Port of Townsville Limited

Townsville Marine Precinct

Initial Advice Statement

1 July 2008

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List of Acronyms

ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
BOM	Australian Bureau of Meteorology
CAMBA	China-Australia Migratory Bird Agreement
CBD	Central Business District
CHMP	Cultural Heritage Management Plan
CP & M	Coastal Protection and Management Act
DPA	Dugong Protection Area
DPIF	Department of Primary Industries and Fisheries
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environment Protection Agency
EPBC	Environment Protection and Biodiversity Conservation Act
EPP	Environmental Protection Policy
ERA	Environmentally Relevant Activity
FHA	Fish Habitat Area
GBRWHA	Great Barrier Reef World Heritage Area
GBRMP	Great Barrier Reef Marine Park
IAS	Initial Advice Statement
JAMBA	Japan-Australia Migratory Bird Agreement
POTL	Port of Townsville Limited
RE	Regional Ecosystem
SDPWOA	State Development and Public Works Organisation Act
SSC	Suspended Sediment Concentration
TAM	Townsville Access Mapping
TCC	Townsville City Council
ToR	Terms of Reference
WHA	World Heritage Area

List of Abbreviations

Cd	Cadmium
Ha	Hectares
Hg	Mercury
Km	Kilometres
Pb	Lead
QLD	Queensland

1. Introduction

1.1 Project Background

The Port of Townsville presently extends over a wide coastal stretch within the major regional centre of Townsville on Queensland's east coast. In response to the ongoing and increasing development pressure in this region, together with increased recreational, industrial and port commercial traffic Port of Townsville Limited (POTL) proposes to develop a commercial and recreational Marine Precinct (hereafter called the Townsville Marine Precinct).

A Marine Precinct concept at the mouth of the Ross River has been proposed in various forms since the mid 1970's. Through development of the Townsville Marine Precinct, POTL seeks to address key issues such as a preference to relocate older commercial marine facilities away from expanding inner city residential precincts, an opportunity to provide alternative mooring space for private and commercial vessels currently moored upstream of the proposed Port Access Road bridge, the desirability of co-locating marine-related commercial industries in a purpose-built facility with best practice environmental management infrastructure, and an opportunity to relocate the recreational boat ramp facility currently on Sir Leslie Thiess Drive.

The proposed Townsville Marine Precinct will require the reclamation of lands on Lot 773 and EP2211. The total area of the precinct will be approximately 34 hectares (ha), extending south from the Benwell Road Beach (Figures 1 and 2).

With increasing trade and commercial growth in Townsville, strategic planning activities have focussed on consolidation of existing old commercial marine facilities spread around Ross Creek and South Townsville into a new, purpose-built facility on Ross River incorporating current best practice environmental management. It is intended that this development will precede the completion of the proposed Port access road and rail infrastructure upgrade.

At a local level, the Townsville Economic Gateway Strategy (2006) recognises the Port of Townsville as being central to the region's economy and the focus of trade for the North. This strategy presents a vision for revitalisation of the Townsville CBD, strategic upgrades of the Townsville Port, a new marine industries precinct on Ross River (the subject of this IAS), the Townsville State Development Area and the Townsville Port Eastern Access Corridor that will link industrial activity in the State Industrial Area and western minerals province to the Townsville Port. It identifies a series of projects that aim to progressively relocate industrial activities from areas of proposed inner city residential expansion and revitalisation to purpose-built industrial sites at the Port and the city boundaries.

At a State level, the Northern Economic Triangle Infrastructure Plan (2007 – 2012), prepared by the Department of Infrastructure and Planning, recognises Townsville's place alongside Mount Isa and Bowen in an economic triangle for mining, mineral processing and industrial development. The Plan objectives, strategies and actions are aimed at realising the vision for an economic triangle through the provision of infrastructure, skills development and leadership capable of underpinning major private sector investment. The Plan provides a commitment to "facilitate broad economic and social development of Townsville by adoption and implementation of the Townsville Economic Gateway Strategy".

The Townsville City-Port Strategic Plan (2007), prepared by the Department of Infrastructure, aims to provide a shared vision for an effective and sustainable interface between Townsville's Port area and the adjacent city area. It highlights the desirability of 11 proposed development projects in the City-Port interface area, including the Townsville Marine Precinct project.

1.2 Project Proponent

The proponent for the Townsville Marine Precinct is Port of Townsville Limited (POTL). As Proponent, POTL is responsible for gaining all relevant approvals necessary to facilitate the development of the Project.

1.3 Purpose of Document

This Initial Advice Statement (IAS) seeks to address requirements of Section 27 (a) of the *State Development and Public Works Organisation Act 1971* (SDPWOA). That is, it provides relevant information about the Project to public and advisory government agencies at the local, State and National level. This will allow key stakeholders to determine the nature and level of interest in the Project and accordingly:

- Assist the Coordinator General in making a determination regarding the declaration of the Project's status;
- Facilitate the preparation of Terms of Reference (ToR) for an Environmental Impact Statement (EIS) for the Project; and
- Identify relevant statutory approvals that may be required for the proposal to proceed, such as Environmentally Relevant Activities (ERAs) and approval under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.

1.4 Scope of Document

This IAS has been prepared for POTL, for the purpose of identifying environmental, cultural and community issues and regulatory approvals required prior to development of the Townsville Marine Precinct (the Project). This IAS is intended to scope potential impacts that will be investigated in detail, prior to obtaining relevant approvals for the Project. The ToR for the EIS will be developed based on the outcomes of this report, the requirements of relevant government agencies and public submissions from key stakeholders and the general community.

2. Description of the Project

2.1 Location

The Port of Townsville is located within the dry tropics of the north Queensland coast. Townsville's Port represents a gateway facility not only for the adjoining Great Barrier Reef World Heritage Area (GBRWHA), Magnetic Island and the surrounding coastal environments, but also inland northern Australia. The Port of Townsville is situated at the mouth of the Ross River in Cleveland Bay, an area that is defined by Cape Pallarenda, Cape Cleveland and includes Magnetic Island. The proposed Townsville Marine Precinct will be situated at the mouth of the Ross River in Cleveland Bay. A locality map is provided in Figure 3.

Similar to many other port facilities throughout the world, the Townsville Port has evolved as a dynamic industrial area. The Port lies entirely within the GBRWHA in Cleveland Bay and is characterised by a sensitive marine and estuarine ecosystem including a Dugong Protection Area 'A' (DPA). It is adjacent to the Great Barrier Reef Marine Park, a Fish Habitat Area (FHA) pending gazettal by the Department of Primary Industries and Fisheries (DPIF) and other sensitive habitats such as seagrass beds, mangrove forests and fringing coral reefs, although many of these are some distance from the operating Port.

The Port of Townsville is almost wholly comprised of reclaimed land. The present Port Operations Precinct is situated adjacent to the central business district (CBD), which contains a significant concentration of commercial, administrative, service and cultural facilities. The Ross Creek Precinct also comprises part of the CBD. The area extending from the Ross River Precinct to Cape Cleveland is considered to be of high ecological and conservation value although the Ross River itself is a significantly modified environment. From 1951 to 1960, sand was dredged from the Ross River mouth and used in reclamation work on Port land. Between 1968 and 1980 over three million cubic metres of sand was removed from the Ross River estuary and pumped ashore for reclamation of land (Pringle, 1989). Maintenance dredging is ongoing in the Ross River channel to maintain navigability for the fishing fleet, which was moved from Ross Creek to Ross River in 1983.

A key challenge for development of the Townsville Marine Precinct is to balance protection of the natural resources of this region with growing demands of regional industry.

2.2 Project Need and Justification

Investigations into the potential for a Marine Precinct in this location have been documented since 1977. The industries proposed for consolidation in the Townsville Marine Precinct are the slipways, vessel maintenance facilities and associated marine service industries currently scattered around South Townsville and Ross Creek. Since the Project was first envisaged, new environmental management and marine park legislation have been gazetted, and trade and commercial activities in Townsville have grown considerably. There is a pressing need to either upgrade or relocate the older facilities, many of which are now situated in inner city and residential areas as the city has grown and provide capacity for new marine-related activities. A new purpose-built facility will provide an opportunity to co-locate similar marine-dependent industries in the one place and will enable the provision of best practice environmental management infrastructure.

The location of existing marine commercial industries does not allow for potential growth for a range of reasons, some of which are identified below:

- Residential encroachment;
- Water depth restrictions;
- Restricted slipway access because there is no multi-user facility;
- Noise restrictions on hours of operation because of the proximity of residential communities;
- Limitations on adjacent land available for expansion that have resulted in a number of operators spreading their operations over several sites or restricting growth;
- Environmental constraints associated with the cost of retrofitting existing facilities to meet increasingly stringent standards;
- Remote wharf facilities causing inefficiencies because of time lost through travel between sites and the need to spread supervisory staff across a number of sites;
- Costs incurred in the maintenance of floating plant and delays to implementing maintenance because of current inefficiencies in lift-out facilities;
- Load limits on hired wharves; and
- Limited waterfront access.

Because these industries are no longer compatible with the inner city residential lifestyles, the potential for conflict between land uses will only increase the longer they remain in the old locations.

POTL has undertaken an initial demand analysis to identify those industries that may relocate to the Townsville Marine Precinct and opportunities for new industries. The following feedback was received from a survey of marine industries:

- The lack of suitable land to relocate existing marine-related industries has to date seriously impacted the ability of the marine industry to properly service the needs of its clients and to grow its business commensurate with other growth in the region;
- The Townsville Marine Precinct would generate significant employment opportunities;
- Construction of the Townsville Marine Precinct would allow for the expansion of existing contracts and permit the marine industry to bid for larger projects which could include mechanical and electrical fit-out of vessels, servicing of tugs and other Port vessels, expanded boatbuilding and repair activities and construction, fabrication and assembly work associated with larger regional marine-related projects;
- The Townsville Marine Precinct could lead to investment by marine industry participants in a new leisure boat “rack and stack” operation providing covered storage for recreational boats; and
- The safe storage of and servicing of luxury vessels would greatly enhance the commercial viability of the local marine industry.

POTL has appointed a Transaction Manager who will assist POTL in understanding the options available for delivering the facility and the best way to structure and package a development proposal in order to make it financially viable for potential developers. The process of economic investigation will proceed in parallel with environmental investigations during the EIS phase.

