Townsville Port Expansion Channel Upgrade Project

Acid Sulfate Soil & Contamination Management Plan

October 2021

Document Control Sheet

Revision History

Revision No.	Date	Changed by	Nature of amendment
0	14/02/2020	T Smith	Submitted version
1	19/10/2021	T Smith	Revised with SAP and reclamation detail

Review History

Revision No.	Date	Reviewed by
0	14/02/2020	M Louden, M Wise prior to submission
1	26/10/2021	M Louden, M Wise prior to submission

Document approval

Approval of the Acid Sulfate Soil & Contamination Management Plan (R0) was issued by DAWE on 26 February 2020.

The Acid Sulfate Soil & Contamination Management Plan (R0) was published on the CU Project's website on 11 March 2020.

This document has been prepared to meet the Commonwealth Government's EPBC Approval No. 2011/5979 Conditions for the Port of Townsville Limited's Port Expansion Project.

DECLARATION OF ACCURACY

EPBC Number	2011/5979
Project Name	Port of Townsville Port Expansion Project
Approval Holder	Port of Townsville Limited
ACN / ABN	130 077 673 / 44 411 774 236
Approved Action	To expand the Port of Townsville, in Townsville Queensland. The action is for dredging, land reclamation and construction of infrastructure.
Location of the Action	Townsville, Queensland

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

_____

Full name (please print)

Marissa Wise

_____

Organisation (please print)

Port of Townsville Limited

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Date 26 / 10 / 2021

GLOSSARY

ANC	Acid Neutralising Capacity
ASC	Assessment of Site Contamination
As	Arsenic
AS/NZS	Australian Standard / New Zealand Standard
ASS	Acid Sulfate Soil
ASSCMP	Acid Sulfate Soil & Contamination Management Plan
Cd	Cadmium
CEMP	Construction Environmental Management Plan
Cr	Chromium
Cu	Copper
CU Project	Townsville Port Expansion Channel Upgrade Project
DES	The Queensland Government Department of Environment and Science, or any other state agency regulating coastal developments and dredging from time to time
DAWE	Department of Agriculture, Water and the Environment (Cth)
DSITIA	Department of Science Information Technology, Innovation and the Arts
EIL	Environmental Investigation Level
FOS	Factor of Safety
HIL A	Health Investigation Level A
LAT	Lowest Astronomical Tide
NAGD	*National Assessment Guidelines for Dredging 2009*
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	*National Environment Protection (Assessment of Site Contamination) Measure 2013*
Ni	Nickel
PASS	Potential Acid Sulfate Soil
Pb	Lead
PEP	Port Expansion Project
Port	Port of Townsville Limited
QASSTM	Queensland Acid Sulfate Soils Technical Manual
RHM	Regional Harbour Master
SAP	Sediment and Analysis Plan for the CU Project
S_{CR}	Chromium reducible sulfur
Zn	Zinc

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1. INTRODUCTION

Port of Townsville Limited (the Port) is a Government Owned Corporation established under the *Government Owned Corporations Act 1993 (Qld)*, which manages the Port of Townsville. The Port is located on Cleveland Bay, approximately three kilometres (km) east of the Townsville city centre in North Queensland (Figure 1). It is a multi-purpose port that handles predominantly bulk and general cargo with a land and sea jurisdiction in excess of 450 km^2. The Port is situated in the Great Barrier Reef World Heritage Area but is outside of the Great Barrier Reef Marine Park. Townsville is a long-established township with a history of urbanisation and industrial activities in the Ross River and Ross Creek drainage system.

The Townsville Port Expansion Channel Upgrade Project (CU Project) is Stage 1 of the Port's long-term Port Expansion Project (PEP). The PEP aims to create a series of strategic assets that will address current capacity constraints and accommodate future growth in trade over a planning horizon to 2040. It includes development of port infrastructure, namely work to "top of wharf" facilities, capital dredging; reclamation; breakwaters and revetments; berths; access roads; rail loop; and trunk services and utilities. It does not include the development of "above wharf" infrastructure such as terminal pavements; ship-loaders and unloaders; product conveyors; storage buildings for products; rail loaders and unloaders; stacking and reclaiming equipment; storage tanks; and pipelines, which will be subject to separate statutory assessment and approval requirements prior to the start of their operations.

1.1 PROJECT OVERVIEW

The CU Project involves:

- Supply and haulage of marine-grade armour rock required for rockwalls and revetments at the Port;
- Creation of a ~62-hectare reclamation area via the construction of rockwalls and revetments;
- Capital dredging works of approximately 3.9 million cubic metres from the channels using a mechanical dredge, involving:
    - On its western side to widen the Platypus Channel from 92 metres width to 180 metres (at the harbour entrance) tapering to 135 metres (at the seaward end);
    - On its eastern side to widen the Sea Channel from 92 metres to 120 metres along its length;
- Installation and operation of a temporary offloading facility to allow transfer of dredged material from the dredge barges to the reclamation area;
- Reclamation activities, including the placement of dredged material within the reclamation area and discharge of tailwater via a weir box into Cleveland Bay;
- Construction of the Diagonal Breakwater, including realignment of the seaward end of the western Breakwater, to allow for a widening of Platypus channel at the harbour entrance; and
- Installation of navigation aids in alignment with the new channel configuration.

The capital dredging, construction activities and infrastructure development for the CU Project will occur inside the existing port limits, the designated water areas in which navigation falls under the control of the Regional Harbour Master (RHM). The reclamation area forms part of Lot 794 on SP308904 adjacent to the northern extern of the East Port area (Lot 791 on EP2348, which is Strategic Port Land), while the temporary offloading facility and activities are adjacent to Lot 794.

The layout of the reclamation area, including the boundaries of Lot 794, is shown in Figure 2, along with the layout of the temporary offloading facility (including dredge area).

The capital dredge campaign will last approximately 2 to 2.5 years and dredge approximately 3.9 million cubic metres (m^3) from the channels using a mechanical dredge. Capital dredge material will be placed within the new reclamation area as part of land reclamation activities. Dewatering and ground improvement of emplaced sediments within this area will be undertaken. Note - Treatment of PASS soils will occur primarily within the 62 hectare reclamation and may occur on adjacent land within the port (if required) depending on the presence, timing and sequence of PASS.

