8. Hydrology and hydraulics

8.1 Summary

The changes proposed as part of WEXP1 and WEXP2 are not expected to result in an increase to potential impacts on hydrological resources or hydraulics in the surrounding area.

Reclamation heights previously modelled as part of the hydraulic modelling scenario undertaken for the EIS and SEIS were in excess of 100 year ARI flood event. WEXP1 and WEXP2 reclamation heights will remain at this height, or slightly higher (not exceeding 8 m AHD), and will therefore remain above the 100 year ARI flood event.

The changed Project is not expected to alter the flooding impacts predicted in the modelling undertaken as part of the EIS and SEIS as no additional blockages of flow or loss of flood storage will occur.

8.2 Introduction

This chapter describes the existing environment and potential impacts related to the potential changes to the hydrological resources and hydraulics as a result of the Project changes associated with WEXP1 and WEXP2. The assessment has been based on a review of available information and field investigations. Potential impacts to hydrological resources and hydraulics were originally outlined in the WICT EIS and SEIS (Appendix 1)

This Request for Project Change provides an updated assessment to address changes to the Project which were assessed in the Coordinator-General's (CG) Report (January 2008) and EPBC Act controlled action approval (April 2008). Proposed changes to the Project as part of WEXP1 and WEXP2 (previously Stage 2 and Stage 3) are wholly contained within the Project footprint approved under the EIS and areas subsequently approved for WICET Stage 1

8.3 Existing environment

The proposed WICET Project and associated overland conveyor infrastructure are located adjacent to the downstream reaches of the Calliope River. The proximity of the Project area to both the Calliope River and Gladstone Harbour requires assessment of flooding and fluvial geomorphology.

The sections below address the following:

- A description of the Calliope River catchment
- Hydraulic modelling and results for existing case flooding and developed case flooding
- Potential impacts of the development and mitigation options
- Local catchment flows
- Fluvial geomorphology assessment

8.3.1 Catchment description

Calliope River Catchment

The Calliope River catchment is bounded by the Mount Alma and Mount Larcom Ranges in the north, the Calliope Range in the west and the Boyne Range in the south. The river has the following tributaries:

- Alma Creek
- Harper Creek
- Paddock Creek
- Larcom Creek

- Pyealy Creek
- Beales Creek
- Lost Spring Creek
- Tom Creek
- Double Creek
- Leixlip Creek
- Clyde Creek
- Other unnamed tributaries

Total catchment for the Calliope Basin, including coastal streams that discharge directly to the coast, is estimated to be 2,255 km^2. Excluding the minor coastal catchments, the catchment area is estimated at 1,860 km^2 (Connell Hatch 2006).

Elevations range from approximately sea level at the mouth of the river, to greater than 800 m AHD at the head of the catchment.

Project Area Sub-catchment

Figure 8.1 illustrates the location of watercourses within and adjoining the Project area. Each crossing location has been identified with a number. The extent of the sub-catchment boundaries, which drain to these crossings, is also shown. The delineation of the catchment areas was based on the topographic information extracted from 1:25,000 scale Queensland Topographic Maps (Sheets 9150-31 and 9150-32) together with some more recent aerial photos and detailed survey of the area.

The existing catchments, upstream of and through the proposed works, typically consist of a well-defined system of small watercourses. The catchment surface slopes range from very steep, immediately downstream of the ridgelines to the west of the existing north coast mainline, to flat in the vicinity of the Calliope River and the coastline.

