VOLUME 3

Draft : Environmental Impact Statement

Chapter B18 Cumulative Impacts Assessment

B18.1 Introduction

The EIS is required to consider potential cumulative environmental and social impacts and ecosystem resilience in the assessment of the Cairns Shipping Development Project (the project), particularly in the context of the Great Barrier Reef World Heritage Area (GBRWHA).

The scope for consideration of cumulative impacts and resilience in the EIS can be summarised as follows:

- To take into account interactive and cumulative effects from other existing and potential projects and activities including by Ports North and/or other proponents and developers, that combined, may cause an impact on the environment
- To appreciate consequential impacts that may arise from the project
- To consider ecosystem resilience at regional and specifically local scales and how the project may potentially affect these ecosystems.

In terms of ecosystem resilience, this has been considered as part of the impact assessment in each of the relevant EIS chapters in Part B and cross references, where necessary, will be made to the specific chapters in relation to the potential cumulative impacts on a specific aspect of the environment. The focus of this chapter is on the interactive effects on resilience, i.e. how separate impacts may interact and affect resilience.

A separate and distinct cumulative impact risk assessment has not been reproduced in this chapter as the impact assessment methodology used throughout the EIS (as described in Part A) already employs a risk-based approach to assessment. The assessment summary tables from each chapter provide a summary of residual risk levels for each impacting process. The findings from the assessment summary tables have been used in the preparation of the cumulative impact assessment (CIA) presented in this chapter.

For the purpose of assessing cumulative impacts, the following study areas have been adopted (refer **Figure B18.1a** and **B18.1b**):

- The whole of GBRWHA scale – this scale can be defined as the GBRWHA including both near shore and offshore areas. This scale of assessment would be relevant in the context of the project affecting, for example, a key aspect of the Outstanding Universal Value (OUV) of the GBRWHA property as a whole or otherwise causing impacts that could result in the property no longer meeting one or more of its nomination criteria under the World Heritage Convention. The condition of key assets and values at the whole of GBRWHA scale are reported in the Outlook Report 2014.

As will be outlined later, there are no aspects of the project that will impact the GBRWHA at this scale.

- The regional scale – this scale can be defined as the northern subregion of the Wet Tropics region of the GBRWHA, extending north of Cairns to the Bloomfield River and south to Mission Beach (Dunk Island). The condition of the water quality, seagrass, and coral within the Wet Tropics region of the GBRWHA is reported as spatial areas in the Great Barrier Reef Report Card 2012/2013 within the 'Reef Water Quality Protection Plan – Marine Results' published by the Australian and Queensland Governments. In this context the proposed developments on the coast (e.g within or neighbouring the foreshore) of the northern subregion of the Wet Tropics have been considered.
- As will be presented in this chapter, there are no aspects of the project that will impact the GBRWHA at this regional scale.

- The local scale – this scale is defined as the project area (where works are proposed) and adjacent areas of Trinity Inlet, Trinity Bay and surrounding waters as used in the various chapters of the EIS. For this EIS, the primary focus of data collection, the identification and description of baseline condition of sensitive receptors and impact assessment for most attributes has been undertaken at this scale. In this context, the local scale includes the following features and areas:
  - All waters of Trinity Bay
  - The tidal waters and coastline of Trinity Inlet including Admiralty Island
  - Double Island and associated seagrass and coral reef environments
  - The coastline and near shore waters of Cairns' Northern Beaches
  - Mission Bay
  - The coastline extending north and east from Trinity Inlet, False Cape to Cape Grafton
  - Waterways and catchments that flow into Trinity Inlet and Trinity Bay, such as the Barron River.

Section B18.1.1 and **B18.1.2** of this chapter outline the key requirements of the Commonwealth EIS Guidelines and Queensland Government's Terms of Reference (TOR) for the project in regard to cumulative impacts and ecosystem resilience. These requirements form the basis for the discussion of cumulative impacts and resilience within this chapter.

Figure B18.1a Whole of WHA, Regional and Local Scales

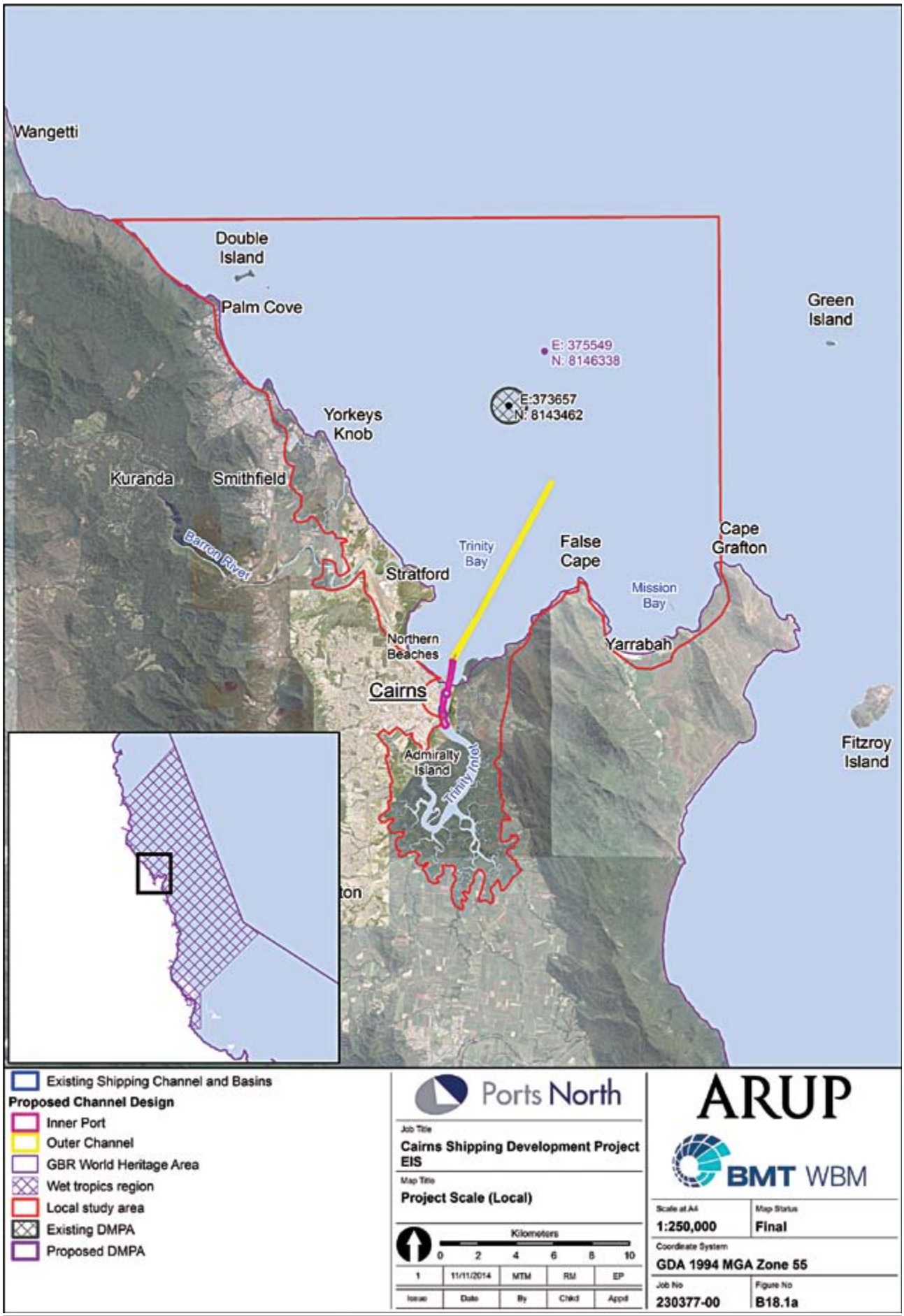
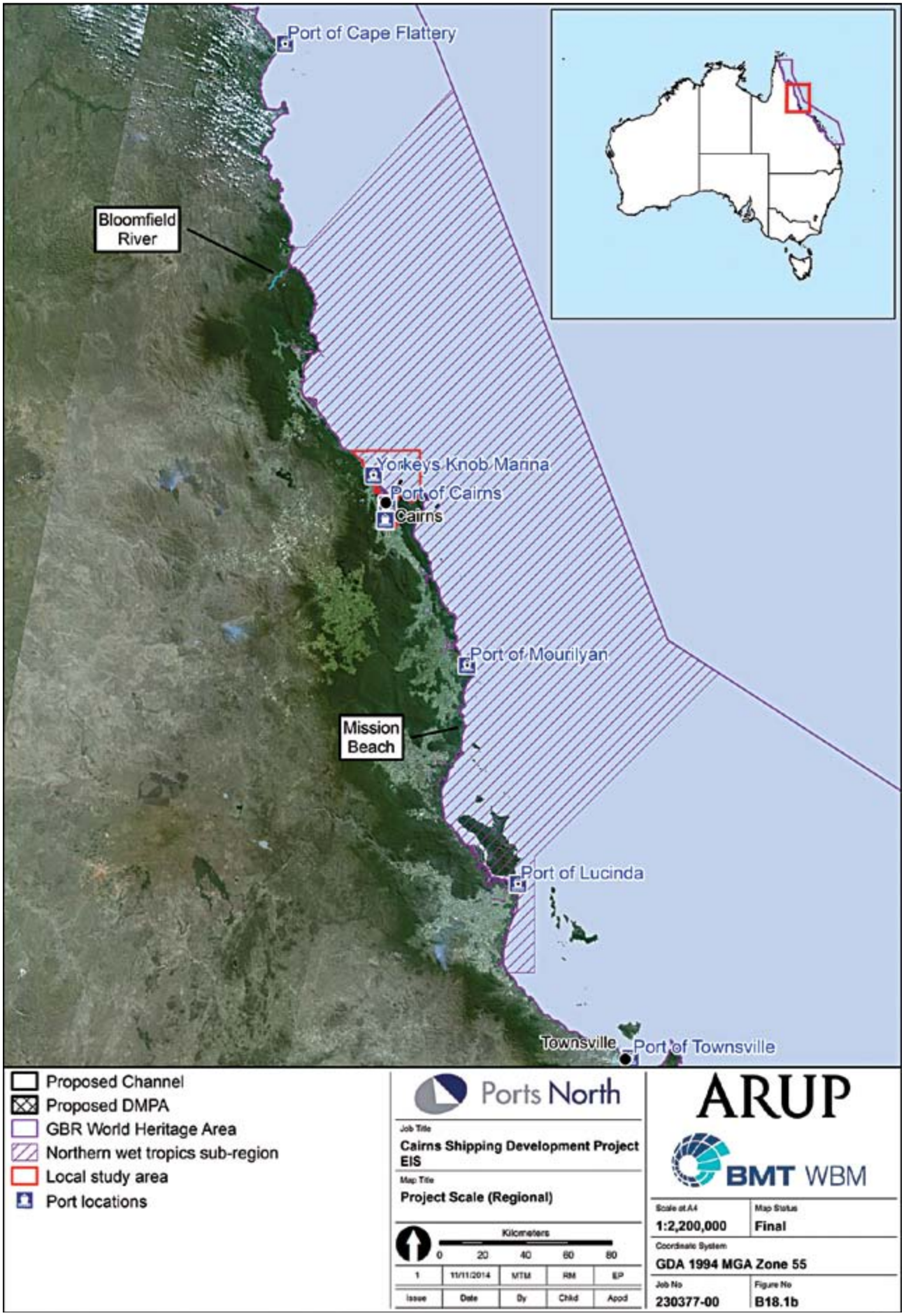


Figure B18.1b Whole of WHA, Regional and Local Scales



B18.1.1 EIS Guidelines

Section 5.10 of the EIS Guidelines states that when discussing potential impacts, consideration of how the interaction of extreme environmental events (e.g cyclones, coral bleaching, flood events) and any related cumulative impacts may impact on the proposal and the environment (both independently and cumulatively).

Section 5.10.7 of the EIS Guidelines states that the EIS must identify and address cumulative impacts, where potential project impacts are in addition to existing impacts of other activities (including known current and future expansions or developments by the proponent and other proponents in the region and vicinity).

Section 5.10.7 of the EIS Guidelines also states the EIS must address the potential cumulative impact of the proposal on ecosystem resilience. The cumulative effects of climate change impacts on the environment must also be considered in the assessment of ecosystem resilience. Where relevant to the potential impact, a risk assessment must be conducted and documented. The risk assessment must include known future expansions or developments by the proponent and other proponents and known impacts on ecosystem resilience, Matters of National Environmental Significance (MNES) and Commonwealth land.

