



Port of Townsville Limited *Marine Water Monitoring Plan*

POT 1569
REVISION 5



Document Control Sheet

Revision history

Revision No.	Effective Date	Comments
0	02/02/2012	Original Document
1	25/06/2014	Updates to reflect revised monitoring program
2	26/07/2015	Updates to reflect revised monitoring program
3	09/08/2016	Updates to reflect revised monitoring program
4	19/10/2017	Updates to reflect revised monitoring program
5	04/11/2019	Reformatting and updates to references etc. and inclusion of buoy monitoring

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 2 of 12



CONTENTS

1	Introduction	4
2	Marine Waters in Cleveland Bay	5
3	Program Scope	6
3.1	Objectives	6
3.2	Equipment and Methodology	6
3.3	Monitoring Locations	6
3.4	Frequency and Timing	8
3.5	Parameters	9
4	Marine Water Objectives	10
5	Reporting	10
6	Review	10
7	References	11
8	Definitions and Acronyms	11

Tables

Table 1: Marine Water Monitoring Locations.....	8
Table 2: Marine Water Parameters	9
Table 3: Marine Water Objectives	10

Figures

Figure 1: Coastal Habitats in Cleveland Bay.....	4
Figure 2: Marine Water Monitoring Locations	7

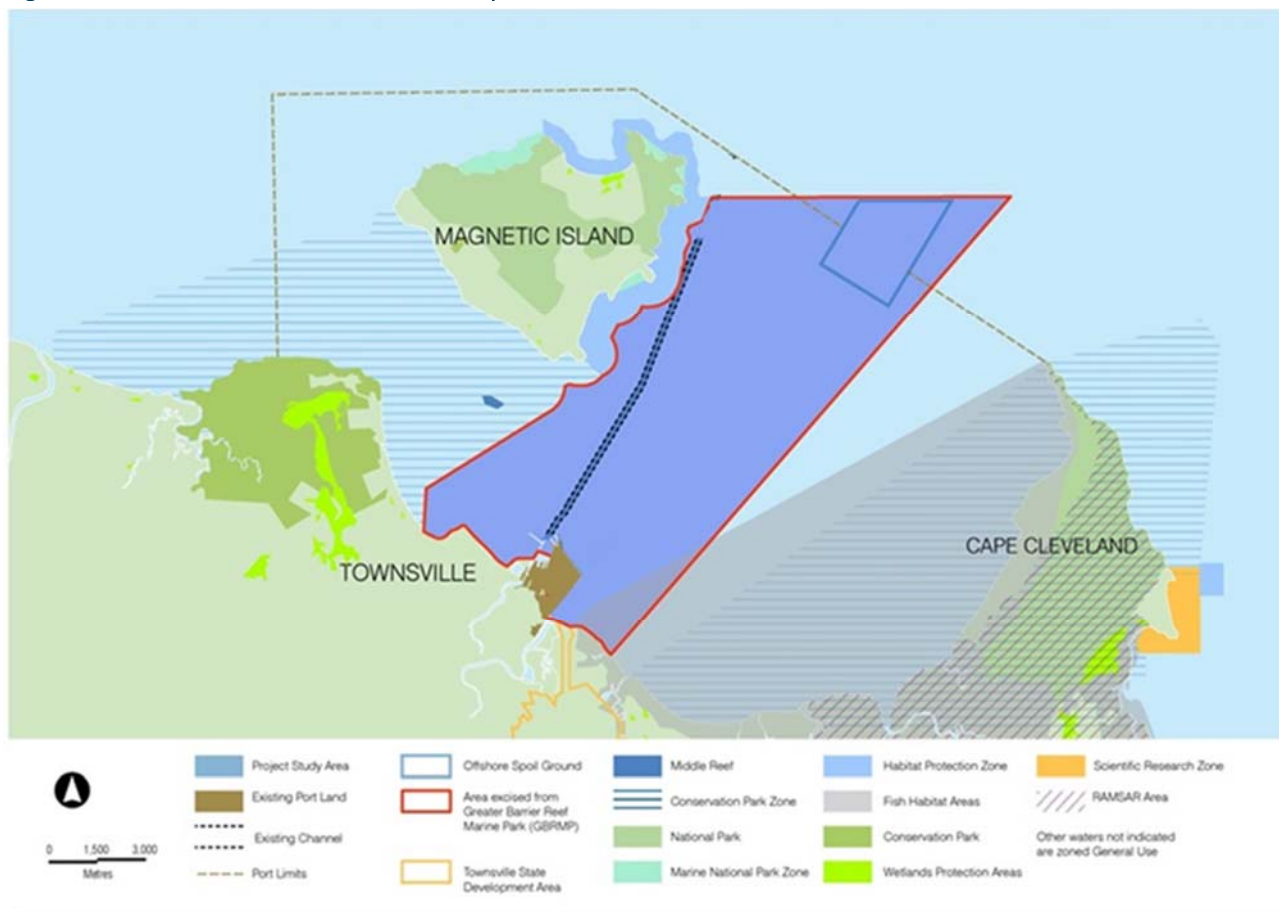
© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 3 of 12



