City Pacific Limited

Townsville Ocean Terminal Hazard & Risk Assessment

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Contents

1 Executive Summary

The Hazard and Risk Assessment describes the potential hazards and risk that may be associated with the Project.

Environmental values both external and internal, to the development likely to be affected by any hazardous materials and actions incorporated in the Project have been addressed and are defined in Section 3 of this report. The degree and sensitivity of risk has been detailed in the Project Risk Register.

An analysis has been conducted into the potential impacts of both natural and induced emergency situations defined in Section 4 of this report, and counter disaster and rescue procedures defined in Section 5 of this report. This analysis is based on the effects of the Project on sensitive areas and resources including water resources, State and local Government controlled roads, places of residence and work, and recreational areas.

This report defines and describes the objectives and practical measures for protecting people and places from hazards and risk, describing how nominated quantitative standards and indicators may be achieved for hazard and risk management. This is addressed in Section 2 of this report. Monitoring, auditing and management of achievement of the objectives is cross-referenced to the Environmental Management Plan (EMP).

An appropriate hazard and risk assessment has been undertaken to determine the level of risk associated with all social, economic and environmental issues associated with the construction activities that have been identified by studies and investigations undertaken for preparation of the EIS. These results are presented in the Project Risk Registers contained in Appendix A and Appendix B.

The risk assessment has been conducted in accordance with AS/NZS Risk Management Standard 4360:1999 to identify the key issues to be addressed in the EIS and the level of mitigation required.

After analysis of all identified risks and application of risk treatment measures, the following items were identified as having high residual risk.

Construction Risks:

- CL1 - Strong winds caused by tropical cyclones or low pressure systems;
- TT3 - Noise associated with haul routes;
- CM6 - Dredge spoil unsuitable as fill material; and
- CM13 - Construction workplace health and safety impacts.

Operation Risks:

- CL1 - Strong winds caused by tropical cyclones or low pressure systems;
- CL5 - Increased frequency and intensity of cyclones due to climate change;
- AI1 - Emission of gaseous pollutants from existing and future Port operations; and

CM7 - Parklands settlement.

These risks will be carefully monitored in both the construction and operation phases and management strategies required by the EMP will be reviewed on an ongoing basis and modified where necessary to ensure health and safety aspects are managed.

2 Introduction

This hazard and risk assessment has been undertaken in consultation with all specialist consultants to identify potential impacts and the level of risk associated with the project. The following issues have been has assessed by specialist studies and investigations and are considered in the risk assessment as detailed in the Project Risk Registers for Construction and Operation.

- All relevant major hazards both technological and natural (Project Risk Register – Construction and Operation);
- Risks to public safety, the environment and property posed by impact of tropical cyclones, particularly the effects of storm tide inundation (Project Risk Register –Sections 4.1, 4.7, and 4.17 and the Health and Safety and Coastal Engineering Reports);
- The risk of impacts on terrestrial and aquatic environments and significant ecological values (Project Risk Register - Section 4.11 and the Nature Conservation Report);
- The risk of impacts on the socio-economic environments (Project Risk Register – Sections 4.13, and 4.15 and the Social Impact Assessment and Economic Impact Assessment Reports);
- Description of processes, type of the machinery and equipment used (Project Risk Register – Section 4.17 and the Construction Methodology Report);
- All health and safety aspects of any work to which the proposed Project relates (Project Risk Register - Section 4.14 and the Health and Safety Report);
- Hazards and risks associated with working in an operational port environment and close to local fishing areas (Project Risk Register - Section 4.11 and the Nature Conservation Report);
- Hazards and risks associated with proposed helicopter operations (Helicopter operations are no longer proposed therefore not included in the Risk Register);
- Impact to and from existing Port operations including operation of existing major hazard facilities (Project Risk Register - Sections 4.8, 4.10, 4.14, and 4.15 and the Air Quality Assessment, Noise and Hazards and risks associated with operation of the TOT facility including increased visitation of cruise ships and navy vessels (Project Risk Register - Sections 4.5, 4.8, 4.10, 4.11, 4.13, 4.14, and 4.15 and the Waste Management, Air Quality Assessment, Noise and Vibration Assessment, Nature Conservation, Health and Safety and Social Impact Assessment Reports);

- Arrangements for removal or decommissioning upon completion of construction or operation (Project Risk Register – Construction Section 4.17 and the Construction Methodology Report);
- Counter disaster and rescue procedures in the event of major natural hazards and other emergency situations (Project Risk Register – Section 4.14 and the Health and Safety Report);
- The possible frequency of potential hazards, accidents, spillages and abnormal events occurring during all stages of the Project (Project Risk Register – Section 4.7 and the Coastal Engineering Report);
- Indication of cumulative risk levels to surrounding land uses (Project Risk Register and all specialist studies and investigations);
- Licensing requirements and compliance with the relevant standards (EIS Section 1.6).
- Life of any identified hazards (Project Risk Register and all specialist studies and investigations);
- Potential wildlife hazards such as crocodiles, snakes and disease vectors (Nature Conservation Report, Health and Safety Report); and
- Public liability of the State for private infrastructure (e.g. any electricity lines, water supply pipeline, telecommunication facilities, but not major infrastructure) and visitors on public land (Project Risk Register - Section 4.4 and the Infrastructure Report).