The region's economic growth extends from its diversified economy. Townsville/Thuringowa is the most populated centre in north Queensland and the administrative centre for the region. POTL has justified the proposed development, on the basis that the following benefits will be derived:

- Provision of a Townsville Marine Precinct sheltered from prevailing wind and waves where commercial marine activities from Townsville can be consolidated, and provision made for growth;
- Provision of a sheltered swing basin for commercial vessels;
- Provision of an area in Ross River for relocation of the existing trawler fleet and private vessels on upstream pile moorings and for future growth (pile moorings), which is expected to be substantial. The relocation of trawlers and private vessels on pile moorings needs to occur prior to completion of the bridge linking the Port Access Road to Townsville Port.
- Restriction of westward longshore sediment transport into the navigation channel and subsequent reduction in the requirement to dredge in the longer term;
- Provision of a mooring area for vessels currently on buoy moorings in Ross Creek and at anchor in the 'duckpond'; and
- Relocation of recreational boat ramp facilities and parking from Sir Leslie Thiess Drive and consequent reduction of non-commercial vessel traffic through the harbour.

2.3 Development Components

The concept master plan for the proposed Townsville Marine Precinct incorporates onshore and offshore elements, which are listed below. A concept layout is presented as Figure 1. The two breakwater options represent putative maximum and minimum configurations of a protective breakwater. Hydrological and sediment transport investigations during the EIS phase will assist in the location and configuration of a final breakwater design. No further reclamation or development on the eastern side of Ross River is planned beyond the provision of breakwater pile moorings and dredging to provide access to the pile moorings.

- **Access to the Precinct:** A dedicated access point will be provided from Benwell Road. The final design of the access is still under negotiation with the QLD Department of Main Roads in relation to the Port Access Road/Benwell Road interface.
- **Volunteer Coastguard:** The relocation of the Coastguard office and mooring is proposed for this area, providing an opportunity for the public to log their trips before departure and efficient departure in the event of an emergency.
- **Private pile moorings:** The inside of the breakwater will accommodate a minimum of 53 pile moorings relocated from upstream in Ross River. There will be the opportunity for provision of additional pile moorings at a later date should demand arise.
- **Trawler berths:** Approximately 40 trawler berths and two trawler maintenance berths are proposed for the Townsville Marine Precinct.
- **Boat ramps and car/trailer parking bays:** Public boat ramps and a 200-space parking area will be provided to replace those on Sir Leslie Thiess Drive. The new boat ramp will provide a sheltered environment for recreational boats entering Cleveland Bay.
- **Marine industry allotments**: A commercial slipway, barge ramp, ship-lift, docking facility and associated marine facilities are proposed for the Townsville Marine Precinct. An area at the

northern end of the precinct will allow for access and manoeuvrability of large vehicles (including delivery vehicles and straddle lifts). A swing basin will be central to the industry allotments. A rack and stack vessel storage system is being considered as an option by one of the commercial operators.

- **Services:** The full range of site services including power, water, sewerage, stormwater drainage and telecommunications will be provided to the proposed development. Due to evolving legislative changes to wastewater requirements in the GBRWHA, a sullage pump out facility may be required.
- **Breakwater**: Putative maximum and minimum configurations are illustrated in the concept layout (figure 2). Hydrological, sediment transport and other investigations to be undertaken during the EIS phase will inform the design process and allow the best possible final configuration to be determined. A breakwater is needed to:
- Provide shelter for the commercial marine area and pile moorings from prevailing wind and waves;
- Provide a sheltered swinging area for commercial vessels;
- Provide a sheltered departure point to Cleveland Bay for smaller recreational boats;
- Restrict westward longshore sediment transport into the navigation channel and reduce the requirement to dredge the Ross River channel in the longer term;
- Provide an effective barrier between the common use areas and the sensitive environmental areas to the east; and
- Allow sand to accrete on the eastern side of the wall to provide an alternative migratory bird roosting and nesting area.

2.3.1 Breakwater Development Options

At present, two principal design options are being investigated, excluding the 'no breakwater' option. Options considered for this IAS are outlined below.

If the Townsville Marine Precinct is to proceed, the 'no breakwater' option is not an acceptable option for the following reasons:

- No protected anchorage in which to moor boats from upstream on pile moorings;
- No protection for pile moorings from flood flows in Ross River;
- No protection for the Townsville Marine Precinct from wind and waves;
- No protection for the navigation channel from longshore sediment flow; and
- No barrier to increased access to the sensitive environmental areas in eastern Cleveland Bay

Option 1: Longer more distant breakwater option

This is the preferred option but it will be investigated fully during the EIS process along with other options. Potential advantages of this option include:

- A large area available for pile moorings (for upstream vessels) including an allowance for growth;
- Protection for moored vessels during flood events in Ross River (pile moorings would be located out of the main flow channel);

- Protection for moored vessels from boat wash from vessels motoring up Ross River;
- Channel width sufficient for a swing circle by large vessels that may use the Townsville Marine Precinct in the future (not including ships); and
- Potential to provide a sandy beach adjacent to the shore on the east bank, as a replacement dog walking/recreation area for Lot 773.

Option 2: Shorter, closer breakwater option

Option 2 has a number of limitations/disadvantages but it will be investigated fully during the EIS process. Potential disadvantages of this option include:

- Limited allowance for increased demand for pile moorings;
- Decreased protection (less than option 1) for moored vessels during flood events in Ross River, as they would be moored closer to the main flow channel;
- Less protection from boat wash from vessels motoring up Ross River;
- Channel width too small for a swing circle by larger vessels that may use the Townsville Marine Precinct in the future (not including ships); and
- Limited or no potential to provide a sandy beach area adjacent to the shore on the east bank, as a replacement dog walking/recreation area for Lot 773.

2.3.2 Dredging

POTL undertakes an approved program of maintenance dredging to maintain the navigability of channels, within the Port area, including Ross River. The Ross River channel dredging program is sufficient to provide access for the commercial, Defence and recreational vessels that currently use Ross River. It is not anticipated that development of the Townsville Marine Precinct will increase the requirement for maintenance dredging. On the contrary, provision of a breakwater on the eastern side of the development is expected to reduce the requirement for maintenance dredging of the Ross River channel in the longer term.

Potential dredge volumes are presented in Figure 2. Capital dredging will be required for the initial development of the Townsville Marine Precinct to obtain the necessary depth for vessel movements. Capital dredging will also be required to provide a swing basin and mooring area for the pile moorings adjacent to the breakwater. The depth and volume of dredge material will be determined by final design after further investigation during the EIS phase. Dredging will vary across the hatched areas i.e there will be a channel, swing basin and pile mooring area dredged initially to cater for existing vessels on pile moorings relocated from upstream. The requirement for further capital dredging will be driven by demand for additional pile moorings.

Dredge spoil will be used as reclaim fill for the Townsville Marine Precinct (Lot 773). The preferred method of dredging to reclaim would ordinarily be to use a cutter suction dredge discharging through pipes directly into the reclamation area. Any material that is determined unsuitable as engineering fill may be extracted with an excavator rather than cutter suction dredge.

Offshore dumping may be considered for the disposal of unsuitable fill though this is not a preferred option. The EIS will include a review of both onshore and offshore disposal options, with the potential impacts of both options feeding into the considerations for the preferred breakwater configuration.

2.3.3 Road Access

The proposed Townsville Marine Precinct will continue to be accessed via Benwell Road, a locally controlled road currently under jurisdiction of POTL. The two lane bitumen sealed road provides the main access to the Port. A new access intersection from Benwell Road to the proposed public boat ramps will be constructed as part of the Benwell Road/Port Access Road interface.

2.3.4 Drainage and Stormwater

The Project area is the eventual drainage location for much of the areas stormwater and overland surface water flow discharge from South Townsville and the Port. An existing stormwater pipe drains into Lot 773 on EP 2211 from Archer Street under Benwell Road. The asset was constructed in 1963 and is owned by Citiworks. There are approximately ten stormwater drains located along the length of Benwell Road adjacent to the Project site. The stormwater management needs of the Townsville Marine Precinct and interface with the existing system will be investigated during the EIS process and incorporated into a properly designed stormwater management system in compliance with the *Environmental Protection Act 1994* and the Environment Protection (Water) Policy 1997 (EPP Water).

2.3.5 Water Supply

Townsville Access Mapping (TAM) (TCC's Online GIS system) indicates that potable water is supplied via a 300 mm diameter asbestos cement pipeline to the Port along Benwell Road. Citiwater owns the asset, which was constructed in 1969. The potable water needs of the Townsville Marine Precinct, and interface with the existing system, will be investigated during the EIS process and later detailed design phases.

Figure 1 Project location and concept layout

Figure 2 Maximum potential dredge volumes

Figure 3 Locality Plan

3. Legislation Approvals and Other Requirements

3.1 Overview

POTL is required to give due consideration to the likely environmental impacts of the proposal having regard to various national, State and local legislation, guidelines and policies. The Townsville Marine Precinct project will require a complex, multi-government approval process. This section of the IAS is not intended to provide an extensive legal review of the Proponent's obligations, but rather to identify legislation, policies, guidelines and other relevant documents for the environmental management of the Project.

3.2 Commonwealth Legislation

3.2.1 Environment Protection and Biodiversity Conservation Act, 1999 (Commonwealth)

In accordance with the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) an approval from the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) must be sought prior to undertaking an action, which has, would have, or is likely to have, a significant impact (as defined in the Act) on a matter/s of National Environmental Significance (NES). An action includes a project, development, or undertaking of an activity or series of activities. This Act provides automatic protection for World Heritage Properties by ensuring that an environmental impact assessment process is followed for proposed actions that will, or are likely to, have a significant impact on World Heritage values of a declared World Heritage property.

POTL considers that the Project will need to be referred to the DEWHA. If the DEWHA determines that the Project is likely to have a significant impact on a matter of national environmental significance, then the Project (or an element of the Project) will be determined to be a "controlled action" requiring a form of environmental assessment (including an EIA) and approval at the Commonwealth level. POTL will seek to utilise the accreditation given under the EPBC Act to the EIS process under the *State Development and Public Works Organisation Act 1971* (SDPWOA).