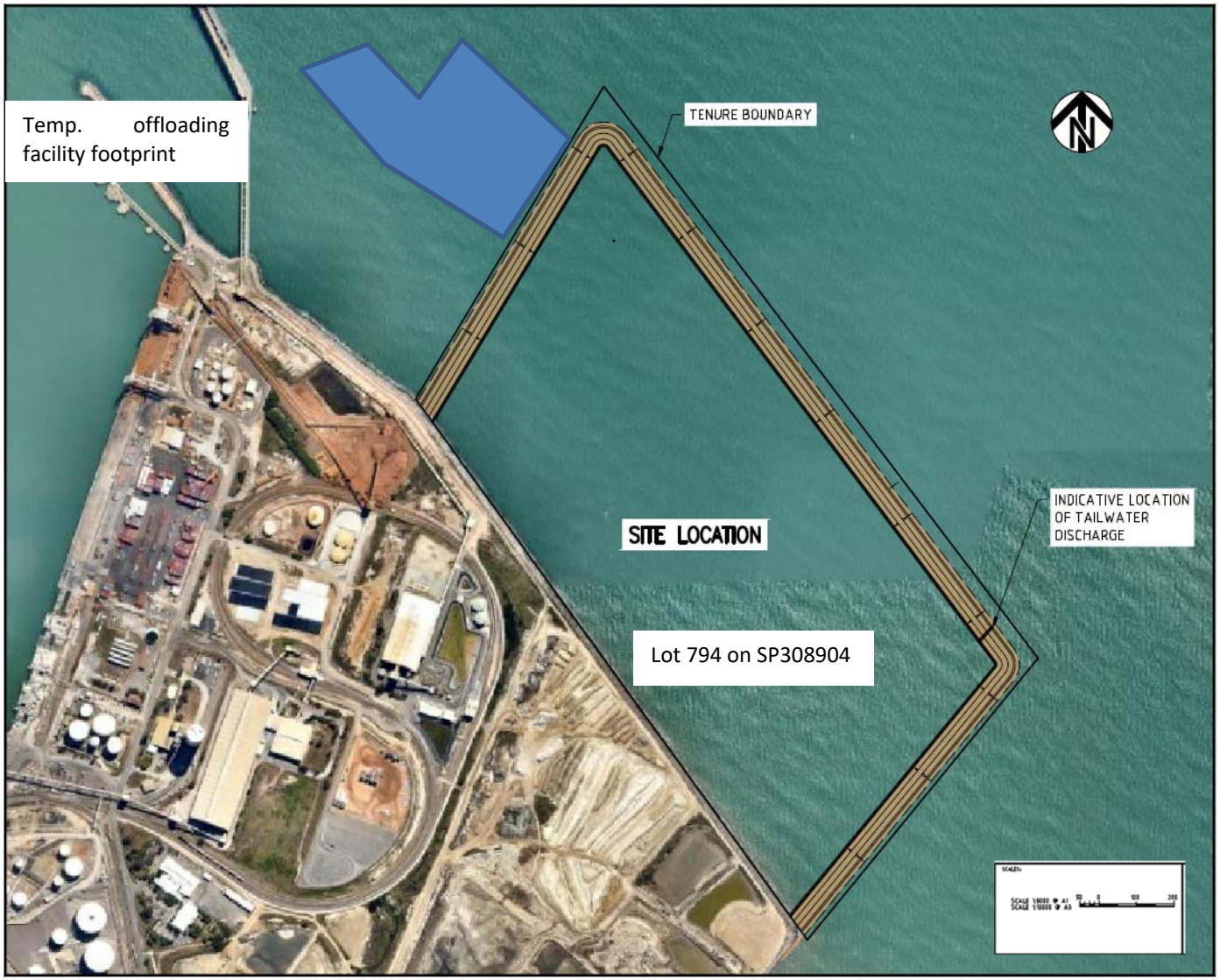
A Construction Environmental Management Plan (CEMP), detailing appropriate environmental management controls, is in place to manage risk and reduce the potential for negative impacts on the environment associated with the CU Project 's construction and reclamation activities. This Acid Sulfate Soil and Contamination Management Plan (ASSCMP) forms part of the CEMP and outlines the Acid Sulfate Soil (ASS) and metal contamination environmental monitoring and management requirements.

This plan details the approach and principles for ASS management, noting additional detail is required and approved under state approvals.

This ASSCMP is Appendix E of the *CU Construction Environmental Management Plan (CEMP POT 2099).* Management actions and controls relevant to mitigating acid sulfate soil impacts from the project are also detailed in the CEMP. This plan must be read in conjunction with the CEMP to ensure all management and mitigation measures are captured in undertaking this plan.

Figure 1: Locality Plan of the Port of Townsville & CU Project

Figure 2: Lot Plan for CU Project Rock Wall Construction & Reclamation Activities



1.2 LEGISLATIVE OVERVIEW

The PEP was the subject of an Environmental Impact Statement (EIS) and a further Additional Information to the Environmental Impact Statement (AEIS), submitted in support of Commonwealth and State project approval applications.

Commonwealth approval (EBPC 2011/5979) under the Environment Protection and Biodiversity Conservation Act 1999 for the PEP was granted on 5 February 2018 by DAWE. The Queensland Coordinator-General issued an evaluation report on the PEP's EIS/AEIS in September 2017. That report contains conditions to be included in the State Development Permits and Environmental Authorities, for the various stages of the PEP, including the CU Project. Since the CG Report, Environmental Authority *EA0002890* has been issued (11/06/2021) and provides the operational conditional requirements for the CU Project.

Both Commonwealth and State approvals prescribe conditions relevant to the management of Acid Sulfate Soils on site (provided by Appendix A). This document provides the management approach to address the prescribed conditions.

1.3 GEOLOGICAL SETTING

The CU Project is in the sea area of Cleveland Bay. Based on geological maps the areas where the dredging and reclamation works are consists of alluvial Holocene soil (clays, silts and sands), overlaying older 'stiffer' soils and rock at deeper depths.

As part of the PEP assessments, several boreholes were performed in the area of the proposed new harbour and reclamation. A further geophysical study was conducted as part of the CU Project.

As outlined in the Golder 2012 Geotechnical Review report, marine sediments in the Reclamation Area, Outer Harbour, Platypus Channel and Sea Channel were described as comprising two distinct layers:

- The surface layer of seabed sediment material is comprised of recent marine sediments generally consisting of a mixture of very soft to soft silty clay to clayey silt with very loose and loose sand to silty sand to clayey sand. Shell fragments and organic materials commonly occur within this layer.
- A subsurface layer comprised of lighter coloured, denser sandy clays, clays and sands.

Typically, the dredging and reclamation area occurs in water depths of LAT-1m down to LAT -11m. The geological conditions below the sea bed consist of a thin layer Holocene (typically <1m to ~ 3m) of very soft to firm clays /silts, and very loose to loose sands, overlying 'stiff' to 'hard' clay and soils, with rock at deeper depths.

The more recent Geophysical assessment of the proposed dredge channel alignment identified a range of geophysical properties through the proposed dredge profile. This determined the boundary between the Holocene unconsolidated sediments and the underlying Pleistocene clays generally between 0.7m and 2.5m. Some deeper Holocene channels were observed to ~ 4.0m.

The geophysical and geotechnical studies have indicated some any paleo channels exist within the dredging footprint areas, with the geophysical and in field sampling aligning very closely for these areas, indicating a high confidence that the geophysical study has identified these areas.

