity of potential impacts from marine spills.

7 MANAGEMENT AND MONITORING

Dredging and spoil disposal would be undertaken in accordance with the conditions of the EA, the Commonwealth Sea Dumping Permit and EPBC Act approval. RTA has established the BPD TAG which includes representatives from the following organisations:

- RTA;
- DAF – Biosecurity;
- DAF – Fisheries;
- DES (QLD);
- DoEE;
- Maritime Safety Queensland (MSQ);
- NQBP
- Members of the Western Cape Communities Coexistence Agreement (WCCCA).

RTA will report to the BPD TAG on implementation of dredging activities for the Port and implementation of the MDMP, including monitoring results, management triggers and response actions. The consultation with the BPD TAG will be used to develop the long term maintenance dredging strategy for the Amrun Port.

Maintenance dredging activities will be confined to the removal of sediment from within the authorised dredge footprint (**Figure 2**) and disposal within the capital dredge spoil ground (**Figure 1**) approved within the Sea Dumping Permit.

As per approval requirements:

- Prior to the commencement of each maintenance dredge campaign, hydrographic surveys of the bed levels of the area to be dredged will be completed, this will be compared to post-dredging surveys to provide an accurate estimate of volume of sediment removed from the area. Dredging activities will not start until provision has been made to lawfully place or dispose of the dredge spoil material.
- Evidence of applicable approvals would be made available to the regulatory authority on request.
- Dredge spoil will 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.
- Disposal of dredge material shall be conducted in accordance with Sea Dumping Permit conditions with compliance managed by the framework defined in **Section 8**.
- DES will be advised in writing at least five (5) business days prior to the date of commencement of each dredging campaign and within ten (10) days following completion of the each dredging campaign.
- The volume of each load of dredged material will be logged and will be dumped so that the material is distributed evenly over the area of the disposal site.
- Prior to dumping the vessel will establish by GPS that it is inside the disposal site before commencing dumping.

7.1 Dredge Equipment and Operators

Maintenance dredging activities will be conducted using the TSHD 'Brisbane'. The vessel is a modern vessel and completes the majority of maintenance dredging in Queensland and has strict environmental performance requirements. The 'Brisbane' will at a minimum meet the following requirements in accordance with Condition J8 of the EA:

- 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;
- 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;
- be maintained and calibrated to keep plant and equipment in an efficient condition and keep records of the maintenance; and,
- operate in an efficient manner.

All persons engaged in conducting maintenance dredging activities including but not limited to employees and contract staff would 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.

Maintenance dredging shall be limited to that required to maintain the approved dimensions of the Initial Capital Dredge Campaign, and shall not include additional capital dredging:

- Dredging will be completed to the approved footprint and depths as recorded on the electronic positioning and depth control system.

7.2 Water Quality

Based on water quality monitoring results during the capital dredge campaign, short duration of the maintenance dredge campaign (likely less than 8.5 days) and the known variability in natural turbidity levels in the region, impacts to water quality are expected to be low and short term (less than two weeks).

7.2.1 Management Measures

- A range of measures will be implemented to manage water quality and impacts to nearby sensitive receptors (e.g. coral assemblages). These measures include:
 - Dredging and disposal will only occur in the permitted areas specified on approved plans and with material approved for unconfined ocean disposal;
 - Not be conducted in unsuitable conditions (eg storm surges);
 - 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.
- Mechanical devices, such as turbidity-reducing ("green") 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;
- 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 ground;

- Safest and shortest sailing routes to and from the spoil ground will be selected to minimise the impact of propeller wash;
- Current and forecasted meteorological and oceanographic information will 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.

7.2.2 Monitoring Measures

Dredge plume generation will be monitored throughout the day with the dedicated marine fauna observer recording the extent and width of plume. The extent and width of the plume will also be monitored daily through MODIS imagery.

Boat based turbidity monitoring will be completed at least once daily using a hand-held water quality probe which will record turbidity measurements at each of the inshore water quality monitoring localities (I2 – I4 and R1). Five readings will be collected approximately 1 m from the seabed at three minute intervals and the readings will be averaged at each site.

7.2.3 Adaptive Management Measures

Data from the monitoring program will be used, in conjunction with data from the offset programs, to assess the level of water quality impact from the dredge campaign. The data will be used to identify if any additional management responses are required to avoid significant impacts occurring across multiple years. The monitoring shall also identify requirements for future monitoring programs.

7.3 Marine Habitats

As previously described in **Section 6.2** sensitive habitats in the area can survive weeks of prolonged increases in turbidity. The turbidity and sedimentation levels will not be elevated for a longer period than experienced naturally. Additionally any consequences would affect less than 1% of the population and the impact is likely to be low. Accordingly no coral monitoring is proposed.

7.4 Marine Mammals and Turtles

As outlined in **Section 5.4**, there are several threatened species which occur in the area which have the potential to be impacted by dredging and disposal operations. The following range of management measures identified to mitigate potential impacts on marine mammals and marine turtles will be implemented for dredging and spoil disposal.

7.4.1 Disturbance from vessel activities (boat strikes and turtle entrapment)

The following management measures will be implemented during dredging and spoil disposal activities:

- The TSHD would have dragheads with depth control fitted with turtle exclusion devices. Turtle exclusion devices will be used at all times as a standard operational specification to ensure the risk of injury to turtles during dredging is minimised.
- Prior to the commencement of maintenance dredging and spoil disposal activities, selected crew from the dredge would 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, a MFO must be on watch during dredging and disposal operations. This has been successful for previous dredge programs worldwide and in north Queensland and is considered appropriate for the level of risk.

- A log would be maintained on dredge and barge vessels detailing marine mammal and marine turtle sightings during operation.

Mobile dredging operations:

- must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge, and
- where underway, must alter course if dugongs, marine turtles or cetaceans are likely to be struck or captured.

Spoil disposal operations:

- must not commence if dugongs, marine turtles, or cetaceans are observed within 300 metres of the TSHD immediately prior to disposal.

Marine turtle monitoring would be carried out as follows:

- daily monitoring for impacted marine turtles would be undertaken at the dredge and at the shoreline down-current from the dredging operation.
- if monitoring identifies that more than two marine turtles are killed within a 24 hour period as a result of dredging, the dredge would relocate from the area until an incident investigation has been carried out and relevant preventative actions implemented. Preventative actions will be specific to the identified causal factors (eg heightened turtle abundance in area).

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, would be developed prior to the commencement of dredging activities. These will be outlined in the contractor's environmental management plan and will include at a minimum dredge suction to only be started where dredge heads are in contact with seafloor at start of dredge run and then stopped once dredge heads are to be lifted from the seafloor.

All dredging vessels will be contractually required to comply with applicable parts of:

- Australian Maritime Safety Authority (AMSA) Marine Notice 12/2011; and
- Division 8.1 of the EPBC Regulations 2000 regarding vessel interactions with cetaceans (eg distance, speeds).

Vessels will be required to maintain a lookout for marine fauna when underway, and when these species or other marine fauna are sighted to consider reducing the vessel's speed or making safe course corrections. In accordance with Condition 6f of the EPBC approval, vessel speed will be restricted to a maximum of 6 knots in water depths less than 2.5 m.

Any injury or death of marine turtle, dugong, dolphin or whale will be reported to:

- The DES-designated marine stranding hotline through the RSPCA Queensland on 1300 ANIMAL. A Queensland Parks and Wildlife Service officer will then be contacted to determine the relevant response. Any stranding or incident that may be attributable to Project dredging activities will be investigated in cooperation with the relevant authorities to determine appropriate corrective action as part of adaptive management.
- EHP is to be immediately notified of any marine turtle captures by the dredge or injury to any marine species of conservation significance.
- All injuries of protected species will be made to the necessary contact within DoEE. Notification to DoEE for cetacean death or injury within 48 hours of resulted activity (1800 803 732 or protected.species@environment.gov.au) will also occur if required.