Section 5.10.7 of the EIS Guidelines suggests that cumulative impacts should be considered in terms of the following activities:

- Existing, planned or potential developments of a similar type and scale to the proposed development that have been approved within the last five years or are still under assessment, with emphasis on those in the region that have, will have or are likely to have impacts on the same MNES and Commonwealth land
- Any current or likely development precincts or zones in the region
- Impacts of other tourism, residential, industrial and infrastructure projects both directly and indirectly related to the proposal in a regional context
- Existing and known and/or predicted increases in shipping in the region
- Discussion and analysis of the cumulative impacts of this proposal on the integrity and OUV of the GBRWHA
- Discussion of any potential future changes to the development which are likely to change the nature or scale of environmental impacts
- If existing impacts on the environment in general and MNES and Commonwealth land will be amplified by the action in combination with impacts of other projects
- Discussion of the developments and activities which are likely to be facilitated by the proposal
- Identify if the resulting impacts on the general environment, ecosystems and MNES and Commonwealth land could be unacceptable
- Identify if these impacts on the general environment, ecosystems, MNES and Commonwealth land could be permanent. If the impacts on MNES and Commonwealth land are not permanent, describe how long it will take before recovery from the effect
- Describe how the cumulative impact of the project will impact on the reproductive capacity and/or survival of listed threatened and migratory species
- Explain how much recovery of MNES and Commonwealth land population, habitat, ecosystems, and the environment in general could occur, with and without mitigation (e.g complete, partial, none)
- Describe how soon restoration of habitat could be achieved to reinstate ecosystem function for MNES
- Where possible, identify how much likely change to MNES and Commonwealth land exceeds natural variability in the region
- Describe how this project will contribute to the desired conservation objectives for MNES
- Describe how housing, workforce and local and regional community changes as a result of the development
- In conducting the risk assessment, key information sources and indicators for assessing change and impact must be described.

In regard to dredging and dredge material disposal related impacts, Section 5.10.9 of the EIS Guidelines states that cumulative impacts of the entire dredge operation and likely maintenance dredging requirements must be described.

Section 5.11 of the EIS Guidelines states that the EIS must provide information on proposed avoidance, safeguards and mitigation measures to deal with the impacts of the action. Particular focus must be given to how any avoidance, safeguards, management and mitigation measures will increase resilience of the environment, ecosystems and MNES and Commonwealth land within the region.

B18.1.2 Terms of Reference (Queensland Government)

Section 5 of the Queensland Government TOR states that the EIS must describe any cumulative impacts on environmental values caused by the project, either in isolation or in combination with other known existing or planned projects.

Section 5.4.2 of the TOR states that the EIS must consider potential impacts on terrestrial fauna, relevant wildlife habitat and other fauna conservation values, including cumulative effects of direct and indirect impacts.

Section 9 of the TOR states that the EIS must summarise the project's cumulative impacts and describe these impacts in combination with those of existing or proposed projects publicly known or advised by the Office of the Coordinator-General to be in the region, to the greatest extent practicable. Assess cumulative impacts with respect to both geographic location and environmental values. In particular, address cumulative impacts in sensitive environmental areas.

Section 9 of the TOR also requires explanation of the methodology used to determine the cumulative impacts of the project, detailing the range of variables considered (including relevant baseline or other criteria upon which the cumulative aspects of the project have been assessed, where applicable).

Section 10 of the TOR requires consideration of the cumulative impacts (both beneficial and adverse) of the project from a life-of-project perspective, taking into consideration the scale, intensity, duration and frequency of the impacts to demonstrate a balance between environmental integrity, social development and economic development.

B18.2 Cumulative Impacts

B18.2.1 Methodology and Definitions Used

The Great Barrier Reef Strategic Assessment (2014) provides the following definitions that have been adopted for the purposes of this chapter:

> ***Cumulative impact:*** *The impact on the environment resulting from the effects of one or more impacts, and the interactions between those impacts, added to other past, present, and reasonably foreseeable future pressures.*
>
> ***Cumulative risk:*** *The combined risks to the environment by multiple impacts.*

This assessment highlights the prospective cumulative impacts or cumulative risks on MNES (to address the EIS Guidelines) and Matters of State Environmental Significance (MSES) (to address the Queensland Government TOR).

Projects that could cumulatively affect MNES and MSES (including the GBRWHA) that are proposed, approved or consequential to the project are discussed in the sections below.

The CIA has used information available in the public domain including government websites (Queensland Department of State Development, Infrastructure and Planning, GBRMPA, etc.), media sources and specific project websites where relevant, to both identify current or prospective projects/developments as well as characterise impacts associated with third party developments including draft and final EIS documents, approvals and associated conditions and similar documentation.

These projects have been identified at a WHA, regional and local scale and their potential for cumulative impacts with the proposed project has been determined by the following:

- Proposed development type, magnitude and timing
- Geographic location and potential receiving environment for any impacts
- Potential processes which may impact the same receiving environments as the project, most notably the marine environments of the Great Barrier Reef (MNES).

At the WHA and northern WHA Wet Tropics regional scale, the CIA has identified other port expansion projects as key projects for assessment. At a local scale, the CIA has identified the Aquis Great Barrier Reef Resort (Aquis project), north of Cairns, as the most significant and able to be included in the assessment (through review of the findings of its draft EIS), but noting a range of smaller projects are also at a planning or preparation stage in the Cairns region.

Where a residual risk has been identified for the project, the cumulative risk of the identified impacting processes of these developments has been qualitatively addressed where possible, based on the information available.

It should be noted that the project aims to cater for the predicted future cruise shipping market for at least the next 10 years, estimated in **Appendix D6, Cairns Cruise Shipping Development – Demand Study** and most likely well beyond that timeframe. There are no other anticipated capital dredging campaigns anticipated at the Port of Cairns within the foreseeable future for cargo ship or naval purposes.

B18.2.2 Assessment Approach

The potential for cumulative impacts to arise from interaction of the project with third party developments was assessed during the preparation of the EIS technical studies (e.g air quality, water quality, traffic, coastal processes). In some cases, technical studies assessed impacts by including the effects of other development (e.g CityPort) or in the case of the natural environment, known and demonstrated in condition and resilience levels.

Table B18.2.4a contains a summary of the key findings related to the project, predicted impacts from other projects at the regional scale (focusing on the other port expansion projects) and impacts from other projects at the local scale (focusing on the proposed Aquis project as the most significant in terms of scale and location to affect the similar areas to this project).

Overall the predicted cumulative risks from all issues are assessed as having a low or negligible risk of impact in relation to potential impacts from the CSD project. This is due, in part, to each project (as required by legislation and conditions of any development approval) ensuring its own impacts are avoided, minimised, or mitigated to acceptable levels, as well as ensuring key cumulative impact issues such as the reduced resilience of natural values have been conservatively considered in the assessments and impact predictions.

B18.2.3 Other Proposed Projects and Developments

A search of available public information has identified a number of planned, proposed and recently approved developments in the vicinity of the project area. Their potential relevance at a WHA, regional and local level (as described in **Section B18.1**), have been identified below.

B18.2.3.1 Proposed Port Expansion Projects in the GBRWHA

There are 12 ports located within the Great Barrier Reef area including those at Quintell Beach, Cape Flattery, Cooktown, Cairns, Mourilyan, Lucinda, Townsville, Abbot Point, Mackay, Hay Point, Port Alma and Gladstone (source: GBRMPA website).

Three of these, Port of Abbot Point, Port of Gladstone and Port of Townsville, are currently undertaking major port expansion projects that involve capital dredge programs in or in close proximity to the GBRWHA. An overview of these projects is provided below and discussed further in Section B18.2.4.

Port of Townsville (located ~ 280km from Cairns)

The Port of Townsville Limited proposes the expansion of the Port of Townsville facilities including:

- Creation of an outer harbour and widening and deepening of the shipping channel requiring the capital dredging of ~11 M m^3
- Reclamation of 100ha of existing harbour for new berths to provide for bulk cargo storage and rail loop
- Construction of new road and rail infrastructure within the project footprint and connecting it to the Townsville eastern access corridor
- Upgrade of port facilities, including new shiploading equipment, and development of a passenger terminal with public spaces and associated marine works
- Marine disposal of 5 M m3 dredge material, noting a large proportion of the dredge material being removed to create the outer harbour is to be placed in reclamation and the project
- A draft EIS has been submitted and the public submission period closed in 2013. The project is currently providing supplementary information prior to a development decision.

Port of Abbot Point (located ~ 415km from Cairns)

North Queensland Bulk Ports Corporation has a development approval for the expansion of the Port of Abbot Point facilities including:

- Expansion of the shipping channel requiring the capital dredging of approximately 3 M m^3
- Expansion of terminals including Terminal O (TO), Terminal 2 (T2) and Terminal 3 (T3)
- Marine disposal of the dredge material, approximately 24km from the dredge area. However. it is noted there is currently investigation of land-based placement options between the proponents and the relevant Government parties.

Following a review of expansion demand and alternatives for terminal expansions beyond the currently planned T0-T3 terminals, the Queensland Government undertook a Registration of Interest process for the allocation of further terminal capacity at the Port of Abbot Point, known as the AP-X Project.

Port of Gladstone (located ~ 960km from Cairns)

Gladstone Ports Corporation proposes duplication of the existing Gatcombe and Golding Cutting shipping channels at the Port of Gladstone.

Expansion of the Port of Gladstone facilities include:

- Duplication and expansion of the original shipping channel and swing basins requiring an estimated capital dredging of approximately 12 M m^3
- The long-term disposal of dredged material associated with capital and maintenance dredging of all channels and berth pockets, land disposal and reclamation close to the foreshore are to be investigated under the EIS process.

Comparison with Port of Cairns (CSD project)

The following provides a summary and comparison of the project with other port expansion projects proposed within the vicinity of the GBRWHA, in order to provide an appreciation of the commonality and differentiators of the project and their potential for cumulative benefit and impact.

In summary there are no aspects of the project predicted to impact the environs of the GBRWHA at a whole of WHA scale and given the scale of the above identified developments it was considered unlikely that these would impact the vicinity of the CSD project receiving environment (localised impacts).

The project is a community project that will support Cairns in taking its place as one of the premier cruise destinations in Australia, capitalising on the booming global cruise industry. The project will have significant regional economic benefits including as far north as the Daintree and west to the Atherton Tablelands, including Kuranda.

It has been demonstrated in the EIS that the infrastructure improvements associated with the project (channel expansion and provision of bunker fuel) can respond to and increase demand for cruise shipping by improving access and facilities at the port and generating tangible benefits for the broader North Queensland economy. It will also be beneficial to expansion of HMAS Cairns Naval facility and have efficiency benefits for existing cargo operations, proposed or currently being assessed in the GBRWHA region.

While the project involves dredging and placement of dredge material activities similar to these other port expansion projects, it is differentiated in the following ways:

Absence of Reclamation

The project does not involve reclamation or other land building/disposal processes that are often linked to port expansion. The existing cruise ship terminal facilities at the Trinity wharves have been upgraded and are already suitable for accommodating the mega class ships that could enter the port after the project construction. No additional land/reclamation works are identified as needed as part of the CSD or other Port projects (e.g Cityport).

Reclamation is a beneficial use of dredge material as it creates port land and provides a controlled area for placement of dredge material, including fine material. The lack of reclamation associated with the project, constrains opportunities to reuse and manage dredge material that is being employed at other ports.

For example, creation of land through reclamation of tidal land and/or land filling processes are options that have been constructed as part of the Port of Gladstone Western Basin project and are proposed for the Port of Townsville Expansion Project. The Queensland Government and North Queensland Bulk Ports are also considering land disposal of some nature for the already approved Port of Abbot Point. In Southeast Queensland, dredge material is being used to fill the port expansion reclamation area at the Port of Brisbane and extracted sand (not dredge material) from Moreton Bay is currently being used to fill intertidal and sub-tidal wetland areas of the Brisbane Airport for a New Parallel Runway.

As outlined in Part A of the EIS, a range of similar reclamation options (including creation of artificial islands) have been examined for the project, but these do not currently present feasible or appropriate solutions to the management of dredge material with respect to environmental and social alternatives. In this context, it should be noted that reclamation comes with its own range of environmental impacts including the permanent loss of habitat from converting the sea bed into land, the removal of areas from conservation estate (e.g marine park, fish habitat and WHA) and the management of water quality from dredge tailwater and the potential to spill placed fine material from semi-permeable bund walls.

Dredge Material Characteristics – Trinity Bay

The dredge material characteristics within and adjacent to the existing Cairns shipping channel in Trinity Bay are also different to other port projects. The bulk of sediments to be dredged by the project - while uncontaminated – are characterised by very fine clays, muds and silts (90 - 95 percent fine content). This material has very different characteristics to the predominantly sandy material present at the Port of Abbot Point, the stiffer clays present at the Port of Townsville's Platypus Channel and in Port Curtis adjacent to the Port of Gladstone. While these sediments allow for the project to adopt a dredge strategy of reduced overflow (without imposing significant impacts on dredging production rates), the dredge material has very poor engineering qualities. This makes the material very difficult to manage in terms of land-based placement due to its acid sulphate and turbidity generation properties, as well as the logistical challenges of prolonged containment, settlement and drying times as discussed previously in the EIS and DMPA options assessment.