2. ACID SULFATE SOILS

2.1 HOW ACID SULFATE SOILS FORM

Potential Acid Sulfate Soils (PASS) is the common name for unoxidised soils that contain metal sulfides, namely pyrite. In an undisturbed and anoxic state, these soils may pose no or low risk. However, when disturbed or exposed to oxygen, PASS undergoes a chemical reaction known as oxidation, resulting in production of sulfuric acid and iron precipitation. Acidity produced by oxidation of ASS may release aluminium and mobilise trace metals bound in the soils, including arsenic, cadmium, chromium, copper, lead, manganese, nickel and zinc. For further details, see https://www.qld.gov.au/environment/land/management/soil/acid-sulfate/explained.

The formation conditions for PASS are most favourable within alluvium of the recent geological past (i.e. Holocene-aged of <10,000 years) rather than within the older Pleistocene-aged alluviums and residuals soils, but both these lithologies are found in Townsville's geology. Other relevant formation conditions include locations in low-lying coastal areas and/or marine sediments, which are waterlogged, that comprise sulfide minerals, high organic matter and salinity.

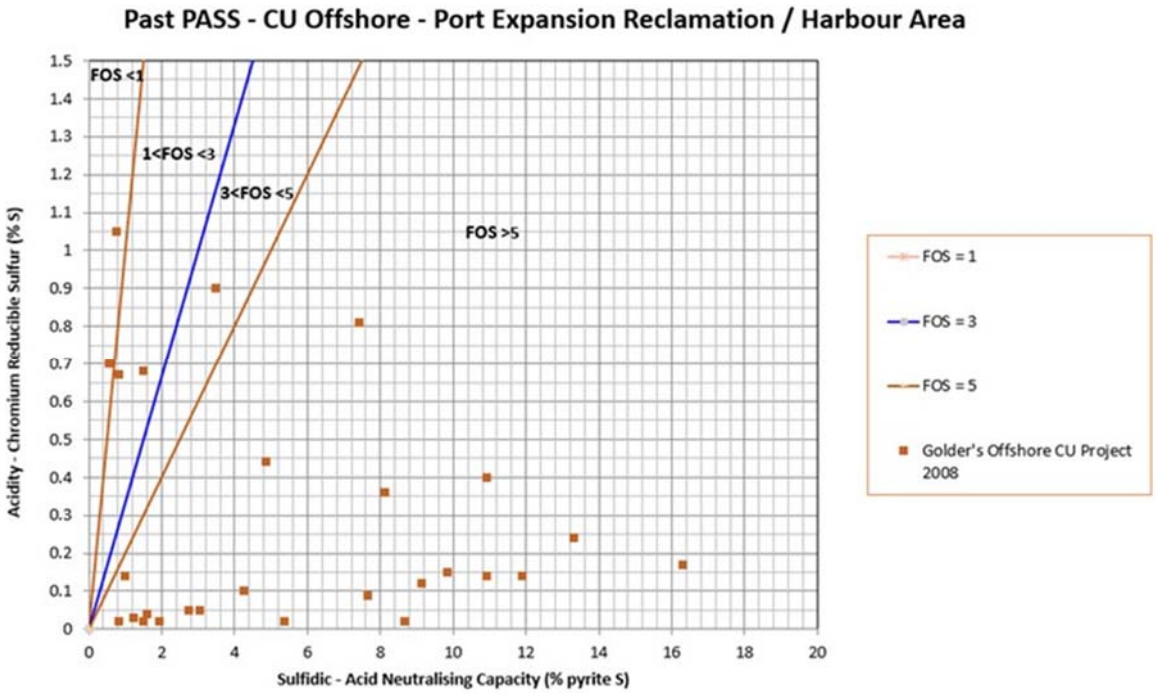
As described in the Queensland ASS Technical Manual, Soil Management Guidelines (2014), ASS in respect of the volumes associated with this project, is defined as material that has a chromium reducible sulfur of <0.03% (S_{CR}).

2.2 PAST ASS STUDIES AT THE PORT

Based on previous studies and ASS management plans within the Port, including Townsville Marine Precinct and Townsville Port Inner harbour Expansion, the 'softer' surface marine deposits were either PASS with sufficient Acid Neutralising Capacity (ANC) to self-buffer (i.e. had a Factor Of Safety (FOS) of >3-5 for self-buffering), or were PASS and required minor precautionary treatment via the addition of lime or a similar neutralising agent to increase the available neutralising capacity. In these previous areas it is noted that column leach testing was used to verify the ANC and carbonate was available for uptake. The results found from the testing indicated FOS≥3 self-buffered. Since these investigations the legislation has been updated and a fineness factor of 3, and sieving of the sample is required prior to the calculation of SNP (Self Neutralising Potential).

A preliminary ASS investigation was conducted of the area of the proposed rock wall and new potential harbour. A summary table of these results are shown in Figure 3 below.

Figure 3: Preliminary Acid Sulfate – Port Expansion Reclamation and Harbour Area



The preliminary results from within the port expansion area (including the rock wall construction area) are consistent with past detailed investigations and verification studies during past dredging campaigns. Noting the above is the full fraction not the sieved fraction. No data is available from the earlier studies to consider the sieved fraction.

It is noted that in the past, the Port has used a modified multi-staged leachate tests, in addition to ASS chromium suite testing, to demonstrate that the natural buffering material available in the sediments were of sufficient quantity for the sediments to be considered self-buffering. The leach tests have demonstrated for PASS sediments within the Port area, a FOS = 3 or larger comparing acid neutralising capacity against acid generation, was sufficient to ensure the soils self-buffered. Sediments below the permanent water table have limited opportunity to oxidise due to the lack of oxygen required for the chemical process and generate no acid.

2.3 RISK ASSESSMENT OF PASS BEING EXPOSED – ROCK WALL CONSTRUCTION

As part of the rock wall and breakwater construction, the rock was placed directly onto the sea bed surface. In the areas where rock placement on the seabed will occur (Rockwall, Diagonal Breakwater and TUF), the seabed has a layer of 'softer' marine deposits (between 1.5 – 3 m) over 'stiffer' soil. This material is very low strength and will enter in between the voids and/or will displace with the rock wall placement. This is similar to past experience with the existing Eastern Reclamation wall built in 1980s.

PASS materials, where present, during the rock wall/breakwater construction were not significantly disturbed / excavated and/or exposed to oxygen, as this material remains below the permanent water level and at the location of the rock wall footprint. No mud wave of any magnitude that would expose PASS material to oxidisation occurred as a result of the rock wall construction

As a result, utilising the risk management guidelines within the Port's Quality Management System (risk tables reproduced in Appendix B), the risk of creating ASS conditions during rock wall construction was assessed as low risk (minor consequence). Therefore, during placement of rock for the rock wall, TUF and

Diagonal breakwater construction it is considered unlikely (likelihood) and low risk that treatment for ASS will be required. This has been demonstrated with the rockwall construction work front, where no mud waving of sediments above the tide level occurred.