The marine turtle and marine mammal management procedures flowcharts for maintenance dredging and spoil disposal are shown in **Figure 16** and **Figure 17** respectively. It is noted that these procedures only work effectively for day time operation to reduce the risk of impact to marine fauna. The risk associated with dredging operations is still considered low with the addition of turtle deflection devices. Daily inspections from the beach and water quality monitoring boat will be conducted within the vicinity of the dredge footprint and spoil ground to identify any injured or dead turtles.

7.4.2 Impacts from Artificial Lighting

Artificial lighting has the potential to disorientate nesting female and hatchling turtles. To minimise the impacts of lighting on nesting females and turtle hatchlings, the following management measures will be implemented where practicable:

- Daily beach inspections between Boyd Bay to Pera Head to identify any potential nests that may successfully hatch during the dredge campaign.
- Light levels from the maintenance dredging activities would be minimised to those lights that are necessary for the safe operation of the vessels; and
- Should multiple marine turtle hatchlings be recorded surrounding a vessel a review of the lighting procedures on that vessel will be immediately initiated and any unnecessary lights will be turned off.

The marine turtle offset programs (RTA 2016a) and RTA (2016b) were specifically developed to offset potential impacts of lighting at the Port on marine turtles nesting within the vicinity of the Port.

7.4.3 Marine Turtle and Marine Mammal Dredging and Disposal Adaptive Management Process

Background

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

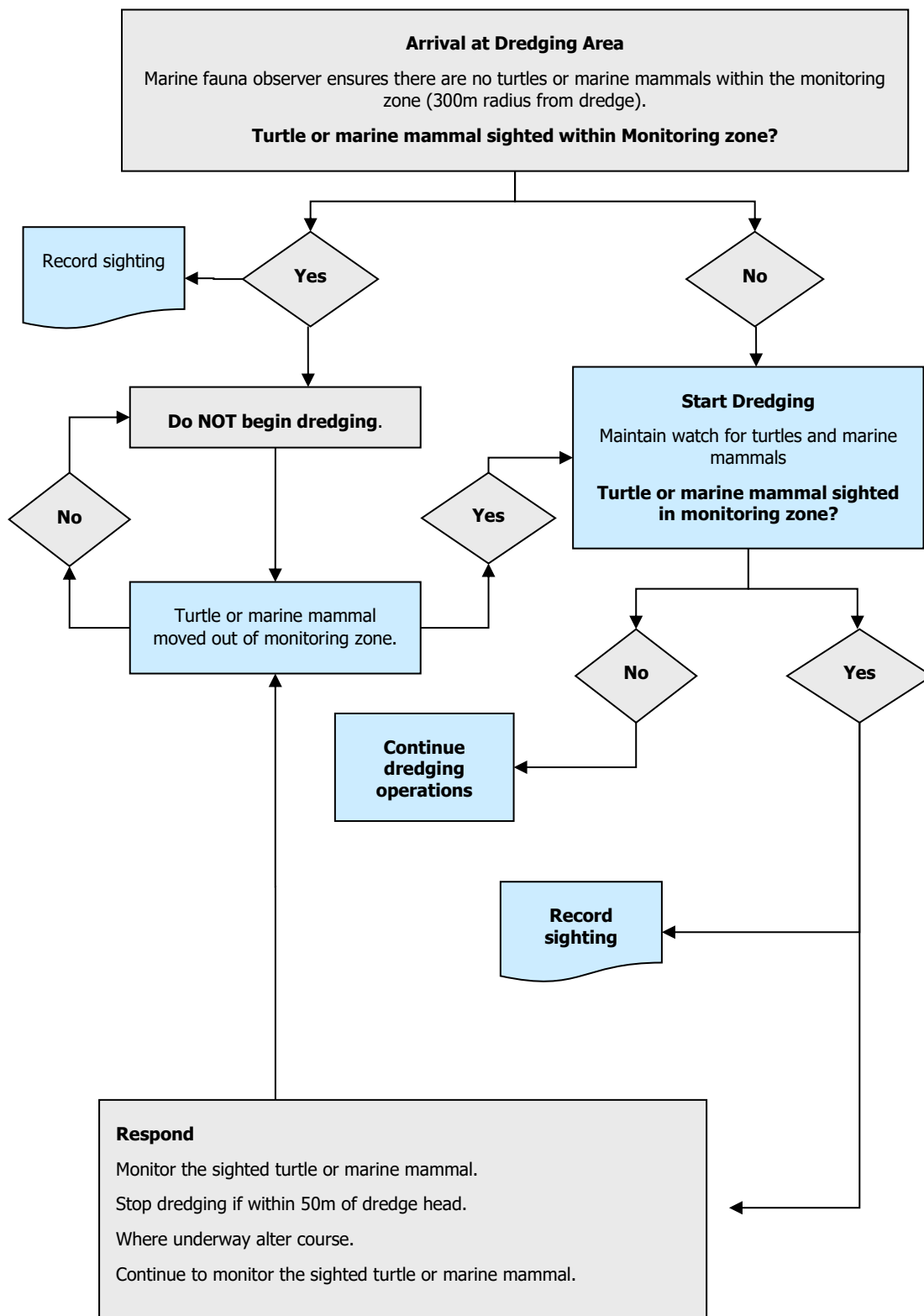
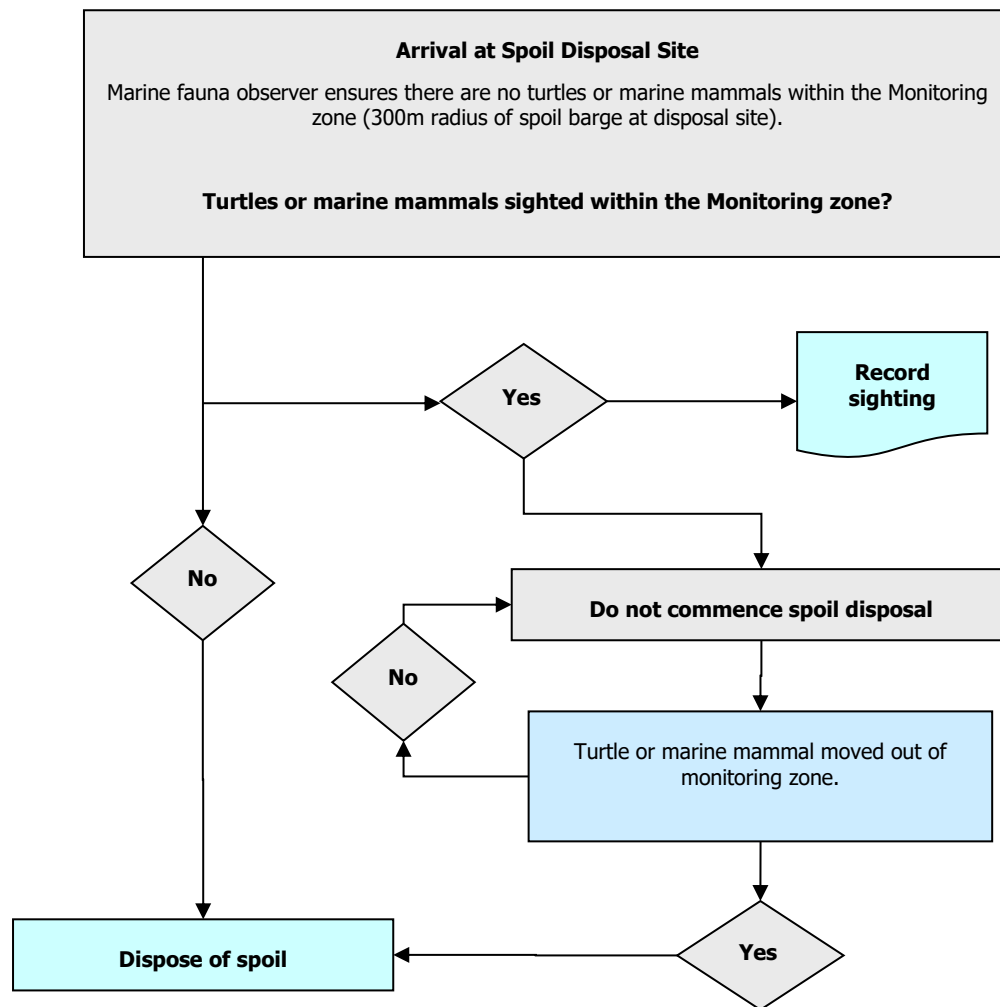
Figure 16 Marine Turtle and Marine Mammal Management Procedure (Dredging)

Figure 17 Marine Turtle and Marine Mammal Management Procedure (Spoil Disposal)

In the event of marine turtle injury or mortality, attributed to maintenance dredging and/or spoil disposal activities, RTA would undertake an investigation. The investigation would 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 maintenance dredging and/or spoil disposal activities.