In this context, the capital dredge material at Cairns is more similar to maintenance dredge material that is already present, which is also similar to the maintenance at the other ports in the GBRWHA, making it generally unviable for beneficial reuse and land disposal (as referenced in the State Party Report, pp 68, Australian Government 2014).

Shipping Movements

Unlike expanding bulk and break bulk cargo and LNG ports at Gladstone, Abbot Point, and Townsville, which involve a high volume of new cargo and LNG ships entering the GBRWHA, the CSD project does not involve or foreshadow a significant increase in the number of cruise ships coming to port.

Current 2014 ship visits to the Port of Cairns/Yorkeys Knob include approximately 45 cruise ships (excluding smaller Adventure Class ships). The cruise demand study (refer **Appendix D6, Cairns Cruise Shipping Development – Demand Study**) predicts this is expected to increase – without the infrastructure improvements proposed by the project – to 67 ships by 2016, 76 by 2021 and 79 by 2026, noting a large number of these ships are mega size cruise ships that would continue to anchor at Yorkeys Knob without the project. If the project was approved and constructed, approximately 110 cruise ships could call at Cairns Port by 2026, taking advantage of the expanded channel infrastructure and bunker fuel provision.

This represents an increase of around 63 mega class ships accessing the port, of which 32 will be diverted from Yorkeys Knob and 31 will be new ship visits to the region. The majority of these additional ships are expected to be relatively new vessels, crewed by competent international crews and subject to international maritime and environmental requirements including the Australian Marine Safety Authorities (AMSA) North East Shipping Management Plan (discussed in more detail later in this chapter). In general, these larger cruise vessels pose a minimal risk to marine animals such as turtles, dugongs and dolphins.

Re-suspension of Fine Sediments

The environmental impacts from the project, such as the generation and dispersion of fine sediment from dredging and placement, have demonstrated in **Chapter B5, Marine Water Quality** and **Chapter B3, Coastal Processes** to be highly localised in nature. This is in large part due to strategies to:

- Undertake the capital dredging with a TSHD that operates under constrained overflow conditions (operating the dredge in this manner will limit the amount of fine material available for resuspension with the principal sources of plume generation during dredging coming from the operation of the drag head and propeller action of the vessel)
- Selection of a non-dispersive marine DMPA which will contain placed sediments in the immediate locality of placement and will have very minimal resuspension following placement (0.1 percent) under normal conditions and with minimal losses predicted under extreme weather events (1.1 percent loss) due to the depth of the DMPA and hydrodynamic conditions.

These strategies respond specifically to statements made in the Outlook Report (2014) and Strategic Assessment (2014) (refer also SKM/APASA Appendix F, 2013) that there is uncertainty about the extent of resuspension of dredged sediment from at-sea placement and the projected distances such sediment can mobilise (refer GBRMPA 2014, pp 258).

In this context, the most practical mitigation measures have been adopted by the project – that is, to minimise the overall volume of fine material that is generated during the dredging activities, to implement practical strategies to limit spill of fine sediment by the dredge during placement activities and to implement a reactive monitoring program to enable the management of dredging operations to respond to insitu water quality and ecological triggers.

Past Performance of Port Dredging Projects

Ports Australia released a report in April 2014 to examine approval processes associated with dredging and at-sea placement in subtropical and tropical ports (Ports Australia, 2014). The report specifically examined the nature of environmental monitoring programs associated with recent port related dredging projects in Queensland, the Northern Territory and Western Australia and the performance of these projects against monitored environmental impacts from EIS and other approval documents.

A key finding of the study was that monitoring programs associated with recent dredging showed ***'recorded impacts consistent with (generally no impact to a sensitive receptor), or less than, those approved or predicted'***. Even in the two case studies where turbidity exceedances were observed (one being the case of recent dredging and reclamation at the Port of Gladstone), ecological monitoring did not indicate impacts to sensitive receptors such as seagrass (Ports Australia, 2014).

This study reinforces the finding that existing assessment, management and environmental monitoring processes have not resulted in unapproved impacts to environmental resources of high conservation value and that generally, the impacts that have eventuated from port dredging projects have been consistent with those predicted by EIS documentation and approved by regulatory agencies.

B18.2.3.2 Northern Wet Tropics Sub-Region

There are several developments along the coastline and within the catchments of the Northern Wet Tropics Sub-Region. These include:

- Mt Emerald Wind Farm (located 49km south west of Cairns): wind farm including 74 wind turbines, substations, generators and associated infrastructure. Status: development applications lodged
- Sheraton Mirage Port Douglas Redevelopment (located 56km north of Cairns): Redevelopment of existing resort lands. Status: planning activities underway
- Ella Bay Integrated Master Planned Community (located 88km south of Cairns): 450 ha master planned resort and residential eco-community including five resorts, 540 residences, golf course and swimming lagoon, over a 15-year period. Status: development approval with conditions
- Port Mourilyan (located 135km southwest of Cairns): Ports North is constructing a bunded magnetite stockpiling facility. The works include a drainage system, sediment pond and filtration system, lighting and access/exit points. The iron ore will be loaded on to ships at the existing berth by mobile ship loader. There are no medium-term plans in place for any expansion of the existing berthing facilities, entrance channel and swing basin at the Port of Mourilyan.

The above are all land-based development projects, with no identified development areas within the GBRWHA itself. It is recognised that there is the potential for any development within the catchment of the GBRWHA to collectively contribute to the water quality of the receiving waters should appropriate development operation and construction controls not be implemented. It has been assumed that any development approvals of projects within these catchments would include conditions for appropriate consideration of standard erosion and sediment control measures and project-specific design elements to ensure this does not occur.

As there are no aspects of the project predicted to impact the GBRWHA at this regional scale and given the scale of the above identified developments it was considered unlikely that these would impact the project area receiving waters.

B18.2.3.3 Local

Within the local study area there are numerous developments proposed on land in the vicinity of the City of Cairns. The most significant of these by far is the proposed Aquis Great Barrier Reef Resort, located approximately 13km from Cairns. Further details on Aquis and other potential local developments are provided in the sections below.

Aquis

As a single project, only Aquis resort is considered to be of sufficient scale and with marine development aspects to have the potential to impact marine Nature Conservation Areas such as the GBRWHA, GBRMPA and GBRCMP. The project is described below based on the findings of its draft EIS which is currently being assessed by the DSDIP.

Figure B18.2.3.3a Image of the proposed Aquis Great Barrier Reef Resort (from Aquis EIS Executive Summary Document)

Background

The draft Environmental Impact Statement for the Aquis development was prepared under the State Development and *Public Works Organisation Act 1971* and released for public comment from 21 June 2014 to 5 August 2014. The submissions are currently being assessed. The project has also been deemed a "controlled action" under the EPBC Act by the Australian Government, requiring assessment under the accredited assessment process.

Situated 13km north of Cairns and three km south of Yorkeys Knob, the Aquis project will involve the redevelopment of 343 ha of rural land into a large-scale integrated tourism resort. The location of the proposed resort in relation to the Port of Cairns Port and the City Centre is shown in **Figure B18.1a**.

Stage 1 of the Aquis project proposes:

- An artificial lake and island within the development site
- A casino
- Five hotels including 4,000 rooms
- Additional facilities including: retail shopping, an aquarium, a theatre, a reef lagoon, an outdoor sport and recreation facility including an 18-hole golf course, a convention and exhibition centre and a cultural heritage centre.

Stage 2 of the Aquis project proposes:

- Three additional hotels including 3,500 rooms
- A second casino
- Additional facilities including: another theatre, retail shopping and a rainforest.

The construction of Aquis Resort is reported to take place over two stages:

- Stage 1. 2014-2018, with a workforce of 3750, and capital expenditure of A$5.05b
- Stage 2. 2020-2024, with a workforce of 3500, and capital expenditure of A$3.10b.

The program is identified to include three distinct construction elements (Executive Summary, 2014):

- External Works: upgrades to the external roads and connections to water and the sewerage treatment plant, all of which will be required before the bulk of the building works starting
- Site works: bulk earthworks, site shaping, roads, landscaping, and the golf course. The lake functions as a flood channel and is required to be at least as deep as the ground water level prior to the building of the resort complex rising above the natural ground level
- Building works: the building of the island from basements up to podium level, prior to construction of the buildings above the podium.

Impact Findings

Chapter 22 of the Draft EIS examines impacts from the Aquis project on MNES. The Executive Summary[1] from the Draft EIS indicates the following with respect to MNES in this chapter:

'…the Aquis Resort site:

- Is not within any area that is a matter of NES (although maps show that a small creek running into Richters Creek from the Aquis Resort site may actually include the 'low water' line);
- Is adjacent to the GBRWHA (at its nearest point – Richters Creek – the site is basically adjacent to the boundary)
- Is 3.5km from the Great Barrier Reef Marine Park
- Is 6.3km from the Commonwealth marine area
- Is 2.5km (line-of-sight) from the Wet Tropics WHA (approximately 8.4km via the Richters Creek/Thomatis Creek and Barron River corridor) is 1.1km from the nearest listed ecological community.

In addition, the lake inlet pipeline:

- Lies almost entirely within the GBRWHA
- At its nearest is 1.9km from the GBRMP
- At its nearest is 4.1km from the Commonwealth marine area.

In terms of predicted impacts to GBRWHA values and other values relevant to MNES and MSES, the following impact assessment findings are provided in the Draft EIS, Executive Summary for the Aquis project:

'In terms of impacts on the values:

- The construction process (including acid sulfate soil, agricultural contamination, and general soil and water issues) can be adequately managed by normal construction management techniques as committed
- The protection of 99 percent of the 53ha of natural vegetation on site and its enhancement by a further 56ha, together with the removal of five waterway barriers, will enhance on-site habitat and the connectivity provided by the site to the GBR and its catchment
- The use of treated sewage effluent as a potable water substitute and the adoption of water sensitive urban design techniques will remove 133 t/a of sediment and nutrients when compared with the existing cane farm
- Water quality modelling of the lake and the receiving waters shows that water quality of the discharge is expected to be superior to that of Richters Creek into which it will be discharged
- There are unlikely to be any visual impacts on the GBRWHA, its OUV and associated aesthetic attributes, or on intangible perceptions or responses, as the built form will be no more visible from offshore than Cairns CBD buildings.

Based on these assessment outcomes, and when considering the impact conclusion of the CSD project, the cumulative impacts from the two projects on the GBRWHA and other MNES are not considered to be unacceptable or will additively result in any unexpected cumulative impacts.

While not able to be quantified at this stage, it is more likely that the Aquis and CSD projects will likely be mutually beneficial to each other in terms of tourism growth, differentiation and overall economic development of the Cairns and North Queensland region.

[1] Document downloaded from: http://eisdocs.dsdip.qld.gov.au/

However, neither project has indicated any degree of interdependence on each other; the cruise demand study that underpins the CSD project has not considered or otherwise accounted for any increased cruise passenger demand that may be generated by the influx of international and domestic tourists associated with an operating Aquis resort.

The extent that future guests of Aquis will or may use the Port of Cairns as an embarkation or disembarkation point for cruise shipping cannot be quantified at the present time but provides a further possible positive economic flow-on both for the existing Adventure Class cruise ship market (which home ports in Cairns) and the possibility of additional home ported cruise ships for parts of the year to address local demand.

Other Local Projects

Other potential development within the catchment of Trinity Inlet and Trinity Bay that have the potential to impact the receiving marine environment in the vicinity of the Port of Cairns include:.

- Potential upgrades to ports, marinas and ferry terminals, for example:
  - Yorkeys Knob: (Located ~ 15km north of Cairns) Ports North is currently undertaking an upgrade to Boat Club facilities including the pontoon, walkways and land-side transport amenities and landscaping
  - Yarrabah: (Located ~10km east of Cairns) A potential ferry terminal proposal under feasibility planning
  - Port of Cairns Cityport development: Ports North is currently undertaking an urban revitalisation project centred around Trinity Wharf. The first stage is completed with further infill development proposed
- Cairns CBD and waterfront redevelopment including Cairns Airport, Cairns Aquarium, Cairns Hospital, Spence Street Redevelopment, Central Queensland University (Cairns) upgrade, Caravonica high density residential precinct and Edmonton Business Park, amongst others
- Mount Peter Residential Master Plan: Located ~10km south west of Cairns, approved 1,500ha residential master planned area to be developed over 25 years.