8.4 Hydraulic modelling

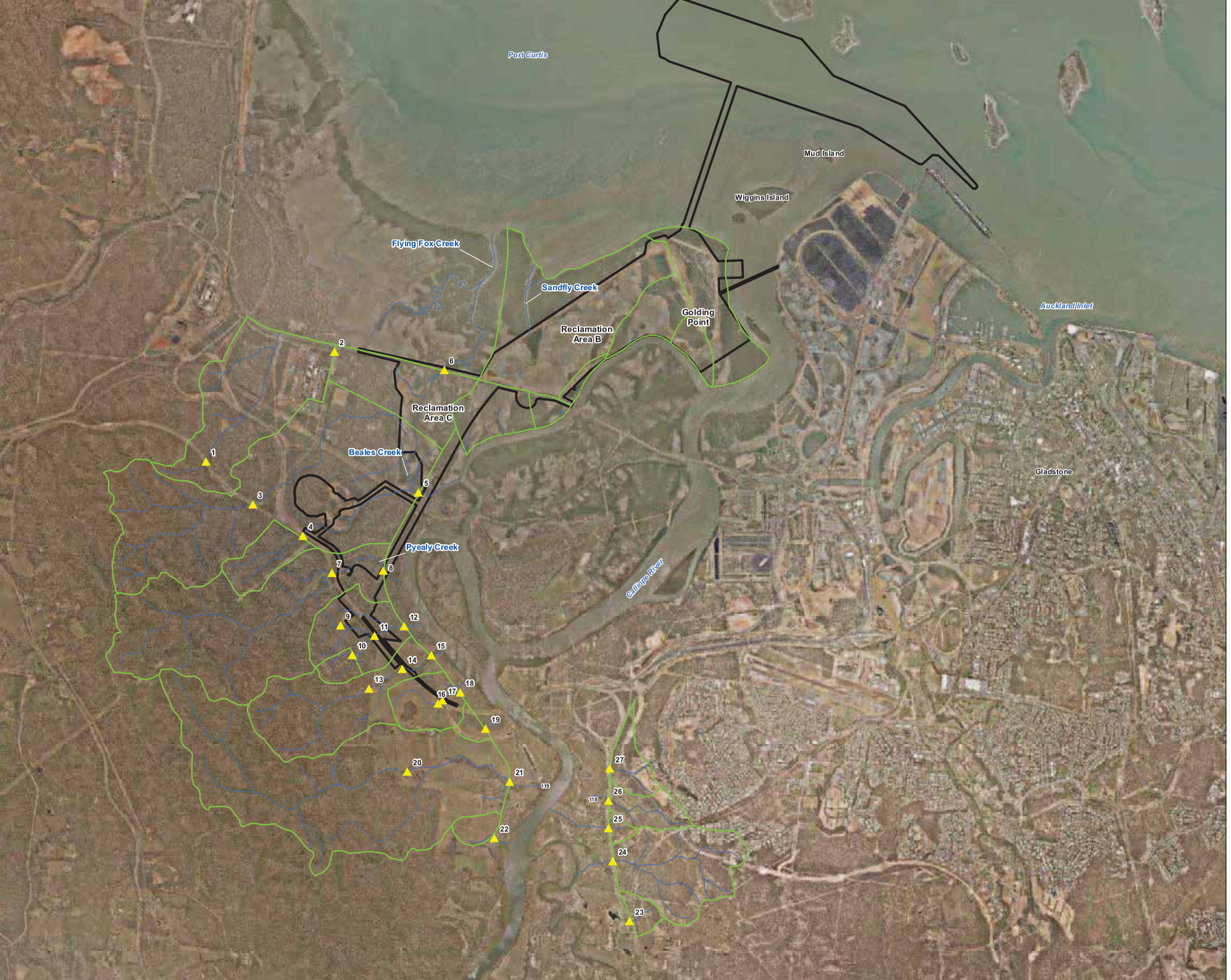
Hydraulic modelling for various flood and tide scenarios was undertaken during the WICT EIS (2006) process by WBM using the TUFLOW modelling software. Additional flood modelling was undertaken after the EIS to assess the potential flooding impacts of the development with incorporated Project design changes (ie no Calliope River Bridge crossing). For this study, four combinations (1, 2, 4 and 6) of inflows and storm tide were used to estimate the flood behaviour in a 100 year Average Recurrence Interval (ARI) flood event (refer Table 8.1).

The WICT EIS also simulated the developed case for an additional four combinations (3, 5, 7 and 8), however for impact assessment and design level assessment purposes the four combinations (1, 2, 4 and 6) were used.

Table 8.1 presents the criteria that have been used in the simulations. These combinations provide the necessary information for the purposes of impact assessment and design.