1 INTRODUCTION

Port of Townsville Limited (POTL) administers the Ports of Townsville and Lucinda. The Port of Townsville (19°15'S, 146°50'E) is a general-purpose cargo port situated in the centre of the growing city of Townsville, the leading population centre in tropical North Queensland (NQ). The port is located in the southwest of Cleveland Bay, in between the mouths of Ross River and Ross Creek, within an environmentally sensitive area of the coastline in close proximity to mangrove habitats, ecologically important seagrass beds, wetlands as well as fringing coral reefs and residential areas (Figure 1). It has a land and sea jurisdiction in excess of 450 km² and the sea jurisdiction encompasses the Great Barrier Reef World Heritage Area, which is also a national heritage place. The port and its marine infrastructure are located within an exclusion area from the Central region of the Commonwealth Great Barrier Reef Marine Park and the State Great Barrier Reef Coast Marine Park (Figure 1).

Figure 1: Coastal Habitats in Cleveland Bay



Due to the potential of port activities to impact on sensitive receiving environments, POTL has a strategic long-term approach to environmental management and conducts a number of monitoring programs to ensure POTL meets both its statutory responsibilities and corporate objectives.

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 4 of 12



2 MARINE WATERS IN CLEVELAND BAY

Cleveland Bay is a north facing bay, bounded to the east and west by Cape Cleveland and Cape Pallarenda respectively, which are approximately 26 km apart. The bay is naturally broad and shallow and is a naturally turbid water body enhanced by significant sediment loads received from the Burdekin catchment and maintains significant sediment mobility through natural re-suspension. The composition of marine waters in Cleveland Bay is the result of a number of factors, such as the upstream water sources and land use practices; natural chemical and physical characteristics; hydrodynamics such as currents, longshore drift and resuspension; groundwater impacts; historical contamination; stormwater discharge and runoff from the wider catchment including the city of Townsville; as well as port operations.

Marine waters in Cleveland Bay are understood to be influenced by discharges from a number of catchments associated with a variety of differing land uses including:

- Burdekin River – approximate catchment 130,109 km² (WetlandInfo 2019);
- Haughton River – approximate catchment 4,051 km² (WetlandInfo 2019);
- Ross River – approximate catchment 1,708 km² (WetlandInfo 2019);
- Ross Creek – approximate catchment 20 km²; and
- Multiple stormwater catchments on POTL controlled lands – approximate catchment 3 km².

The catchments of both the Burdekin and Haughton Rivers are dominated by agricultural activities, including cattle grazing and crop production, and are subject to high pesticide, herbicide and fertiliser runoff. Generally, impact on marine waters is via diffuse sources of these contaminants. The catchments of Ross River and Ross Creek have a history of urbanisation and industrial activities and may impact on marine waters through both point and diffuse sources of contaminants, which may be transported by stormwater to port areas and Cleveland Bay, particularly during the wet season. Sources of potential contaminants in Townsville include refineries, manufacturing and repair facilities, old rail sidings and industrial areas. Multiple industrial sites are licensed to discharge waste streams into Cleveland Bay east of Ross River (refineries, sewage treatment plant, meatworks etc.) and several landfills (both operating and rehabilitated) are also present in the Ross River catchment.

Port operations, conducted by or on behalf of POTL or by Port Customers, have the potential to impact on marine waters through both point and diffuse sources of contaminants. Point sources include spillage of contaminants and bulk products, such as dry metal concentrates, to marine waters during loading and shipping operations; loss of spilt products from berths into marine waters; licensed discharges and stormwater runoff from port facilities, backing land operations and road and rail transport activities. Apart from input from Ross Creek, stormwater entering the Inner Harbour drains from local berth areas only and contaminants from this source would also reflect the products handled at the port. Diffuse sources include fugitive emissions; and agitation and redistribution of sediments by vessel movements and dredging activities. Potential contaminants from port operations include:

- Suspended Solids;
- Metals such as Arsenic, Cadmium, Chromium, Copper, Lead, Nickel and Zinc;
- Nutrients such as Ammonia, Nitrogen, Phosphorus; and
- Total Petroleum Hydrocarbons.