None of the potential or proposed projects include any dredging as part of their developments; however, the proximity of many of these proposed developments to the waterfront and/or catchment of Trinity Bay has the potential to impact upon the water quality of the receiving waters of Trinity Bay. Therefore these developments collectively have the potential for cumulative impact upon these receiving waters should the timing of any such impacts (e.g extreme weather event producing turbid runoff from the construction areas in the catchment into Trinity Inlet/Bay) coincide with dredging operations for the CSD project.

However, any impacts on receiving water quality of the individual projects will need to be mitigated to acceptable levels and would likely be subject to individual monitoring programs. In addition, if broader scale impacts to water quality are occurring this will likely be detected by the proposed reactive monitoring program for the CSD project and then could be considered in the context of the dredging program associated with the project.

B18.2.4 Summary

A summary assessment of potential cumulative impacts has been undertaken for each of the environmental and social aspects and is presented in **Table B18.2.4a**. This table outlines potential cumulative impacts at the three scales discussed above – whole of WHA, regional and local scale.

Table B18.2.4a Summary of Cumulative Impact Assessment

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Land	**Chapter B1**	The project does not involve development or other activities on land (above high water mark) other than upgrading the cruise liner berths and provision of infrastructure for fuel supply and other existing port-zoned areas. It is therefore considered to have a negligible residual risk to Geology and Soils, Land Tenure, and Land Use.	The other port projects in the GBR will not affect land use in the Cairns region due to their distance from the project.	Proposed changes to local land use at the Aquis site (~13km from the CSD) are outlined in the Aquis draft EIS. Cityport is a complementary development master plan for the Port of Cairns SPL. It is assumed that CityPort and all approved development in the CBD and vicinity is in accordance with the Cairns Regional Plan and will be complementary to the project.	Negligible risk of cumulative impact
Nature Conservation Areas	**Chapter B2**	The project has predicted a medium (temporary) risk of local impacts to the GBRWHA, GBRMP and Queensland Great Barrier Reef Coast Marine Park (GBRCMP) at the local scale, primarily related to impacts to unvegetated benthic habitat in the dredge footprint and DMPA. Residual impacts to the Trinity Inlet Fish Habitat area are low as they are being offset by a proposed adjustment to the boundaries to achieve no net loss. There is a low risk of impacts at the regional scale and negligible impacts at the whole of the GBRWHA and GBRMP scale as the impacts from the project are generally confined to the local scale.	If other port projects in the region predict significant impacts on the GBRWHA or GBRMP they will not be approved or otherwise require appropriate offsets. Modelled impacts from dredging and dredge material placement for other port projects have not shown re-suspension impacts that affect the local study area for the project to date. Shipping from other port expansions will increase the number of ships that traverse the GBRWHA/GBRMP and the implementation of the strategies outlined in the North-East Shipping Management Plan (AMSA, 2014) to proactively manage these risks. This increased risk (PGM 2012	The draft EIS for Aquis does not predict impacts on downstream Nature Conservation Areas of MNES and/or MSES. Refer to Water Quality and Marine Ecology sections below for discussion of other local project potential impact on MNES/SES	Low risk of cumulative impact

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Coastal processes	**Chapter B3**	Overall a low to medium risk of impacts on coastal processes from the project are predicted. All risks to coastal processes and dredging-related water quality that have been identified can be reduced to a low or medium residual risk through the application of existing controls (inherent of the CSDP design) and through the proposed implementation of risk mitigation measures. The proposed DMPA location has been shown to be a highly retentive site under both prevailing and "worst case" conditions. Long-term impacts are considered unlikely.	Impacts from dredging and dredge material placement for other port projects in the GBRWHA are unlikely to indicate changes to hydrodynamics, shoreline morphology or sediment transport processes that could affect the project area.	The draft EIS for Aquis identified that the project will not impact coastal processes or have adverse effects on adjacent lands. There are no other local projects known to propose dredging or other significant marine works that would be predicted to significantly impact on coastal processes.	Negligible risk of cumulative impact
Marine sediment quality	Chapter B4	All capital dredge material associated with the project has been tested under the National Assessment Guidelines for Dredging (2009) (NAGD) process and deemed suitable for unconfined at sea placement. Future maintenance material must be tested in accordance with this process; noting maintenance dredging material at the Port of Cairns has always been deemed suitable for marine placement.	All port projects must demonstrate dredged material is suitable for at-sea placement through the NAGD assessment process and sea dumping permit process (administered by the GBRMPA and/or Department of Environment (DoE)). These statutory processes protect the GBRWHA and associated values from the impacts of contaminated sediments.	The draft EIS for Aquis does not indicate there is a risk of sediment contamination from the project. There are no other local projects known to likely pose a significantly impact to sediment quality in Trinity Bay.	Negligible risk of cumulative impact

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Marine water quality	**Chapter B5**	The project predicts a low risk of residual impact on water quality based on the implementation of a strategy to avoid or reduce dredge overflow by the trailing suction hopper dredge. Further, the use of a backhoe dredge where necessary will further reduce the impacts of overflow during capital dredging. Impacts from the dredging and placement will be temporary and will not preclude the achievement of water quality objectives (noting that for some parameters these objectives are already exceeded in ambient conditions).	Studies of water quality impacts from dredging and dredge material placement for other port projects show that turbidity or other water quality impacts will not affect the local study area for the project. Increase in shipping: Cruise ships comprise only a very minor component of the total number of commercial vessels transiting the GBRWHA region. In 2011-2012, cruise ships represented <2 percent of the commercial vessel calls to GBR ports. (GBRMPA website, 2014)	As outlined in the draft Aquis EIS, the development will be required to implement water quality management plans that apply to both construction (EMP, ASS management plan, etc) and operational phases (stormwater and lake water quality management) of the project. If approved, the project will likely be conditioned to ensure the environmental values of water in the receiving environment are protected. It is assumed that conditions for appropriate sediment and erosion controls will be included in any development approvals and therefore, the values of water in the receiving environment are protected. At a local and regional scale there is the potential for water quality impacts from any of the development areas that are in the catchment of the local study area. Should the timing of construction works occur with severe/ extreme weather events there is the potential for turbid runoff from sites in the catchment of Trinity Bay.	Low risk of residual impact. Both projects will likely be subject to extensive monitoring programs to validate EIS findings and to reactively respond to any triggers to water quality performance requirements. It can be assumed that the conditions of any development approval will include provisions to employ minimum standard erosion and sediment control techniques to prevent turbid runoff from leaving the development site. Additionally all coastal developments are required to meet design criteria for storm surge impacts in extreme weather events. The proposed Reactive Monitoring Programe will respond to any triggers to water quality performance requirements and will therefore mitigate the potential for cumulative water quality impacts during capital dredging.

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Water resources	**Chapter B6**	The project predicts a low risk of residual impact on surface waters. The primary risks are associated with handling and storage of minor volumes of chemicals to do with construction as well as additional bunker fuel storage and handling (noting the port currently handles and provides marine diesel fuel). Other risks include on-site management of infrastructure services and other trade products that may release contaminants into waterways.	There are no known regional projects that are predicted to impact upon water resources in the vicinity of the project	Handling of any chemicals or fuels in the catchment of waterways has the potential for impact. However there is a low risk based on implementation of standard management practices as would be conditioned by any development approval.	Negligible risk of cumulative impact
Marine Ecology	**Chapter B7**	The project predicts medium to low level temporary impacts on the important habitats and species of Trinity Bay and Trinity Inlet that could be affected by dredging and placement. The project does not predict long term or permanent impacts on key habitats or species	The resilience of marine ecological resources in the GBR region is well documented in both the Outlook Report (2014) and Strategic Assessment (Australian and Queensland Governments 2014). Local impacts from other port projects on these values are subject to rigorous EIS process and conditions of approval. As outlined above, regional impacts from port projects on marine ecological resources are not predicted for issues such as dredge material placement and shipping.	The draft Aquis EIS indicates that management solutions will result in a net beneficial impact on flora and fauna values both within the site and in external areas downstream to the GBR lagoon via the two Fish Habitat Areas and the Estuarine Conservation Zone of the GBRMP. Refer to water quality aspects as no known local project with direct marine ecology impacts	Low risk of residual impact.

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Terrestrial Ecology	**Chapter B8**	The project predicts a low to negligible residual risk to terrestrial ecology. This is primarily due to the works being predominantly marine based. Further to this, any land-based infrastructure impacts on the terrestrial environment are located within port lands and are being appropriately managed through mitigation measures. There is a low residual risk posed to shorebird foraging habitat within intertidal areas from the project	There are no known regional projects that are predicted to impact upon local terrestrial ecology.	The Aquis project is not predicted to have an impact on the local ecological study area of the CSD project. Potential construction works for adjacent developments (e.g Cityport and other waterfront development) are not expected to have impact on the local terrestrial or intertidal ecological study area of the project.	Negligible risk of cumulative impact.
Socio	**Chapter B9**	The project predicts a low to negligible residual risk from a social perspective. This is as a result of public support for the project and mitigation measures in the form of continued consultation with key parties.	Potential cumulative social benefit due to local and regional job creation and associated economic benefit.	Potential cumulative social benefit due to local and regional job creation and associated economic benefit (refer below). Potential cumulative disbenefit should co-incidental timing of project constructions cause amenity impacts (traffic, noise, air quality, visual, etc) and potential strain on local worker accommodation and other services.	Low risk of cumulative impact.
Economic	**Chapter B9**	The project predicts a beneficial outcome from when it is operational in terms of local economy, local employment, improved efficiency for existing cargo shipping and improved cruise ship passenger experience. However, it identifies a high risk in terms of lost economic opportunity (of which the project is the only mitigation) if the project does not go ahead.	Other port projects primarily cater for bulk cargo exports, while the CSD project which will improve the regional cruise liner shipping revenue. All promote overall regional and wider economic benefits.	Potential cumulative economic benefit due to local and regional job creation and associated economic benefit.	Positive cumulative benefit.

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Noise and Vibration	**Chapter B10**	The project predicts a medium to low level of residual risk. The impacts from noise are primarily seen in construction noise from land-based infrastructure and dredging. All other noise and vibration impacts are considered low residual risk.	There are no known regional projects that are predicted to impact upon local acoustic environment.	Potential cumulative impact should coincidental timing of project constructions cause amenity impacts (traffic, noise, air quality, visual, etc.).	Negligible risk of cumulative impact.
Air Quality	**Chapter B11**	The air quality impact as a result of the project construction and operations is likely to be low due to good existing air quality in the Cairns region and air quality management and mitigation measures proposed for the project. The likelihood of significant air emissions affecting nearby sensitive receivers from the disturbance of dredged material is considered to be negligible. Dust generation and vehicle exhaust emissions are expected to be minor and short term in their nature.	The other port projects in the GBR will not affect air quality in the Cairns region due to their distance from the project.	Potential cumulative impact should coincidental timing of project constructions cause amenity impacts (traffic, noise, air quality, visual, etc.).	Negligible risk of cumulative impact.
Landscape and Visual	**Chapter B12**	The project predicts negligible residual risk from the viewpoints assessed. The incremental increase in the size, frequency and duration of cruise ships will be perceptible in a number of views, but unlikely to be appreciably different than the existing situation.	The other port projects in the GBR will not affect visual amenity in the Cairns region due to their distance from the project.	Potential cumulative impact should coincidental timing of project constructions cause amenity impacts (traffic, noise, air quality, visual, etc.).	Negligible risk of cumulative impact.
Cultural heritage	**Chapter B13**	The project predicts a low residual risk to Indigenous and Non-Indigenous Cultural Heritage. Known places of significance have been identified and are considered unlikely to experience impacts.	There are no known regional projects that are predicted to impact upon local cultural heritage aspects.	There are no known other local projects that are predicted to impact upon identified cultural heritage aspects within the CSD study area.	Negligible risk of cumulative impact.

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Land Transport	**Chapter B14**	The project predicts a low residual risk to transport infrastructure. This is based on the low to moderate level of impact expected on the network, and the implementation of key mitigations measures.	There are no known regional port projects that are predicted to impact upon the local Cairns transportation network.	Development conditions of all approved projects will include predicted traffic management measures. Cityport will be developed to facilitate all port transport requirements in accordance with the approved master plan.	Negligible risk of cumulative impact.
Waste Management	**Chapter B15**	The project predicts negligible residual risk to human health, ecological values and amenity from waste. This is as a result of the implementation of key management measures.	Potential cumulative impact from increased shipping (ballast water, sewage, etc.) has the potential to impact at a regional scale, however, the cruise liner industry contribution is <2 percent total shipping. Additionally, most modern cruise ships have on board incinerators reducing the generation of solid wastes.	No additional shipping wastes predicted from any local development.	Negligible risk of cumulative impact.