2.4 RISK ASSESSMENT OF PASS BEING EXPOSED – DREDGING AND RECLAMATION

As part of the dredging process, the dredge material is dredged, placed in a barge, unloaded into truck and placed into the reclamation. PASS material becomes a concern when the material is exposed to oxygen and there is insufficient buffering capacity in the material to neutralise any Acid generated. For material that remains saturated there is insufficient oxygen available to pose a concern. The dredge material remains saturated until this material is dewatered within the reclamation area, as such the key area to manage for potential acid sulphate is the onshore placement of Holocene material.

Some PASS can be partially or completely 'self-neutralising' due to an abundance of naturally occurring calcium carbonate (e.g. crushed shells, skeletons, coral and foraminifera). If shell particles are mostly >0.5 mm, soils may only be partially self-neutralising. The Queensland Guidelines allows for ANC to be considered in acid-base accounting calculation to determine net acidity and possible reduced management requirements. As part of these calculations a 'fineness factor' is applied to the ANC to account for possible overstatement of neutralising capacity as a result of laboratory ring grinding of samples prior to analysis. A fineness factor of 3 is recommended and has been applied for this project.
The in-field sampling indicated that the Holocene deposits extend to depths of approximately 0.25 to 1.5m below the seabed surface in the TUF dredge area; and typically around 3m in the Channel dredge area, however this varies along the profile.

All dredge areas contain Holocene material which has potential acidity (chromium reducible sulfur) levels which would classify these materials as PASS. There is variable neutralising capacity across the dredge areas ranging from self-neutralising PASS through to non-self neutralising. The areas inshore (0-5000m) have a higher SNP than the dredge areas 5000m + in the channel due to ancient mangrove mud expressing towards the end of the Platypus channel and within sea channel. This mangrove mud has very little in the way of natural calcium carbonate available so has limited natural self neutralising capacity.

As a result, utilising the risk management guidelines within the Port's Quality Management System (risk tables reproduced in Appendix B), the risk of creating ASS conditions during reclamation was assessed as medium risk (minor consequence as reclamation is fully contained). Therefore, during placement of dredge material it is considered possible (likelihood) and as such treatment for ASS will be required.

2.5 ASS MANAGEMENT FRAMEWORK:

The ASS Management framework as detailed below will be followed for all dredge material:

1. Identification/Characterization:

   All Dredge material has been tested as part of the sediment sampling program (SAP) prior to the commencement of capital dredging. This allowed for the PASS to be mapped and characterised.

2. Handling:
   As per existing controls all dredge material is to be managed appropriately through dredging, during transport to the unloading facility, during placement, and during reclamation to ensure releases to the environment are avoided.

Through the characterisation, the Dredging and Reclamation contractor will be able to segregate non-PASS material from PASS material, streamlining the treatment and management program required. Knowledge of dredge cut depth and location assists in understanding if treatment is required and what that treatment approach is. The port has implemented a precautionary approach in cases were PASS and non-PASS material is comingled this material will be treated as PASS material.

3. Treatment:

All dredge material will be placed in the reclamation area, the first placement area for dredge material is to line the entire reclamation with competent dredge material which will form a 30+m perimeter encapsulating the reclamation prior to placement of the remaining dredge material. The softer material dredged during this period that is unable to be used in the perimeter, due to poor engineering qualities will be placed within the reclamation pond on the zone adjacent to existing port land. The dredge area to be targeted to place this perimeter is from 3000m-5000m chainage in the platypus channel which has the thinnest layer or Holocene material.

PASS/ASS material will be treated as a precaution with a neutralizing agent (typically Agriculture lime) where sampling has indicated this is required. The volumes of neutralizing agent to be applied will be variable based on the pre dredge sampling information depending on depth, and location The liming rate will also be adaptively managed throughout the project as informed by the confirmation sampling that occurs throughout placement. All Acid sulfate Soil Management is under the direction of Appropriately Qualified Person (experienced ASS practitioner) as per state requirements.

In summary, the approach for PASS/ASS is:

- where additional SNP is required for PASS/ASS material, additional neutralizing agent will be added under the direction of Appropriately Qualified Person (experienced ASS practitioner)
- If material is found to have insufficient self neutralizing capacity following confirmation testing, additional treatment of the material to be undertaken by adding agricultural lime or other neutralising agent.
- Water quality testing will be undertaken within the reclamation ponds throughout dredging to detect any change in pH. Noting release of water from the reclamation pond needs to achieve the tailwater release requirements across a range of parameters, release limits for pH are 6.5-8.5. This is controlled by the state approvals and the tailwater management plan

This approach will ensure that sufficient neutralising capacity is incorporated throughout the entire reclamation and that all released from the reclamation are within approval requirements.

3. SOIL CONTAMINATION

3.1 POTENTIAL SOURCES OF CONTAMINATION

The composition of marine sediments in Cleveland Bay is the result of a number of factors, including natural chemical and physical characteristics; upstream sediment sources and land use practices; hydrodynamics such as currents, longshore drift and resuspension; groundwater impacts; historical contamination (if any); stormwater discharge and runoff from the wider catchment including the city of Townsville. Port operations may potentially impact marine sediments, historically this has been found isolated to the berth pockets within the inner harbour, with this material being brought to land for approved disposal.

Ports and Coastal Environmental (PaCE) was commissioned by the Port to conduct sediment quality survey within the dredge areas forming part of the CU Project. A sampling and analysis plan (SAP) was prepared in accordance with the following guidelines:

- National Assessment Guidelines for Dredging (NAGD);
- Queensland Acid Sulfate Soil Technical Manual (QASSTM); and
- National Environment Protection (Assessment of Site Contamination) Measure (NEPM).

Areas of hotspots or potential hotspots were considered in the EIS, the proposed control for any hotspots was to dredge using a mechanical dredge to minimise any mobilisation of the material from that hotspot. As the entire CU project is being undertaken by a Mechanical Backhoe dredge this control is implemented throughout all dredge areas.

3.1.1 ROCK WALL CONSTRUCTION AREA

The location where the rock wall has been constructed in an area where there is no current industry, with access by humans transiting using recreational craft. It is noted the rock wall is being constructed on the mouth of Ross River, that has some industry upstream.

The Port as part of existing investigations has undertaken sediment sampling and analysis at several locations, within the existing port, existing shipping channels and within the area of the future port expansion. The location of the Port sediment sampling relevant to the rock wall construction area is shown in Figure Error! Not a valid bookmark self-reference..4.