The Proponent will seek approval for development relative to Matters of National Environmental Significance that may be impacted, which include:

- Sections 12 and 15A (World Heritage properties);
- Sections 18 and 18A (Listed threatened species and communities); and
- Sections 20 and 20A (Listed migratory species) of the EPBC Act

3.2.2 Great Barrier Reef Marine Park Act 1975 *(*Commonwealth*)*

A Marine Parks Permit will be required under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act) where an activity has potential direct or indirect effects on the GBRMP. Where an application is made under the GBRMP Act, the Great Barrier Reef Marine Park Authority (GBRMPA) will consider the *Sea Dumping Act*, *National Ocean Disposal Guidelines for Dredged Material*, *Great Barrier Reef Marine Park Regulations 1983* and any GBRMP policies.

3.2.3 Environment Protection (Sea Dumping Act) 1981 (Commonwealth)

The *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act) was enacted to fulfil Australia's international responsibilities under the London Convention of 1972 and has been amended to implement the 1996 Protocol to the London Convention (which Australia ratified in 2001).

In accordance with the Protocol, Australia is obliged to prohibit ocean disposal of waste materials considered too harmful to the marine environment and regulate the permitted dumping of wastes at sea to ensure the environmental impact is minimised, (for example with dredge spoil or the disposal of vessels or platforms).

The Sea Dumping Act regulates the deliberate loading and dumping of wastes and other matter at sea. It applies to all vessels, aircraft or platforms in Australian waters and to all Australian vessels or aircraft in any part of the sea.

The Sea Dumping Act is administered by the DEWHA. The Sea Dumping Act applies in respect of all Australian waters (other than waters within the limits of a State or the Northern Territory), from the low water mark out to the limits of the Exclusive Economic Zone.

Only material that is deemed to be clean under the '*National Ocean Disposal Guidelines for Dredged Material'* (2002) will be disposed at sea.

3.3 State Legislation

3.3.1 State Development and Public Works Organisation Act 1971 (Qld)

POTL will seek Significant Project status under section (26)(1)a of the *State Development and Public Works Organisation Act 1971* (SDPWOA). The SDPWOA empowers the Coordinator General to facilitate and coordinate a project with "Significant Project" status. The Coordinator General is responsible for administering the EIS process including an evaluation of the EIS and the preparation of a report. The Coordinator General is empowered to make certain recommendations, as well as, to state conditions of approval that must be imposed under certain approval processes.

In the case of the Project, it is POTL's expectation that these conditions would relate to:

- Any development approval required under the *Integrated Planning Act 1997* (IPA), using the Integrated Development Assessment System (IDAS);
- The granting of, or conditions to be imposed on, any other approvals under other Acts that require the preparation of an EIS, or similar statement to address environmental effects.

Once the Coordinator General has completed the EIA process under the SDPWOA, project approvals may be granted in accordance with the relevant legislation.

3.3.2 Environmental Protection Act 1994 (Qld)

Sections 36 and 37 of the *Environmental Protection Act 1994* (EP Act), notes that all persons have a duty of care to the environment. Therefore, it is not permissible to cause environmental harm (as defined in the Act) whilst undertaking any activity unless all reasonable and practical means are taken to minimise that harm.

Under the EP Act, a marine industry (boat repairs etc) would require a licence to conduct an Environmentally Relevant Activity (ERA), as it has a high potential to impact on the environment. ERAs

are usually industrial activities with the potential to release contaminants to the environment and have been defined in Schedule 1 of the *Environmental Protection Regulation 1998*.

Levels of Environmentally Relevant Activities

There are two levels of ERAs:

Level 1 ERAs are considered to present a higher risk to the environment. There is an annual fee for level 1 ERAs.

Level 2 ERAs are considered to present a lower risk to the environment than level 1 ERAs. There are no ongoing fees for level 2 ERAs.

ERAs (excluding mining and petroleum activities) are required to have obtained development approval or a code of environmental compliance (where one has been approved for a particular ERA or certain aspects of a particular ERA) and a registration certificate.

The EP Act outlines the scope and content for preparing environmental protection policies to protect Queensland's environment. These policies may be made about the environment or anything that affects or may affect the environment. It should also be noted that all subordinate legislation to the Act, such as the Environmental Protection Policies are binding and compliance with such policies is required.

3.3.3 Environmental Protection (Noise) Policy, 1997 (Qld) (EPP Noise)

The Project is likely to generate noise, attributed to construction, maintenance, commissioning and operation of the development and dredging activities. However, the Proponent is advised of the requirements outlined under the EPP Noise and the *AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites*.

Key reference sections within the policy, that would need to be addressed by the Project include:

- Section 11- Acoustic quality objectives;
- Part 3- Evaluation procedure and the approval of a Draft EMP;
- Part 4- Measures for noise nuisance control;
- Part 6- Procedures for noise assessments; and
- Schedules 1 and 3- Planning levels for particular noise generating works.

3.3.4 Environmental Protection (Air) Policy, 1997 (Qld) (EPP Air)

The aim of this policy is to identify environmental values to be protected or enhanced, specify air quality indicators and provide a framework for decision-making. Future development undertaken by the proponent within the Townsville Marine Precinct must fulfil obligations prescribed under the EPP Air Policy.

3.3.5 Environmental Protection (Water) Policy, 1997 (Qld) (EPP Water)

The policy provides a framework for decision making about Queensland waters that promotes efficient use of resources, best practice environmental management and involvement by the community.

Under Sections 31 and 32 of the EPP Water Policy, the proponent must be aware that deposits or release of materials into a watercourse, or an area with the potential to be washed into a watercourse is prohibited, unless prior approval is obtained.

3.3.6 Environmental Protection (Waste Management) Policy (2000)

The Waste EPP provides a strategic framework for managing waste in Queensland. Objectives of this policy are achieved by establishing a preferred waste management hierarchy and principles for achieving good waste management, which should be applied by both government and industry (Refer to Sections 8-13 and Schedule 1 of the Waste EPP). The waste hierarchy ranges from the most preferred to the least preferred method: waste avoidance – waste reuse – waste recycling – energy recovery from waste – waste disposal.

The principles for achieving waste management objectives include:

- The polluter pays principle - all costs associated with waste management should be borne by the waste generator;
- The user pays principle - all costs associated with the use of a resource should be included in the price of goods and services developed from the resource; and
- The product stewardship principle - the producer or importer of a product should take all reasonable steps to minimise environmental harm from the production, use and disposal of the product.

The Waste EPP also defines the required contents of waste management programs (Refer to Sections 18-21 of the Waste EPP), which POTL may be required to implement as a condition of an environmental licence for an ERA.

3.3.7 Aboriginal Cultural Heritage Act 2003 (Qld)

The *Aboriginal Cultural Heritage Act 2003* and the *Torres Strait Islander Cultural Heritage Act 2003* were enacted on 16 April 2004. Underpinning the Act is a 'cultural heritage duty of care', which requires that a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage.

The Act establishes a framework for the conduct of assessment of cultural heritage impact and processes to be undertaken in preparing a Cultural Heritage Management Plan. Where an EIS is required for a project under any legislation, a Cultural Heritage Management Plan (CHMP) must be prepared and accepted by both POTL and the Traditional Owner representatives.

3.3.8 Coastal Protection and Management Act 1995 (Qld)

The *Coastal Protection and Management Act 1995* (CP&M Act), as amended from 20 October 2003, repeals the *Harbours Act 1955, the Canals Act 1958* and the *Beach Protection Act 1968*. Provisions from these repealed Acts have been integrated into the CP&M Act and other Government statutes. The CP&M Act includes provisions to continue permissions and approvals given under the older coastal legislation. An assessment under the CP&M Act may be triggered in relation to assessable development within tidal waters. This includes disposal of dredge material within tidal areas and construction within tidal areas.

3.3.9 Transport Infrastructure Act 1994 (Qld)

Under the *Transport Infrastructure Act 1994*, POTL is required to have a Land Use Plan that outlines proposed operational works or tidal works, reclamation, change of use for buildings and excavation permits within Port land. POTL currently has a new Land Use Plan in preparation. The Project is consistent with the new draft Land Use Plan.

3.3.10 Integrated Planning Act 1997 (Qld)

The *Integrated Planning Act* 1997 (IPA) regulates 'development' (as defined in the Act). In relation to the Project, assessment under IPA would be triggered if:

- The proposed development constitutes a 'Material Change of Use' and is inconsistent with a Land Use Plan approved under Section 171 of the *Transport Infrastructure Act 1994;* and
- Development involving coastal works.

Pursuant to provisions of the IPA, approval would be required for both the dredging works and ocean disposal of the dredged material. Any reclamation proposed will also require an IPA approval.

3.3.11 Fisheries Act 1994 (Qld)

Any Project works that disturb marine plants will require approvals under the *Fisheries Act 1994* and *Integrated Planning Act 1997.*

The Department of Primary Industries and Fisheries (DPIF) is the administering body for these approvals and maintain an interest in the proposed works in relation to:

- Any temporary or permanent disturbance to protected marine plants and tidal fish habitats;
- Any temporary or permanent waterway barrier works (i.e. barriers to the movement of fish between fish habitats);
- Achieving offsets for any disturbances to fish habitats or tidal land; and
- Ensuring the adoption of best practice construction and environmental management techniques to minimise impacts to fish habitats.

Other legislation that may need to be addressed for this Project, depending on the nature of proposed works, include:

- *Water Act 2000 (Qld);*
- *Vegetation Management Act 1999 (Qld);* and
- *Nature Conservation Act 1994 (Qld).*

3.4 Local Planning Scheme - Townsville City Plan

The area proposed for the Townsville Marine Precinct (Lot 773) is identified as Strategic Port Land in the current (1996) Port Land Use Plan. The area proposed for location of the breakwater and pile moorings on the eastern side of Ross River is identified as proposed future Strategic Port Land in the Statement of Proposal for review of the Port Land Use Plan released for public comment in 2007.

Strategic Port Land is under the jurisdiction of Port of Townsville Limited. Consistent with the *Transport Infrastructure Act 1994*, Townsville City Council City Plan 2005 designates Strategic Port Land as 'not subject to Planning Scheme'.

4. Environmental Values and Potential Project Impacts

4.1 Introduction

The potential environmental impacts associated with this Project are those that may result from development and conduct of the construction and operation of the Townsville Marine Precinct facilities. As such, the following overview of the existing environment and an initial assessment of potential impacts are based on information drawn from previous studies undertaken within the Project area and surrounds.