Issue	EIS Chapter	CSD Project Residual Risk Assessment Summary	Impacts from other Projects at a GBRWHA Regional Scale (e.g. other GBR Port Projects	Impacts from other Projects at a Local Scale (Aquis and other projects)	Predicted Cumulative Risk for the Issue
Climate Change and GHG's	**Chapter B16**	The project predicts low to medium risks regarding potential climate change impacts, and from the generation of carbon emissions. Due to potential increase in storm surges, cyclones and weather impacts, there may be increased deterioration or damage on berthing infrastructure or water, sewer and power networks. This may lead to more frequent maintenance or temporary delays or obstruction of cruise ship berthing. Further, moderate levels of carbon emissions are predicted as a result of dredging during the construction and maintenance stage, which is due to the amount of fuel usage required to undertake dredging activities. The amounts produced are well below the National Reporting Thresholds (which are an indication of high carbon emitters), and are only an extremely small percentage (>1 percent) of Queensland's annual total carbon emissions.	Potential cumulative impact from dredging projects and other construction activities.	All developments contribute GHGs, however, none are considered to significantly impact. Aquis is predicted to produce 17.4kt of CO2e during its construction and 189kt of CO2e annually once it is operational. Similarly to the CSD project, these are relatively small amounts when compared to Queensland's annual total carbon emissions.	Negligible risk of cumulative impact.

B18.3 Consequential Impacts

B18.3.1 Background

Consequential impacts are those that arise as a result of the project, particularly in the long term. The EIS Guidelines and Queensland TOR require consideration of any likely impacts development may facilitate on the relevant MNES and MSES at relevant local, regional, state, national and international scales.

The key consequential impacts from the project are as follows:

- Maintenance dredging
- Increased fuel bunkering
- Increased shipping
- Increased maintenance dredging.

As discussed in **Chapter B3, Coastal Processes**, the expansion of the Port of Cairns shipping channel is likely to result in an increase in annual maintenance dredging volume on the order of 80,000-100,000 m^3 per annum.

Annual dredging at the Port of Cairns is likely to continue to be undertaken by the TSHD ***Brisbane***, a similar but slightly smaller dredge vessel to that modelled as part of this project. As such, the frequency and duration of turbidity impacts from future maintenance are likely to be similar in nature to those presented in this EIS and as observed over historical dredging campaigns; albeit occurring over a shorter duration each year (four-five weeks). As outlined previously in this EIS, Ports North has an approved Long term Dredge Spoil Disposal Management Plan (LTDSMP) and 10-year permit to undertake maintenance dredging and associated at-sea placement of maintenance dredging material at an approved DMP site within the GBRMP. If the project was approved, a new maintenance permit would be required to reflect a new DMPA site and the larger annual volumes required for placement. In the context of this new maintenance dredging and disposal permit the following findings are relevant:

- It is proposed that placement of future maintenance material will be in the new DMPA identified by the project (e.g, Option 1A). This site has greater long-term capacity than the current DMPA due to its depth and will likely provide adequate storage capacity for 20+ years. The existing DMPA would cease to be used following completion of the capital works and allowed to naturally rehabilitate similar to other disused sites in Trinity Bay, as agreed with the relevant agencies
- Current channel maintenance dredging campaigns typically occur during the months of July to September and generally take about three-four weeks to complete. The additional volume associated with the expanded channel will likely extend these campaigns by approximately one week. **Chapter B5, Marine Water Quality** discusses the water quality impacts from future maintenance dredging, noting the impacts from maintenance dredging has been assessed previously as being acceptable to regulatory agencies based on historical observations (as outlined in the Port of Cairns LTDSDMP). It is therefore not anticipated that a slightly extended maintenance dredging campaign will make a significant difference to local marine ecosystems
- The project will not increase the risk of contamination of maintenance dredge sediments. The only variation will be in the context of the larger channel resulting in a larger volume of sediment collected each year that needs to be removed from the channel to allow safe navigation. There is also the potential for increased oil spills or leakages from the provision of fuel oil at the cruise terminal berth; however, the Port has procedures and equipment that can be quickly utilised to limit any spill and would respond to any spill to reduce the risk and potential impacts from such spills. These issues are discussed further in **Chapter B4, Marine Sediment Quality** and **Chapter C1, Construction and Operational Environmental Management Plan.**
- Placement of maintenance dredge material at the new DMPA, which is approximately one nautical mile in diameter with an area of 2.7 km^2, will be undertaken similarly to the existing practice, whereby the material is evenly spread over the whole DMPA area. The result of this even spreading will increase the fill platform approximately 15cm (0.15m) per year from maintenance placement and will not prevent rapid benthic recolonisation of the DMPA, as may be the case with deeper fill. This recolonisation process is further discussed in **Chapter B7, Marine Ecology**, noting surveys of the existing DMPA indicate that maintenance placement is not having a significant adverse impact on the benthic habitat in the long term (e.g communities rapidly recover from temporary impacts of placement and are similar to adjoining benthic habitat areas that are not used for dredge placement).

In the longer term, the port will continue to be required to prepare and implement a sediment sampling and analysis plans (SAP) to determine the suitability of future maintenance dredge material for marine placement. These will be need to be undertaken at regular intervals noting current investigations are permitted to remain current for a period of six years under the NAGD. Despite any approval issued pursuant to the project, any contaminated dredge material detected in future testing will not be permitted to be placed at sea under the NAGD and sea dumping permit process.

B18.3.2 Increase in Cruise Shipping

Thousands of domestic and international ships transit the GBRWHA each year with very few, if any, incidents. The Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS) currently monitors about 11,000 ship voyages annually (i.e, vessels >50m) in the Great Barrier Reef and Torres Strait, and has recorded four 'grounding' incidents since its inception in 2004 (AMSA, 2014).

During this period, the service has recorded a gradual increase (about one per cent per annum) in the number of ship voyages undertaken through the GBR region. This increase has been driven mainly by industry and mining demands, with cruise shipping only contributing <2 percent of all shipping calling at Queensland Ports (GBRMPA, 2014). Despite this increase in shipping traffic, improvements in shipping safety management as outlined below have resulted in fewer major shipping incidents in the past 10 years, with almost all ships travelling safely along the designated shipping routes of the GBR.

Shipping activity in the GBRWHA has the potential to impact the OUV of the World Heritage Area and other MNES through the following (PGM Environment 2012):

- Collisions, groundings and other maritime navigational incidents
- Oil spills
- Anchorages (in relation to potential damage and contamination of the seabed and associated habitats)
- Ship sourced atmospheric emissions
- The incision and possible establishment of marine pests in relation to ballast water and biofouling
- Ship sourced oily wastes, sewage and garbage
- Marine fauna strike
- Underwater noise.

Given these risks, the GBRHWA is one of the world's most regulated shipping areas (Strategic Assessment, 2014). The GBRMPA together with the AMSA and MSQ work closely to protect the marine environment from the potential adverse consequences of shipping operations. The Reef was designated as a "Particularly Sensitive Sea Area' by the International Maritime Organization (IMO) in 1990 and shipping traffic is confined to a Designed Shipping Area unless otherwise permitted by GBRMPA.

Measures to increase navigational safety and reduce the risk of ship groundings and collisions include:

- Compulsory and recommended pilotage areas (noting specified areas of the GBR requires accredited reef pilots as well as port specific pilots within port limits)
- An automatic ship identification and vessel tracking system (REEFVTS system)
- Traffic separation controls
- Ship vetting procedures
- Mandatory vessel reporting and monitoring.

Standing arrangements are in place for dealing in an effective and expeditious manner to any oil or chemical spill in the GBRWHA under the ***Australian National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances.*** The National Plan links with Queensland State-wide and regional measures that address the waters of the GBRWHA and include 1st Strike Response plans for each port (including the Port of Cairns) as well as an Oiled Wildlife Response Plan.

The Port of Cairns already regularly handles a range of petroleum cargos at its fuel wharf and provides smaller quantities of marine diesel fuel at the CCLT via road tankers. Oil and chemical spill response assets are pre-positioned at the Port of Cairns including AMSA's national stockpiles of spill response equipment for use by other ports and marine users.

The overall approach to the environmental management of shipping in the GBRWHA has also recently been reviewed and updated as part of the North-East Shipping Management Plan, 2014. The plan examines shipping-related risks in the GBRWHA, the Torres Strait and the Coral Sea and identifies protective measures and is identified in the State Party Report as a key supporting measure for protecting the OUV of the World Heritage Area.

With shipping numbers predicted to significantly increase in the next 10 to 15 years as a result of mining and LNG industry growth, port expansions and increases in trade, the North-East Shipping Management Plan (AMSA et al, 2014) has made recommendations to further reduce the risks from shipping and to consolidate and improve upon the existing shipping record in the GBR.

Specific environmental management measures for shipping that operate in the GBR region include:

- Areas where anchoring is prohibited
- Special requirements for tankers and hazardous cargos
- Oily waste discharge restrictions
- Sewage discharge restrictions
- Garbage discharge restrictions
- Ballast water discharge restrictions consistent with IMO Protocols.

As outlined previously, the net increase in cruise ship visits from the improved infrastructure provided by the project will be incremental, with many of the larger class cruise vessels that currently anchor at Yorkeys Knob able to 'moor alongside' at Trinity wharves following completion of the project.

The net increase in the number of ship visits (based on projected demand with and without improved infrastructure by 2026) is estimated to be 30 vessels which is a far smaller number than the increase in bulk and break bulk cargo and fuel ship movements projected at other expanding GBR ports.

In addition to the small volume of ships involved, other aspects of the project which reduce the risk of impacts from cruise shipping include:

- The wider and deeper channel and swing basins improve navigational safety in terms of all tide access to the port. The 130m channel and wider bend have been designed to fully meet regional harbour master and marine pilot safety requirements. While existing cruise ship operations at the Port of Cairns are very safe, the expanded channel will further improve factors of safety, noting the overall manoeuvrability and navigability of modern cruise ships also continues to improve through technological advances and the continued higher use of larger cruise ships in the region.
- The project will enable the Port of Cairns to cater for the majority of cruise vessels visiting the area, minimising the use of anchorages at Yorkeys Knob. Management of shipping within the port limits is considered a favourable and safer alternative for the overall management of shipping risks.
- Large cruise ships and the cruise ship companies who operate them, have accredited good practice Environmental Management Systems (EMS) to manage incidents as well as ship sourced waste and pollution. This includes waste incineration and the ability to hold large volumes of wastewater. Alongside operations at Trinity wharves (particularly during overnight visits) provides cruise ships with the additional opportunity to dispose of liquid and solid waste materials to appropriate on-shore facilities, as well as take on new supplies and crew exchange.

Based on the above, the forecast increase in cruise shipping visits presents a very minimal change to the substantive risk levels of shipping in the GBRWHA and in the port limits of Port of Cairns if managed accordingly.

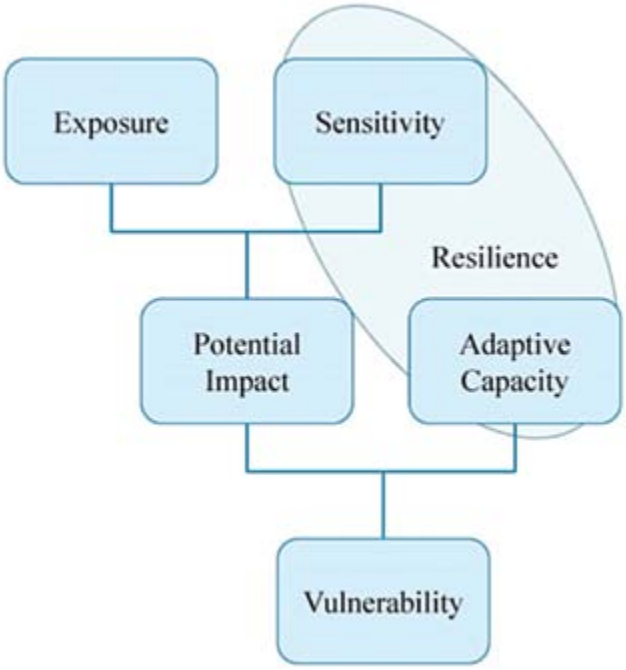
B18.4 Ecosystem Resilience

B18.4.1 Definitions and Concepts Used

The Outlook Report (2014) defines resilience as 'the capacity of a system to resist disturbance and undergo change while still retaining essentially the same function, structure, intensity and feedbacks. The Outlook Report (2014) further states that 'resilience is a way of describing the properties of a system and how it responds to exposure to disturbance. Together with exposure, resilience helps determine a system's overall vulnerability.'

In their work on a conceptual framework for understanding cumulative impacts for managing the GBRWHA, Anthony ***et al.*** (2013) reproduced a figure from Fussel and Klein (2006) which shows the relationship between the concepts of sensitivity, adaptive capacity, resilience and vulnerability. This figure is reproduced in **Figure B18.4.1a**.