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 5 of 12



3 PROGRAM SCOPE

3.1 Objectives

Since November 2004, POTL has conducted a long-term marine water monitoring program at the Port of Townsville, primarily to characterise marine water in the environment within and surrounding the port; to ensure a high standard of environmental protection; and to meet relevant approval requirements and conditions. This program monitors the ambient marine water within and in the vicinity of the operational areas of the Port of Townsville in Cleveland Bay. It is designed to:

- Characterise ambient marine water in the environment within and immediately surrounding the port; and
- Identify trends across a range of environmental parameters.

This program is not designed to monitor maintenance dredging and dredge material placement activities. The Cleveland Bay Marine Water Quality monitoring program has therefore been designed and implemented to measure turbidity and light availability at a number of locations within Cleveland Bay (refer to POT 1971 Cleveland Bay Marine Water Quality (Turbidity and Available Light) Monitoring Plan) for further details).

3.2 Equipment and Methodology

Marine water monitoring is conducted via a boat with Global Positioning System (GPS) equipment to locate monitoring locations. A calibrated hand-held water quality meter is used to analyse the physico-chemical parameters. Surface water samples are collected in suitable clean, sterile sample containers and transported to a National Association of Testing Authorities (NATA) accredited laboratory where they are analysed for the remainder of the parameters.

In addition, marine water monitoring is undertaken via real time water quality monitoring buoys in Cleveland Bay. These buoys measure water parameters including temperature, conductivity and turbidity.

3.3 Monitoring Locations

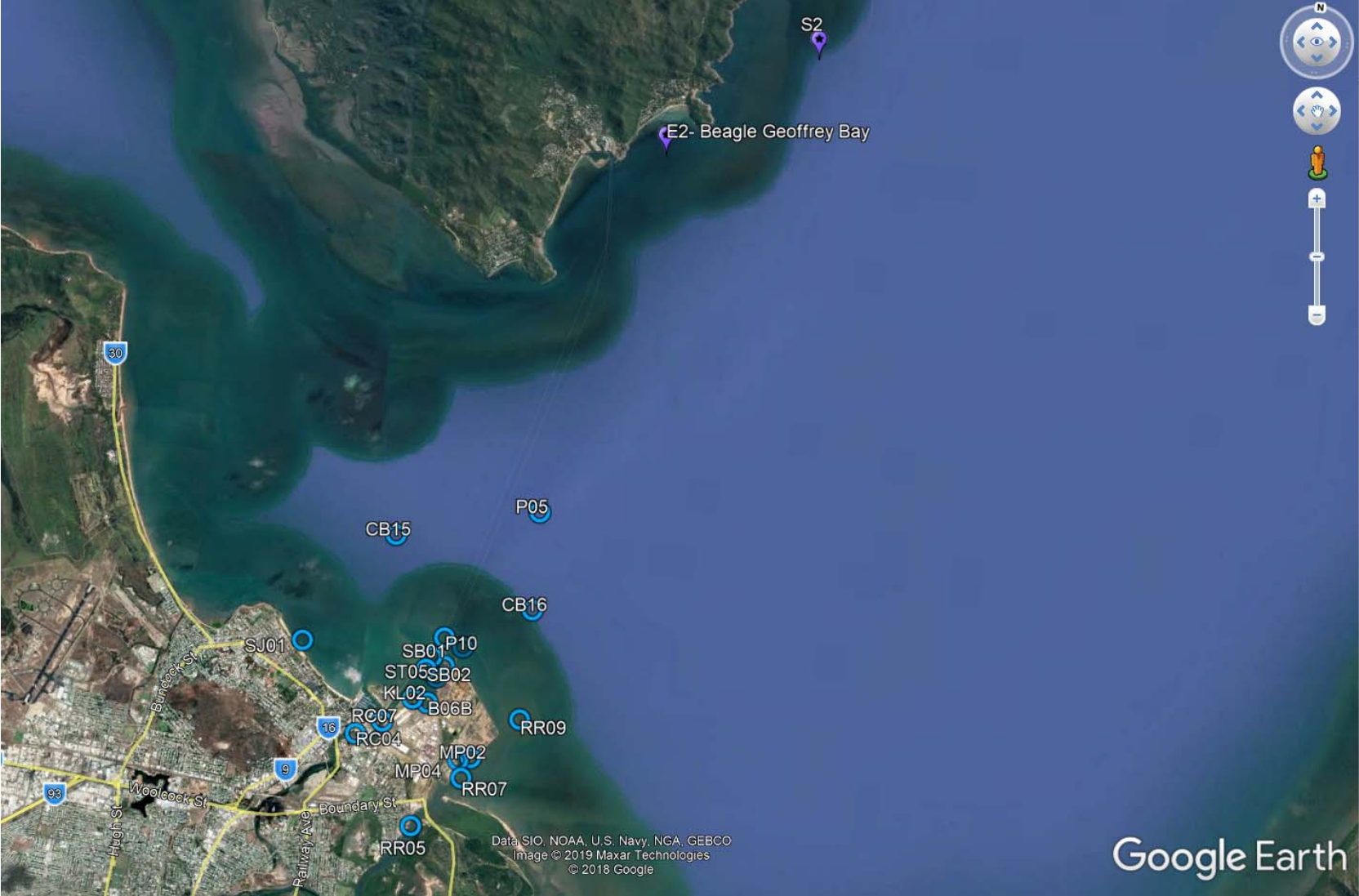
Routine grab sample monitoring is conducted at 19 locations (Figure 2). These locations have been selected to represent defined areas of port operations and maintain a similar spatial coverage as the historical marine water monitoring previously conducted at the port. Locations RC04 and RR05 represent the approximate city/port boundary between Townsville City Council and port waters. Locations SJ01 and CB15 represent assessment sites which are unlikely to be influenced by port operations and CB16 represents an assessment site downstream of port operations. GPS co-ordinates for all monitoring locations are included in Table 1.