Table 8.1 Simulation Combinations

Combination	Inflow	Tide / Storm Surge	Greenhouse Allowance
1	100 year ARI event	50 year ARI event	No
2	100 year ARI event	50 year ARI event	Yes
3	100 year ARI event	HAT	No
4	100 year ARI event	MLWS	No
5	20 year ARI event	100 year ARI event	Yes
6	20 year ARI event	MLWS	No
7	500 year ARI event	100 year ARI event	Yes



Legend

- Project Area
- Catchment Bou
- Drainage Line
- Proposed Culve

Source:
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Combination	Inflow	Tide / Storm Surge	Greenhouse Allowance
8	2000 year ARI event	100 year ARI event	Yes

Table Notes: HAT = Highest Astronomical Tide
MLWS = Mean Low Water Spring
The 2000 year ARI inflow has been extrapolated from the available design flows

Results reported in Chapter 8 of the WICT EIS and the SEIS are still considered valid as the Project changes proposed for WEXP1 and WEXP2 will be wholly contained within the Project area approved under the EIS, and modelling was undertaken with the assumption that no overtopping or flooding of the Project area would occur. Furthermore, a raise in height of Reclamation Area B by up to 1.4 m is likely to reduce overland flooding, subsequently reducing in stream sedimentation. The WICT EIS and SEIS (Appendix 1) contain further details of the hydraulic modelling scenarios.

8.5 Potential flooding impacts associated with Project changes

No further flood impact modelling has been undertaken for the proposed Project changes associated with WEXP1 and WEXP2. The WICT SEIS reported that flooding associated with the original proposed footprint was mainly due to the following two reasons:

- Filling of Reclamation Areas above 100 year ARI flood levels would result in blockage of a flowpath that conveys up to 540 m^3/s in the base case. The blockage of this flow would result in a redistribution of flow and result in an increase in flow in the Calliope River
- Filling of the Reclamation Areas above 100 year ARI flood levels would cause a loss of storage on site, with an area of up to 4 km^2 west of the Anabranch lost from available floodplain storage. As peak flood levels are higher for Combinations 1 and 2, the loss of storage in terms of volume is more significant, and as a consequence impacts are greater than for Combination 4 (100 year ARI inflow with mean low water spring (MLWS)) or Combination 6 (20 year ARI inflow with MLWS)

The changed Project is not expected to alter the impacts predicted in the modelling undertaken as part of the EIS and SEIS as no additional blockages of flow or loss of flood storage will occur.

8.6 Fluvial geomorphology

The WICT EIS (Appendix 1) contains a detailed summary of the fluvial geomorphology assessment undertaken by Hydrobiology addressing the following:

- Review of existing literature
- Past and current flow regimes
- Past and current sediment transport processes
- Current riparian vegetation condition, particularly in reference to its influence on erosion rates
- Past and current erosion rates and processes

8.7 Conclusions

The proposed changes will be wholly contained within the Project footprint approved under the EIS and is not expected to have any additional impacts to hydrology/hydraulics of the area. The potential impacts from changes associated with WEXP1 and WEXP2 are considered minor in relation to hydrology and hydraulics, and manageable by implementing the WICET Management Plans.

Flood modelling post construction of the WICET Project indicated that an increase in flood heights, flow velocities and stream powers within the Calliope River catchment is unlikely to occur. Instead, it indicated that restricting this portion of floodplain flow to the channel would not cause major changes to any of the hydrological attributes, due principally to the wide channel that exists in the Calliope River estuary (with exception of the reach immediately

south) in both the existing and developed scenarios. Modelling predictions reported in the WICT EIS and SEIS are still valid as reclamation areas will be above the flood levels for all combinations of hydrological and flooding events, and a proposed increase in bund height by 1.4 m as a result of the Project changes will not influence these scenarios.

As such, it is expected that the proposed Project changes associated with WEXP1 and WEXP2 will not significantly alter expected outcomes during each hydraulic modelling scenario outlined in the WICT EIS and SEIS (Appendix 1).