The Project Environmental Management Plan (EMP) contained in Chapter 5 of the EIS and this Hazard and Risk Assessment addresses the following components.

- Operational hazard analysis (Project Risk Register – Operation);
- Regular hazard audits (incorporated in the Project EMP).;
- Fire safety, emergency response plans (Health and Safety Report, incorporated in the EMP, addressed in Section 4 of this report);
- The requirements of the State Coastal Management Plan are addressed in the Coastal Engineering Report (Project Risk Register - Sections 4.7); and
- Qualitative risk assessment (addressed in Section 2 of this report); and Construction safety (Construction Methodology Report and the Project EMP).

Section 6 of this report provides an inventory for the anticipated classes of substances listed in the Australian Dangerous Goods Codes to be held onsite. Management of Dangerous and Hazardous Substances are also addressed in the Construction Methodology and Health and Safety Reports and the Project EMP. Details have also been provided of:

- safeguards proposed on the transport, storage, use, handling and onsite movement of the materials to be stored on-site contain in the Construction Methodology and Health and Safety Reports and the Project EMP;
- the capacity and standard of bunds to be provided around the storage tanks for classified dangerous goods and other goods likely to adversely impact upon the environment in the event of an accident in the Construction Methodology and Infrastructure Reports and the Project EMP; and
- the procedures to prevent spillages, and the emergency plans to manage hazardous situations in the Construction Methodology Report and the Project EMP).

The methodology used in undertaking this Hazard and Risk Assessment is outlined in Section 3 of this report. A discussion of the results of the assessment is provided in Section 8.

3 Methodology

A hazard and risk assessment consistent with the AS/NZS *Risk Management Standard* 4360:2004 has been conducted by Hyder Consulting for the TOT Project. The risk management process is the systematic application of management policies, procedures and practices for the tasks of communicating, establishing the context, identifying, analysing, evaluating, treating, monitoring and reviewing risk. Risk assessment is the process of analysing and evaluating risk. It entails estimating risk in terms of likelihood of occurrence and the severity consequence, combining these elements to obtain a level of risk and comparing this level against predetermined criteria.

Risk analysis is about developing an understanding of the risk. It provides an input to decisions on whether risks need to be treated and the most appropriate and cost-effective risk treatment strategies. Risk analysis involves consideration of the sources of risk, their positive and negative consequences and the likelihood that those consequences may occur.

The objectives of an environmental risk analysis are to provide information to:

- how big the risks are;
- allow the risks to be prioritized;
- obtain information to decide whether a risk is tolerable; and
- make informed decisions about treating risks.

The analysis should provide data to assist in the evaluation of risks and in separating minor tolerable risks from the major risks.

Risk analysis techniques include:

- qualitative assessment;
- semi-quantitative assessment; and
- quantitative assessment.

The risk assessment methodology for this EIS uses a qualitative process for determining risk. The qualitative process estimates the degree of the consequence and probability, then determines a risk rating based on these estimates. The risk rating allocated to each description does not have to bear an accurate relationship to the actual magnitude or likelihood of the consequences (as per Section 2.5.3 of Australian Standards, 2006). The

estimates used in this analysis were derived are based on specialist reports and professional judgements.

The risk assessment methodology used to analyse and evaluate the risks is described in detail in Section 2.1. The ratings of consequence, probability and resultant risk rating have been developed using the following risk analysis tables, based on the Austalian Standard (AS/NZS *Risk Management Standard* 4360:2004) and the Australian Standards HB 203:2000 *Environmental risk management – Principles and Process*).

The attached Project Risk Registers (Appendix A and B) provides a summary of the risks associated with the Project. Each risk has been assigned an alphanumeric identifier relevant to the description in Section 4 of the TOT Project Terms of Reference.

Each risk is given a risk rating based on the Likelihood and Consequences of the risk as per Sections 2.1, 2.2, 2.3, 2.4 below. Mitigation measures have also been detailed for each risk.

3.1 Identify Impacts and Consequences

In order to conduct an initial risk assessment, potential impacts have been identified for each aspect of the Project. In this qualitative level of analysis, the magnitude of potential consequences and likelihood of the consequences occurring are described in words. The initial risks were derived from the project consultants reports.

It is not possible to directly compare the impacts from a diverse range of project aspects (for example, comparing air quality impacts to turbid plumes impacts). Therefore, relative consequences must be judged according to different criteria, as discussed below.

For example, in the case of turbid plume, the relative consequence should be assessed by evaluating such factors as:

- persistence;
- concentration;
- duration of the plume;
- proximity to sensitive environments;
- area of marine waters affected; and

- taking into account secondary consequences and existing mitigation measures.

The potential consequences must be judged using all available information.

For this risk assessment, five levels of consequences severity have been used – insignificant, minor, moderate, major and catastrophic. The definitions used to assess relative consequences have been adopted from HB 203:2006 *Environmental risk management – Principles and Process*, as shown in Table 2.1. The table provides a consistent method of assessment that can be applied by different personnel and at different times.