4.2 Land

The Project area includes Lot 773 and areas on the eastern side of Ross River. Lot 773 is reclaimed land currently comprising a sandy beach margin with mudflats exposed at low tide. This area is held under perpetual lease by POTL and is identified as Strategic Port Land. The public has been allowed to access the beach and mudflats for recreation purposes until such time as the land is required for Port-related purposes. Current uses include fishing, yabbying, walking and dog exercise. POTL has commissioned an observational survey of the area in an effort to quantify public use.

4.3 Landscape Character and Visual Amenity

The topography of the study area is characterised by relatively flat land surface adjacent to the Ross River Channel. Landfall is from west to east, draining toward the Ross River, with ultimate discharges directed into Cleveland Bay.

The eastern Port precinct has been progressively reclaimed since approximately 1965 (Pringle, 1989). Between 1968 and 1970, 150 acres of industrial land was reclaimed on the north east bank of the Ross River estuary by pumping ashore over three million cubic yards of sand from the adjacent intertidal zone. Further developmental (capital) dredging occurred up to the late 1980s. Most of the sand was pumped ashore for land reclamation at the Port (Pringle, 1989). Since that time POTL has continued a program of regular maintenance dredging to keep the Ross river channel navigable.

The result of all the dredging and reclamation work at the mouth of the Ross River has been to move the main channel westward from its former position across the intertidal zone so it now lies almost due north of the mouth (Pringle, 1989).

The highest elevation (0.6m AHD) occurs along the existing road network (Benwell Road) of the Project area, on the edge of the existing shoreline (www.msq.qld.gov.au).

The geology of the area, as illustrated on Geological Sheet SE 55-14 for Townsville, 1:250,000 (geological map) is generally Quaternary Period alluvium and colluvium, Toomba basalt from the Cainozoic Era.

The soils of the area are described as alluvial delta plains with a complete pattern of present and prior stream channels and levees. The dominant soils consist of loamy or fine sandy brown earths, which occur on the older flatter levees (Murtha, 1975). Coastal tidal flats, mangrove flats, saltpans and grasslands - silt, mud, sand and minor salt pans characterise the Project area.

4.4 Transport and Infrastructure

In 1996/97, a study into a new port access road/rail link from the eastern bank of Ross River was commissioned. This link, now known as the Port Access Road will require new road and rail links to be built over the mouth of Ross River.

Both Boundary Street and Benwell Road form part of the 'Principal Road Freight Network' as defined in Townsville City Council's City Plan 2005. A future access route to the site will be via the Stuart Bypass and proposed Port Access Road. The proposed Port Access Road Corridor will provide a direct transport connection along part of Benwell Road and across Ross River to the State Development Area. No transport infrastructure currently exists on the Project site. Construction of the Stuart Bypass and Port Access Road is expected to commence in August 2008.

4.5 Climate/Natural Disasters

Located within a dry tropical region, Townsville is characterised by a tropical wet and dry climate. During the wet season (November to April), Townsville experiences high humidity and frequent storms with occasional cyclones, while the dry season (May to October) produces mild and moderate temperatures. Temperatures range from an average maximum of 31.4 °C in December/January to an average minimum of 13.6 ° C in July. Relative humidity is highest in the morning and monthly averages range between 60% during September/October and up to 74% in the summer months (www.BOM.gov.au).

Wind speed is highest in the afternoon and is predominantly onshore, from the northeast during the wet season and the southeast during the dry season. Monthly wind speed averages vary between 18 km/hr in June and 23.5 km/hr in September.

There are three key elements of the climatic characteristics of the Townsville region that influence aspects of the design, construction and maintenance of port infrastructure. These are:

- Potential for cyclonic rains and wind and periodic heavy rains (erosion and sedimentation issues);
- Prevailing wind conditions (dust generation and desiccation of plants) during construction; and
- Monsoonal dry season inhibiting plant growth and subsequent requirement for irrigation of landscaping.

Tropical cyclones have the potential to develop from late December until early April and can lead to major flooding and beach erosion. The average frequency of cyclones affecting Townsville is estimated to be 1.78 events per season. Storm surges often occur during the passing of a tropical cyclone, causing flooding of low-lying coastal areas and the potential for severe wave action acting on coastal structures.

Extreme events may have impacts on coastal structures within the Townsville Marine Precinct. Further studies will be undertaken to assess the potential impacts of extreme events on the Project. These impacts may include damage to buildings and property and potential risk to human lives.

As a mandatory requirement in cyclone prone areas, all development must comply with minimum engineering and construction standards to withstand such forces. These standards must be met by all future development within the Townsville Marine Precinct.

An evacuation route within the Townsville Marine Precinct will be identified to provide safe passage during an emergency event. A site-specific Disaster Action Plan will be developed to address response measures in the event of a natural hazard such as a storm, flood or cyclone.

4.6 Surface Waterways

The Townsville region is a diverse catchment area with a series of approximately forty small creeks and river catchments collecting from Mt Elliot, Hervey and Paluma Range escarpments in the west and running to the coast in the east.

Flooding occurs within the Ross River with flow velocities generally high. There is little development on the floodplain, due to its high risk of flooding and water-logging. Flood flows have been modified due to existing transport infrastructure.

The database of the National Land and Water Resources Audit has assessed:

- The Ross River estuary as being 'extensively modified'; and
- The Ross River basin as being 'moderately modified'.

4.7 Coastal Environment

4.7.1 Coastal Processes

Sediment transport in coastal environments is driven by the prevailing combination of wind, waves and tides, with storm events capable of causing large-scale change. In particular, the occurrence of tropical cyclones, which can generate extreme wind and wave conditions, can lead to very high rates of sediment deposition in the Port's waterways. Additionally, the longer wavelengths of swell waves make them more important than wind waves to the transport of suspended sediment within the Bay (Lou and Ridd, 1996)

The creation of berth pockets and a breakwater will result in an alteration to the seabed bathymetry in this area. In turn, this is likely to affect the hydrodynamic processes and local sediment dynamics. In addition to the possible changing orientation of adjacent foreshores, waves can re-profile the beach slope itself.

Previous studies have confirmed that reclaimed land and breakwaters have interrupted sediment transport. A significant amount of longshore drift sediment is trapped by Platypus Channel, necessitating regular dredging (Pringle, 1989). The potential impacts of the proposed Project on coastal processes in the study area will be quantitatively explored through detailed hydrodynamic and sediment transport modelling, commissioned as part of the EIS.

4.7.2 Hydrodynamics

Cleveland Bay is a shallow, north-easterly facing bay and is approximately 15 km wide and 15 km in length. The Bay is bounded by Cape Cleveland to the east and Magnetic Island to the west. These topographical features have a defining role in shaping the local wave climate, tidal hydrodynamics and ocean water levels on the foreshore and near-shore regions of Cleveland Bay. The Great Barrier Reef, which is located approximately 70 km offshore, contributes further to the attenuation of oceanic swell entering into the Bay. The topographic and bathymetric features mentioned above heavily influence the amount of wave energy reaching the Townsville shoreline. At its seaward limit, Cleveland Bay is approximately 12 metres deep. Seabed approach slopes through the Bay to local foreshores are very mild.

In the vicinity of the Townsville Harbour Ross River area, tidal currents are affected by the reclamation of land into the bay. Research undertaken by Riedel and Byrne (1983), concluded that the beaches to the

east of the mouth of the Ross River have been unstable and have eroded at an average of 1 m per year and that holes dredged east of the Port for reclamation sediment were rapidly refilled by sediment shifting southwest from the delta. In 2003, GHD also undertook an investigation of sedimentation in this area. Whilst the study related to a different Townsville Marine Precinct layout than that currently proposed, the findings remain relevant as a guide. Additional sediment modelling will be undertaken in relation to the new layout during EIS investigations.

Further hydrodynamic modelling will also be undertaken in order to assess any impacts at the river mouth during normal tide, flood or storm events. Reference will need to be made to the Townsville-Thuringowa Storm Tide Study (GHD and SEA, 2007).

4.7.3 Marine Sediment

Cleveland Bay is characterised by land-derived sediments that have been deposited by numerous creeks and rivers in the region. Original sediment yield from the Ross River has been variously estimated as being between 68,000 tonnes per year (Sinclair Knight Merz, 1996) and 330,000 tonnes per year (Belperio, 1978). These sediments have been described in previous studies as being comprised of varying amounts of sand, mud, massive or bedded grey mud up to 4 m thick and cross-bedded delta sediments of pre-existing tidal and river channel systems.

Underlying stiff clay is present throughout much of the coastal region and is the result of coastal weathering. Maunsell McIntyre undertook a geotechnical survey of the proposed site in 1999. Ground conditions to RL -3.0 were found to consist mainly of clayey to silty sand, fine to medium grained of loose consistency with some pockets of soft clay encountered near the Ross River channel. Stiff and hard sandy clay was found below RL -4.0.

Cleveland Bay is a highly turbid environment, due to its shallow depth, predominance of very fine terrigenous sediments that are easily resuspended and its exposure to the south easterly trade winds (Larcombe and Wolfe 1999). Suspended sediment concentrations (SSC) near the seabed in the Bay have been measured at a maximum of approximately 300 mg/L, with an SSC of 100 mg/L occurring on around 20 days each year (Anderson *et al.* 2002). Under moderate to rough sea conditions, Cleveland Bay is subject to SSCs of between 5 and 20 mg/L. Typical open-water spring tidal currents are too weak to stir bottom sediments within the Bay (Ridd and Orpin, 2001). Only in close proximity to headlands, and under significant spring tidal conditions has resuspension been observed (B. Kettle, pers obs.).

The EIS will reference previous studies relating to background measurements and dredging within Cleveland Bay. Relevant conclusions of these studies include:

- Most sedimentation occurs within several hundred metres of dredging activities;
- Sediment plumes remain visible for more than 4 hours (possibly 6);
- In prevailing light southerly winds, plumes of fine sediment may reach sensitive habitats and may cause sedimentation and light attenuation problems (depending on the point of origin of the plumes); and
- In rough conditions plumes are likely to dissipate to background levels more quickly and wave action is likely to ameliorate sedimentation problems (Ridd and Orpin, 2001).