Minor changes to the hydrological regime within the Calliope River catchment may exacerbate past instabilities (tidal scour and associated failure mechanisms) especially within proximity to the Oxbow bend and the Calliope River Anabranch. As a result, conveyor infrastructure has been positioned far enough away from the banks to minimise impacts from potential hydrological instabilities. However, it may be necessary to provide bank stabilisation works to protect this infrastructure from fluvial processes. The need and timing of these works will be investigated during detailed design.

Raised water levels, regardless of their magnitude, particularly in the more confined reaches upstream of the Project area, should be monitored during and after construction phases of the Project to ensure that model predictions are accurate and no commensurate increases in stream power and erosion potential occur.

A Soil and Water Quality Management Plan (refer Appendix 23.15) has been developed, including stormwater management measures, to ensure that flood return water and runoff from the development is returned to the river in a controlled fashion in order to prevent gullying and erosion of the banks from the top, subsequently contributing to in stream instabilities.

Conclusion 1: It is expected that the proposed Project changes associated with WEXP1 and WEXP2 will not significantly alter expected outcomes during each hydraulic modelling scenario previously conducted. Reclamation heights previously modelled were in excess of the 100 year ARI flood event.

9. Water quality

9.1 Summary

The changes proposed as part of WEXP1 and WEXP2 will not result in an increase to potential impacts on water quality. There are no planned changes to the dredging as outlined in the approved Project.

The additional minimal excavation associated with Stockyard Area B infrastructure is offset by the reduced volume of excavation in Stockyard Area A, due to omission of the stockyard reclaim tunnels on the eastern half of Golding Point. Potential erosion and sedimentation impacts will be managed in accordance with the WICET SWQMP approved by DEHP.

Potential impacts to water quality resulting from the additional stormwater outfall will be managed in accordance with mitigation measures outlined in the SWQMP.

9.2 Introduction

This chapter describes the existing environment and potential impacts relating to water quality for the changed Project. Potential impacts relating to water quality were originally outlined in the WICT EIS and SEIS (refer Appendix 1).

This Request for Project Change provides an updated assessment to address changes to the Project which were assessed in the Coordinator-General's (CG) Report (January 2008) and EPBC Act controlled action approval (April 2008). Proposed changes to the Project as part of WEXP1 and WEXP2 (previously Stage 2 and Stage 3) are wholly contained within the Project footprint approved under the EIS and areas subsequently approved for WICET Stage 1.

9.3 Environmental values

The Environmental Protection (Water) Policy 2009 (EPP (Water)) under the *Environmental Protection Act 1994* identifies Environmental Values (EVs) and Water Quality Objectives (WQOs) for waters within Queensland. The EPP (Water) serves to protect Queensland's environment, while allowing for ecologically sustainable development. Part 2, Section 5 of the Policy states:

> ***How purpose of policy is achieved***
> *The purpose of this policy is achieved by:*
>
> *(a) identifying environmental values and management goals for Queensland waters*
>
> *(b) stating water quality guidelines and water quality objectives to enhance or protect the environmental values*
>
> *(c) providing a framework for making consistent, equitable and informed decisions about Queensland waters*
>
> *(d) monitoring and reporting on the condition of Queensland waters*

Part 3, Section 6 of the policy states that:

Environmental values to be enhanced or protected

> *(1) The environmental values of waters to be enhanced or protected under this policy are:*
>
> > *(a) for water mentioned in schedule 1, column 1-the environmental values stated in the document opposite the water in schedule 1, column 2*
> >
> > *(b) for other water-the environmental values stated in subsection (2)*

(2) For subsection (1)(b), the environmental values are as follows:

(a) for high ecological value waters-the biological integrity of an aquatic ecosystem that is effectively unmodified or highly valued

(b) for slightly disturbed waters-the biological integrity of an aquatic ecosystem that has effectively unmodified biological indicators, but slightly modified physical, chemical or other indicators

(c) for moderately disturbed waters-the biological integrity of an aquatic ecosystem that is adversely affected by human activity to a relatively small but measurable degree