Figure 18.4.1a Concepts of Resilience in the context of a Vulnerability Assessment



In general terms, a resilient system is one that can resist pressures and return to its existing state within a very short time frame. However, it is recognised that tropical marine systems such as the GBRWHA and its underlying coastal ecosystems are subject to a wide range of natural and human-related threats that can make resilience and recovery complex and difficult to measure.

This section of the chapter examines these concepts of resilience at three scales: whole GBRWHA scale, regional scale and local scale as defined in **Section B18.1**.

B18.4.2 Resilience of the GBR WHA and other MNES

B18.4.2.1 Whole of WHA Scale

As outlined in the State Party Report (Australian Government 2014), the drivers for the current condition of the GBRWHA are well understood. The most fundamental impacts have been from the 150 years history of land use change that continues to contribute sediment, nutrients and pesticides to the GBRWHA.

Overall the health and resilience of the reef is affected by a range of short-term acute and longer-term chronic disturbances, including:

- Catchment runoff and diffuse land-based pollution including sediment and nutrient enrichment
- Floods
- Cyclones
- Crown of Thorns Starfish (COTS) outbreaks
- Elevated sea surface temperatures.

While the Strategic Assessments by the Australian and Queensland Governments found that the World Heritage property continues to retain its OUV and integrity, a number of attributes are in decline, particularly in areas south of Cooktown.

Over recent years, a 'confluence' of severe weather events has occurred resulting in cyclones and flooding that have significantly affected near-shore water quality and associated habitats, increased the mortality of dugong and green turtle, due to the loss of seagrass as a result of these events, and created conditions suitable for outbreaks of COTS.

In particular, multiple acute disturbances in short succession as has been experienced in the region since 2010 can have a combined negative effect on reef condition and resilience that is greater than the effect of each disturbance in isolation (Report Card 2013).

There is no comprehensive information on the ecosystem resilience of the GBRWHA due to the vast extent and complexity of the ecosystem and because resilience is a complex and dynamic property that is difficult to quantify and measure. However, indicators of resilience (in the form of case studies) are listed in the Outlook Report (2014) (section 8) and shown in **Table 18.4.2.1a**.

Not all of these indicators are relevant to Trinity Bay and Trinity Inlet where the project is proposed, but this list forms a useful set of indicators that will be used and discussed later in this chapter.

Table B18.4.2.1a Indicators of Resilience from GBR Outlook Report

Indicator	Summary	Assessment grade	Trend
Coral reef habitat	Increases in the frequency and severity of disturbances, such as cyclones, flooding, and crown of thorns starfish outbreaks have reduced the capacity for coral reefs to recover since 2009. There is evidence of recovery at the local scale.	Poor	Deteriorated
Lagoon floor habitat	On-going management arrangements mean that some lagoon floor habitats previously at risk are continuing to recover from disturbances. There is little monitoring of lagoon flood condition or recovery.	Good	Stable
Black teatfish	Based on recent modelling, populations of black teatfish in the region are likely to be slowly recovering.	Very Poor	Improved
Coral trout	Coral trout populations demonstrate a strong ability to recover and increased reproduction on zones closed to fishing disperses beyond those zones. However, there are emerging concerns about the overall condition of populations.	Good	No consistent trend
Loggerhead Turtles	Loggerhead populations are recovering. There are comprehensive management arrangements in the region but some threats remain. Pressures from outside Australian waters are likely to influence their full recovery.	Poor	Improved
Urban coast dugongs	The urban coast dugong population has declined further since 2009 affected by the loss of seagrass from cyclones and flooding. Continued effective implementation of all management arrangements is required to reduce direct threats.	Very Poor	Deteriorated
Humpback whales	Humpback whales continue to recover at their maximum population growth rate 50 years following the cessation of whaling.	Very Good	Improved

Source: Great Barrier Reef Outlook Report 2014

B18.4.2.2 Regional Scale

The GBR Report Card (2012 and 2013) – ***Marine Results*** published by the Australian and Queensland Governments in 2014, is the most recent and comprehensive assessment of regional habitat condition for the Wet Tropics region of the GBRWHA, which includes the coastal areas north of Cairns to Ingham in the south. **Figure B18.4.2.2a** provides a snapshot summary of the status of key ecosystem components and processes in this region. Water quality in the region is assessed as being 'Poor' although the trend is positive and the overall grade close to 'Moderate' due to 'Good' Total Suspended Solids. Corals are assessed as being 'Poor' and seagrass is assessed as 'Very Poor'. **Figure B18.4.2.2b** (Water Quality), **Figure B18.4.2.2c** (Seagrass) and **Figure B18.4.2.2d** (Corals) from the Report Card show trend information within each grading category for these components.

Coral reefs in the region have declined from a previous 'Moderate' rating in 2011, noting that disturbances, especially from tropical storms, are a major driver of coral cover and more acute disturbances have been demonstrated to affect reefs (De'ath ***et al*** 2012). Continuing and increasing catchment runoff (nutrients, sediment, pesticides) post the repeal of the specific legislation in relation to this aspect are also affecting reefs in the region with likely increased COTS outbreak frequencies. De'ath ***et al.*** (2012) notes in their article on the ***27 year decline in coral cover on the Great Barrier Reef and its causes***, that in the absence of cyclones, COTS and bleaching, the estimated rate of increase in coral cover would be 2.85 percent per year and that in the absence of COTS coral cover could increase by 0.89 percent per year despite ongoing losses due to cyclones and bleaching.

Figure B18.4.2.2a Marine Condition in Wet Tropics (From GBR Report Card 2012-2013)

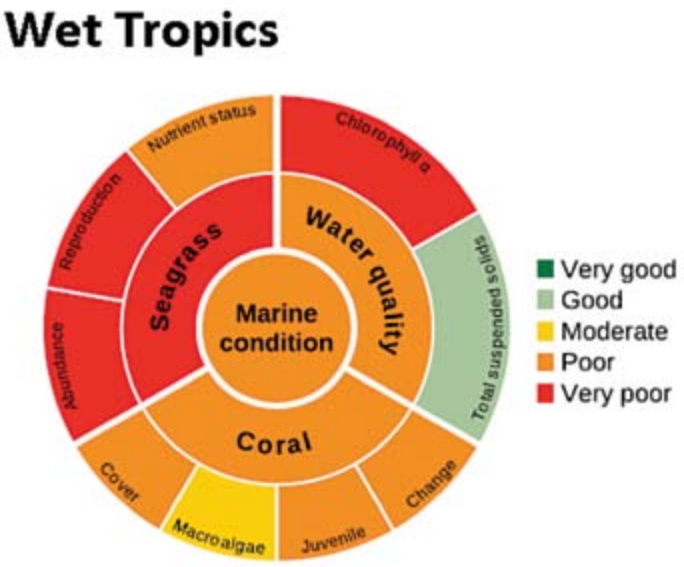


Figure B18.4.2.2b Water Quality in Wet Tropics (Sourced from GBR Report Card 2012-2013)

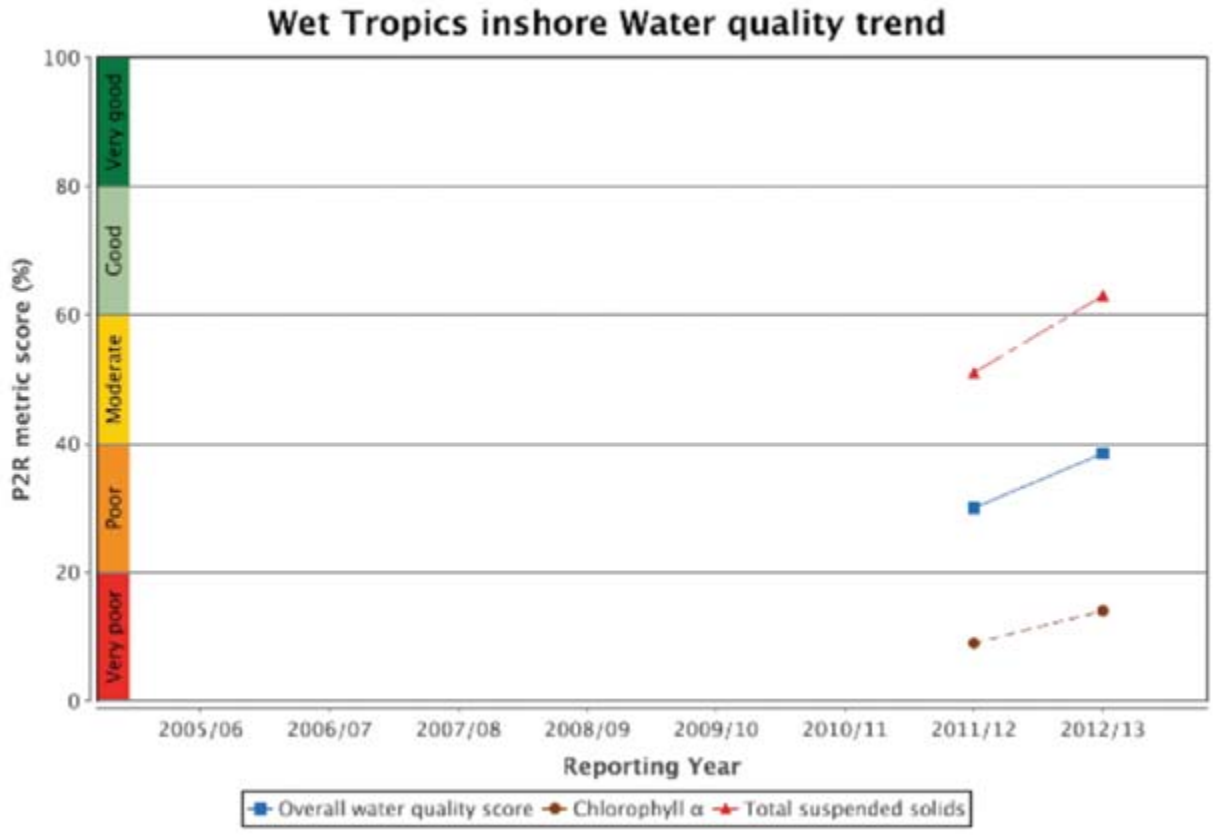


Figure B18.4.2.2c Inshore Seagrass in Wet Tropics (Sourced from GBR Report Card 2012-2013)