Heavy metal accumulation and distribution is an important environmental measure for POTL. In 2007, Muciano Virto undertook core sediment analysis to identify heavy metal (Pb, Hg, Cd) distribution across Cleveland Bay. The study of surface samples and the cores concluded that despite the anthropogenic

pressure in Cleveland Bay metal concentrations are at mostly pristine levels, although a slight influence of the port is seen in metal concentrations at the south and south-east part of the bay.

POTL has established a program to monitor the sediment quality in the high and intensive use areas of the harbour, Ross Creek, Ross River and port access channels. Further investigations by POTL are currently planned to identify the proposed site sediment profile and background turbidity conditions.

4.7.4 Marine Water Quality

Research conducted to date shows that water within Cleveland Bay is typical of shallow bays, and that many natural and anthropogenic processes that occur may influence water quality conditions. The shallow depth of the bay, coupled with the muddy terrigenous nature of the central bay facies and its exposure to southeast wind-wave events can result in naturally high suspended sediment concentrations. Water and sediment analyses show isolated instances of pollutants above guideline values, primarily in the Ross Creek, Ross River and Harbour regions of the Port.

Blue green algae (*Trichdesmium sp.)* often bloom in the Bay as they do along other parts of the Queensland coast. Casual factors include warm, still water conditions during the late dry season and early wet season. Sediment and nutrient loss from rural industries and the consequent effects upon terrestrial runoff quality have been identified as significant issues. POTL undertakes a regular program of water quality monitoring. Baseline water quality values have been collected adjacent to the proposed Townsville Marine Precinct. The proposed Precinct will adopt a similar protocol with a focus on industry-specific issues for water quality management.

4.8 Terrestrial Ecology

4.8.1 Terrestrial Flora

The Project area is listed as a ‘non remnant’ Regional Ecosystem (RE) by the Queensland EPA, see Appendix A.

Of significance to the Project area is the riparian mangrove vegetation. Mangroves form extensive stands on the southern portion of Cleveland Bay and also occur along the banks of Ross River. The Townsville Marine Precinct development will involve the removal of mangrove species, which will require a permit under the *Fisheries Act 1994 (Qld).*

4.8.2 Terrestrial Fauna

Within and surrounding the Project area; numerous common and invasive species are likely to occur as the habitat is a highly modified environment. The EPBC Protected Matters Search Tool identified numerous threatened and migratory species that may occur within the area. These species are detailed in section 5. Within a 2 km buffer of the Project site, the Queensland EPA has recorded the presence of:

- 181 bird species;
- 14 mammals; and
- six reptiles.

An extensive search in the specific Project area, lot 773 and the proposed breakwater area across Ross River will be undertaken during the EIS phase.

4.8.3 Terrestrial Pest Management

A number of introduced terrestrial flora and fauna species are likely to occur within the Project area. Species that have been identified as introduced and naturalised within the Project region by the EPA are listed in Appendix B. An invasive species management plan will be developed for the Project region, to reduce opportunity for proliferation and to maintain the ecological integrity of the Project area.

Invasive fauna species potentially occurring in the Project area (9 species) include the following:

- Cane toad (*Bufo marinus*)
- Rock dove (*Columba livia*)
- Nutmeg manikin (*Lonchura punctulata*)
- House sparrow (*Passer domesticus*)
- Common starling (*Sturnus vulgaris*)
- Common myna (*Acridotheres tristis*)
- Dog (*Canis familiaris*)
- House mouse (*Mus musculus*)
- Black rat (Rattus rattus)

Invasive weed species potentially occurring in the Project area (35 species) include the following:

- *Barleria lupulina*
- *Aerva javanica*
- Gomphrena weed (*Gomphrena celosioides*)
- *Alternanthera ficoidea*
- Rubber vine (*Cryptostegia grandiflora)*
- Wild aster (*Aster subulatus*)
- *Gamochaeta pensylvanica*
- *Eleutheranthera ruderalis*
- *Helitropium indicum*
- *Crotalaria pallida var. obovata*
- Siratro (*Macroptilium atropurpureum*)
- Butterfly pea (*Clitoria ternatea)*
- Jerusalem thorn (*Parkinsonia aculeate*)
- *Drymaria cordata subsp. Cordata*
- *Merremia quinquefolia*
- *Ipomoea hederifolia*
- *Argyreia nervosa*
- *Ipomoea triloba*
- Dwarf poinsettia (*Euphorbia cyathophora*)

- *Jatropha gossypiifolia*
- *Indigofera tinctorial*
- Purpletop chloris (*Chloris inflata*)
- Fountain grass (*Pennisetum setaceum*)
- *Passiflora foetida*
- Hyptis (*Hyptis suaveolens)*
- Summer grass (*Digitaria ciliaris)*
- *Sida cordifolia*
- *Prosopis glandulosa var.glandulosa*
- Small-fruited devil's claw *(Martynia annua)*
- Indian jujube *(Ziziphus mauritiana)*
- Scoparia *(Scoparia dulcis)*
- Devil's fig *(Solanum torvum)*
- *Cyperus compressus*
- Mackie's pest *(Chrysopogon aciculatus)*
- *Urochloa subquadripara*

4.9 Aquatic Ecology

4.9.1 Overview

Cleveland Bay, its coastline and Magnetic Island have significant environmental and natural resource values. The processes associated with an active trading port imply a degree of impact in contrast to the values assumed as a WHA, which highlights the need for robust environmental assessment and monitoring.

The Ross River estuary is a significantly modified environment. Extensive capital dredging for land reclamation has been undertaken since the period 1951-1960, with the peak activity between 1968 and 1980. The proposed project area (Lot 773) is reclaimed land. Although annual maintenance dredging has been undertaken in the Ross River channel since at least 1974, the proposed Townsville Marine Precinct will alter the current marine environment adjacent to the dredged channel and therefore create an impact. Direct disturbance associated with the construction of a breakwater, relocation of sediments from dredging, disposal of dredged material (if disposed offshore), removal of habitat, and indirect impacts associated with a localised and temporary reduction in water quality caused by the mobilisation of sediments in the water column, can be expected.

Mobile marine fauna are better able to avoid impacted areas for the duration of dredging activities compared to sessile species such as corals and other invertebrates. Habitat disturbance is a concern and mitigation measures to ensure these impacts are reduced will be implemented during consideration.

Threatened marine and migratory species impacts will be investigated during the EIS program.

Given the extensive prior disturbance, it is unlikely that any endangered ecological communities exist either within or adjacent to the footprint of the proposed development. Marine plants including macro algae, seagrasses and mangroves are protected under the *Fisheries Act 1994 (Qld)*. A permit will be sought under Section 55 of the Fisheries Regulation 1995 if removal is required.

4.9.2 Mangroves

A narrow fringe of mangroves lines the upper shore of the proposed Project area (Lot 773). This shoreline strip is not sufficiently wide to enable zonation characterising the mangrove communities. Mangrove habitats can be highly productive environments that support a diversity of species. It is anticipated that the mangroves on Lot 773 (which have grown since earlier reclamation of this site in the late 1960s) and on the eastern side of the Ross River mouth will require removal for the construction of a breakwater and Townsville Marine Precinct facilities.

4.9.3 Seagrass

The distribution, community composition and density of seagrass meadows in Cleveland Bay fluctuate seasonally and in response to a range of environmental influences (Lee Long *et al.* 1993). The seagrass habitats within this region are of high ecological significance and provide a regionally important foraging habitat for threatened species as noted above and economically important fishery species. The primary locations within Cleveland Bay for seagrasses tend to be in areas that are less than 4 m in depth , between the mainland and Magnetic Island, and adjacent to Cape Cleveland (Lee Long *et al*. 1993, Lee Long *et al.* 1996). Most research has been focussed on intertidal species within the Bay; however, sub-tidal seagrasses have previously been mapped. It is highly likely that seagrasses in Cleveland Bay already exist at the lower limit of their tolerance due to light attenuation and small increases in turbidity can be expected to cause mortality (Waycott *et al*. 2005).

A survey commissioned by POTL and undertaken by DPIF in October-December 2007 indicated that the closest seagrass beds were four kilometres east of the mouth of Ross River (pers comm. to POTL, Dr Michael Rasheed DPIF). During construction and operation of the Townsville Marine Precinct, careful management of Port activities (i.e. sedimentation from dredging) will aid in preventing damage to seagrasses in the Bay. The proposed inclusion of a breakwater with a return at the northern end will also act as a barrier to any sediment mobilisation eastwards and northwards into Cleveland Bay from within the footprint of the project area, once the development is complete.

4.9.4 Reef

There are no coral reefs that have been identified within the immediate Project area. Coral reefs in Cleveland Bay are located at Middle Reef and Virago Shoals, both more than six km north-west of the existing Port eastern reclaim area. Magnetic Island also supports numerous fringing reefs (Kaly *et al*. 1994, Stafford-Smith *et al*. 1994). POTL has undertaken research at these sites as part of their capital dredging program and they have been regularly monitored since by AIMS and GBRMPA in response to various projects. This data should provide an indication of trends in these habitats relative to impacts such as dredging, thus informing potential risks and appropriate management. The EIS will include measures to mitigate potential impacts to these vulnerable habitats if modelling indicates they may be at risk.

4.9.5 Benthic Communities

Kettle *et al*. (2002) reported that soft-sediment communities make up 85% of the seabed in Cleveland Bay and suggested that such communities should provide an initial stage for impact monitoring. Benthic flora and fauna communities are most likely to be impacted by dredging activities, as they are relatively immobile. In particular, the dumping of dredge spoil may smother benthic communities at the spoil ground although previous studies indicate rapid recolonisation by benthic communities of POTL soil dumping grounds. Offshore spoil dumping is unlikely at this stage as terrestrial options are currently viable.

The remobilisation of sediments into the water column during dredging temporarily reduces light penetration to flora and fauna in the plume path. These impacts are likely to be transient. Disturbance of sediments may result in the release of any contaminants that may be present into the water column, increasing their bioavailability and toxicity to marine organisms. However, sediment samples collected on a quarterly basis in POTL maintenance dredge areas in Ross River do not indicate the presence of contaminants above relevant guideline limits. Investigation of the benthic environment within the Project area will be undertaken during the EIS program.