Figure Error! Not a valid bookmark self-reference..4: Preliminary Sediment Sampling Points

A preliminary assessment of metal contaminant concentrations was conducted using the sediment sampling results from relevant locations (i.e. RR09, CB01, CB02, CB03, CB04, CB10, CB12, CB13, CB14, CB17, CB18 and CB19). The results were compared against the guidelines for both land-based and sea-based placement of dredge material. The thresholds adopted for this preliminary assessment are based against the *National Environment Protection (Assessment of Site Contamination) Measure, 1999* (NEPM), the Department of Environment and Science (DES) 2018 guidelines and the *National Assessment Guidelines for Dredging*, 2009 (NAGD), as listed in Table 1. It is noted that land-based contamination assessment and guidelines have more recently shifted towards adopting a risk-based assessment approach for assessment taking into account potential natural variations. The limits adopted using ASC NEPM (2013) as reference, is therefore used as a direct health-based assessment approach for preliminary guide on risk.

Table 1: Metal Contamination Threshold Limits – used as guide for preliminary assessment

Contaminant	NEPM (2013) HIL A (mg/kg)	NEPM (2013) EIL guidelines (mg/kg)	NAGD guidelines (mg/kg)
Arsenic	100	n/a	20
Cadmium	20	n/a	1.5
Chromium (VI)	100	n/a	80
Copper	6,000	190	65
Lead	300	n/a	50
Nickel	400	n/a	21
Zinc	7,400	400	200

A summary of the results available between 2015 -2018 for the points of interest in relation the rockwall /TUF construction area is provided in Table 2.

Table 2: Preliminary Metal Contamination Assessment

Metal	Assessment	
	Land-Based Guideline ASC NEPM - HIL A	Sea-Based Guideline NAGD
Arsenic (**As**)	Range of results 2.81 – 19.2 mg/kg Samples reviewed 63 All samples were below Health Investigation Level A (**HIL A**) – the lowest threshold and not deemed to be a risk	All samples were below the NAGD screening level and not deemed to be a risk
Cadmium (**Cd**)	Range of results <0.1 – 0.1 mg/kg Samples reviewed 63 All samples were below Health Investigation Level A (**HIL A**) – the lowest threshold and not deemed to be a risk	All samples were below the NAGD screening level and not deemed to be a risk
Chromium (**Cr**)	Range of results 5.5 – 28.3 mg/kg Samples reviewed 63 All samples were below Health Investigation Level A (**HIL A**) – the lowest threshold and not deemed to be a risk	All samples were below the NAGD screening level and not deemed to be a risk
Copper (**Cu**)	Range of results 1.4 – 14.9 mg/kg Samples reviewed 63 All samples were below Health Investigation Level A (**HIL A**) – the lowest threshold and not deemed to be a risk	All samples were below the NAGD screening level and not deemed to be a risk
Lead (**Pb**)	Range of results 5.3 – 18.4 mg/kg Samples reviewed 63 All samples were below Health Investigation Level A (**HIL A**) – the lowest threshold and not deemed to be a risk	All samples were below the NAGD screening level and not deemed to be a risk
Nickel (**Ni**)	Range of results 2.8 – 15.4 mg/kg Samples reviewed 63 All samples were below Health Investigation Level A (**HIL A**) – the lowest threshold and not deemed to be a risk	All samples were below the NAGD screening level and not deemed to be a risk
Zinc (**Zn**)	Range of results 16.7 – 56.3 mg/kg Samples reviewed 63 All samples were below Health Investigation Level A (**HIL A**) – the lowest threshold and not deemed to be a risk	All samples were below the NAGD screening level and not deemed to be a risk

Based on the available information, the potential for the rock wall /TUF construction to disturb "contaminated" material, which may potentially pose an environmental risk on land or in water, is considered unlikely and low risk.

3.1.2 TEMPORARY UNLOADING FACILITY DREDGING FOOTPRINT

The Temporary Unloading Facility dredge area is considered uncontaminated according to the NAGD. These materials are not expected to generate imposts to chemical water quality during dredging or placement, or impact organisms living in or on the seabed surrounding the dredge footprint. In accordance with the NAGD, the sediments to be dredged from these areas are considered non-toxic, with no chemical obstacles associated with the proposed dredging and placement of these sediments at the reclamation area.

The results indicate material is suitable for placement within the reclamation area without further treatment.

3.1.3 SEA AND PLATYPUS CHANNEL DREDGING FOOTPRINT

The Platypus Channel, Sea Channel areas are considered uncontaminated according to the NAGD. These materials are not expected to generate imposts to chemical water quality during dredging or placement, or impact organisms living in or on the seabed surrounding the dredge footprint. In accordance with the NAGD, the sediments to be dredged from these areas are considered non-toxic, with no chemical obstacles associated with the proposed dredging and disposal of these sediments at the reclamation area.

3.1.4 DIAGONAL BREAKWATER AREA

Elevated results were identified within the 0.0-0.5m horizon at the Western Breakwater dredge area, so additional analysis was conducted using dilute acid extraction (DAE) and elutriation. The weak acid extraction process used during DAE analysis continued to return elevated concentrations for lead (95% UCL 53.67 mg/kg). Progress to elutriation testing resulted in a low-level release of lead from the sediment water matrix. Raw elutriate results (2.7 mg/l) remained below the ANZECC screening criteria for lead (4.4 mg/l 95% Species Protection). As the specific dredging process is still to be informed by the demolition staging and methodology for the Diagonal breakwater dilution factors and controls were not able to be incorporated into this assessment as per NAGD for the sediments within the Western Breakwater. Regardless the placement of sediments within a dedicated reclamation facility will remove the physical interaction pathways between benthic and epibenthic fauna and the dredged sediments. The tender for removal and realignment of the breakwater has not been released, as such this poses challenges to resolve a number of key aspects for dredging the western breakwater dredge area.

Screening undertaken using elutriation tests indicated some potential for the release of metals exceeding ANZECC guideline criteria at 95% Species Protection. Further consideration of dredging and placement processes, including estimates of dilution will need to be considered when the demolition staging and methodology are resolved. Additional dredging controls or management techniques will need to be considered prior to the dredging of the Western Breakwater, as it is deemed a contaminant hot spot. As such it is proposed that further review and consideration is needed for the western breakwater dredge area once the contractor and construction methodology for the realignment of the breakwater is known. Further consultation and discussion will occur with the ITAC on the proposed mitigation strategies to be implemented for this hot spot once the scheduling and programming is understood for this works. Following this work the DMP will be updated and approved as relevant prior to dredging being undertaken in this area. As the material is being placed within the reclamation area, there is no concern for placement of the material with this low level of contamination.

3.2 CONTAMINATED MATERIAL MANAGEMENT FRAMEWORK:

1. Identification/Characterization:

   All dredge material has been subjected to a sediment sampling program (SAP) prior to the commencement of capital dredging. This addressed the relevant sampling and testing requirements for contamination, specifically in relation to the following guidelines:

- National Assessment Guidelines for Dredging (NAGD)
- National Environment Protection (Assessment of Site Contamination) Measure

The SAP allowed for the identification of contaminants to be mapped and characterised.