Table 2.1 Consequence ratings

Area Impacted	Insignificant consequences	Minor consequences	Moderate consequences	Major consequences	Catastrophic consequences
Marine flora and fauna / ecosystems	Occasional short-term impact and/or disruption to marine flora and fauna.	Minor impact on marine ecosystem, including flora, fauna and habitat. No significant impact on marine resources.	Significant localised impacts but without longer-term impact on marine ecosystems, and/or short term impacts on marine resources.	Significant widespread impact on protected wildlife (eg migratory shorebirds, marine plants or marine ecosystems of moderate duration.	Damage to an extensive portion of marine ecosystem resulting in severe impacts on marine populations and habitats and/or long-term impact on marine resources
Terestrial Flora and fauna / ecosystems	Occasional short-term impact and/or disruption to terrestrial flora and fauna. No negative impacts on ecosystem function. Limited damage to a minimal area of land of no significant value. (i.e. no nature reserves, parks or unique	Minor impact (short-term) on terrestrial ecosystem, including flora, fauna and habitat.	Significant localised impacts, no long term impacts. Significant changes in flora / fauna populations and habitat, but not resulting in eradication or any impact on endangered or beneficial species.	Significant widespread impact on protected terrestrial fauna or flora. Impact on Terrestrial ecosystems of moderate duration.	Long-term and significant change in population (e.g. eradication of beneficial or endangered species) or habitat with negative impact on ecosystem function. Widespread and persistent damage to a significant area of

			Non-persistent but possibly widespread damage to land; damage that can be remediated without long-term loss; or localized persistent damage		land and/or groundwater resource (having regard for the importance of the land, e.g. unique habitat / national park).
Atmosphere / waste / dust / noise	Temporary nuisance from noise, odour, dust, other air emissions, greenhouse gases, vibration, visual impact. Results in the majority of the waste being classified as nonhazardous wastes.	Minor environmental impact due to contained release of pollutant (including odour, dust and noise), fire or explosion with no lasting detrimental effects. No outside assistance required. Significant use of water, fuels and energy and other natural resources.	Creation of noise, odour, dust, other controlled/ uncontrolled air emissions, greenhouse gases, vibration, and visual impact at significant nuisance levels. Results in the generation of significant quantities of hazardous wastes.	Major environmental impact due to uncontained release, receptor exposed to regular nuisances that affect there lifestyle (closing windows, contribution to sleep depravation), fire or explosion with detrimental effects. Outside assistance required.	Catastrophic environmental impact due to uncontained release, fire or explosion with detrimental effects. Outside assistance required. Extensive chronic discharge of persistent hazardous pollutant. Results in the generation of significant quantities of intractable wastes.
Cultural heritage	Minor repairable damage to areas of little or no cultural	Minor repairable damage to areas / items of cultural	Moderate damage to areas / items of cultural significance, or significant	Major damage to areas / items of cultural significance, or major infringement	Irreparable damage to highly valued areas / items of cultural significance or sacred

	significance.	significance, or minor infringements of cultural values.	infringement of cultural values/ sacred locations.	of cultural values/ sacred locations.	value.
Community/ media reaction & reputation	Possibility of detrimental local media reports. Minor substantiated complaints from the community. Public concern restricted to local complaints.	Detrimental local media reports. Subject of local government action. Infrequent substantiated complaints from the community. Minor negative impacts on reputation.	Detrimental national or state media reports. Subject of parliamentary questions or ministerials. Systematic substantiated community / Non Government Organisations concerns and complaints.	Numerous detrimental national or state media reports. Subject of a number of parliamentary questions or ministerials. Organised community concern. Mobilisation of significant Non Government Organisations campaign.	Sustained detrimental international, national or state media reports. Subject of parliamentary committee hearing. Sustained community / Non Government Organisation outrage.
Licence to Operate	Some difficulties experienced with regulator in gaining approvals.	Minor delays experienced in gaining approvals or ability to continue operating.	Ongoing minor delays experienced in gaining approvals or ability to continue operating.	Major difficulties or delays experienced in gaining approvals or ability to continue operating.	Licence to operate likely to be revoked or not granted.
Legal	Minor technical / legal issues. No serious breach of regulation. Minor licence non-	Minor breaches regularly. Repeat non-conformances with regulatory conditions.	Probable serious breach of regulation identified with serious prosecution or fine. Involved in significant litigation.	Serious breach of regulation and or incident. Triggers actual *serious environmental harm* under the EP	Major breach of regulation identified and/or serious incident notification and/or major investigation by authority with

	compliances. Minor on the spot fines.	Subject to third party investigations / audits (i.e. EPA) as result of repeat non-conformances.		Act 94'. Environmental Protection Order received or similar (stop works).	prosecution and very significant fines. Very serious litigation, including class actions.

Source: Standards Australia/ Standards New Zealand "HB 203:2006, Environmental risk management."

3.2 Estimated Probability of Occurrence (Likelihood)

Following identification of potential impacts and consequences, the probability of occurrence needs to be estimated. The table below provides likelihood ratings with descriptions for estimating the likelihood of each occurrence.