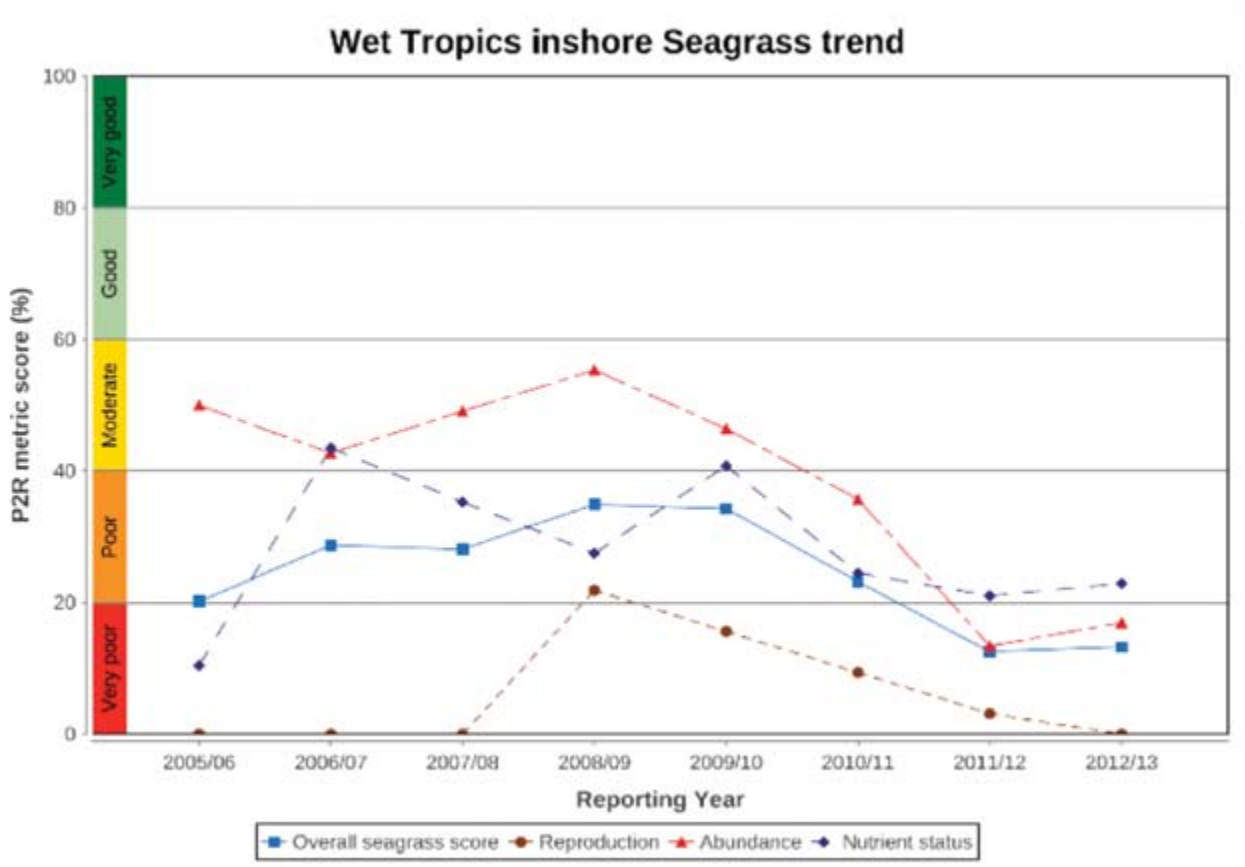
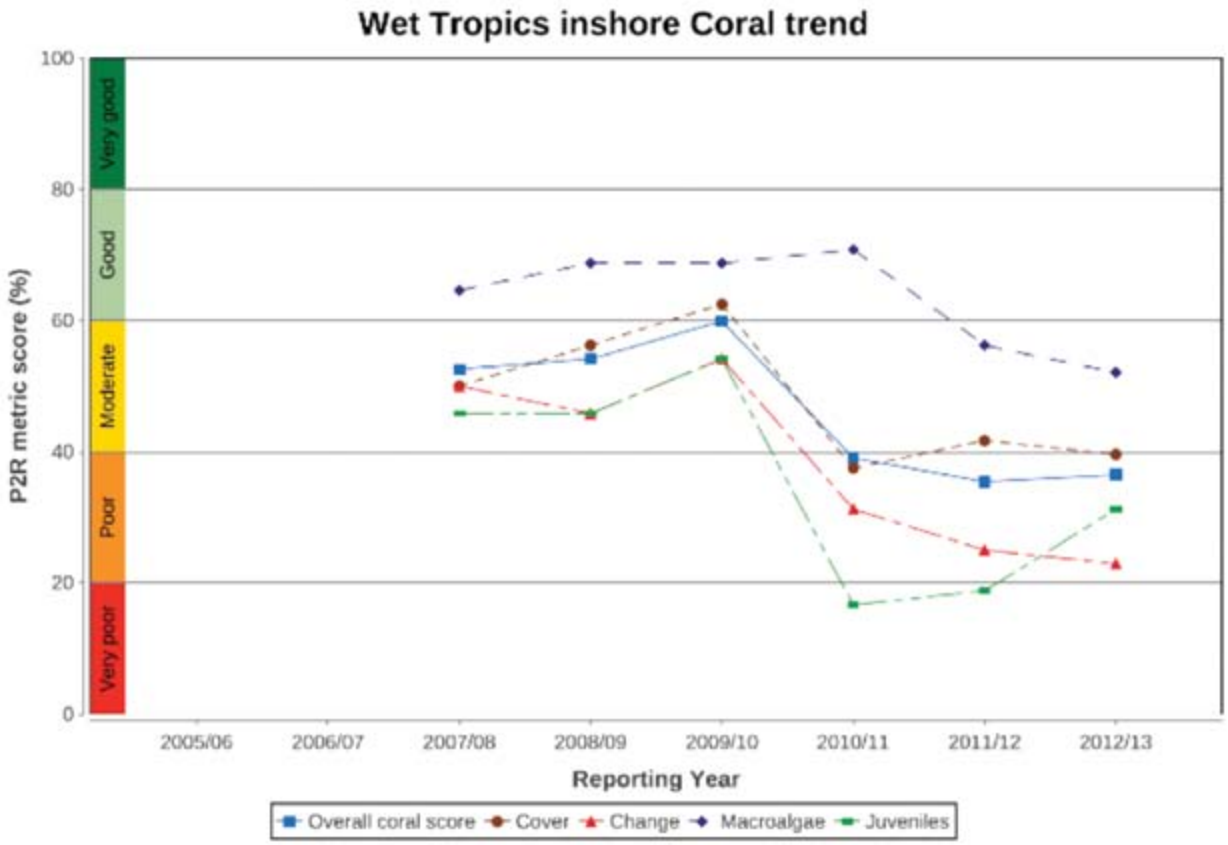


Figure B18.4.2.2d Inshore Corals in Wet Tropics (Sourced from GBR Report Card 2012-2013)



B18.4.2.3 Local Scale

The existing baseline environmental conditions within the local study area (e.g Trinity Bay and Trinity Inlet) are described elsewhere in Part B of this EIS and are summarised below.

Water quality

Local water quality resource condition and trends are outlined in **Chapter B5, Marine Water Quality**. Trinity Bay and Trinity Inlet are naturally turbid environments especially following periods of high rainfall and sustained winds and currents which resuspend seabed sediments. As a result, naturally occurring turbid plumes are a regular feature of the marine environment.

Turbidity is a critical water quality parameter as it contributes to the available light within the marine environment for key habitats such as seagrass and coral. Findings from **Chapter B5, Marine Water Quality** (and the 12-month local water quality data capture program undertaken for the EIS) with respect to turbidity found that:

- During the wet and dry seasons, turbidity levels generally increased from the Trinity Inlet out to near shore areas (False Cape, Cape Grafton and Northern Beaches). Turbidity was relatively low (<10 NTU) at offshore areas during both seasons based on conditions in 2013-2014
- All monitoring locations demonstrated median turbidity levels in excess of the relevant Water Quality Objective (WQO) for both seasons, with the exception of Trinity Inlet (Region 1b) during the dry season.

These results and trends are generally consistent with long-term trends in water quality observed as part of previous monitoring by Ports North as well as by other studies in Trinity Bay both with and without dredging and at-sea placement

Corals

As reported in SKM/APASA – Appendix D (2013), coral reefs in the region have been monitored since 1992 by Ayling and Ayling (2005) and by Sweatman ***et al.*** (2005). The Australian Institute of Marine Science (AIMS) has also been monitoring sites at Fitzroy Island, High Island and the Frankland Group.

The monitoring programs have recorded five major disturbances that have resulted in substantial reductions in coral cover on reefs within the study area including bleaching events in 1998 and 2002, COTS outbreaks in 1999-2000 and cyclone impacts in 2006 (from Cyclone Larry) and in 2010/11 (from Cyclone Yasi).

While hard coral cover has fluctuated considerably in response to these pressures, cover for offshore reef areas at Fitzroy Island and Green Island has increased from 1993 to 2011. Soft coral cover has fluctuated over the same period but has generally recovered to similar levels as those recorded in 1993.

Seagrass

In 2011, the total area of seagrass meadows in Cairns declined for the fourth consecutive year to 211 ha, the lowest spatial extent observed since 2001 (SKM/APASA Appendix F, 2013). Reason et al (2012) attributed the recent declines to seagrass in Cairns to several years of high rainfall and flooding and the effects of Cyclone Yasi which passed through Cairns in February 2011. Reason et al (2012) concluded that port activities (shipping, maintenance dredging and at sea placement) were unlikely to have had impacts.

Annual and quarterly monitoring of seagrass undertaken by James Cook University (JCU) for 2013 is reported in Jarvis et al (2014). Seagrasses in Cairns harbour and Trinity Inlet remained in a poor condition in 2013 following continuing climate-related losses. The remnant meadows remain in a vulnerable state. There were, however, positive signs expressed through increases in biomass and area in most meadows from 2012, but these areas remain significantly below average (Jarvis et al 2014). In addition, a seed bank remains for most areas that could facilitate further recovery but the seed back densities are declining over time for most sites. A reduced seed bank may limit the capacity for natural recovery of these systems.

Benthos

Extensive infauna studies have been conducted throughout the Cairns region since 2003 including as part of the current EIS study. These studies have found that the infauna composition within the area do not show high levels of spatial variability and are dominated by fine silts and muds. High natural levels of turbidity and low light levels preclude the establishment of significant macroalgae communities.

Megafauna

As outlined in **Chapter B7, Marine Ecology**, marine megafauna that potentially exist in the study area include whales (noting key whale species such as Minke and Humpback whales are most likely to occur offshore in waters between 30 and 60m), coastal dolphins species (noting the area is not known to be an important habitat for the Snubfin Dolphin), several species of marine turtle and dugongs. There are no dugong protected areas within the study area.

With the exception of whales, local population information on megafauna species is generally poor, however, it is likely that dugong and turtles in Trinity Bay are probably at very low numbers at the present time due to the sustained reduction in key food resources in terms of seagrass. Populations of Humpback and Minke whales continue to remain at a stable or ever increasing seasonal abundance based on published anecdotal observations from tourism operators in the local area.

B18.4.3 Cumulative Impacts from the Project that could Affect Resilience

Key aspects of the project have been examined in terms of their potential to cumulatively impact on the resilience and recovery of the inshore GBRWHA from recent climatic events. Described below, these include:

- Marine placement and the potential resuspension and transport of placed dredge material outside of the DMPA
- Impacts on local resilience from the project's capital dredging and placement activities.

B18.4.3.1 Marine Placement and the Transport of Placed Material

A recent modelling study undertaken by SKM/APASA – Appendix F (2013), ***Improved dredge material management for the Great Barrier Reef Region,*** found dredge material disposed at sea has the potential to migrate over greater distances than previously understood, due in part to repeated resuspension and deposition.

The study was intended to compare sediment dynamic issues associated with several alternative DMPAs and it was clearly stated that it should not be used to infer sediment movement, as the study had a number of key limitations (for example, modelled plumes were not field validated as was required for this EIS, the model used a broad scale, deposition was ignored, and plumes were modelled for an energetic year). The study highlighted the need for future modelling to take into consideration large-scale currents (and their inter-annual variability) and greater temporal and geographic scales to better predict the extent of dredge material dispersion.

The suggested modelling approach from the Strategic Assessment (2014) and as outlined in GBRMPA Hydrodynamic Modelling Guidelines have been fully employed by the project, as described in the **Appendix D4, Water Quality Model Development and Calibration Report**. The modelling was a key tool for determining the most optimal DMPA site in Trinity Bay, examining long term re-suspension of multiple sites at various depths within Trinity Bay and further offshore.

Using this modelling approach, the project was able to select a DMPA site with almost no long-term dispersion of placed sediment. Other than the losses which are unavoidable during the dumping process (e.g the material that is lost in the water column on its way to the seabed), the DMPA will be highly retentive with average losses of 0.1 percent in normal annual conditions and a predicted loss of 1.1 percent of the placed material under cyclonic conditions (using 2011 Cyclone Yasi as the model storm for assessment).

The performance of the DMPA will be verified as part of proposed proactive and adaptive monitoring before, during and after placement (as outlined in **Chapter C2, Dredge Management Plan**), but there is considerable confidence of the intended retentiveness of the chosen DMPA site based on:

- Findings predicted by a fully calibrated and validated model that has been externally peer reviewed
- The model utilising 12 months of locally collected hydrodynamic data as well as accounting for offshore currents and other forces
- The performance of the previous DMPA and clear evidence of retained sediment in historical (now disused) DMPAs based on bathymetric studies and the accounts of stakeholders.

This modelling approach and the resultant preferred DMPA site address key concerns and uncertainties expressed in the Strategic Assessment (2014) and by stakeholders about the long-term fate of placed dredge material in the GBRWHA.

B18.4.3.2 Impacts on the Resilience of the Local Environment

The EIS chapters presented in Part B have found that the residual impacts on local environmental values (including World Heritage values) from dredging and placement process are acceptable in that they are:

- Not assessed to result in any 'Extreme' or 'High' risks of impact following the application of mitigation measures. All residual impacts have been assessed as having a Medium, Low or Negligible risk
- Not assessed as resulting in a 'significant impact' to a MNES or a MSES
- Generally temporary in nature and are within the range of natural variability for key parameters such as water quality.

Notwithstanding, as outlined in **Section B18.4.2**, it is recognised that the overall resilience of the GBRWHA (including at the local scale) is currently low. In particular, the low biomass and vulnerability of seagrass in the region is likely having an impact on other important MNES values in the region, for example, the abundance and health of marine megafauna such as marine turtles and dugong that use seagrass as feeding habitat.