2. Treatment/ Management Potential 'Contamination':

Whilst the SAP has shown overall the dredge material is suitable for placement within the reclamation area, a number of potential contamination hotspots were identified (as per NAGD). The below will apply for all dredge material:

- no further testing / treatment required, if all metal concentrations are below NAGD guidelines and NEPM Contaminated Land guidelines.
- If heavy metal concentrations exceed the NAGD and NEPM guidelines, further assessment will be undertaken to guide the likely treatment requirements. This may include treatment through mixing with lime or cement to bond the contaminants in place, treated either in the reclamation area or on land; or transported and disposed at an appropriate onshore facility, in accordance with relevant Queensland guidelines.

4. PERFORMANCE OBJECTIVES

This plan addresses the performance objectives prescribed for ASS and contamination as required by the CEMP.

The following performance objectives will apply for this ASSCMP:

- All sampling to be undertaken as per section 2.5 and 3.2 , meeting the guideline requirements;
- Any PASS or contamination impacted areas, identified through monitoring as per section 2.5 and 3.2, are addressed in accordance with the Treatment/ management requirements outlined ;
- Timely compilation of draft and final annual monitoring reports and datasets (as per Section 6); and
- Timely reporting of all incidents to regulators.
- Annual review undertaken against the Performance Objectives to review the effectiveness and relevance of the performance objectives

5. REPORTING AND RESPONSIBILITY

The Port will take responsibility for coordinating the implementation of this management plan, with the assistance of suitably qualified contractors/consultants, as required.

The dredging and reclamation contractor will keep dredge logs and logs of placement (daily) The Port will produce summaries of the monitoring results from the ASSCMP. This will include details of the monitoring undertaken, the results found and an interpretation of the results in relation to the construction activities, SNP and liming rate. This will also detail any identification of ASS and the application of mitigation controls.

Copies of data and report(s) will be kept on-site and will be available for regulatory inspection. If requested by the regulators, all monitoring data and information related to this ASSCMP will be submitted within 30 business days of the request, or within a timeframe agreed in writing between the Port and the relevant regulator.

Any releases of water outside of the licenced discharge limits will be reported to regulators as per the incident reporting process for the project. The incident report will include control measures being implemented to address the incident. The Manager Environment CU will report to DAWE (or successor agency) any exceedance of the MNES performance criteria, including any implementation of MNES risk management, adaptive management strategies, corrective actions and emergency response measures implemented, within 21 days of the initial incident/exceedance notification.

Where management controls are to be amended during the CU Project in response to assessment under this ASSCMP, the relevant Management Plans (CEMP, DMP) will be updated to incorporate updated management arrangements into the on ground practices. The updating of the plans will occur immediately, or as part of the regular review of the plan depending on the significance of the management action modification. A record of changes made will be kept.

In the event that this plan needs to be revised during implementation, then the Port will consult with the regulators on the need for amendments and submit a revised plan for approval. Changes of a minor administrative nature will not require approval, in accordance with the Department's policy on management plans.

Monitoring
Undertake regular dredge inspections and observations to determine the effectiveness of the mitigation measures (frequency of observations to be determined by sediment sampling and analysis and adapted to particular dredge area).

Monitoring conducted as per the Acid Sulphate Soil and Contamination Management Plan (POT 2100).
Review/audit toolbox/pre-start records for discussions on ASS and Tailwater monitoring and management where issues arise

6. CONTINUOUS IMPROVEMENT

The ASSCMP will be subject to regular review.

This ASSCMP is a "living document" which will undergo formal review annually during the construction phase as part of the CEMP review (in association with the Annual Compliance Reporting function). During delivery, review and amendment will occur as necessary via adaptive management actions to ensure it remains fit for purpose and to allow new or changing environmental risks and mitigation actions to be addressed. Feedback mechanisms will be in place for the duration of the CU Project to enable this ASSCMP to be updated and responsive to learning from any incidents, complaints and ongoing monitoring results.

Other triggers for ASSCMP review may include:

- Changes in project operations or management;
- Changes in environmental legislation and/or policies; and
- New technologies / innovation relevant to applied monitoring methods and mitigation actions that provide innovative means of executing activities in order to meet performance objectives.

Changes to the ASSCMP may be developed and implemented in consultation with relevant regulators and other stakeholders over time. All changes are to maintain the approval conditions and be approved by the CU Project Management, before implementation.

Information from this ASSCMP will be used to assist with improving the control measures in the CEMP and MEMP where relevant and required.

Continuous improvement will also be achieved via the *Construction Environmental Management Plan*, to which this plan is a part of (Appendix E of CEMP). Consideration and review of improvements to the CEMP will be reflected within this Plan.

7. REFERENCES

AS4482.1-2005. *Guide to the investigation and sampling of sites with potentially contaminated soil – Part 1: Non-volatile and semi-volatile compounds.* Standards Australia, 2005

Coffey Geotechnics 2010. *Townsville Marine Precinct - Geotechnical Investigation Report*. Coffey Geotechnics, Townsville, 2010.

Dear, S-E., Ahern, C. R., O'Brien, L. E., Dobos, S. K., McElnea, A. E., Moore, N. G. & Watling, K. M., 2014. Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government.

DERM 1998. *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland,* dated May 1998;

DES 2018. *Queensland auditor handbook for contaminated land: Module 6: Content requirements for contaminated land investigation documents, certifications and audit reports*. Brisbane: Department of Environment and Science, Queensland Government.

DES 2018. *Queensland Monitoring and Sampling Manual: Environmental Protection (Water) Policy 1999*. Department of Environment and Science, Brisbane, 2018.

DSITIA 2014. *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines*. Department of Science, Information Technology, Innovation and the Arts, Brisbane, 2014.

Golder Associates 2008. *Offshore Geotechnical Investigation - Preliminary Geotechnical and Acid Sulphate Soils Investigation Report*. Golder Associates, Townsville, 2008.

NAGD 2009. *National Assessment Guidelines for Dredging*. Department of Environment and Energy, Canberra, 2009.

National Environment Protection Council (NEPC), 1999, *National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM). Last amended in 2013.*

NEPC 2013. *National Environment Protection (Assessment of Site Contamination) Measure.* National Environment Protection Council 1999 (Amended 2013).
Schedule B(2) Guideline on Site Characterisation.
Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater.

Port of Townsville Limited 2014-2018. Internal marine sediment database. Port of Townsville Limited, Townsville, 2014-2018.

SMEC 2019. *Channel Capacity Upgrade Project – Channel Widening and Reclamation Area - Geophysical Study*. SMEC, Brisbane, 2019.