4.9.6 Fish

Cleveland Bay is an important fish habitat area. Traditional, recreational and commercial fishing occurs within the tidal creeks and estuaries of Townsville. Target recreational fishing species include barramundi, threadfin salmon, queenfish, grunter, flathead and mud crabs (R. Baker pers comm.). The fish within the Bay have important interactions with their habitat and other species. As mobile species, they are unlikely to be significantly impacted by the Project, though assessment of the Project area will determine any sensitive habitats to fish species (i.e. breeding aggregations) and potential impacts to species of economic importance. Potential impacts to fish species and their habitat will be assessed during the investigations for the EIS.

4.9.7 Wetlands

The Bowling Green Bay Ramsar wetland area is located approximately 52 km southeast of Townsville and is listed on the Department of Environment, Water, Heritage and the Arts, '*Directory of Important Wetlands*'. Under this directory the Project area falls adjacent to the Ross River Reservoir (QLD008) and Bowling Green Bay (QLD002) (www.environment.gov). Wetlands south of the Ross River are designated as being within an Area of State Significance (natural resources) by virtue of their listing within the Queensland chapter of the '*Directory of Important Wetlands*' in Australia. If a use or activity has the potential to adversely affect this area, it must demonstrate an overriding net benefit for the State as a whole. Because of the considerable distance from the Ramsar wetland to the project area it is unlikely that the Project will have an effect on the Ramsar area.

4.9.8 Marine Pest Management

POTL acknowledges the potential introduction of marine invasive species into the Port environment through shipping and vessel transit. POTL supported a baseline survey of endemic and introduced marine species in the Port in 2001 by Neil *et al*. Results concluded that no introduced species existed at the time of survey that would detrimentally impact the surrounding ecology. More recently, detection of invasive mussel species within Australian waters has enhanced the level of concern. Marine pest management and monitoring will be further discussed in the Project EIS.

4.10 Air

At present, air quality in the port area and adjacent locations is influenced by traffic, commercial and industrial emissions. Atmospheric dust, which comprises fine dust particles that can be carried substantial distances, is the main component of emissions together with minor quantities of nitrogen and carbon oxides and residual hydrocarbons. The potential for impacts on air quality from the Townsville Marine Precinct project will be investigated during the EIS program.

4.11 Noise and Vibration

Noise can occur as a result of construction and operation activities and emissions from both stationary and transitory sources. The nature of noise emitted varies depending upon the source. Potential noise sources for the Project include the following:

- Vessel engines;
- Precinct-related activities, such as loading and unloading of vessels;
- Land reclamation;
- Dredging activities; and
- General vehicular traffic.

The impact these emissions will have on nearby sensitive receptors (such as residential dwellings), will depend upon the extent to which these emissions exceed background noise levels, which vary with the time of day. Licence requirements regarding the investigation of excessive noise are complaint driven.

Amenity of the Port and surrounding areas can be affected by the impacts of POTL activities. Impacts such as odours, dust and other air emissions, noise, traffic and visual effects can all affect the visual and physical amenity.

Surrounding land uses that may be affected include:

- Residential areas;
- Recreational and tourist areas;
- Industrial areas; and
- Commercial areas.

The potential for noise and vibration impacts from the Townsville Marine Precinct project will be investigated during the EIS program.

4.12 Waste Management

Solid, inert waste from POTL activities includes waste metal, timber, packaging materials, office waste and other general solid waste. The majority of solid inert waste is land-filled at TCC's municipal facility, although scrap metal associated with pile renewal is segregated for recycling. Waste transporters are contracted to remove this material.

There will be a need to manage the collection and containment of wastes derived from vessels berthed in the Townsville Marine Precinct or moored in Ross River. Regulated wastes generated by port users include waste oils, old batteries, oily rags, tyres, chemical containers, obsolete light fittings and sewage sludges. Regulated wastes require special disposal arrangements due to their hazardous or toxic nature.

Likely wastes generated from a Townsville Marine Precinct will be investigated during the EIS program and recommendations made for appropriate disposal.

4.13 Cultural Heritage and Native Title

The status of Native Title for the area is yet to be determined. The land surrounding the Port has significant cultural value to indigenous communities; in particular stone artefacts and shell middens are known to exist within the vicinity though not in the immediate Project site. There is also an indigenous burial reserve in a dune system at the eastern end of Cleveland Bay. The Ross River is also a feature in the indigenous cultures, bestowing myth cycles and dreamtime creation (M. Bird pers. comm.). POTL will directly consult with local indigenous communities and will develop a Cultural Heritage Management Plan (CHMP) in accordance with Part 7 of the *Aboriginal Cultural Heritage Act 2003*.

4.14 Social and Economic

Townsville is seen as the unofficial capital of North Queensland as it hosts a significant number of government, community and major business administrative offices for the northern half of the state. The Townsville region is described as moderately populated, with a regional population of approximately 143,328 people (ABS, 2008).

Recent economic performance has been very strong, with 2004-05 economic growth estimated at 12.0%. Over the last 15 years the local economy has outperformed the rest of the Queensland and Australian economy (www.townsville.qld.gov.au). Potential impacts on the regional economy as a result of the proposed development are likely to be beneficial because of improved efficiencies through co-location of marine-dependent industries, opportunities for growth and improved environmental management in a purpose-built facility. Tourism has assisted in the city's expansion, though its fundamental role is as an industrial port for exporting minerals from Mount Isa and Cloncurry, beef and wool from the western plains and sugar and timber from the coastal regions. These trades continue to be of importance to the regional economy.

The likely economic and employment benefits cannot be accurately estimated at this point in time until further investigation is undertaken (in a parallel process with the EIS). However, based on estimates prepared in 2004, a probable cost estimate for construction of the Townsville Marine Precinct may lie in the range $100M to $150M. Current direct employment in commercial marine industries is estimated at 150 employees. Social and economic benefits from development of the Townsville Marine Precinct may include the following:

- Potential new revenue streams and reduced operating costs for POTL;
- Enhanced fiscal returns for Queensland State Government via new stamp duty and land tax collections;
- Efficient and effective use of currently underutilised Port land;
- Development of substantially improved business capabilities for marine operators and generation of new employment opportunities;
- Direct and indirect (through redevelopment of lands vacated by industries that relocate to the new Townsville Marine Precinct) public infrastructure improvements for the broader community of Townsville;

- Security of future port operations and development through effective management of land use conflicts.

The State Coastal Management Plan (State Coastal Plan) commenced in February 2002 and describes how the coastal zone is to be managed as required by the *Coastal Protection and Management Act 1995.* Policies for managing the major coastal issues are detailed under a series of headings.

The State Coastal Plan provides coastal management policy direction and defines how government, industry and the community should implement these directions. Specifically, policy 2.1.1 refers to 'Areas of State Significance (social and economic)', including Strategic Port Land. Lot 773 is identified as Strategic Port Land in the current Land Use Plan and the proposed area for development across the river is identified as proposed future Strategic Port Land in the new draft Land Use Plan.

Sustainable development of the Port area is consistently supported in planning documents for the region.The Northern Economic Triangle Infrastructure Plan 2007-2012, released in August 2007, is a commitment by the Queensland Government to foster sustainable economic, social and community growth through the emergence of Mount Isa, Townsville and Bowen. As a triangle of mineral processing and industrial development, the plan integrates the activities of each economic centre through the development of strategies to support stronger regional linkages as well as enhance mining, mineral processing and industrial development in individual economic centres.

These planning documents also support the objectives of the Townsville City-Port Strategic Plan and Townsville Economic Gateway Strategy which contain a focus on the Port interface area and examine the interconnections between various projects within and adjacent to the Townsville Port.

A coordinated vision is provided by these planning instruments which holistically address the Townsville Marine Precinct requirements ensuring key infrastructure can be provided in a timely manner with minimal impediments.

4.15 Hazard and Risk

POTL operates a Safety Management Plan. POTL's Safety Management Plan deals with many aspects of hazardous materials handling and access to personnel. An appropriate Safety Management Plan will be developed to support the proposed development.

5. Matters of National Environmental Significance

5.1 World Heritage Values

The Project site is not within the boundaries of the GBRMP, but is located within the boundaries of the GBRWHA. The World Heritage Values of the Great Barrier Reef are extensive and not all apply to the Project area or the wider Cleveland Bay area. The specific criteria for which the GBRWHA was listed and those that are inclusive of elements found throughout the Cleveland Bay area, include:

- Coral reefs;
- Inter-reefal and lagoonal benthos;
- Coastal/continental islands (Magnetic Island) of exceptional natural beauty;
- Many species of coral, macroalgae crustaceans, polychaetes, molluscs, phytoplankton, fish, seabirds, mammals and reptiles;
- Seagrass meadows and mangrove ecosystems; and
- Habitats for species of conservation significance.

5.2 Ramsar Wetland

The Bowling Green Bay Ramsar wetland area is located approximately 52 km southeast of Townsville and is listed on the Department of Environment, Water, Heritage and the Arts, '*Directory of Important Wetlands*'. Under this directory the Project area falls adjacent to: the Ross River Reservoir (QLD008) and Bowling Green Bay (QLD002) (www.environment.gov). The Bowling Green Bay wetland environmental values will be addressed under the EPBC Act NES considerations, however it is assumed the distance from the Project to the Ramsar wetland is sufficiently remote to avoid potential impacts resulting from the proposed development.

5.3 Listed Threatened and Migratory Species

5.3.1 Overview

Fifty-two listed (national and state) threatened and migratory fauna species, and one threatened plant species, which may occur or have been recorded within the Project area, are listed in Appendix C. This information has been obtained from the EPBC Protected Matters Search Tool (www.environment.gov) and the Queensland Environment Protection Agency (EPA) online search tool-Wildlife Online (www.epa.qld.gov.au). The presence or absences of these listed species will be investigated during the EIS process. The number of species in each category is listed directly below, with individual species information presented in Table 1.

- Threatened plant: 1 species
- Threatened birds: 5 species
- Threatened terrestrial fauna: 5 species
- Threatened marine mammal: 1 species
- Threatened reptiles: 8 species

- Threatened/migratory shark: 1 species
- Migratory mammals: 6 species
- Migratory reptiles: 7 species
- Migratory birds (marine/terrestrial/wetland): 19 species
- Listed ray-finned fishes: 33 species
- Listed cetaceans: 12 species
- Listed seasnakes: 15 species

Table 1 below outlines species that have been identified by the EPBC Protected Matters Search Tool as potentially occurring or having suitable habitat within the Project area.