Table 2.2 Likelihood of occurrence

Descriptor	Likely / Frequency
Almost Certain	Is expected to occur in most circumstances
Likely	Will probably occur in most circumstances
Possible	Could occur
Unlikely	Could occur but not accepted
Rare	Occurs only in exceptional circumstances

The probability of occurrence from any event, mode of occurrence or failure mechanism is considered.

In addition to evaluating the frequency for normal operating conditions, the following conditions could be considered:

- abnormal, startup and shutdown operation conditions;
- incidents, accidents and potential emergency situations; and
- current activities and planned future activities.

3.3 Risk Estimation

The level of risk is calculated by assessing Likelihood and Consequence descriptors assigned to each risk to calculate the risk rating described in Table 2.4.1.

3.4 Risk Evaluation

3.4.1 Risk Rating

The relative risk rating estimated above enables definition between those risks that are significant, and those that are of a lesser nature. This allows a better understanding of the least probable events with high consequence against the highly probable low consequence events. Having established the comparative risk level applicable to individual impacts, it is possible to rank those risks.

Five risk categories have been used as described in Table 2.4.1. Once the impact has been ranked according to the relative risk level it poses, it is then possible to target the treatment of the risk exposure, beginning with the highest risks.

Table 2.4.1 Risk categories

	Consequence				
Likelihood	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	**Moderate**	**High**	**Extreme**	**Extreme**	**Extreme**
Likely	**Low**	**Moderate**	**High**	**Extreme**	**Extreme**
Possible	**Negligible**	**Low**	**Moderate**	**High**	**Extreme**
Unlikely	**Negligible**	**Negligible**	**Low**	**Moderate**	**High**
Rare	**Negligible**	**Negligible**	**Negligible**	**Low**	**Moderate**

3.4.2 Risk Review Workshop

A Risk Review Workshop was conducted to:

- Review risks and risk ratings derived from consultants reports;
- Separate risk into Construction Phase or Operation Phase or both;
- Formulate proposed risk treatments (mitigations) for each risk identified;
- Evaluate the Residual Risk post-mitigation; and
- Identify for each mitigation the relevant action plan.

The output of the Risk Review Workshop has been captured in the Project Risk Register.

3.4.3 Limitations

As with any model, the relevance and applicability of the risk model revolves around a number of basic assumptions and limitations. The application of the risk model has been based on subjective ranges of consequences and probabilities within the parameters of the project.

The assessment has been limited to a selected number of primary risks and the assessment of cumulative risk to the environment from multiple pollution sources or sources of environmental degradation has not been addressed.

Although a qualitative methodology was used to conduct the risk assessment, the resulting risk estimation is purely relative. The risk estimations do not imply an absolute scale of risk that can be applied to any other situation or assessment.

4 Description of Environmental Values

4.1 Internal and External Environmental Values

The environmental values that may be affected by hazardous materials and actions associated with the TOT Project include the values of receiving environments as identified below and described by site-specific investigations undertaken during the preparation of this EIS. Cross-references to sections of the EIS where relevant environmental values are described are provided in Table 3.1.

Table 3.1: Environmental values potentially affected by the project

Environmental Values	Section of the EIS
Port of Townsville operations	2.2
Soils, geology and adjacent land uses	4.2.1
Traffic and transport infrastructure and marine infrastructure	4.3.1
Local government infrastructure and service providers	4.4.1
Surface water quality, downstream water uses, groundwater resources and coastal environments	4.6.1 and 4.7.1
Local air quality, public amenity and well-being	4.8.1
Visual amenity and landscape character	4.9.1.
Ambient noise levels and noise sensitive receptors	4.10.1
Flora and fauna species, communities and habitats	4.11.1
Areas and objects of cultural heritage significance	4.12.1
Community facilities, social amenity and well-being	4.13.1
Health and safety of community and workforce	4.14.1
Economic activities including Port of Townsville, commercial, tourism, recreation and business activities.	4.15.1

5 Potential Impacts of Emergency Situations

5.1 Workplace Health and Safety Impacts

Workplace Health and Safety (WH&S) hazards may occur during both operation of the ocean terminal and during site construction works. Potential impacts associated with workplace emergencies are outlined in the Health and Safety Report.

5.2 Public Safety Impacts

Emergency situations may also arise during operation of the ocean terminal that may impact on public safety. Management of large crowds by security personnel in consultation with local fire and rescue services, police, ambulance services and local hospitals is outlined in the Health and Safety Report.

5.3 Natural and Induced Hazards

Townsville and Thuringowah City Councils have developed a Local Disaster Management Plan (LDMP) to manage potential risks to the community during disaster events. This plan identifies the potential threats to communities within the local government areas as detailed in the Health and Safety Report. These natural and induced emergency situations will be relevant during operation of the Breakwater Cove and Ocean Terminal precincts. Threats and risk levels as identified by the LDMP are outlined in Table 4.3.