Should it be determined that current management measures were not being followed, appropriate action would 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 would be implemented over the following week. For example, additional monitoring of beaches or the reclamation area as appropriate.

Level 2

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

RTA would 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 would be implemented to prevent possible sources of harm, where practicable, to reduce the risks of further marine turtle injury or mortality. Interim measures will be specific to the identified causal factors (eg heightened turtle abundance in area).

Level 3

Four injured or dead marine turtles attributable to maintenance dredging and/or spoil disposal activities are found per seven day period or more than two marine turtles killed within 24 hours attributable to dredging and/or spoil disposal.

Immediate action would 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 would be undertaken by RTA to identify longer-term alternative or additional management measures to reduce the risks of further marine turtle injury or mortality. Additional measures will be specific to the identified causal factors (eg heightened turtle abundance in area).

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 would guide adaptive management decisions and further actions as required.

7.5 Marine Pests

Marine pests have the potential to be transported to site as biofouling or in ballast water. To prevent the incursion of marine pests on site all Amrun vessels, including dredge and dredge support vessels, are subject to marine pest risk assessment.

The current dredge to be used is the TSHD Brisbane which completes the majority of maintenance dredge campaigns at all ports throughout Queensland, including Weipa. The vessel will be subject to a marine pest risk assessment which assesses the ballast and biofouling risk of translocating marine pests of concern. The assessment will consider:

- vessel type
- cleaning and marine pest inspection history
- the presence, age and suitability of antifouling coating
- the type and treatment history of internal seawater systems
- previous areas of operation (including climatic region, and the presence of marine pests of concern) since the last documented cleaning and/or marine pest inspection, and the duration the vessel spent in those areas
- activities in areas with known records of marine pests
- residual sediment
- the nature of previous vessel operations
- any periods spent out of water immediately prior to mobilisation.
- All vessels rated a high risk will be required to implement risk mitigation measures such as:
 - hull and niche space cleaning
 - internal seawater systems treatment
 - physical marine pest inspection by personnel with qualifications and experience in marine pest management
 - additional management methods must be detailed and the vessel must be cleared as free of biofouling or low risk prior to mobilisation to site.
- Vessel contractors will be contractually required to provide the documentation and information necessary to conduct the risk assessment.

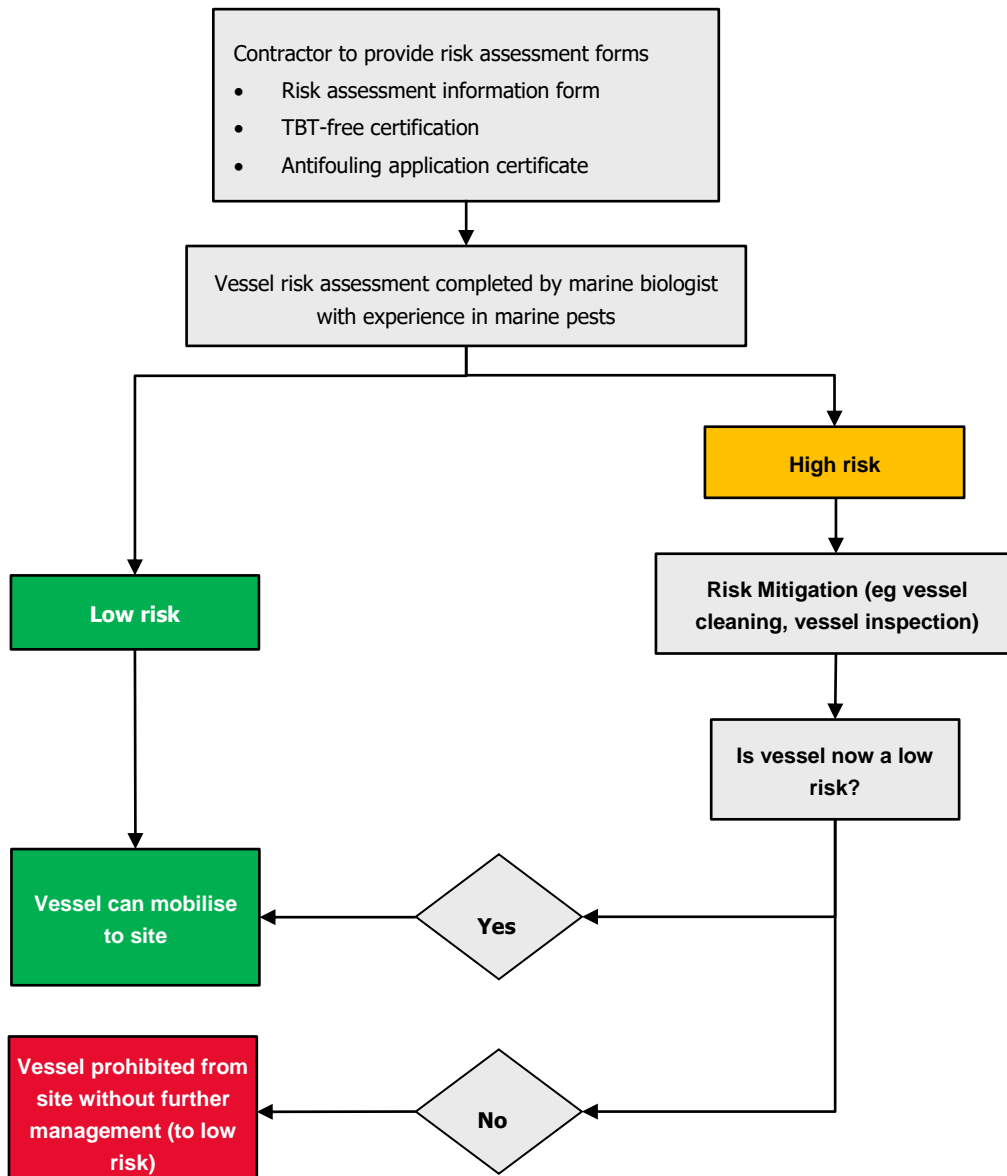
This method is consistent with previous assessment methods completed for Queensland projects (BMA 2014) and WA Fisheries entry requirements (Vessel Check; DoF 2015; DoD 2014; DoF ND.) and was considered appropriate by QLD DAF to manage risk associated with marine pests (pers

comms. A. Damage). The vessel will be assessed prior to leaving site to confirm there is a low risk of translocating any marine pests.

The process for marine pest risk assessment is shown in **Figure 18**.

Prior to departing site all vessels associated with dredging will be assessed for risks associated with marine pests.

Figure 18 Marine Pest Vessel Risk Assessment Procedure



Should a marine pest listed on the CCIMPE Trigger List of marine pest species be detected, the Project will notify DAF Biosecurity Queensland as soon as practicable. Relevant government agencies will then initiate a response in accordance with the Australian Emergency Marine Pest Plan (EMPPPlan) marine pest Rapid Response Manuals and the Biosecurity Incident Management System 2012 (BEPWG, 2012). All contracted vessels will be required to comply with requests from the regulatory authorities implementing the emergency marine pest response.