(d) for highly disturbed waters-the biological integrity of an aquatic ecosystem that is measurably degraded and of lower ecological value than waters mentioned in paragraphs (a) to (c)

(e) for waters that may be used for producing aquatic foods for human consumption-the suitability of the water for producing the foods for human consumption

(f) for waters that may be used for aquaculture-the suitability of the water for aquacultural use

(g) for waters that may be used for agricultural purposes-the suitability of the water for agricultural purposes

(h) for waters that may be used for recreation or aesthetic purposes, the suitability of the water for:

(i) primary recreational use

(ii) secondary recreational use

(iii) visual recreational use

(i) for waters that may be used for drinking water-the suitability of the water for supply as drinking water

(i) for waters that may be used for drinking water-the suitability of the water for supply as drinking water

(j) for waters that may be used for industrial purposes-the suitability of the water for industrial use

(k) the cultural and spiritual values of the water

(3) In this section-

***cultural and spiritual values**, of water, means its aesthetic, historical, scientific, social or other significance, to the present generation or past or future generations.*

***primary recreational use**, of water, means full body contact with the water, including, for example, diving, swimming, surfing, waterskiing and windsurfing.*

***secondary recreational use**, of water, means contact other than full body contact with the water, including, for example, boating and fishing.*

***visual recreational use**, of water, means viewing the water without contact with it.*

Chapter 9, Table 9.1 in of the WICT EIS identified the EVs for the watercourses and receiving environment downstream of the Project. The number of watercourses and water bodies potentially affected by this Project has been reduced since the WICET EIS and SEIS were submitted and approved, this is due to the rail component of the Project now being managed and delivered as a separate project by QR National.

Watercourses and water bodies downstream of the WICET Project are presented in Table 9.1. These watercourses are defined by the EPP (Water) as being a modified aquatic ecosystem. In the absence of specific WQOs for the watercourses, EVs have been

determined from the EPP (Water). Major watercourses and catchment boundaries are illustrated in Figure 9.1.

Table 9.1 Environmental values for the watercourses and receiving environment of the Project area

Environmental Values	Supporting Details	Calliope River and Tributaries	Port Curtis
Aquatic Ecosystem	Slightly to moderately disturbed ecosystem	✓	✓
Primary Industries	Irrigation	✓	
	Farm Water Supply	✓	
	Stock Watering	✓	
	Aquaculture	✓	✓
	Human Consumers of Aquatic Food	✓	✓
Recreation and Aesthetics	Primary Recreation	✓	✓
	Secondary Recreation	✓	✓
	Visual Recreation	✓	✓
Drinking Water			
Industrial Uses		✓	✓
Cultural and Spiritual Values		✓	✓

The EVs of these systems are related to adjacent land use, as the systems are primarily used for agricultural purposes (grazing and horticulture). The ecological value is variable depending on catchment location and size, adjacent land uses and overall complexity and health of the system.

9.4 Water quality guidelines

The Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines provide guideline values or descriptive statements for different indicators to protect aquatic ecosystems and human uses of waters (eg primary recreation, human drinking water, agriculture, stock watering). The ANZECC Guidelines (2000) are a broad scale assessment and it is recommended that, where applicable, locally relevant guidelines are adopted.

The Queensland EPA (now DEHP) Queensland Water Quality Guidelines 2009 (QWQG) are intended to address the need identified in the ANZECC Guidelines by:

- Providing guideline values (numbers) that are tailored to Queensland regions and water types
- Providing a process/framework for deriving and applying local guidelines for waters in Queensland (ie more specific guidelines than those in the ANZECC Guidelines)