Table 4.3: Potential threats to communities in the Townsville and Thuringowah areas*

Threat	Probability of Occurrence and Risk
Disruption to road and rail transport and property damage due to flooding	High probability, Medium risk
Damage to coastal areas from cyclone, severe storm and storm tide	High probability, High risk.
Impacts on life and property from earthquake and landslide	Low probability, High risk
Major building fires in urban areas	Low probability, High risk
Aircraft accidents in flight paths are over residential and industrial areas	Low probability, High risk

Shipping accidents within harbour channels used by cargo, passenger and naval vessels as well as recreational vessels, ferries and barges	Low probability, Medium risk
Industrial accidents including explosion or chemical spills	Low probability, High risk
Road and rail accidents from high volumes of traffic on major roads in the area	Medium probability, High risk.
Outbreaks of disease	High probability, High risk
Oil spills within Townsville harbour and shipping lanes	Low probability, Low risk
Space debris falling to earth from man-made satellites and meteors	Low probability, Low risk
River flooding due to breach of the Ross River Dam	Low probability, High risk (probability increases if heavy rain occurs during cyclone events)

*Source: TTLDMP 2005.

The above risks that are relevant to the TOT project were also considered in this Hazard and Risk Assessment.

6 Counter Disaster and Rescue Procedures

6.1 Workplace Health and Safety Procedures

The operator of the TOT facility will be required to prepare a site-specific Workplace Health and Safety Plan (WHSP) to ensure protection of employees and visitors to the ocean terminal. During the construction phase, the principal contractor will be required to provide a WHSP to ensure implementation of health and safety principles for all contractors engaged to work on the construction site. Specific procedures for WH&S are detailed in the Health and Safety Report.

6.2 Public Safety Procedures

In order to prevent public safety impacts during operation of the TOT, an emergency response plan will be prepared for the ocean terminal facility. Emergency procedures are provided in the Health and Safety Report and will include coordination of security personnel with local emergency services, crowd surveillance and control and evacuation processes.

6.3 Disaster Management Procedures

The Townsville Thuringowah Local Disaster Management Group has developed systems for management of disaster events. In addition, a Disaster Action Plan will be developed for the site to provide prevention and response measures for preservation of life and property in the event of a natural hazard such as a storm, flood or cyclone. The Disaster Action Plan will be based upon the intent of the main objects of the *Queensland Disaster Management Act 2003* and will be controlled by the Body Corporate.

The Disaster Action Plan will inform residents of the characteristics of the site, its environs and provide details of the evacuation processes in case of an emergency. The Body Corporate Manager will be responsible for educating the residents in relation to being aware of emergency agency warnings and monitoring the Bureau of Meteorology and SES reports in relation to possible events to provide timely and adequate advice of such reports to all residents and occupants of the site.

6.4 Flooding Hazard

The minimum design level of R.L 3.2m for the TOT Project is adequate to ensure that no adverse impacts due to flooding up to and including the Q100 year Average Recurrence Interval (ARI). An additional freeboard of 0.3m has been provided for all building platforms during the bulk earthworks design. Townsville City Council has confirmed that the minimum flood immunity design level is R.L 3.2m for immunity up to and including the Q100 year storm event. Flooding from runoff from stormwater events will not effect the proposed site up to and including the Q100 year storm event.

Coastal Engineering Solutions (CES) has confirmed that the Q100 year ARI storm tide and associated wave effects constitutes the Designated Storm Tide Event (DSTE) under the State Coastal Plan Policy 2.2.4. The TOT Project complies with the requirements of State Coastal Plan Policy 2.2.4 as follows.

- All dwellings are sited so that floors on all habitable rooms are above the DSTE level and are not located within the high hazard zone. Access roads for emergency evacuation purposes are also above the DSTE level.
- The proposed works will not adversely increase the storm tide or the associated waves on adjacent foreshores or properties.
- The proposed building work is not sited within the high storm tide hazard zone.
- The proposed works will not significantly interfere with tidal flows or alter existing hydrological flows.

Reference is made to the CES report *Townsville Ocean Terminal – Coastal Engineering Studies* dated 14th September 2007 which provides extensive comment on flooding assessment.

6.5 Port Emergency/Evacuation Procedures

The Port of Townsville manages emergencies and disasters within the Port through implementation of an Emergency Response Plan (ERP). This ERP includes procedures for evacuation of all personnel and visitors from the Port should an emergency occur.

The Townsville Port Authority (TPA) will implement the following protocol in the event of an emergency within the Port.

1 Initiate the Emergency Response Plan.

2 Contact the appropriate emergency services.

3 Advise affected port users/customers, in the immediate vicinity.

4 Evacuate Port if necessary.

5 Contain/control any spills or release to the environment (land, water, air) if safe to do so.

6 Advise the Regional Harbour Master if required.

Appropriate emergency services will be notified and will be responsible for any incident requiring response and evacuation. However, Port Users are required to develop and initiate their own Emergency Plan to control the initial response to an emergency within the Port. Evacuation of the Port in the event of a major incident is the responsibility of the TPA and/or the appropriate emergency service. The operator of the TOT will comply with emergency and evacuation procedures as directed until clearance is given for return to normal operations.

The operator of the TOT Precinct will prepare an Emergency Plan in consultation with the TPA and Townsville City Council. This Plan will include procedures to be followed in the event of accidents or incidents. Actions taken within the TOT Precinct during an emergency will be in accordance with all emergency and evacuation procedures required under the Port of Townsville ERP.