Real time water quality is measured at 2 locations; the navigational channel marker pylon S2 in Cleveland Bay and at Geoffrey Bay, Magnetic Island (Figure 2).

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 6 of 12



Figure 2: Marine Water Monitoring Locations



© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 7 of 12



Table 1: Marine Water Monitoring Locations

Area	Location ID	Location Coordinates	
		Easting	Northing
Inner Port	B06B	482546	7871306
	KL02	482270	7871358
	SB01	482428	7871961
	SB02	482461	7871908
	SB09	482663	7871780
	ST05	482783	7871993
Outer Port	OSB01	482967	7872185
	P05	484102	7874747
	P10	482618	7872323
Marine Precinct	MP02	483430	7870401
	MP04	483206	7870338
Ross River	RR05	482361	7868892
	RR07	483179	7869842
	RR09	484127	7870998
Ross Creek	RC04	481304	7870624
	RC07	481767	7870890
Cleveland Bay	SJ01	480083	7872107
	CB15	481646	7874240
	CB16	484278	7873162
	S2	488411	7883589
	E2 - Beagle	485825	7881585

3.4 Frequency and Timing

As Townsville is located in the tropics, predominant wet/dry seasonality is experienced. The summer wet season from November to April provides approximately three-quarters of the yearly rainfall (and hence runoff). Therefore, monitoring rounds are conducted in both the wet and dry seasons. Routine grab sampling monitoring is scheduled in the following months:

- February;
- May;
- August; and
- November.

It takes one day to conduct the grab monitoring with the order of locations being dependent upon weather, tides and shipping movements. As far as practicable, routine grab sampling monitoring is undertaken on consistent tidal phases. Ideally, sampling commences on the top of the high tide just prior to Ross River and

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 8 of 12



Ross Creek draining back to the ocean. Weekend or night time sampling is avoided for safety reasons. A routine monitoring timetable is developed every year which incorporates the above considerations.

The real-time water quality buoys are deployed all year round, unless they need to be removed in natural events (e.g. cyclones) or require equipment maintenance. Raw data from the sensors is collected every 15 minutes via a data logger on the buoy and transmitted by 3G network to a data server. Data is then averaged over the hour.

3.5 Parameters

Table 2 lists the parameters monitored in this program and the associated methodology.