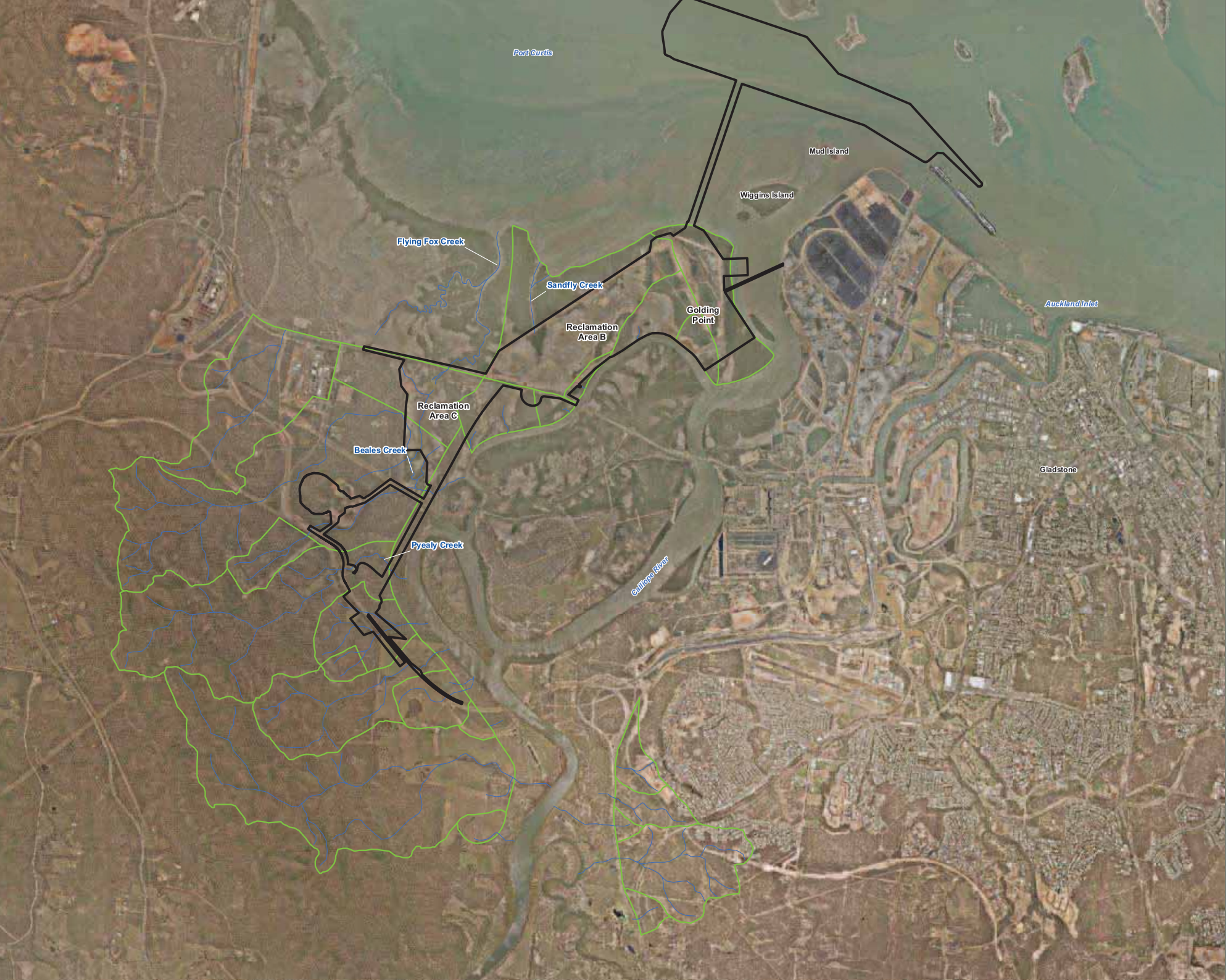
Further information on the water quality guidelines use for the Project are outlined in Section 9.2 of the WICT EIS, as well as Section 9.3 of the SEIS (refer Appendix 1).

9.5 Freshwater existing environment

Chapter 9, Section 9.3 of the WICT EIS addresses freshwater systems within the Project area. Only one defined watercourse occurs within the Project footprint; that being Pyealy Creek. Several other drainage lines occur within the area.