6.5.1 Tropical Cyclones

The TPA is responsible for coordinating activities in the event of a tropical cyclone or other extreme climatic events. The TPA outlines general procedures for cyclones and severe weather conditions for ships in port and for small craft owners.

The TOT Operator will prepare an Emergency Plan detailing emergency, evacuation and recovery procedures in response to extreme events. The TOT Operator will be notified of a potential threat by the TPA and will carry out all directions from the TPA and the relevant response agency.

6.5.2 Fire and Explosion

The Queensland Fire and Rescue Service will be responsible for directing a response to any fire within the Port. The TOT Operator will comply with all instructions from the TPA and the response agency as is the requirement for all port users.

Fire-fighting equipment will be provided within the TOT Precinct and will be maintained in accordance with relevant standards and legislation including requirements for equipment testing and inspections and annual evacuation drills. The TOT Operator will be responsible for preventing and managing impacts from fire and explosion within the TOT Precinct.

In the event of an incident requiring response and/or evacuation of the TOT site, the following general procedure would apply:

- TOT Security officers would contact the relevant emergency services and liaise with the TPA;
- TOT Security officers would notify Port Control, the Regional Harbour Master (if required) and other port users that may be affected by the incident;
- TOT Security officers would assess the location and extent of the incident, conduct a search of the area if safe and initiate evacuation procedures if required;
- TOT Emergency Wardens would direct persons within the site during an evacuation and liaise with emergency services;
- TOT Emergency Wardens would ensure that all instructions delivered by the TPA and the emergency services are carried out;
- TOT Security officers would notify Wardens when clearance is given by TPA for a return to normal operations.

7 Dangerous Goods and Major Hazard Facilities

7.1 Major Hazard Facilities within the Port of Townsville

Dangerous goods and operation of Major Hazard Facilities (MHF) where hazardous materials may be stored or handled are currently managed within the Port of Townsville. These materials are managed in accordance with the *Hazardous Substances Regulation 1997*, the *Dangerous Good Safety Management Act 2001* (DGSM Act) and the *Dangerous Goods Safety Management Regulation 2001* (DGSM Reg).

Potential hazards associated with the operation of MHFs include the potential for spillage or accidental release of hazardous substances to air land or water and the potential for fire or explosion as a result of inappropriate storage and handling procedures. These potential hazards present risks to the life and property of future residents within Breakwater Cove as well as other sites within Townsville.

Origin Energy is identified as an existing MHF within the Port of Townsville. Other storage facilities are classified as Large Dangerous Goods Locations. These include:

- Patrick Logistics;
- Acid storage tanks near Qld Nickel; and
- Ampol, BP, Shell and Caltex fuel storage tanks.

The locations of these facilities and relative distances to the Breakwater Cove Precinct are indicated on Drawing 01-QL00704-01 contained in Appendix C.

These facilities have the potential to cause accidents that may result in injury, damage to property and the environment and loss of life. The operators of MHFs have obligations under the DGSM Act to minimise the likelihood of accidents and impacts arising from operation of these facilities. Safety obligations include:

- Undertaking systematic risk assessment and risk reduction measures;
- Developing emergency plans and procedures;
- Implementing a safety management system;
- Providing education, training and supervision of MHF personnel; and
- Preparation of safety reports.

It is noted that the proximity of these facilities to the Breakwater Cove Precinct is comparable to the proximity to other potentially impacted residential sites within South Townsville as indicated on Drawing 01-QL00704-01 contained in Appendix C The risk of impacts from MHFs on residents of Breakwater Cove is assessed in the Operational Risk Register contained in Appendix B.

7.2 Dangerous Cargoes at Port of Townsville Berths

The Port of Townsville has approved limits for loading and unloading of Class 1 Explosives and Security Sensitive Ammonium Nitrate at Berths 1 to 4 and 7 to 11. These berths are in closer proximity to the Breakwater Cove Precinct than major hazard facilities and the future residences of Breakwater Cove would be within the zone of influence should an explosion occur at one of these berths.

The Port of Townsville complies with the Australian Standard for the Handling and Transportation of Dangerous Cargoes in Port Areas in order to minimise risks of injury and loss of life or property. The risk of impacts from explosive substances on residents of Breakwater Cove is assessed in the Operational Risk Register contained in Appendix B.

7.3 Dangerous Goods Inventory for the TOT Project

Hazardous substances and dangerous goods may be stored at or transported to and from the TOT project site. The requirements for safe handling and transport of dangerous goods within Ports are documented by the Australian Standard AS3846, *The Handling and Transport of Dangerous Cargoes in Port Areas*. The operator of the TOT Precinct will implement these requirements for handling and transport of dangerous goods.

Dangerous goods that are to be stored and handled within the TOT project site will be recorded in a register and will be stored with the relevant Material Safety Data Sheet (MSDS) for each substance. Adequate signage providing visual warning of the hazards associated with dangerous goods present at the TOT project site will be displayed if substances are stored in tanks or if the volume exceeds the quantity specified in Schedule 1 of the DGSM Regulation. Any fuel storage tanks installed within the TOT Precinct will comply with the Australian Standard AS 1940:1993 *The Storage and Handling of Flammable and Combustible Liquids*.