7.6 Underwater Noise

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

- All vessel equipment and machinery will receive regular maintenance while engaged on the Project.
- Where possible, leaving vessel engines, thrusters and auxiliary plants in stand-by or running mode unnecessarily will be avoided.

With the implementation of these mitigation measures, consequences of dredging operation on listed threatened estuarine and marine fauna and non-avian migratory species in the vicinity of the Project from underwater noise associated with maintenance dredging activities and offshore spoil disposal would be negligible.

7.7 Vessel Traffic

Project-related vessel movements during the maintenance dredging have the potential to impact marine flora and fauna both directly and indirectly, measures to manage risks include:

- Vessels will be contractually required to comply with all relevant legislation and operate safely and use authorised shipping routes for all travel.
- All vessels will have adequate lighting for safe navigation.
- Vessels will comply with all requests from MSQ or the regional harbour master unless it is unsafe to do so.
- In water depths less than 2.5 m, vessel speed will be restricted to a maximum of 6 knots.
- Vessel tracking systems, including automated identification systems (AIS) will be used on all project related vessels.

With the implementation of these mitigation measures, impacts of dredging operations on fauna are expected to be low.

7.8 Marine Pollution

Numerous waste materials will be generated during maintenance dredging activities and may include which may include oil, sewage, garbage, steel scrap, aluminium, electrical cables, maintenance parts, sewage and other liquid wastes. These have the potential to impact the environment including posing a health risk to animals (eg ingestion and entanglement), marine habitats such as seagrass (smothering) and to water quality. Some of these wastes are classified as regulated wastes, as listed in the Queensland *Environment Protected Regulation 2000* and requires appropriate storage, transport, disposal and tracking.

All chemical substances used on the dredge must be recorded in a chemical register, which identifies the chemical properties of the substance, storage and handling requirements and any potential for environmental harm.

All waste or sewage will be disposed at an appropriate facility and in accordance with MARPOL and if disposed locally in accordance with Queensland legislative requirements. The following pollution prevention and waste management measures will be implemented:

- No disposal of wastes within the marine environment.
- Segregation of waste into scrap steel, oily wastes, recyclable wastes (paper, cardboard, aluminium cans) and general wastes.
- Waste skips and bins will be fitted with lids.
- All bins shall be clearly labelled including waste oil storage tanks.
- All employees and contractors involved in the handling, transfer, storage, and disposal of oil and hazardous substances will be trained in the relevant regulatory requirements.
- All wastes received at site shall be removed from site for disposal at a landfill or recycling. Regulated wastes shall be transported and received by a licensed operator under the

relevant state applicable legislation (eg QLD operator will have approved Environmental Authority).

7.8.1 Vessel Discharge and Waste Management

Some specific provisions that will be applied to maintenance dredge vessels with regard to the MARPOL pollution categories are as follows:

MARPOL Annex I: Oil

- All discharges of oil, oil residues and oily mixtures from vessels will be contractually banned within the Weipa Port Limits.
- Outside of these limits any discharge of oil from vessels must be in strict compliance with MARPOL, the PS(PPS) Act and the TOMP Act and Regulation (i.e. <15ppm oil content in any discharge of oily water from machinery spaces only).
- All vessels will be contractually required to comply in full with the construction, equipment and operational requirements of MARPOL Annex I and to have the relevant MARPOL-mandated documentation such as Oil Record Book, IOPP Certificate and SOPEP, as applicable to the vessel type and size. Waste oil will be held in segregated waste containers on each vessel.
- All waste oil received from vessels will be managed in accordance with relevant legislation (Queensland Environment Protection Act & Environment Protection (Waste Management) Regulation).
- All bunkering of vessels will be conducted in accordance with the Project's Bunkering Management Plan.

MARPOL Annex II: Noxious liquid substances carried in bulk

It is not anticipated that any liquid substances other than fuel and oil will be carried in bulk during dredging. Should this occur, all vessels will be contractually required to comply with all relevant Australian and Queensland legislation for the transport, handling, transfer and disposal of the substance in question.

MARPOL Annex III: Harmful Substances in Packaged Form (Dangerous Goods)

- Any harmful substances carried in packaged form by vessels will be packaged, labelled, loaded, carried, offloaded, stored and disposed of in compliance with MARPOL Annex III, the IMDG Code and the implementing Australian and Queensland legislation.
- All vessels will be contractually required to comply with the prohibition on discharges of harmful substances carried in packaged form, including discharge of packages themselves and leakage from packages.
- All vessels will be contractually required to carry and to submit the relevant MARPOL-mandated documentation for harmful substances carried in packaged form, such as Stowage Plan and Harmful Substances Manifest.

MARPOL Annex IV: Sewage

- All discharges of sewage from vessels will be contractually banned within the Weipa Port Limits.
- Outside of these limits any discharge of sewage from construction vessels must be in strict compliance with MARPOL, the PS(PPS) Act and the TOMP Act and Regulation.
- All vessels will be vetted to confirm they have adequate sewage treatment, management and/or holding facilities prior to contracting.
- Sewage will be pumped from the vessel to a waste management tug or direct to vacuum truck at Evans Landing or Humbug Point to be disposed of by a waste management company at Lorim Point Sewage Treatment Plant or a suitable Sewage Treatment Facility.

- Any sewage not treated on board or received by the waste reception services in Weipa will be retained on board until it can be disposed of in accordance with MARPOL, Australian and Queensland legislation.

MARPOL Annex V: Garbage

- All discharges of MARPOL-defined garbage from vessels will be contractually banned within the Weipa Port Limits.
- Outside of these limits any discharge of garbage from vessels must be in strict compliance with MARPOL, the PS(PPS) Act and the TOMP Act and Regulation (i.e. zero discharges <3nm from nearest land, only food waste ground to <25mm >3nm from nearest land and only food waste (not ground) >12nm from nearest land).
- All vessels will be contractually required to have the relevant MARPOL-mandated documentation such as Garbage Management Plan and Garbage Record Book as applicable to the vessel type and size.
- Waste will be held in segregated waste bins on board the vessel. The waste will then be transported to a barge, tug or waste management area for disposal at a suitable waste management facility
- All garbage received from vessels will be managed in strict accordance with relevant legislation (Queensland Environment Protection Act & Environment Protection (Waste Management) Regulation).
- All garbage received from international vessels will be treated as quarantine waste and will be managed in strict accordance with the Quarantine Act under the Maritime Arrivals Reporting System (<http://www.agriculture.gov.au/biosecurity/avm/vessels/mars#mars-benefits>).

MARPOL Annex VI: Air Emissions

All vessels will be contractually required to comply in full with the requirements of MARPOL Annex VI as applicable to the vessel type and size.

7.8.2 Spill Management

Spill Management Controls

Operational spill management controls to prevent oil and other spills into the marine environment during construction include:

- Daily inspection logged for excessive oil and grease from cutter and drag heads.
- Complying with vessel traffic management controls (**Section 7.7**).
- Bunkering in accordance with an approved Bunkering Management Plan.
- Compliance with AMSA Marine Order 32 (Cargo handling equipment 2011) or current version with clearly identified roles and responsibilities.
- Regular and documented maintenance of all vessels and equipment.
- Relevant employees and contractors involved in the storage, handling, transfer and disposal of fuel and other materials will be trained to ensure they are aware of their responsibilities systems, processes and procedures.
- Relevant contractors will be required to undertake spill response training and appropriate training exercises in accordance with their plans.
- Properly trained and certified crew
- AIS on all vessels
- Regular drills and exercises for crews.

Spill Response

While the occurrence of spills is unlikely and the vessel management measures outlined in **Section 7.7**, and the operational controls are designed to prevent marine pollution they have the potential to significantly impact on local flora and fauna.