APPENDIX A

COMMONWEALTH (EPBC APPROVAL) AND STATE (EA) CONDITIONS RELEVANT TO ASS

DA0190/1905-11091 SRA Conditions relevant to this ASSCMP

Ref	Cond. No.	Condition Requirement	Plan Reference	Demonstration of how the plan addresses the condition requirement
1	6	a) In the event that the works cause disturbance or oxidization of acid sulfate soil, the affected soil must be treated and thereafter managed in accordance with the current *Queensland Acid Sulfate Soils Technical Manual: Soil Management Guidelines*, prepared by the Department of Science, Information Technology and the Arts, 2014. **Timing:** Upon disturbance or oxidization until the affected soil has been neutralized or contained.	2	Section 2 identifies - the potential for ASS to form and details the likelihood of ASS formation with the project based on previous the Port studies. - the potential sources of ASS from the project, the verification testing to be undertaken to confirm PASS presence and the Corrective and Management measures to be implemented should PASS be encountered.
		b) Certification by an appropriately qualified person(s), confirming that the affected soil has been neutralized or contained, in accordance with (a) above is to be provided to palm@des.qld.gov.au or mailed to: Department of Environment and Sciences Permit and License Management Implementation and Support Unit GPO Box 2454 Brisbane. Qld. 4001. **Timing:** On completion of works, if acid sulfate soils are encountered.	5	Section 5 details the reporting and responsibility associated with the ASS assessment. Note for state requirements a specific operational plan(s) have been developed for dredge areas. This plan captures the high level aspects.

EPBC Approval conditions relevant to this ASSCMP

Ref	Cond. No.	Condition Requirement	Plan Reference	Demonstration of how the plan addresses the condition requirement
1	2	The person taking the action must ensure that an analysis of the sediment to be dredged within the dredging footprint at Appendix A is undertaken to meet at least the standards in the NAGD, before the commencement of dredging associated with each stage of the action (stages 1-3).	2 & 3	Section 2 and 3 outlines the potential sources of ASS and contaminant risk for the project, including high level summary of the sampling and analysis plan.
2	10	**Construction and management of the reclamation area** The person taking the action must submit a Construction Environmental Management Plan (CEMP) for the **Minister's** approval, which includes measures to mitigate impacts to **MNES** from the construction of the reclamation area before the **commencement** of the action. The person taking the action must not **commence** the action unless the **Minister** has approved the CEMP. The CEMP must be prepared in accordance with the **Department's Environmental Management Plan Guidelines** and include at least the following: d) Management measures for potential acid sulfate soils.	2 4 5	Section 2 outlines the verification testing to be undertaken to confirm PASS presence and the Corrective and Management measures to be implemented for PASS. Section 4 outlines the performance objectives including for PASS Section 5 outlines the reporting and responsibly including for PASS

Definitions:

Capital dredging as defined in the NAGD, being 'dredging for navigation, to enlarge or deepen existing channels and port areas or to create new ones'.

Commencement Any works that are required to be undertaken for construction (includes works associated with the construction of the reclamation area, pile driving activities, dredging activities, and any infrastructure associated with the action). Excludes preliminary works.

Minister The Minister administering the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and includes a delegate of the Minister

MNES Matters of National Environmental Significance: In the context of this approval: Great Barrier Reef World Heritage Area, Great Barrier Reef National Heritage Place, Listed turtle species, listed dolphin species, and all other Cetaceans, Dugong (*Dugong dugon*), Commonwealth marine area and the Great Barrier Reef Marine Park.

NAGD National Assessment Guidelines for Dredging (2009), as amended or substituted.

Stage As identified at Section 2.4.1 of the *Townsville Port Expansion Project – Additional Information to the Environmental Impact Statement (October 2016).*