To address the current low resilience of the marine environment, the project has sought to achieve a high level of environmental performance through the following measures:

- Reduction in dredging overall through reducing channel widths from 140m to 130m (could be reduced further as part of future design studies) which reduces the duration of dredging and the volume of future maintenance dredging
- Sediment quality of capital dredge sediments has been rigorously tested to ensure no contaminated sediment (as defined by the NAGD 2009) is placed at sea
- Placement of the dredge material offshore in a retentive site which represents the best environmental outcome compared to land-based placement (maintenance material will also be placed at the optimised site in future as well)
- Expansion of the channel and the new DMPA are in areas that do not have seagrass
- Dredging areas seek to maximise buffers to coral communities and other hard substrate
- Mitigation by dredging with no/limited overflow by the TSHD will significantly reduce the amount of fines generated by dredging that are available for re-suspension and reduces temporary stress on Trinity Bay seagrass
- Timing of dredging will seek to minimise (but cannot completely avoid) impacts on marine receptors in terms of prioritising the scheduling of the dredge campaign for when the system is predicted to be the most resilient through:
  - Avoiding dredging during the peak growing period for key seagrass species (Zostera sp.)
  - Avoiding key coral spawning and heat stress periods
  - Avoiding key fish spawning periods.
- Dredge triggers and the proposed reactive monitoring program have considered the low resilience of seagrass including historical extents. A key feature of the reactive monitoring program will be to target and protect existing remnant patches of seagrass, noting these areas may be critical to broader scale recovery and seed banks
- While the impacts from the project are not significant, it will seek to invest in a range of programs and initiatives that offset or otherwise build resilience of the natural environment to the temporary impacts of the project (discussed in **Section B18.4.4** below).

Table B18.4.3.2a provides a cumulative assessment of resilience for key attributes of the study area identified in previous chapters of the EIS. For each attribute, the key existing threats and stressors are identified (from the Outlook Report 2014, Chapter 6) and together with the key findings from the CSDP EIS, an assessment of potential cumulative risk is provided.

The predicted cumulative risk levels assume the full implementation of the mitigation, monitoring and compensatory measures identified in this section and as further articulated in the Management Plans contained in Part C of the EIS.

Table B18.4.3.2a Cumulative assessment of resilience for key attributes of the study area

Attribute	Examples of this Attribute in the Local or Regional Study Area	Stressors and Threats influencing this Attribute (from GBR Outlook Report Chapter 6)	Predicted Residual Risk from the CSD Project	Predicted Cumulative Risk
Islands	Green Island, Fitzroy Island, Double Island	• Climate change and extreme weather events • Coastal development	Low – changes to coastal processes such as shoreline erosion, accretion and associated changes to island morphology are not expected from the project.	No additional risk from the project.
Mangrove forests	Trinity Inlet, Admiralty Island, Mainland coastal areas	• Climate change and extreme weather events • Coastal development	Low – predicted impacts on hydrodynamics and sedimentation rates are not expected to adversely affect mangroves in areas such as Trinity Inlet with rates and deposition levels well within the range of natural variability.	No additional risk from the project.
Hard coral communities	Double Island reefs Green Island reefs Fitzroy Island reefs Mission Bay reefs	• Climate change and extreme weather events • Land-based runoff • COTS outbreaks • Direct use	Low – water quality modelling predicts that coral communities are situated outside of direct impact zones but in the zone of influence of dredging and placement turbidity plumes. Impacts are not expected based on the low turbidity levels predicted	No additional risk from the project.
Soft coral communities	Offshore soft coral communities (isolated and sparse)	• Climate change and extreme weather events • Land based runoff • Direct use	Low – these communities are generally situated outside of direct impact zones (dredging footprint and placement area) and water quality impacts are not expected to cause adverse impacts.	No additional risk from the project.
Seagrass meadows	Trinity Bay seagrass Trinity Inlet seagrass Seagrass at Double Island	• Climate change and extreme weather events • Land-based runoff (nutrients and sediments) • Coastal development	Low to Medium – water quality modelling predicts that existing seagrass meadows are in the zone of influence of dredging turbidity plumes but are not expected to be adversely impacted based on the low turbidity levels and sedimentation predicted. There is uncertainty regarding tolerance levels for recovering seagrass areas. These areas to be further assessed and monitored at the time of dredging.	Possible additional risk; the extent and condition of recovered seagrass in Trinity Bay will need to be integrated into the reactive monitoring plan to identify and reduce impacts as far as practicable.

Attribute	Examples of this Attribute in the Local or Regional Study Area	Stressors and Threats influencing this Attribute (from GBR Outlook Report Chapter 6)	Predicted Residual Risk from the CSD Project	Predicted Cumulative Risk
Diversity of benthic invertebrates (soft bottom benthos)	Soft bottom benthic environments within Trinity Bay	• Direct use (port activities) • Direct use (trawling)	Medium – soft bottom benthic habitats will recover following disturbance by dredging (widening and deepening) and placement of the capital dredge material. Recovery will occur progressively but full recovery is not expected for periods of months (e.g six – 24 months).	No additional risk from the project.
Cetaceans (dolphins)	Inshore dolphins (Indo Pacific and Snubfin dolphins)	• Direct use	Low – impacts on near-shore soft bottom benthic habitat used as foraging habitat by dolphin species as per above; impacts from underwater noise not expected to be significant with mitigation and monitoring proposed to reduce impacts from marine piling in the inner port.	No additional risk from the project.
Cetaceans (whales)	Humpback whales and Minke whales	• Direct use	Low – Trinity Bay and proposed DMPA are not an important or highly utilised habitat for these short-term visiting species; impacts from underwater noise not expected to be significant.	No additional risk from the project.
Marine turtles	Green turtles, Loggerhead turtles and other species	• Direct use	Low – impacts on soft bottom benthos and seagrass habitat as per above; mitigation and monitoring proposed to reduce impacts from dredging (turtle exclusion devices, etc.)	No additional risk from the project.
Dugongs	Dugongs	• Direct use	Low – impacts on seagrass habitat as per above; impacts from underwater noise not expected to be significant. Key dugong habitat is distant to proposed piling works, however, mitigation and monitoring is proposed to reduce impacts from marine piling in the inner port.	No additional risk from the project.
Migratory waterbirds	Wading birds Sea birds	• Direct use • Coastal development	Low – impacts on soft bottom and mangrove habitat as per above. Residual impacts on these species are predicted to be low.	No additional risk from the project.

Attribute	Examples of this Attribute in the Local or Regional Study Area	Stressors and Threats influencing this Attribute (from GBR Outlook Report Chapter 6)	Predicted Residual Risk from the CSD Project	Predicted Cumulative Risk
Diversity of fish species	Commercially and recreationally important fisheries	• Direct use • Land-based runoff (nutrients and sediments)	Low – impacts on fisheries species of significance are not expected other than temporary impacts on fish movement during dredging. The new DMPA is located in an area currently used by commercial trawlers and will be subject to further consultation on management options between Ports North and the commercial fishing industry.	No additional risk from the project.
Seascapes and landscapes	Trinity Inlet, Trinity Bay, Islands	• Coastal development	Low – no land-based development outside of existing port areas; impacts from dredging plumes will be minimal and temporary and not result in permanent changes to the landscape or seascape. .	No additional risk from the project

B18.4.4 Climate Change and Future Resilience

Degradation of key GBR values, especially coral reefs, is forecast to occur from climate change in the middle of the 21st century unless there are marked reductions in global CO2.

The most significant threatening processes include:

- Increased sea surface temperature (increasing the frequency and severity of coral bleaching)
- Increased ocean acidity (affecting the ability of corals to grow and colonise areas)
- Increased severe storms and cyclones (leading to physical damage to corals, seagrass and other marine habitats), as well as associated increased flood flows from catchments (leading to water quality declines, increased nutrients and COTS outbreaks).

As these effects worsen, it is likely that interactions between climate-related threats and other threats will have increasingly serious consequences (Outlook Report 2014).

Maintaining the resilience of local water quality and habitats is therefore important and a key focus of environmental offsets and other investment proposed by Ports North as part of the project (as outlined in **Section B18.4.5** below).

These impacts are outside the scope of the project to manage; however, key aspects of the project that have been developed to limit the long-term impacts from the project when impacts from climate change are most likely to be experienced include:

- Placement of maintenance dredging material is to occur within the retentive deeper DMPA identified for capital dredging. The deeper DMPA has adequate capacity to accept sediments for a period of 20+ years without increasing the risk of significant re-suspension. This will further reduce the volume of fine sediment that can be re-suspended from placement activities.
- Continuing to manage annual maintenance dredging activities in a manner that protects water quality, prevents the dredging and placement of contaminated sediments and protects the values of sensitive receptors. This will include continued investment in the monitoring of resource condition in Trinity Bay for critical assets such as seagrass, including light measurements and seed bank assessments.

B18.4.5 Environmental Offsets

B18.4.5.1 Policy Context

Environmental offsets for the project are governed by the following documents:

- EPBC Act Environmental Offsets Policy (October 2012)
- Queensland Environmental Offsets Policy - Version 1.0 (July 2014).

As outlined in these documents, environmental offsets become applicable when the impacts from a development/ action cannot be fully avoided or minimised; and where all other government standards are met. Specifically, offsets are required under the offset policies listed above where a 'significant' residual impact is predicted or likely based on a determination of significance for both MNES and MSES.

Offset principles from the two documents concur that suitable offsets must:

- Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by environment law and affected by the proposed action
- Be built around direct offsets but may include other compensatory measures
- Be in proportion to the level of statutory protection that applies to the protected matter
- Be of a size and scale proportionate to the residual impacts on the protected matter
- Effectively account for and manage the risks of the offset not succeeding
- Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs
- Be efficient, effective, timely, transparent, scientifically robust and reasonable
- Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

It is important to note that offsets are not required for all approvals under the EPBC Act and under the Queensland *State Development and Public Works Organisation Act 1971*. In particular, offsets are not required where the impacts of a proposed action are not thought to be significant (as defined by significance guidelines published by the Australian Government such as the OUV Guidelines for the GBRWHA) or that are considered to be able to be reasonably avoided or mitigated.

B18.4.5.2 Application of Offsets to the Project

The CSD EIS does not predict or otherwise identify that the project will result in a significant residual impact on any MNES and MSES within the meaning of the two offset policy regimes. This conclusion has been determined through the detailed assessments undertaken within each chapter of this Part B and will be predicated on the implementation of proposed mitigation and monitoring strategies as outlined in the management plans in Part C. These include for example:

- Constrained overflow of the dredge
- Selection and use of a new non-dispersive DMPA
- Dredging during periods that have minimised impact on marine sensitive receptors
- Implementation of corrective actions by the dredger if impacts are detected through a reactive monitoring program
- Amendment to the boundaries of the Trinity Inlet Fish Habitat Area to ensure no net loss as a result of the project.

In the absence of significant residual impacts, environmental offsets for the project are not strictly required.

However, offsets initiatives have been identified and developed for the project on the basis that:

- The current low resilience of the GBRWHA may mean that offsets are required by regulatory agencies for the temporary (non-significant) impacts predicted for the project
- A condition may be imposed by regulatory agencies that offsets are required to be developed and implemented as a contingency measure if monitoring shows unexpected impacts have occurred to marine resource from the project during construction.

Offset packages can comprise a combination of direct offsets and other compensatory measures. Other compensatory measures are those actions that do not directly offset the impacts on the protected matter, but are anticipated to lead to benefits for the impacted protected matter, for example funding for research or educational programs. Given the difficulty and complexity of implementing direct offsets in the marine environment, compensatory measures tend to be an important component of offsets for dredging and other marine works.

In general, offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain.

In accordance with this principle and looking at the residual impacts from the project, the two broad areas for offset investigation are related to the following aspects of the project:

- Impacts from the marine placement of dredge material in the GBR Marine Park
- Impacts on water quality and seagrass from dredging in the GBR World Heritage Area.

B18.4.5.3 GBR Marine Park

Initiatives related to the GBRMP that are currently being explored include:

- Investment in programs related to reef health, management and tourism (COTS eradication program and other initiatives)
- Investment in reef-related research and education
- Disusing the current DMPA and use of the new DMPA for all future maintenance dredge placement.

B18.4.5.4 GBR World Heritage Area

Initiatives related to the GBRWHA that are currently being explored include:

- Increased investment in programs that improve water quality coming out of the GBR catchments and in particular the Barron and Mulgrave Rivers in order to improve resilience of inshore habitats in Trinity Bay
- Investment in further rehabilitation of East Trinity site to improve outgoing water quality and quality of fish habitats in order to improve resilience of inshore habitats in Trinity Inlet

- Maintain and increase investment in monitoring of long-term ecosystem health in Trinity Bay and Trinity Inlet, including related to water quality, seagrass and corals.

Ports North has been investigating these initiatives for some time and currently provides funding and support for the COTS eradication program as well as various monitoring programs including annual seagrass monitoring within port limits. Where practicable, the approach will be to invest and/or leverage support for existing initiatives including, for example, programs under the joint Reef Water Quality Protection Plan.

It is noted that the offset policies require that the proponent must provide clear information about the scale and intensity of impacts of the proposed action and the on-ground benefits to be gained through each of these offset measures.

Accordingly, the initiatives and offset projects identified above will be developed into a formal offset plan with this information following feedback obtained during the consultation period on the EIS.

B18.5 References

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