A Spill Management and Response Plan will be developed specifically for dredging operations in the Amrun Port area by the dredging contractor. The plan will be based on the Australia's National Plan for Maritime Environmental Emergencies (NATPLAN), the Queensland Coastal Contingency Action Plan (QCCAP) and the South of Embley Spill Management and Response Plan. RTA will ensure the Spill Management Plan is compliant with all relevant legislation using the "*Technical Guidelines for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities*" (AMSA, 2013) and the information outlined in this document. MSQ will be the Statutory and Combat Agency and the Amrun Port Dredging Contractor will be the first-strike agent

Shipboard Oil Pollution Emergency Plan (SOPEP)

In addition to the site-specific plans, vessels will have SOPEPS as required by Annex I of MARPOL and the implementing Australian and Queensland legislation.

Marine Pollution Reporting (POLREP)

POLREPs are required for any illegal vessel discharge to the marine environment. Discharges will be reported to the relevant authority which may be MSQ or AMSA, depending on the location. Any vessel discharges in Queensland of any size to the marine environment will be reported to MSQ using Marine Pollution Report form (POLREP). This can be accessed online <http://www.msq.qld.gov.au/Marine-pollution/Contingency-plans.aspx> and will be submitted by email to MSQ. Discharges outside Queensland waters will be reported to AMSA.

7.9 Physical Disturbance

Direct physical disturbance is unavoidable consequence of dredging. Physical disturbance to the marine environment have been minimised by dredging within the approved footprint. Management methods will also include:

- Removal of material is restricted to authorised area of disturbance (dredging footprint).
- Quantity of material removed is restricted to approved quantity.
- Disposal restricted to the approved spoil ground.

7.10 Summary of Potential Impacts, Management and Monitoring Methods

Table 16 identifies the potential impacts and the mitigation, management and monitoring measures to be implemented to manage the potential impacts. The timeframe for implementation is identified in line with the activities within the dredge cycle (**Section 2.6**) and dredge schedule (**Section 2.7**).

Table 16 Potential Impacts and Mitigation, Management and Monitoring Measures

Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Residual Risk (consequence/likelihood risk)	Management Objective	Performance Indicators	Timeframe (Activity)	Corrective Actions	Responsibility
Plume generation (contaminants, light and sedimentation) - within zone of influence	Management measures are detailed in Section 7.1, 7.2 and 7.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 7.2.2). Modis imagery will also be reviewed daily	Negligible / Likely – Moderate	Water quality impacts are restricted to the zone of influence identified	Number of times sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera Head.	During dredging and disposal activities	Monitoring data used to review dredge operations and monitoring requirements in subsequent years (Section 7.2.3).	MFO, HSE Manager
Plume generation (contaminants, light and sedimentation) on sensitive habitats	Management measures are detailed in Section 7.1, 7.2 and 7.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 7.2.2). Modis imagery will also be reviewed daily	Negligible / Unlikely – Low	No significant impacts to water quality, with potential to impact sensitive habitats (reefal areas) from dredging activities.	Number of times sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera.	During dredging and disposal activities	Monitoring data used to review dredge operations and monitoring requirements in subsequent years (Section 7.2.3).	MFO HSE Manager
Marine habitats – reef	Management measures are detailed in Section 7.2 and 7.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 7.2.2). Modis imagery will also be reviewed daily	Negligible / Unlikely – Low	Nil impact to marine habitats reef from dredging or disposal activities	Number of times sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera.	During dredging and disposal activities	Monitoring data used to review dredge operations and monitoring requirements in subsequent years (Section 7.2.3).	MFO HSE Manager
Marine habitats – seagrass	Management measures are detailed in Section 7.2 and 7.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 7.2.2). Modis imagery will also be reviewed daily.	Negligible / Unlikely – Low	Nil impact to seagrass habitats from dredging activities	Number of times sediment plumes are observed to disperse to sensitive seagrass communities near Boyd Beach	During dredging and disposal activities	Monitoring data used to review dredge operations and monitoring requirements in subsequent years (Section 7.2.3).	MFO HSE Manager
Marine habitats – open substrate outside area of influence	Management measures are detailed in Section 7.2 and 7.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 7.2.2). Modis imagery will also be reviewed daily	Negligible / Unlikely – Low	Impacts restricted to area of influence.	Sediments plumes are restricted to predicted area of influence	During dredging and disposal activities	Monitoring data used to review dredge operations and monitoring requirements in subsequent years (Section 7.2.3).	MFO HSE Manager
Marine Pests establishment	Management methods as outlined in Section 7.5 including the completion of vessel risk assessments and inspections as necessary.	Marine pest monitoring including baseline, during and completion monitoring	Major / Rare - High	No marine pests established in the Amrun Port as a result of dredging activities. Zero non-compliance with Quarantine Regulations 2000. No marine pest incursions during the dredging phase of the Amrun Project.	Number of marine pests species established in the Amrun Port as a result of dredging activities Number of non-compliances with Quarantine Regulations 2000.	Managed during mobilisation and demobilisation. Monitoring before during and after the dredging campaign.	Any incidents to be reported and appropriate corrective actions implemented as per Section 7.5. Review current marine pest assessment practices and amend as necessary. Increase training and awareness if required.	Dredging Contractor Amrun Project Team Project Manager HSE Manager
Mega fauna – vessel strike and vessel avoidance	Implementation of measures identified in Section 7.4	Monitoring of marine fauna by crew when vessel underway	Negligible / Rare - Low	Vessel Speed Requirements IMO Guidance document for minimising the risk of ship strikes with cetaceans, MEPC.1/Circ.674, dated 31 July 2009. Zero marine fauna vessel strikes associated with dredging activities	Number of marine fauna vessel strikes associated with dredging-related shipping. Number of non-compliances with vessel speed requirements (including ferries and barges not slowing to 6 knots in water depths of 2.5m or less). Number of times ferries and barges do not follow specified transit lanes.	During Travelling	Any injured or dead listed species will be reported to marine stranding hotline through RSPCA Queensland on 1300 ANIMAL Notification to DoE contact for protected species injury or death. Any incidents or near miss to be reported and appropriate corrective actions implemented. Breaches to be investigated and appropriate discipline actions implemented. Increased training and awareness if required.	Vessel master Dredging Contractor Amrun Project Team Project Manager
Mega fauna – entrainment	Implementation of measures identified in Section 7.4	Monitoring of marine turtle and marine mammals as identified in Section 7.4.3 and implementation of the adaptive management process	Negligible / Rare - Low	No records of marine turtles capture by dredging activities	Number of animals caught in dredge Number of incidence where pumps were not turned on or off in accordance with management Number incidence where TED were not utilised.	During dredging activities	Implementation of Adaptive Management Process as identified in Section 7.4.3 . Any injured or dead listed species will be reported to marine stranding hotline	Vessel master Marine fauna observer Dredging Contractor

Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Residual Risk (consequence/likelihood risk)	Management Objective	Performance Indicators	Timeframe (Activity)	Corrective Actions	Responsibility
		Nest monitoring daily during dredging for potential hatchling incidents			Number of non-compliances of management process Figures 16 and 17 Number of turtle hatchlings not observed congregating around vessel		through RSPCA Queensland on 1300 ANIMAL Notification to DoE contact for protected species injury or death. Any incidents to be reported and appropriate corrective actions implemented. Increased training and awareness if required.	Amrun Project Team Project Manager
Mega fauna – pollution	Implement management measures outlined in Section 7.8	Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	Negligible / Unlikely – Low	All waste management and disposal in accordance with project management plan, MARPOL, Commonwealth and State regulations No waste disposed of incorrectly and any spilled debris removed	Number of non-conformances Total area disturbed due to waste	Throughout the dredging campaign	Any breaches identified are to be investigated and appropriate corrective actions implemented	Team Members Dredging Contractor Amrun Project Team
Mega fauna – loss or avoidance of foraging habitat	Management measures are detailed in Section 7.1, 7.2 and 7.3	Dredge plume will be monitored by marine fauna observer and if identified extending towards sensitive environments a vessel based water quality monitoring program will be implemented.	Negligible / Unlikely – Low	Nil impact to marine habitats reef from dredging or disposal activities	Number of time sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera Head. Foraging in area observed during dolphin surveys and zone inspections (LSMP).	During dredging activities	If plume extends to sensitive reef environment water quality monitoring will be implemented. This information will be used for future dredging operations to determine if additional management and monitoring is required.	MFO HSE Manager
Mega fauna – reduction in nesting due to dredge plume	Management measures are detailed in Section 7.1, 7.2 and 7.3	Nest inspections daily during dredging	Negligible / Unlikely – Low	No reduction in nesting levels during dredge program	Nesting similar to levels previously recorded for the time of year	During dredging activities	If nesting levels decrease consider timing to avoid peak nesting period (August/September). This information will be used for future dredging operations.	MFO HSE Manager LSMP
Mega fauna – nesting and hatchling disorientation	Light levels from the maintenance dredging works would be minimised as described in Section 7.4.2	Visual monitoring of light levels from dredge associated vessels Visual identification of marine turtle congregation around dredging associated vessels	Minor / Unlikely - Low	No records of marine turtles and/or their hatchlings aggregating around dredging-related shipping. No interference with nesting due to dredging activity	Number of incidence of marine turtles and/or their hatchlings aggregating around dredging-related shipping.	During dredging activities	Breaches to be investigated and appropriate corrective actions implemented. Increase training of dredge lighting management.	Vessel Master Dredging Contractor
Fish assemblage – area avoidance	Management measures are detailed in Section 7.1, 7.2	Dredge plume generation will be monitored through the water quality monitoring program (Section 7.2.2). Modis imagery will also be reviewed daily	Negligible / Unlikely – Low	Water quality impacts are restricted to the zone of influence identified	Sediment plumes are not observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera Head.	During dredging and disposal activities	Monitoring data used to review dredge operations and monitoring requirements in subsequent years (Section 7.2.3).	MFO, Environmental Lead
Noise - Underwater Noise – Vessel	Management methods are detailed in Section 7.6 and include: Vessels contracted will have service and maintenance histories that meet MSQ requirements, regular vessel maintenance, vessel engines, thrusters and auxiliary plant will not be left in standby where possible, vessel speeds restrictions, use of transit lanes	Vessel inspections by HSE team.	Negligible / Unlikely – Low	Contracts requirements. All dredging-related shipping has the appropriate mitigation measures applied to reduce underwater noise. Contracted dredging-related shipping has appropriate underwater noise mitigation measures included in their contract.	Number of dredging-related shipping that has the appropriate mitigation measures applied to reduce underwater noise. Number of contracted dredging-related shipping that are appropriately vetted for appropriate underwater noise mitigation and measures included in their contract	During dredging activities	Check regular maintenance is being conducted on dredging-related shipping. Breaches to be investigated and appropriate corrective actions implemented.	Dredging Contractor Vessel Master Amrun Project Team Project Manager
Physical disturbance – benthic habitats	Physical disturbance restricted to dredge footprint and approved dredge quantity. Disposal restricted to the approved spoil ground. See Section 7.9 .	Area to be surveyed to ensure compliance with designated footprint. Vessel logs (including date, time, dump paths and volumes for dredging)	Negligible / Almost certain – Moderate	Dredging and disposal as per that identified in this DMP.	Number of incidence where dredging was recorded outside the designate footprint Disposal restricted to approved spoil ground	During dredging and disposal activities	Any breaches identified are to be investigated, reported and appropriate corrective actions implemented	Dredging Contractor Amrun Project Team
Marine Pollution - Vessels and waste	Implement management measures outlined in Section 7.7 and 7.8	Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	Negligible / Possible – Low	All waste management and disposal in accordance with project management plan, MARPOL, Commonwealth and State regulations	Number of non-conformances Areas disturbed due to waste	Throughout the dredging campaign	Any breaches identified are to be investigated and appropriate corrective actions implemented	Team Members Dredging Contractor

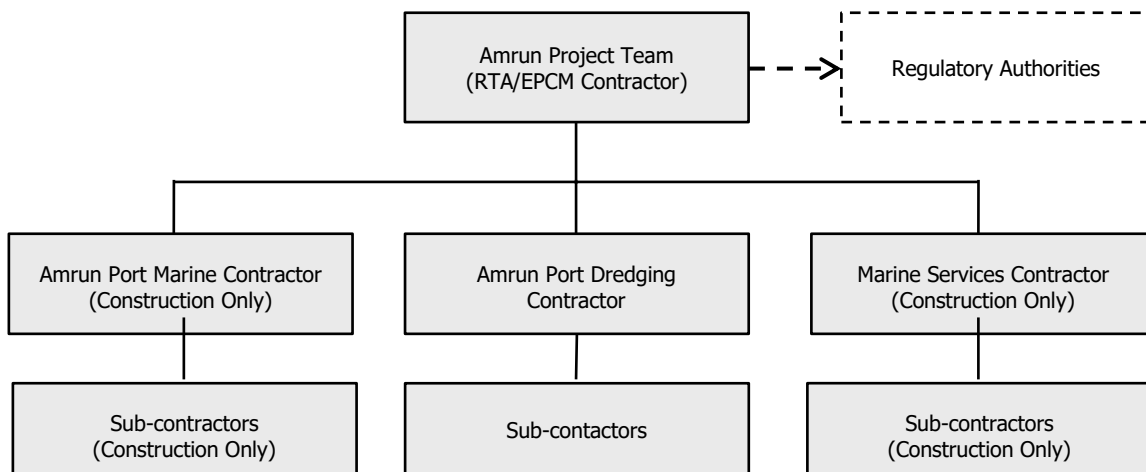
Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Residual Risk (consequence/likelihood risk)	Management Objective	Performance Indicators	Timeframe (Activity)	Corrective Actions	Responsibility
				No waste disposed of incorrectly and any spilled debris removed				Amrun Project Team
Marine Pollution - Spills	Implementation of measures identified in Section 7.7 and Section 7.8.	Inspections of work area and equipment occurring during working hours. Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	Minor / Unlikely – Low	No spills Zero non-compliance with waste regulations If a spill occurs, all oil spills are contained and are responded to and cleaned up in a timely manner.	Number and quantity of vessel discharges from dredging-related shipping. Number and quantities of incidents Number of non-compliances with national and international regulations	Throughout the dredging campaign	Implement appropriate spill response measures and comply with agency requests Any spills or discharges of wastes to be reported and appropriate corrective actions implemented. Breaches to be investigated and appropriate corrective actions implemented. Increase training and awareness if required.	Vessel Master Dredging Contractor Amrun Project Team Project Manager

8 ENVIRONMENTAL MANAGEMENT FRAMEWORK

8.1 Management Structure

The Amrun Project will be managed by both RTA and the EPCM Contractor as a team through until the end of construction in 2018/early 2019, with tasks including managing subcontractors delegated among the team. From 2019 the Port operation, including dredging activities, will be managed by RTA directly. A dredging contractor will be appointed for dredging of the Port facilities. The Contractor will have operational responsibility for managing smaller sub-contractors, including vessel operators. Management for the project is clearly defined, with identified lines of authority and reporting. The overall management structure is outlined in **Figure 19**.

Figure 19 Overall Management Structure for the Amrun Project



A number of key management roles have been identified for the Project, as summarised below. The role names are subject to change but the basic structure will remain the same.

Amrun Project / RTA Weipa Operations, General Manager

- Manages the Project construction or Operation, including providing adequate resources for environmental management requirements
- Liaises with Regulatory Authorities, in coordination with the Amrun Project Team Environmental Manager.

Amrun Project Area Managers / RTA Weipa Operations Manager Integrated Operations

- Report to the Amrun Project Team Project Manager
- Day-to-day management of the Project, ensuring employees including subcontractors report to the Project Manager
- Monitor implementation of management plans including the Dredge Management Plan, refining procedures as necessary to ensure relevant management measures are implemented effectively and adaptive management/corrective action is taken in a timely manner
- Review and report on environmental incidents.