Table 1 Listed threatened flora and fauna species

Species	EPBC status	Comments
THREATENED FLORA		
Frogbit *Hydrocharis dubia*	V	An aquatic plant found in freshwater lagoons. It is unlikely this plant occurs in the Project area.
THREATENED BIRDS		
Red Goshawk *Erythrotriorchis radiatus*	V	The red goshawk has a large home range spanning between 50 and 220 square kilometres. The species is commonly found inhabiting mixed vegetation types, including tall open forest, woodland, lightly treed savannah and the edge of rainforest (Queensland Parks and Wildlife, 2006).
Australian Painted Snipe *Rostratula australis*	V	The Australian painted snipe is usually found in either permanent or temporary shallow inland wetlands, generally freshwater although brackish wetlands are also utilised. It nests on the ground amongst tall reed-like vegetation near water, and feeds near the water's edge and on mudflats, taking invertebrates, such as insects and worms, and seeds. Although the Australian painted snipe can occur across Australia, the areas of most sensitivity to the species are those wetlands where the birds frequently occur and are known to breed. (www.environment.gov.au).
Squatter pigeon (southern) *Geophaps scripta scripta*	V	The species prefer to inhabit areas with access to water, commonly in the grassy understorey of eucalypt woodland. Gravel ridges with sandy areas are also a preferred habitat. Their southern habitat has become fragmented. It is not known whether the subspecies occurs past their usual range.
Black-throated finch (southern) *Poephila cincta cincta*	E	During the wet season this species ranges between a variety of habitats, it has been recorded in 17 different regional ecosystems. Generally occupying grassy woodland made up of eucalpyts, paperbarks and acacias gaining access to grasses in seed and water (www.environment.gov.au). The finch feeds almost exclusively on native grasses however will use exotic grasses for nesting or shelter only. In the dry season is only found close to freshwater (A. Small – pers. comm.).
Star finch (eastern and southern) *Neochmia ruficauda ruficauda*	E	Star finches (endangered under the EPBC Act and the NCA) are commonly found near water on grassy woodlands. These finches are relatively sedentary and build domed nests. Historical records state that the species has been identified in Cardwell (north) and also Blackall (west). Since 1990 only four definite sightings of the star finch have been recorded.

TERRESTRIAL MAMMALS		
Northern quoll *Dasyurus hallucatus*	E	Northern quolls live in a range of habitats, but prefer rocky areas and eucalypt forests. The quoll is a good climber but spends most of its time foraging and sleeping on the ground. During the day it likes to hide in hollow logs, rock crevices, caves and hollow trees.
Semon's leaf-nosed bat *Hipposideros semoni*	E	The habitat used for foraging include rainforest and savannah woodland.
Spectacled flying-fox *Pteropus conspicullatus*	V	The spectacled flying fox inhabits rainforest regions and can be found along the north-eastern coast of Queensland.
Water mouse *Xeromys myoides*	V	The False Water Rat or Water Mouse can be found near shallow water holes close to the coastline. Commonly feeding on small crabs, shellfish and worms found in the mangrove forests.
Greater large-eared horseshoe bat *Rhinolophus philippinensis*	E	Found in North Queensland, from Townsville to Cape York. Often inhabits mine sites and caves. This species occurs in rainforest, gallery forest, tropical eucalypt woodland, Melaleuca forest with rainforest understorey, and open woodland. They forage within vegetation, at the edge of vegetation, and in gaps. Not likely to be impacted by the proposed Project.
MARINE MAMMAL		
Humpback Whale *Megaptera novaeangliae*	V/M	Deep ocean species with seasonal migration to feeding areas. Unlikely to be affected by this Project.
REPTILES		
Yakka skink *Egernia rugosa*	V	Skinks can be found in dense ground vegetation, hollow logs, fallen trees and beneath rocks of dry open sclerophyll forest/woodland. Their presence is unlikely in the Project area.
Striped-tailed delma *Delma labialis*	V	This species is endemic to Australia. On the mainland the species is found in low open forest with a grassy understorey. It is unlikely that this species occurs in the Project area.
Loggerhead turtle *Caretta caretta*	E/M	This species is known to forage within Cleveland Bay. Consideration will be required to actively address conservation concerns relating to its habitat and to mitigate for boatstrike.
Green turtle *Chelonia mydas*	V/M	This species is known to forage and nest (low density) within Cleveland Bay. Consideration will be required to actively address conservation concerns relating to its habitat and to mitigate for boatstrike.
Leatherback turtle *Dermochelys coriacea*	V/M	This species is unlikely to inhabit the Project area. It generally feeds in pelagic waters and rarely nests along the Australian coastline.
Hawksbill turtle *Eretmochelys imbricata*	V/M	Species are not common within Cleveland Bay. However, consideration will be required to actively address conservation concerns relating to its habitat and mitigate for boatstrike.
Olive Ridley turtle *Lepidochelys olivacea*	E/M	This species may be present in low numbers in Cleveland Bay (no direct records). However, consideration will be required to actively address conservation concerns relating to its habitat and to mitigate for boatstrike.

Flatback turtle *Natator depressus*	V/M	This species is known to forage and nest within Cleveland Bay. Consideration will be required to address conservation concerns relating to its habitat and to mitigate for boatstrike.
SHARK		
Whale shark *Rhincodon typus*	V/M	The proposed development is unlikely to affect this species significantly as they are widespread and migratory. Found most often in Western Australia. Unlikely to be impacted by this Project.

Note:

(EPBC) Environment Protection and Biodiversity Conservation Act, 1999: E – Endangered, V – Vulnerable, M – Migratory

5.3.2 Threatened Flora

Table 1 presents information obtained from the EPBC Protected Matters Search Tool and the Queensland Environment Protection Agency (EPA) online search tool, Wildlife Online. The frogbit (*Hydrocharis dubia),* was the only threatened terrestrial flora species listed under the EPBC Act and NCA as vulnerable and was identified as potentially inhabiting the area. Its status and the potential for impact on this species as a result of the Project are outlined above. The presence of this listed species will be investigated during the EIS.

5.3.3 Threatened Birds

Bird nesting and roosting sites are known to exist within the Project area. An investigation to determine the presence of threatened bird species in the Project site is currently underway. The results from this survey will be incorporated into the EIS and mitigation measures will be adopted where appropriate.

5.3.4 Migratory Birds

The Project area is known to support species that are listed under the JAMBA (Japan-Australia Migratory Bird Agreement) and CAMBA (China-Australia Migratory Bird Agreement). The habitats in which most migratory species have been recorded include mangroves, saltpan/saltmarsh, foredune and saltwater couch grassland. The mobile sandbar located at the mouth of the Ross River is within the Project area and is the major roosting site documented in Cleveland Bay. A noteworthy “non-shorebird” roost site (Great Egret, Cattle Egret, Sacred Ibis) is located in the tall mangroves along the southern bank of the Ross River estuary about 600 metres upstream of the proposed site. A survey by Buosi and Adkins (2005) identified the Project area as:

- A regionally significant migratory shorebird area (32 species identified); and
- Internationally significant in terms of relative proportion of total East Asian-Australasian Flyway populations of Great Knot, Greater Sand Plover and Red-Necked Stint.

The presence of a breeding population of Little Tern on the Ross River mouth sand bar, is considered noteworthy. However, the sandbar is a mobile feature and changes shape regularly with seasonal and flood influences.

Habitat loss and alteration is probably the greatest contributing factor to the decline of shorebird populations in the past century. Recreational activities and uncontrolled dogs can also disrupt the normal foraging and resting activities of shorebirds at stop-over sites. Observations by Buosi and Adkins (2005) noted that numerous small disturbances were more damaging than fewer larger disturbance events.

Some potential impacts that may result from the Project include:

- Loss of habitat –mangroves, grassland/saltpan and intertidal mud flats. These habitats will be quantified and assessed during the EIS; and
- Displacement – The sandbar and tidal habitat is considered to be a valuable roosting site, as is the adjacent egret roosting site. These habitats may be altered. However it should be noted that the sandbar is a temporary habitat subject to seasonal and flood influences.

POTL has commissioned a threatened and migratory bird species survey. The results of the survey are anticipated in time for the EIS. The EIS will review in detail the potential impacts of the Townsville Marine Precinct and mitigate for these where appropriate. For example, it is expected that sand will accumulate over time on the eastern side of the proposed breakwater. This may provide alternative habitat for roosting migratory birds. This potential will be investigated during the EIS phase.

5.3.5 Threatened/Migratory Reptiles

Six of the seven species of marine turtle are listed species and potentially occur within the waters of Cleveland Bay (Environment Australia, 2003). Cleveland Bay is known to support a foraging, nesting, breeding and migration habitat to some or all off these species. Preferred habitat types include seagrass and reefal areas, both of which are under influence of anthropogenic impacts in Cleveland Bay.

Onshore and offshore activities associated with the construction and operation of the Project such as dredging, marine construction, habitat modification and pollution run-off can impact foraging marine turtles. Mitigation measures will be investigated during the EIS to address potential impacts and protect valuable foraging habitats. Best practice dredging operations incorporate turtle exclusion devices and fauna spotters. The speed of vessel traffic is already managed in the Port limits for navigational safety. This will assist in addressing potential boat strike issues.

Estuarine crocodiles (*Crocodylus porosus*) are known to inhabit this region and occasionally visit Cleveland Bay. Estuarine crocodiles are migratory and are declared vulnerable under Schedule 3 of the *Queensland Nature Conservation Act 1992*, *Nature Conservation (Wildlife) Regulation 1994*. Their presence in the Project area is unlikely to be problematic and they are not likely to be impacted by the proposed development.

Two threatened lizard species, Yakka skink (*Egernia rugosa*) and Striped-tailed delma (*Delma labialis*) are terrestrial species and have been identified as potentially occurring within the Project area. It is unlikely that the Project area provides an ideal habitat for these species; however, their presence or absence will be determined during field investigations undertaken for the EIS.