The TOT project will use a number of hazardous substances such as fuel and oil that are regulated by the Australian Dangerous Goods Code, including substances in the following classes.

Class 2.1 - Flammable gases

The construction and operational phases (for domestic uses) may include the following:

- liquefied petroleum gas (LPG)
- liquefied natural gas (LNG)
- acetylene.

Class 2.2 - Non-flammable, non-toxic gases

The construction phase may include mobile units for maintenance of vehicles:

- compressed air

Class 3 - Flammable liquids

The construction and operational phases (for domestic uses) may include the following in small quantities

- unleaded petrol
- kerosene

Class 6.1 - Toxic substances

Examples that may exist on site in small quantities

- pesticides.

Class 9 - Miscellaneous dangerous goods

Examples of class 9 goods that may be utilised on site for road construction include:

- molten bitumen.

8 Risk Assessment Results

The results of this Hazard and Risk Assessment are presented on the Project Risk Registers for Construction and Operation contained in Appendix A and Appendix B respectively and are summarised below.

8.1 Climate

The risks associated with climatic events including tropical cyclones, storm surge and climate change have been appropriately mitigated through design of buildings and infrastructure and development of hazard management strategies. Following risk treatment, these risks were predominantly assessed as low to moderate. However, high residual risks include:

- Strong winds caused by tropical cyclones or low pressure systems during construction;
- Increased frequency and intensity of cyclones due to climate change during operation; and
- Strong winds caused by tropical cyclones or low pressure systems during operation.

Climate risks are applicable to all development in the region and appropriate design measures are required to manage potential impacts. All requirements of Townsville City Council are met by the project in this regard.

8.2 Land

Risks relating to land in the project area include potential for soil erosion, geotechnical stability and potential acid sulphate soils. Project risks will be mitigated by implementation of geotechnical design parameters and construction management procedures. Once these risk treatment measures are applied, the residual risk of land impacts are considered to be negligible to moderate. There were no high residual risks associated with this element.

8.3 Traffic and Transport

The potential risks relating to traffic and transport are associated with haulage of construction materials to the project site and increased operational traffic generated by the project. These risks will be appropriately mitigated through adherence to the Project EMP. Residual

risks were predominantly assessed as negligible to moderate. However, a high residual risk associated with the construction phase is:

- Noise associated with haul routes.

Elevated noise levels along construction haul routes will be short-term and haulage vehicle noise will be mitigated by adherence to the control measures outlined in the Project EMP.

8.4 Non-Transport Infrastructure

Public and private ownership of infrastructure has been identified in the Infrastructure Report. Potential risks associated with non-transport infrastructure include the capacity of existing infrastructure networks to service the project and the required upgrade of State and local government infrastructure.

Assessment of existing infrastructure indicates that network capacity is adequate to service the project and that any required upgrades will be met by the proponent or will be subject to headworks charges. Residual infrastructure risks were assessed as negligible to moderate. There were no high residual risks associated with this element.

8.5 Waste

The risks associated with waste management generally relate to emission of wastes to sensitive environments and excessive use of non-renewable resources. These risks can be adequately mitigated by adherence to waste minimisation and management strategies contained in the Project EMP. Residual risks are assessed as negligible to low. There were no high residual risks associated with this element.

8.6 Water Resources

Potential water quality risks are associated with flushing of artificial waterways during operation and release of contaminants to waterways during construction. These risks have been successfully mitigated by modification of site layouts to improve flushing and application of site bunds to contain pollutants during construction. Residual risks are therefore assessed as being negligible to low.

8.7 Coastal Resources

Extreme climatic events including storm tide, extreme waves and climate change present a risk to coastal structures including project breakwaters and building within the coastal zone. Project structures have been designed to withstand extreme events and hazard management measures proposed for site operation will ensure safety of site personnel and future residents. Residual risks are therefore assessed as negligible to moderate.

8.8 Air Quality

Air quality risks are associated with emission of pollutants during construction (dust and vehicle emissions) and emissions from the operations within the Port of Townsville (odour, particulates and gaseous substances). Construction emissions can be controlled by implementation of the control measures in the Project EMP.

Ongoing monitoring of gaseous substances within the project site is being undertaken and design criteria for future buildings within the project site will be incorporated into the Port Protection Code.

8.9 Visual Amenity and Lighting

It is considered that minimal risks are associated with visual amenity and lighting impacts. These impacts can be adequately mitigated by site landscaping, architectural design measures and specification of low-spill lighting fixtures within the TOT precinct and street lighting.

8.10 Noise and Vibration

Impacts associated with noise and vibration as a result of construction activities has a residual risk of negligible to moderate following application of noise attenuation measures during construction.

Although noise emissions from the Port of Townsville are identified as a potential impact for the TOT project, these risks have been substantially mitigated by incorporation of a noise attenuating acoustic barrier within the project site and specification of design criteria for future residences within the Breakwater Cove precinct. Residual risks are therefore assessed as being negligible to moderate.

8.11 Nature Conservation

A number of risks of impacts on terrestrial and aquatic environments were identified were identified for this project given the location of the project site in near vicinity of sensitive ecological values. These impacts will be managed by ongoing monitoring of receiving environments allowing early detection of changes in habitats and populations of protected species. A comprehensive monitoring and management program has been incorporated into the Project EMP for mitigation of risks. Residual risks are therefore assessed as being negligible to moderate.