8. APPENDIX B

EXTRACT FROM POT442 – RISK MANAGEMENT GUIDELINES

ANNEXURE A – QUALITATIVE MEASURES OF CONSEQUENCE OR IMPACT

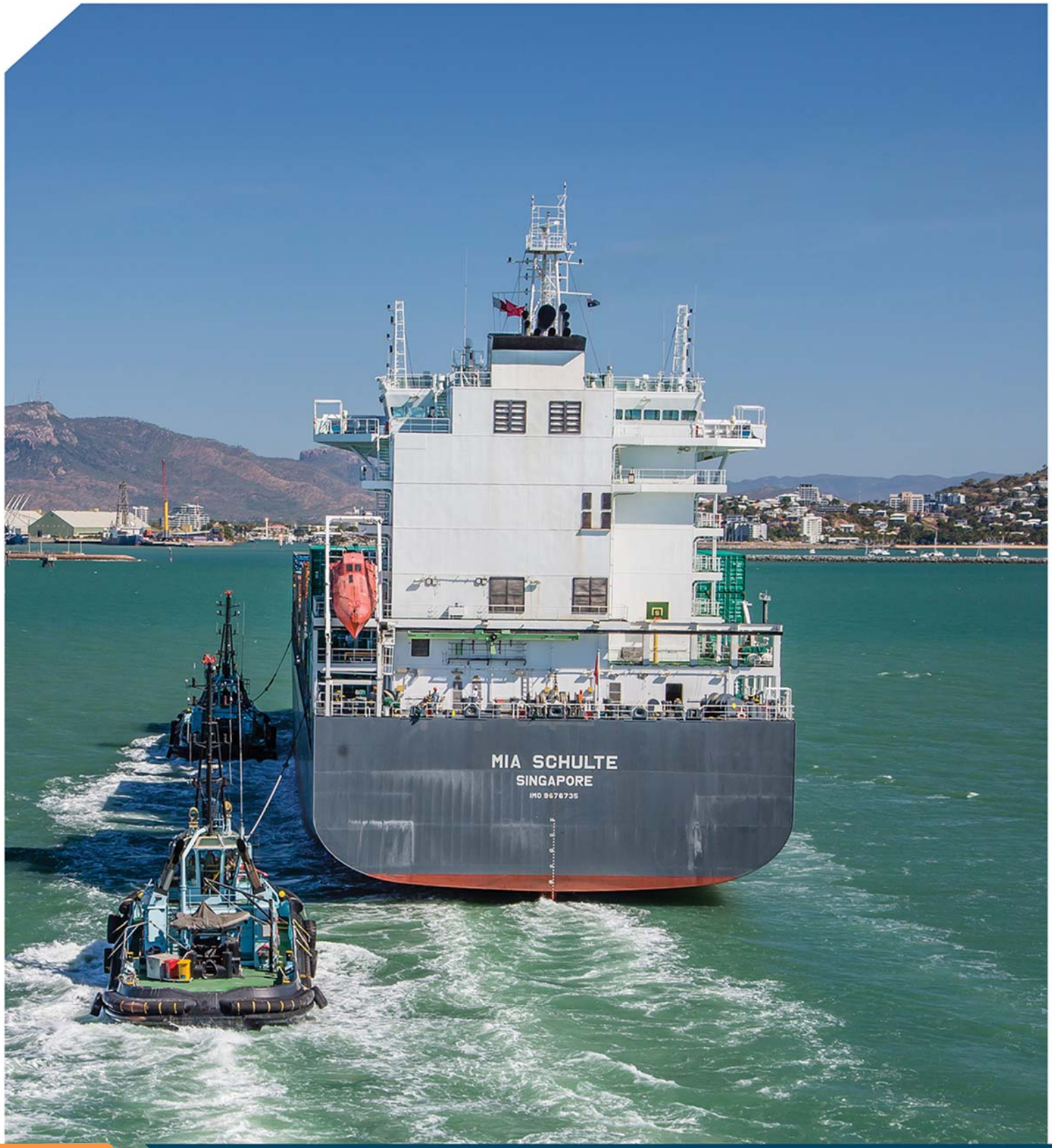
Rank		Operations (Trade)	Financial Loss	Asset Loss	Interruption to Services	Reputation, Image & Political Implications	Performance	Criminal Penalty	Information Security	Safety	Health	ENVIRONMENT	
												Nature & Extent of Potential / Actual Environmental Harm	Frequency, Intensity, Duration, Offensiveness of Activity
1	Insignificant	Insignificant impacts on operations and trade. No navigation closure. Insignificant delays.	$0 - $50K	Little or no impact on assets	< ½ day	Unsubstantiated, low impact, low profile or no news items. No political implications.	Up to 5% variation to KPI	Pecuniary	Can be dealt with by routine operations.	Minor temporary – irritation, first aid treatment required.	Reversible health effects of concern.	Environmental Nuisance resulting in insignificant impacts on the natural receiving environment, plants and/or wildlife. No impact on community or business.	Low frequency / intensity / duration activity (days). No substantiated offensive amenity impacts on surrounding area.
2	Minor	Minor impact on operations and trade. No navigation closure but minor revenue loss due to loading or unloading delays.	$50K - $500K	Minor loss or damage to assets	½ - 1 day	Substantiated, low impact, low news profile. Minor political implications resulting in minor local media attention.	5 -10% variation to KPI	Pecuniary	May threaten the efficiency or effectiveness of some aspect of the infrastructure but would be dealt with internally.	Minor temporary – medical treatment required.	Severe reversible health effects of concern.	Environmental Nuisance resulting in minor adverse impacts on or unreasonable interference with the natural receiving environment, plants and/or wildlife, but noticeable effect on amenity. Minimal impact on community or businesses.	Minor frequency / intensity / duration activity carried out during normal operating hours over a short term (weeks). Minor amenity impacts experienced within surrounding area with potential to trigger complaints.
3	Serious	Temporary navigation closure or prolonged restriction of navigation.	$500K - $5m	Major damage to assets	1 day – 1 week	Substantiated, public embarrassment, moderate impact, moderate (local) media attention. Political implications resulting in directions given by the shareholding Ministers.	10-25% variation to KPI	Imprisonment	Would not threaten the infrastructure but would mean that the program could be subject to significant review or changed ways of operating.	Major permanent – loss of body part or function.	Short term health problems or irreversible health effects of concern.	Actual or potential Material Environmental Harm resulting in noticeable adverse or unreasonable impact on the natural environment, plants and/or wildlife within surrounding area. Noticeable impact on community or businesses.	Medium frequency / intensity / duration activity carried out for a significant period of time on most days or over a period of months. Adverse amenity impacts on community giving rise to multiple/sustained substantiated complaints.
4	Major	Temporary closure of a navigation channel affecting movements to the port for several days. Ensuing loss of trade.	$5m - $10m	Significant loss of assets	1 week – 1 month	Substantiated, public embarrassment, high impact, high (local and national) news profile, third party actions. Political implications resulting in state/ national inquiry.	25-50% variation to KPI	Imprisonment	May threaten the survival or continued effective functioning of the infrastructure or project and require top-level management intervention.	Major permanent– single fatality, total blindness, quadriplegia.	Health impacts, long term/chronic health problems or life threatening or disabling illness.	Material Environmental Harm resulting in significant adverse or unreasonable impact on the natural receiving environment, plants and/or wildlife over an extensive area as a result of the duration or magnitude or nature of impact. Extended disruption/impact to community or businesses. Potential exists to remedy the impact if the activity is ceased or impact is reversible.	High frequency / intensity / duration activity carried out during most hours of the day or impact is long term (years). Significant adverse impacts on community.
5	Catastrophic	Port closes, navigation seriously disrupted for an extended period. Serious and long term loss of trade.	>$10m	Complete loss of assets	> 1 month	Substantiated, public embarrassment, very high multiple impacts, high widespread (national and international) news profile, third party actions. Political implications resulting in state/ national inquiry. Significant national and worldwide attention from governments and media condemning activity.	>50% variation to KPI	Imprisonment	May threaten the survival of not only the infrastructure but also the business, possibly causing major problems for clients.	Multiple fatalities	Long term, permanent or irreversible health problems. Chronic health affects too many people.	Serious Environmental Harm resulting in irreversible, high or widespread adverse impact on the natural receiving environment/high conservation or special significance area. Severe and protracted disruption/impact to community or businesses. Irreversible loss of amenity experienced.	Permanent high frequency / intensity / duration activity carried out 24/7. Serious adverse impacts on community.

ANNEXURE B – QUALITATIVE MEASURE OF LIKELIHOOD

Level	Descriptor	Description	Ongoing Activities	Projects
1	Rare	May only occur in exceptional circumstances	Unlikely in the life of the facility	0.1% chance
2	Unlikely	Could occur at some time	Once in 20 years	1% chance
3	Possible	Might occur at some time	Once in 5 years	10% chance
4	Likely	Will probably occur in most circumstances	Once per year	50% chance
5	Almost Certain	Expected to occur in most circumstances	Many times per year, continuous	99% chance

ANNEXURE C – RISK EVALUATION FACTORS

	Consequence	Insignificant	Minor	Serious	Major	Catastrophic
Likelihood	***Score***	***1***	***2***	***3***	***4***	***5***
Rare	***1***	**L** ***1***	**L** ***2***	**L** ***3***	**L** ***4***	**M** ***5***
Unlikely	***2***	**L** ***2***	**L** ***4***	**M** ***6***	**M** ***8***	**S** ***10***
Possible	***3***	**L** ***3***	**M** ***6***	**M** ***9***	**S** ***12***	**H** ***15***
Likely	***4***	**L** ***4***	**M** ***8***	**S** ***12***	**H** ***16***	**E** ***20***
Almost Certain	***5***	**M** ***5***	**S** ***10***	**H** ***15***	**E** ***20***	**E** ***25***



Registered Office
Administration Building
Benwell Road
South Townsville QLD 4810

p + 61 7 4781 1500
f + 61 7 4781 1525
e ccuproject@townsvilleport.com.au
w www.channelcapacityupgrade.com.au