Section 9.3 of the WICT EIS (refer Appendix 1) addresses the following:

- A description of the freshwater wetlands, including natural and constructed watercourses, surface drainage patterns and flows of the freshwater wetlands
- An assessment of the existing water quality of the freshwater wetlands



Legend

- Project Area
- Catchment Bou
- Drainage Line

Source:
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- An assessment of the environmental values of the freshwater wetlands

9.6 Tidal influenced waters existing environment

A summary of the tidally influenced waters within and adjacent to the Project area can be found in the Chapter 9, Section 9.4 of the WICT EIS. This section addresses the tidally influenced waters within and adjacent to the Project area. Areas addressed include:

- A description of the tidal influenced watercourses, including surface drainage patterns
- An assessment of the existing water quality of the tidal influenced watercourses
- An assessment of the environmental values of the tidal influenced watercourses

Chapter 9, Section 9.4 of the WICT EIS (refer Appendix 1) contains detailed descriptions of the Calliope River, Calliope River Anabranch, and near shore environments associated with Port Curtis. The Port Curtis Ecosystem Report 2008-2010, prepared by Vision Environment QLD (refer Appendix 9.1), provides an updated assessment of the water quality of various regions in Port Curtis, based on data collected from July 2008 to November 2010.

9.7 Water quality potential impacts

A number of potential impacts to water quality were highlighted during the WICT EIS and SEIS. This includes fresh and marine waters within the Project area and the surrounding receiving waters. These impacts may threaten EVs of the area as identified by the EPP (Water) and outlined in Table 9.1. This section updates potential impacts to water quality that may have changed since the submission and approval of the WICT EIS and SEIS (refer Appendix 1) as a result of the changes to the Project.

Mitigation measures to manage these potential impacts are outlined in Section 9.8.

9.7.1 Construction impacts

The potential impacts of the Project on water quality and EVs during the construction phase are provided below. The additional minimal excavation associated with construction of Stockyard Area B infrastructure is offset by the reduced volume of excavation in Stockyard Area A, due to omission of the stockyard reclaim tunnels on the eastern half of Golding Point. Potential erosion and sedimentation impacts will be managed in accordance with the WICET SWQMP approved by EHP.

Dredging

There are no planned changes to the dredging as outlined in the approved Project. The proposed dredging activities do not exceed volumes (ie 6.3 Mm^3) outlined in the Project approved under the EIS.

Further details of the potential impacts from the initial campaign of the WICET dredging works are contained in the WICET Dredge Management Plan (DMP) (refer Appendix 23.18) (approved by DEHP in April 2012). Potential impacts will be addressed by implementing mitigation measures contained in Section 9.8 and the DMP.

Future dredging campaigns will be addressed through updates of the existing DMP or preparation of new DMP(s).

Infrastructure works

The majority of the Project excavation earthworks will be undertaken during Stage 1 construction activities. If WEXP1 dredging is undertaken directly after the Stage 1 dredging (as planned), the bunds of both Reclamation Areas B and C may require raising to accommodate the short term disposal volume. This is discussed in detail in Section 3.6.1.

Soil erosion and sedimentation impacts are summarised in Section 9.5.1 of the WICT EIS and Section 9.6.1 of the SEIS (refer Appendix 1). WEXP1 and WEXP2 infrastructure works are not expected to have further impact on water quality within the area. The new settlement pond works will involve excavation of previously deposited dredged materials and the outfall will require excavation of some soils, however these will be managed through the implementation of the existing EMP.

The Stage 1 south stormwater pond will be extended twice in WEXP1 and WEXP2. This will involve excavation of fill placed in Stage 1 for the temporary facilities platform.

The following potential impacts are discussed in other chapters of the Change Request:

- ASS and contaminated soils (refer Chapter 4)
- Groundwater quality (refer Chapter 10)
- Downstream aquatic values (refer Chapter 16)

Mitigation measures will be implemented during construction works to minimise water quality impacts (refer Section 9.8).

9.7.2 Operational impacts

The key locations where potential impacts may occur from operation are areas where runoff and/or discharge waters from the Project, including discharge from the new stormwater outfall system associated with the new stormwater storage pond to be constructed in Reclamation Area B during WEXP1, can enter waterways and drainage lines.