8.12 Cultural Heritage

Consultation has been undertaken with Traditional Owners to identify all cultural heritage values and to establish an agreed strategy for management of such values. The risk of adverse impacts following application of mitigation measures is considered to be negligible.

8.13 Social Impacts

A comprehensive program of community consultation has been undertaken during the planning phase of the development and consultation will be ongoing throughout the project. The predominant impacts identified during community consultation include nuisance and amenity impacts during construction and impacts on community facilities and social values during operation.

8.14 Health and Safety

Health and safety risks associated with construction and operation project workforce and public health and safety have been considered in this risk assessment. Such risks are expected to be adequately mitigated by control of air and noise emissions, controlled access to the construction site, operational workplace health and safety practices and specification of design criteria for all building within the site. Residual risks associated with health and safety are considered to be moderate.

8.15 Economic Impacts

The economic impacts of the TOT project have been assessed and impacts are expected to be minimal. The project will provide important infrastructure and future employment opportunities to support local business and industries. Residual risks associated with health and safety are considered to be negligible to low.

8.16 Construction Risks

The potential risks associated with construction of the TOT project will be mitigated by measures provided in the Project EMP. This includes procedures for equipment use, site decommissioning, spills and accidents and storage and handling of hazardous substances In addition, the construction contractor will be required to provide a Site-based

Management Plan for construction to ensure the project objectives are met and management strategies of the Project EMP are implemented.

High residual risks associated with construction include:

- Dredge spoil unsuitable as fill material;
- Construction workplace health and safety impacts; and
- Parklands settlement (during operation).

Dredge spoil disposal may be possible within the Port of Townsville approved disposal site if spoil material is unsuitable for reuse within the project site. Negotiations with the Townsville Port Authority are continuing in this regard.

The construction contractor will be required to prepare a Workplace Health and Safety Plan to implement the control measures outlined in the Project EMP to prevent health and safety impacts on the construction workforce.

Parkland settlements may continue for up to 10 years. However, this is a non-habitable area. Settlements will be monitored and any major settlements will require remediation.

8.17 Operational Risks

The location of the TOT project within near proximity of the operations of the Port of Townsville has been considered during development of the construction methodology and measures are proposed to ensure that no impacts occur to the safe operation and navigation activities of the Port. It is expected that the control measures recommended by specialist studies and investigations will ensure mitigation of construction risks. Residual risks of construction are considered to be moderate.

Operational project risks including increased marine and land-based traffic have been assessed by investigations undertaken for the EIS and are considered in this risk assessment. It is expected that these risks can be successfully managed.

8.18 Other Potential Risks

Cumulative impacts have been considered as part of the specialist studies and investigations undertaken as part of the EIS. In particular the cumulative effects of air, noise and traffic impacts from the project in conjunction with surrounding land uses has been assessed and are considered in the risk assessment.

The licensing requirements of the project have been considered and all necessary approvals will be obtained prior to commencement of construction and operational activities. All relevant standards for such activities will be applied in accordance with the conditions of any development approvals and operational licences.

The risks associated with wildlife hazards such as crocodiles and snakes will be managed by education of workforce personnel and residents. Persons will be informed of the potential presence of venomous snakes and crocodiles within Cleveland Bay. In total, 13 seasnakes are known to occur within habitats in Cleveland Bay and are protected under the EPBC Act. The protected estuarine crocodile is found in estuaries and mangrove creeks and may use habitats within Cleveland Bay (Nature Conservation Report). These species should be avoided if spotted and persons should avoid feeding wildlife or swimming in proximity to these species.

Disease vectors such as mosquitos and midges will be controlled by preventing formation of potential breeding habitat as outlined in the Health and Safety Report. The risks associated with these vectors are therefore considered to be minimal.

Project risks have been assessed using all information on the characteristics of risks. The potential frequency of occurrence and the potential life or persistence of identified hazards are considered in the rating of likelihood and consequences and in the Risk Estimation of each risk in the Project Risk Register as described in Section 3 of this report.

9 Conclusion

After analysis of all identified risks and application of risk treatment measures, the following items were identified as having high residual risk.

Construction Risks:

- CL1 - Strong winds caused by tropical cyclones or low pressure systems;
- TT3 - Noise associated with haul routes;
- CM6 - Dredge spoil unsuitable as fill material; and
- CM13 - Construction workplace health and safety impacts.

Operation Risks:

- CL1 - Strong winds caused by tropical cyclones or low pressure systems;
- CL5 - Increased frequency and intensity of cyclones due to climate change; and
- CM7 - Parklands settlement.

These risks will be carefully monitored in both the construction and operation phases and management strategies required by the EMP will be reviewed on an ongoing basis and modified where necessary to ensure health and safety aspects are managed.

APPENDIX A: CONSTRUCTION RISK REGISTER

APPENDIX B: OPERATION RISK REGISTER

APPENDIX C: LOCATION OF MAJOR HAZARD FACILITIES WITHIN THE PORT OF TOWNSVILLE