Amrun Project Team / RTA Weipa Operations, HSE Manager

- Reports to the Amrun Project Team Project Manager
- Supports the Amrun Project Team Line Managers in day-to-day management of environmental performance;

- Monitors environmental performance;
- Reviews compliance with permits and management plans;
- Monitors, investigates and reports on complaints, incidents of environmental non-compliance and environmental incidents;
- Liaises with relevant regulatory authorities including providing monitoring results and reporting non-compliance and environmental incidents;
- Ensures non-compliances and environmental incidents are followed up and corrective actions are implemented within reasonable timeframes;
- Ensures environmental monitoring is completed in accordance with approved management and monitoring plans;
- Arranges regular environmental audits;
- Reviews contractor environmental management plans;
- Ensures all contractors are trained in environmental awareness, site issues and the requirements of environmental management plans;
- Ensures environmental management plans and procedures are updated as necessary including annual review of the MDMP; and
- Ensures that an RTA representative is present at all BPDTAG meetings and that outcomes of the meetings are appropriately addressed.
- Review the MDMP in accordance with the Sea Dumping Permit once approved.

Dredging Contractor Project Managers

- Responsible for day-to-day management of construction activities under the direction of the Amrun Project Team Project Manager and Environmental Manager;
- Ensure all staff are trained in environmental awareness, site issues and the requirements of environmental management plans;
- Monitor environmental compliance and reports non-compliance to the Amrun Project Team Environmental Manager;
- Assist in developing corrective actions for complaints, non-compliances and environmental incidents and ensures they are implemented;
- Facilitate regular environmental audits by the Amrun Project Team Environmental Manager to monitor compliance; and,
- On-site monitoring as provided for in management plans and procedures.

Employees, contractors and sub-contractors

- Conduct all activities in accordance with the MDMP, including water quality monitoring and marine mammal and marine turtle monitoring;
- Regularly report on the dredging works to RTA; and,
- Report any non-compliances to their line manager.

8.2 Non-compliance, inspections and audits

The Amrun Project and RTA Weipa Operations operate under environmental management systems (EMS) which conform to the requirements of ISO14001. The RTA Weipa Operations EMS is certified to ISO14001 Environmental Management System standard. The EMS's provide a systematic approach to continuous improvement of environmental management and performance.

RTA will ensure compliance with the Maintenance DMP and in turn the EPBC Act approval, Sea Dumping Permit and EA through required reporting of non-compliance and routine inspection and auditing of mitigation and monitoring measures which include:

Audit and Inspections – Project worksite inspections and audits will be carried out on a routine basis during maintenance dredging activities. These inspections and audits will be documented and deficiencies recorded in a corrective action register, with a copy of the documented checklist

submitted to the HSE Manager and Dredging Contractor Project Manager. The audit findings will be acted on by the Dredging Contractor Project Manager and implementation of corrective actions reported to HSE Manager. Relevant regulatory agencies and external stakeholders will be notified by the HSE Manager as required by the Project approvals.

Condition 69 of the EPBC Act approval requires that an independent audit of compliance with the conditions of approval, and by extension with this Plan, be conducted by an independent auditor approved by the Minister. Criteria for the audit must be approved by the Minister prior to the audit, and the audit report must address the criteria and be submitted to the Minister.

Incidents - Should any personnel become aware of an environmental issue associated with Port Operations or maintenance dredging activities that is causing, or may cause, environmental harm, the person must immediately advise their line manager, who will contact the HSE Manager. Incidents will be investigated and impacts assessed. Corrective actions will be developed as required and recorded in a corrective action register, with a copy of the documented checklist submitted to the HSE Manager and Dredging Contractor Project Manager. Corrective actions will be acted on by the Dredging Contractor Project Manager and implementation of corrective actions reported to HSE Manager. Relevant regulatory agencies and external stakeholders will be notified by the HSE Manager or Project Manager as required by the Project approvals.

Sources of potential environmental impact that might give rise to an environmental incident have been considered and assessed in **Section 7.10, Table 16**. Where objectives and goals are not met for each potential impact source, relevant management measures and corrective actions will be assessed for continued effectiveness and amended where necessary.

8.3 Document and Data control

Dredging documents and records (electronic and hard copy) will be stored safely in accordance with the EMS's, and remain accessible to nominated personnel.

Standard Operating Procedures will be developed and implemented for monitoring methods, site maintenance, and data capture, analysis and interpretation, which include strict Quality Assurance and Quality Control (QA/QC) processes.

8.4 Reporting

RTA will report to the BPD TAG on maintenance dredging activities for Amrun Port and implementation of the MDMP for the Port. Where comments from the BPD TAG are appropriate to assist in the establishment of longer term management for the maintenance dredging programs the comments will be formally actioned.

RTA will provide reports as required by the Conditions of the Sea Dumping Permit, including:

- Bathymetric surveys to the Australian Hydrographic Office within 2 months of the final bathymetric survey being conducted in accordance with Condition 16;
- A report on the bathymetry to DoEE in accordance with Condition 17; and,
- Information to facilitate annual reporting to the International Maritime Organization in accordance with Condition 18.

Additionally if requested RTA will facilitate site access and assistance to DoEE to witness, inspect, examine or audit operations and provide appropriate documentation to support as requested.

This MDMP, and the associated Independent Peer Review of this MDMP, will be published on the RTA website within one (1) month of approval in accordance with Condition 59 of the EPBC Act approval. The RTA website address is:

<http://www.riotinto.com/australia/reports-and-publications-16120.aspx>

If the MDMP is reviewed, all subsequent reviews will be published on the RTA website within one (1) month of approval in accordance with Condition 59 of the EPBC Act approval.

In accordance with Condition 57 all survey data, methodologies and related analysis of data associated with the Dredge Management Plan shall be published annually in August.

In accordance with Condition 68 of the EPBC Act approval RTA will publish a report on this web site addressing compliance with the Dredge Management Plan over the previous 12 months annually in August. When published the annual report will be provided to DoEE along with reporting any non-compliance with any condition of the environmental authority.

In accordance with EA Condition A13 any release of contaminants, not in accordance, or reasonably expected to be not in accordance with the EA, or any monitoring result which indicates an exceedance of an EA limit, shall be reported to DES within 24 hours.

A summary of reporting requirements associated with maintenance dredging activities is presented in **Table 17**.

Table 17 Reporting Requirements

Incidents/Non-compliance	Potential Impact Sources	Timeframe	Reporting Requirement
Environmental Incidents	All potential impacts in Table 16	Immediately	Report to line manager, Line manager to report to HSE Manager
Release of contaminants not in accordance, or reasonably expected to be not in accordance with the EA	Marine Pollution - Vessels and waste Marine Pollution - Spills	Within 24 hours	HSE Manager to report to DES Dredge contractor to report to Maritime Safety Queensland (POLREP)
Non-compliance with EPBC Act Approval condition	If dredging commences before approval of the MDMP Approved MDMP not implemented. Non-compliance with Sea Dumping Permit condition	Annually, in August	HSE Manager to report to DoEE
Marine Pest listed on the CCIMPE Trigger List identified from monitoring	Marine Pest – Establishment	As soon as practicable	HSE Manager to report to DAF Biosecurity Queensland
Any stranding, injury or death of marine turtle, dugong, dolphin or whale	Megafauna – vessel strike and vessel avoidance Megafauna – entrainment Megafauna – pollution Megafauna – nesting and hatchling disorientation	As soon as practicable	HSE Manager to report to: - DES-designated marine stranding hotline through the RSPCA Queensland on 1300 ANIMAL and Queensland Parks and Wildlife Service;
Injury or death to any marine species	Megafauna – vessel strike and vessel avoidance Megafauna – entrainment Megafauna – pollution Megafauna – nesting and hatchling disorientation	Within 48 hours of resulted activity	HSE Manager to report to DoEE: 1800 803 732, or protected.species@environment.gov.au
Bathymetric surveys	Physical disturbance	Within 2 months of the final bathymetric survey being conducted	HSE Manager to report to the Australian Hydrographic office
Bathymetric surveys	Physical disturbance	Within 2 months of the final bathymetric survey being conducted	HSE Manager to report to DoEE
Annual International Maritime Organisation reporting	Not applicable	31 January each year	HSE Manager to report to DoEE

8.5 Independent Peer Review

Consistent with Condition 60 of the EPBC Act Approval an independent peer review of the Maintenance DMP has been performed by an independent marine scientist with recognised expertise in dredge management plans and an understanding of matters of national environmental significance in the marine environment. The review included the analysis and effectiveness of management measures and recommendations and advice of the peer reviewer and how these have been addressed and revised in the DMP has been provided to the Minister.