Table 2: Marine Water Parameters

Parameter	Relevance	Method
Turbidity	indicates suspended or dissolved particles in the water column	Field Measurement & Buoys
Electrical Conductivity	indicates presence of salts / fresh water influence	Field Measurement & Buoys
Temperature	measures temperature	Field Measurement & Buoys
Water Clarity	indicates clarity of water column	Field Measurement (secchi)
pH	identifies presence of acids or alkaline substances	Field Measurement
Dissolved Oxygen	indicates chemical or biological activity	Field Measurement
Oxygen Reduction Potential	indicates changes in a system	Field Measurement
Barometric Pressure	measures atmospheric pressure	Field Measurement
Visible Gross Pollutants	identifies presence of pollutants	Field Observation
Visible Oils + Grease	identifies presence of oil-related pollutants and trigger if PAH analysis is required	Field Observation
Suspended Solids	identifies degree of catchment disturbance or variety of particulate pollutants	Laboratory Analysis
Total Metals/Metalloids Suite (Arsenic, Cadmium, Chromium, Copper, Lead, Nickel and Zinc)	indicates total concentration of metals/metalloids in the water column	Laboratory Analysis
Dissolved Metals/Metalloids Suite (Arsenic, Cadmium, Chromium, Copper, Lead, Nickel and Zinc)	indicates dissolved concentration of metals/metalloids in the water column.	Laboratory Analysis
Total Nitrogen + Ammonia + Oxidised Nitrogen	indicates total concentration and amount available for direct plant/algal uptake	Laboratory Analysis
Total Phosphorus + Filterable Reactive Phosphorus	indicates total concentration and amount available for direct plant/algal uptake	Laboratory Analysis

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 9 of 12



4 MARINE WATER OBJECTIVES

Results from the marine water monitoring program are compared against the objectives listed in Table 3.

Table 3: Marine Water Objectives

Parameter	ANZECC 2000 Marine Water 95% Guideline for "slightly to moderately disturbed systems"	QWQG 2009 – Central Coast, Enclosed Coastal	Ross River – Townsville Port Sub-Zone Waters
Turbidity		6 NTU	<4.9 NTU
pH	7.0 to 8.5	8.0 to 8.4	8.2 to 8.5
Dissolved Oxygen	>6.0 mg/L*	90-100% saturation	90-105% saturation
Suspended Solids		15 mg/L	13-22-34 mg/L
Dissolved Cadmium	0.7 µg/L		0.7 µg/L
Dissolved Chromium	4.4 µg/L		<4.4 µg/L
Dissolved Copper	1.3 µg/L		<1.3 µg/L
Dissolved Lead	4.4 µg/L		<4.4 µg/L
Dissolved Nickel	7 µg/L		<7 µg/L
Dissolved Zinc	15 µg/L		<15 µg/L
Ammonia as N	910 µg/L	8 µg/L	<20 µg/L
Total Nitrogen as N		200 µg/L	<220 µg/L
Total Phosphorus as P		20 µg/L	<30 µg/L

5 REPORTING

A preliminary assessment of the data is undertaken after each monitoring event, with a detailed data and trend analysis undertaken annually.

6 REVIEW

This program is subject to regular review and refinement to ensure it remains fit for purpose. As a minimum, this review occurs every three years.

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 10 of 12



7 REFERENCES

ANZECC 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

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

EPP (Water) 2019. *Environmental Protection (Water and Wetland Biodiversity) Policy 2019: Ross River Basin and Magnetic Island Environmental Values and Water Quality Objectives Basin No. 118 including all waters of the Ross River Basin, and adjacent coastal waters (including Magnetic Island)*. Department of Environment and Science, Brisbane.

POTL 2019. *POT 1791 Cleveland Bay Marine Water Quality (Turbidity and Available Light) Monitoring Plan*. Port of Townsville Limited, Townsville.

QWQG 2009. *Queensland Water Quality Guidelines*. Department of Environment and Heritage Protection, Brisbane.

WetlandInfo 2019. *WetlandInfo Facts and Maps*. Department of Environment and Science, Brisbane.
<http://wetlandinfo.des.qld.gov.au/wetlands/facts-maps>.

8 DEFINITIONS AND ACRONYMS

ANZECC	Australian and New Zealand Environment and Conservation Council
EPP (Water)	<i>Environmental Protection (Water and Wetland Biodiversity) Policy 2019</i>
GPS	Global Positioning System
ID	Identification Number
NATA	National Association of Testing Authorities
NQ	North Queensland
POTL	Port of Townsville Limited
QWQG	Queensland Water Quality Guidelines

© Port of Townsville Limited A.C.N. 130 077 673	Document Type	Plan	Document No.	POT 1569
Only electronic copy on server is controlled. To ensure paper copy is current, check revision number against entry in Qudos - Master Document List			Revision	5
			Date	04/11/2019
			Page	Page 11 of 12