5.3.6 Threatened/Migratory Marine Mammals

Dugong

Australia supports the global stronghold for the dugong (Marsh and Lawler, 2000); thereby providing a significant obligation to manage their conservation appropriately. Dugong feed almost exclusively on seagrass species *Halophila ovalis*, *Halophila spinulosa* and *Halodule uninervis* (Lanyon and Marsh, 1995, Sheppard *et al*. 2006). Dugong feeding trails have been observed within Cleveland Bay and they are known to migrate along the Queensland coast up to hundreds of kilometres between feeding sites. The largest aggregation of dugongs in Cleveland Bay has been observed around Cape Cleveland where extensive seagrass beds are known to occur (I. Lawler, pers comm.). Dugongs are at risk from many

threatening activities and impacts, such as seagrass dieback from flooding, or sedimentation, habitat removal, boat-strike (Groom 2004, Hodgson and Marsh 2007) and gill-netting (Marsh *et al*. 2002). Data is available on dugongs for this region with regular aerial survey monitoring being undertaken by James Cook University (Marsh and Lawler, 2001). As a coastal species, dugongs are often in conflict with anthropogenic impacts. They will require special consideration to manage potential impacts from the proposed development. There are no seagrass beds within four kilometres of the project area. The potential for impact on dugong and their habitat, and any mitigation measures, will be investigated further during the EIS program.

Dolphins and other cetaceans

The Australian snubfin dolphin is a recently described species that inhabits the waters of Cleveland Bay and coastal waters of Queensland. It is thought to be the only species of dolphin endemic to Australia and is listed as rare under the *Nature Conservation Act 1992*. This species has been observed to occur all year round throughout Cleveland Bay and has been known to frequent the waters of the Port. The Indo-Pacific humpback dolphin is also known to inhabit the waters of the Bay, year round. It has a similar distribution and is vulnerable to the same type of threats as the Australian snubfin (Para *et al*. 2006). The Indo-Pacific humpbacked dolphin has important feeding and nursing areas in the Bay, in particular the mouth of the Ross River and associated channels. Potential impacts to these species from the proposed development include noise pollution, habitat degradation and vessel strike. Other cetacean species that were identified as potentially existing in the Project area included whale species that are more likely to inhabit deeper coastal waters. It is highly unlikely that they will be impacted by the Project. All potential impacts and mitigation measures will require further investigation in the EIS process.

5.4 Environmental Management Plan (EMP)

The Townsville Marine Precinct will require a site-specific EMP that will aim to:

- Facilitate the development and operation of Townsville Marine Precinct in accordance with applicable environmental laws, policies and procedures;
- Integrate environmental considerations into the development and operation of POTLs planning;
- Provide a framework for continual improvement to environmental performance and strive for best practice; and
- Provide a platform for integration with POTL Environmental Management System (EMS).

All users of the Townsville Marine Precinct will accommodate the EMP.

5.5 Environmental Offset Opportunities

During the EIS phase POTL will investigate a series of offset opportunities in the local area where appropriate, having regard to existing approved land uses.

6. Conclusion

It is expected that any impacts resulting from this Project on the natural, social or built environment can be minimised through appropriate mitigation measures, specified in an Environmental Management Plan for the construction, operation and maintenance phases of the Project. It is POTL's vision to develop a Townsville Marine Precinct, which balances the need for economic development whilst achieving sustainable environmental outcomes.

Consultation with the relevant State and Commonwealth Government agencies will be undertaken to identify the scope of the environmental impact assessment. A Draft ToR for an EIS will be prepared and advertised for public comment. Agency and community comments will then be incorporated into a Final ToR for the EIS.

7. References

Anderson, C., Battershill, C. Carter, RM., Cruz-Motta, JJ., Doherty, G., Ericson, G., Evans-Illidge, E., Haynes, D., Hesse, A., Jones, GB., Larcombe, P., Lough, J., Neil, K., Orpin, A., Reichelt-Brushett, AJ., Ridd, P. Roche, M., Veitch, V. 2002. *Cleveland Bay, Townsville, Queensland Australia. Status Report.* Cleveland Bay Consortium, Townsville.

Australian Bureau of Statistics. www.abs.gov.au: Website accessed on January 15th 2008.

Belpario, AP.1978. *An inner-shelf sedimentation model for the Townsville region, Great Barrier Reef province.* PhD thesis, Geology Department, James Cook University of North Queensland, Townsville, Australia.

Buosi, P. and Adkins, A. (Natural Resource Assessments) 2005. *Townsville Port Access Project: Migratory Bird Impact Assessment*. Technical report for Qld Rail.

Bureau of Meteorology. www.BOM.gov.au: Website accessed on January 15th 2008.

Department of Environment, Water, Heritage and the Arts. www.environment.gov.au: Website accessed on January 15th 2008.

Department of Infrastructure 2007. *Northern Economic Triangle Infrastructure Plan 2007 – 2012 and Townsville City-Port Infrastructure Plan.* Department of Infrastructure, Brisbane.

Department of Infrastructure and Planning. www.infrastructure.qld.gov.au: Website accessed on January 15th 2008.

Environment Australia. 2003. *Recovery plan for marine turtles in Australia.* Environment Australia, Canberra.

Environment Protection Authority. www.epa.qld.gov.au: Website accessed on January 15th 2008.

GHD Pty Ltd. 2001 prepared for Townsville Port Authority.

GHD Pty Ltd. 2003. *Commercial Marina Inner Model: Preliminary Results*. Report to the Townsville Port Authority.

GHD Pty Ltd. 2007 prepared for Townsville and Thuringowa City Councils.

Groom, RA., Lawler, IR., and Marsh, H. 2004. *The risk to dugongs of vessel strike in the Southern Bay Islands area of Moreton Bay.* School of Tropical Environment Studies and Geography, James Cook University. Unpublished Report to the EPA.

Hodgson, AJ. and Marsh, H. 2007. Response of dugongs to boat traffic: The risk of disturbance and displacement. *Journal of Experimental Marine Biology and Ecology* 340: 50-61.

Kettle, B., Dalla Pozza, R. and Collins, J. 2002. *New Directions. A review of the impacts of dredging in Cleveland Bay, and research priorities for the next decade.* Report prepared for:Townsville Port Authority Dredge Spoil Disposal Technical Advisory and Consultative Committee., Townsville.

Lanyon, JM. and Marsh, H. 1995. Temporal changes of some tropical intertidal seagrasses in North Queensland. *Aquatic Botany* 49: 217 -237.

Larcombe, P., and Woolfe, KJ.1999. Increased sediment supply to the Great Barrier Reef will not increase sediment accumulation at most coral reefs. *Coral Reefs*, 18: 163-169.

Lee Long, WJ., Mellors, JE., and Coles, RG. 1993. Seagrasses between Cape York and Hervey Bay, Queensland, Australia. *Australian Journal of Marine and Freshwater Research* 44: 19-31.

Lee Long, McKenzie, LJ., Roelofs, AJ., Makey, LJ., Coles, RG., and Roder, CA. 1996. *Baseline survey of Hinchinbrook Region seagrasses. October (spring) 1996. Research Publication 51*, Great Barrier Reef Marine Park Authority, Townsville.

Maritime Safety Queensland. www.msq.qld.gov.au: Website accessed on January 15th 2008.

Marsh, H. and Lawler, IR. 2000. *Dugong distribution and abundance in the northern Great Barrier Reef Marine Park - November 2000*. Report for the Great Barrier Reef Marine Park Authority. Townsville. (Public access)

Marsh, H. and Lawler, IR. 2001. *Dugong distribution and abundance in the southern Great Barrier Reef Marine Park and Hervey Bay: Results of an aerial survey in October – December 1999*. Report for the Great Barrier Reef Marine Park Authority. Townsville. (Public access)

Marsh, H., Penrose, H., Eros, C. and Hugues, J. 2002. *Dugong status report and action plans for countries and territories*. UNEP, Nairobi. (Public access)

Maunsell McIntyre, 1999. *Proposed marina geotechnical report*. Report for the Townsville Port Authority.

Murtha, G.G. 1975. *Soils and land use on the northern section of the Townsville coastal plain, north Queensland*. CSIRO. Melbourne.

Neil, KM., Sheaves, J., Cruz, JJ., Hoedt, FE., and Choat, JH. 2001. *Port baseline surveys and surveys for introduced marine pests: the Port of Townsville Final Report*. CRC Reef Research Centre and JCU Marine Biology and Aquaculture report to the Townsville Port Authority.

Parra, GJ, Corkeron, PJ., and Marsh, H. 2004. Population sizes, site fidelity and residence patterns of Australian snubfin and Indo-Pacific humpback dolphins. *Journal of Animal Ecology*. 75:862 – 874.

Pringle, A.1989. *The history of dredging in Cleveland Bay, Queensland and its effects on sediment movement and on the growth of mangroves, corals and seagrass.* Great Barrier Reef Marine Park Authority, Townsville, Australia.

Ridd, P. and Orpin, A. 2001. *Water and sediment movement in Cleveland Bay*. In : Roche, M. and Anderson, C. (eds.), Cleveland Bay Status Review (DRAFT) Report to the Cleveland Bay Consortium.

Riedel and Byrne Pty Ltd.1983. *Preliminary design of breakwaters for the 105 ha Benwell Road reclamation*. Report to the Townsville Harbour Board.

Sheppard, JK., Lawler, IR., and Marsh, H. 2007. Seagrass as pasture for seacows: Landscape-level dugong habitat evaluation**.** *Estuarine, Coastal and Shelf Science* 71, Issues 1-2, 117-132.

Sinclair Knight Merz, 1996. *Beach Erosion Issues*. Report to the Townsville Port Authority, March 1996.

Stafford-Smith, MG., Kaly, UL. And Choat, JH. 1994. Reactive monitoring (short term responses) of coral species of coral species. In: Benson JL, Goldsworthy, PM., Butler IR. And Oliver, J. (eds.) Townsville Port Authority Capital Dredging Works 1993: Environmental Monitoring Programme. Townsville Port Authority, Townsville (pp 23-53).

Townsville City Council, www.townsville.qld.gov.au: Website accessed on January 15th 2008

Townsville City Council 2006. Townsville Economic Gateway Strategy. Townsville City Council, Townsville.

Waycott, M., Longstaff, BJ., and Mellors, JE. 2005. Seagrass population dynamics and water quality in the Great Barrier Reef region: A review and future research directions. *Marine Pollution Bulletin* 51: 343-350.

Appendix A

Regional Ecosystem Map

Appendix B

EPA Search Results

Appendix C

Listed Species

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	R Groom	J Keane	JAK	J Keane	JAK	05/02/2008
B	R Groom	J Keane	JAK	J Keane	JAK	22/02/2008
0	R Groom	J Keane	JAK	J Keane	JAK	03/03/2008
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