8.6 DMP Review

This plan and the performances pertaining to it will be reviewed annually based on data and analysis from monitoring programs, incidents and non-compliances, results of audits or reviews which identify improvements that should be incorporated. This review process will enable work methods to be updated when deemed to be ineffective and will also facilitate continuous improvement of environmental management.

Annually the BPDTAG (including DoEE and DES) will review the MDMP until expiry of the Sea Dumping Permit, comments made by the BPDTAG and how these have been addressed and revised in the DMP will be provided to the Minister.

8.7 Training

All employees involved in dredging operations will be appropriately qualified and trained or under appropriate supervision. All employees related to dredging operations will undergo environmental training and awareness through the induction program at a minimum this will include:

- roles and responsibilities – General Environmental Duty, who to contact and when to contact them when an environmental issue is identified;
- general site requirements – EMS elements such as policy, objectives & targets, general aspects and "environmental awareness" in everyday duties, and particularly good housekeeping;
- marine Pollution Prevention requirements;
- spills Prevention and Response procedures and reporting;
- general emergency response, incident identification/classification and reporting/notifications;
- marine fauna identification and reporting procedures; and
- easily identifiable marine pests and reporting procedures.

9 TRADITIONAL OWNER EMPLOYMENT OPPORTUNITIES

RTA has committed to working collaboratively with Traditional Owners, through the relevant WCCCA Sub-Committees and the WCCCA Coordinating Committee to further increase representation of local Aboriginal people, and in particular, the Wik & Wik Waya Traditional Owners across the workforce. For this reason, focussed work, in collaboration with Traditional Owners and the Members of the WCCCA Employment, Training, Environment and Heritage Sub-Committee will be undertaken, to understand the current challenges, the outcomes achieved to date and the development of strategies specific to the needs of this community.

In addition, RTA as a signatory to the Western Cape Regional Partnership Agreement (RPA) is actively working with the RPA working group on employment and training to identify opportunities where industry, Governments and local Aboriginal people can strategically partner to develop relevant skills and employment pathways prior to and during the construction phase of the Amrun Project.

Traditional Owner employment opportunities associated with dredging will be available in the following Land and Sea Management Programmes, which are part of the Communities, Heritage and Environmental Management Plan (Amrun Communities, Heritage and Environment Working Group, 2014):

- Marine Mammal Observations.

Marine Mammal Observation opportunities during dredging activities include use of Traditional Owners as MFOs on the dredge during dredging and downstream monitoring for dead or injured turtles.

In addition, through the existing Indigenous Land Use Agreement, opportunities for employment of Traditional Owners are identified through an employment and training plan. This plan identifies work opportunities and roles within these work opportunities that may be filled by Traditional Owners. Traditional Owners that may be capable of filling these roles are then identified with RTA supporting identified candidates to become appropriately skilled to fill the identified roles. RTA supports the employment of Traditional Owners if they are appropriately skilled and qualified in all areas of the business.

As part of RTA's reporting obligations under the Indigenous Land Use Agreement, quarterly review reports on Indigenous employment and training obligations are made to Traditional Owners.

Implementation of Traditional Owner employment opportunities within this MDMP will be reported annually within the EPBC Act approval annual compliance report. The annual compliance report is available at:

<http://www.riotinto.com/australia/reports-and-publications-16120.aspx>

RTA also provides annual reports on Traditional Owner employment opportunities as part of RTA's reporting obligations under the Social Impact Management Plan and Communities, Heritage and Environment Management Plan.

10 INDIGENOUS CONSULTATION

Indigenous consultation was conducted in accordance with the process under the Indigenous Land Use Agreement during the preparation of this Plan. This consultation involved the following:

- Consultation with Traditional Owners regarding the MDMP commenced with the Communities, Heritage and Environment Management Plan (CHEMP) Working Group in October 2017. No concerns were received regarding the dredge activities, mitigations or management actions within the Plan;
- Consultation on the MDMP continued with the WCCCA Environment and Heritage Sub-Committee in November 2017;
- The MDMP was lodged with the WCCCA and submitted to the Coordinating Committee meeting in December 2017 along with minutes of the Environment and Heritage Sub-committee meeting.

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**11 APPENDIX A – DEPARTMENT OF ENVIRONMENT AND ENERGY
APPROVAL NOTICE**



Australian Government

Department of the Environment and Energy

Glenn Woodrow
Principal Advisor Environment
RTA Weipa Pty Ltd
123 Albert Street
BRISBANE QLD 4000

South of Embley bauxite mine and port development – Approval of Maintenance Dredge Management Plan (EPBC 2010/5642)

Dear Mr Woodrow

Thank you for your letter dated 28 May 2019 and subsequent correspondence to the Department seeking approval of the *Maintenance Dredge Management Plan – Port, June 2019* in accordance with condition 16 of EPBC Approval 2010/5642.

As a delegate of the Minister for the Environment, I have decided to approve the *Maintenance Dredge Management Plan – Port, June 2019*. As per condition 18 of EPBC Approval 2010/5642, this plan must now be implemented.

In accordance with condition 72 of EPBC approval 2010/5642, if the approval holder wants to act other than in accordance with this approved plan, it must submit a revised plan for approval. Until the Minister (or his delegate) has approved the revised plan, the approved version of the plan must continue to be implemented.

Should you require any further information please contact Panna Patel,
Post Approvals Officer, Post Approvals Section, on (02) 6275 9299 or by email:
post.approvals@environment.gov.au.

Yours sincerely

Greg Manning
Assistant Secretary
Assessments (WA, SA, NT) & Post Approvals Branch
Environment Standards Division

18 June 2019

**12 APPENDIX B - DEPARTMENT OF ENVIRONMENT AND SCIENCE
APPROVAL NOTICE**



Department of
Environment and Science

Ref 101/0008738

7 June 2019

RTA Weipa Pty Ltd
123 Albert Street
BRISBANE QLD 4000

Email: glenn.woodrow@riotinto.com

Attention: Mr Glenn Woodrow

Dear Mr Woodrow,

Environmental Authority EPML00725113 – Amendment to Dredge Management Plan – Port (Maintenance Dredging)

I refer to your email of 28 May 2019 to the Department of Environment and Science (the department), relating to approval of the revised Dredge Management Plan – Port (Maintenance Dredging) (the amended Plan) required under condition J11 of Environmental Authority EPML00725113 (the EA).

The department has reviewed the amended Plan and determined that the document satisfies the requirements of the EA. It is acknowledged that extreme weather events over the 2018/19 wet season have necessitated a revised dredge volume for the 2019 and 2020 maintenance dredging periods in order to maintain safe operations at Amrun Port.

Should you have any further enquiries, please contact Mike Trenerry, Principal Environmental Officer of the department on telephone (07) 4222 5439.

Yours sincerely

A handwritten signature in black ink, appearing to read 'D Sharpe', written over a horizontal line.

Dean Sharpe
Delegate of the Chief Executive
Environmental Protection Act 1994