The potential impacts of the changed Project on water quality during operation are consistent with those identified in Section 9.5.2 of the WICT EIS and Section 9.6.2 of the SEIS which include:

- Stormwater discharge and flow redirection

9.8 Mitigation measures

The mitigation measures below will assist in the management of potential impacts to water quality. These are described in Section 9.6.1 of the WICT EIS (refer Appendix 1) in terms of design, construction and operational mitigation measures for the coal Terminal. Discharge water quality targets are identified and mitigation measures will be designed to achieve these targets.

9.8.1 Design

Dredging and dewatering

Remains consistent with the approved WICT EIS and all dredging activities will comply with the approved DMP.

Dewatering

Potential dewatering impacts are addressed within the WICET DMP (refer Appendix 23.18) which includes the following:

- Measures to prevent the loss of any values of receiving waters or significant threat to those values
- Measures to minimise harm to native vegetation, or erosion of structures or services
- Measures to minimise soil erosion and local flooding
- Measures to ensure that discharges to the Anabranch comply with guidelines detailed in Table 9.3 and approval conditions
- Management of any pre-discharge treatment including flocculation
- Monitoring and reporting requirements

- Measures to minimise nuisance to the local community (eg odours, noise impact on nearby residents and fauna)
- Measures to minimise the loss or reduction of flows in public or private water sources

Sedimentation and runoff

Sedimentation and runoff mitigation measures remain consistent with the following:

- WICT EIS/SEIS commitments (refer Appendix 1)
- Acid Sulfate Soils Management Plan (refer Appendix 23.4)
- Dredge Management Plan (attached in Appendix 23.18)
- Stormwater Management Plan (now Soil and Water Quality Management Plan – attached in Appendix 23.15)
- Waste Management Plan (refer Appendix 23.17)

9.8.2 Construction

Dredging

The WICET DMP (refer Appendix 23.18) specifies the performance objectives, actions and procedures to be carried out to minimise and mitigate identified potential environmental impacts of dredging activities and meet WICT EIS commitments and approval requirements. The WICET DMP is currently being assessed by DEHP.

In accordance with the Western Basin Water Quality Monitoring Plan (WQMP), the WICET DMP adopts an adaptive management approach based on turbidity as an indicator of water quality, with limits set for key environmentally sensitive locations that trigger an operational response. At the present time, there are a number of factors restricting this style of water quality management being implemented. These include:

- The light requirements and stress thresholds of seagrass species is not clearly known. Preliminary studies conducted by the Department of Agriculture, Fisheries and Forestry (DAFF) – Fisheries Queensland have produced initial values of Photosynthetically Active Radiation (PAR) that seagrass require to survive, however these values need to be validated through further research. Fisheries Queensland's research has also indicated that light requirements vary over seasons and time, potentially giving multiple light values for management purposes
- Indicators for seagrass stress that can be used as part of a reliable proactive management approach

Until these factors can be verified they cannot be used reliably, in a water quality monitoring programme. As such, the Western Basin Project dredging works and the WICET dredging works are proceeding with using trigger values based on the analysis of background water quality data. Further details are included in Appendix 23.18.

Dewatering

The discharge limits outlined in Table 9.3 were adopted from the approved WICET DMP (refer Appendix 23.18). Discharge will occur from the outfall systems associated with both stormwater storage ponds proposed to be located in Reclamation Area B (the Stage 1 southern stormwater storage pond and the new WEXP1 stormwater storage pond).

Table 9.3 Stormwater outfall discharge limits

Monitoring point	Quality characteristics	Alert level	Release limits		Monitoring frequency
			Minimum	Maximum	
Interior of Reclamation Areas B and	Turbidity	TBA	-	TBA	Interior of Reclamation Areas B and

Monitoring point	Quality characteristics	Alert level	Release limits		Monitoring frequency
			Minimum	Maximum	
C Discharge Outlets					C Discharge Outlets
	Suspended solids	80 mg/L	-	100 mg/L (including background)	Weekly
	Turbidity	TBA		TBA	Hourly
	pH	<6.5 or > 9.0	6.5	9.0	Hourly
	Metals	Refer ERA 16 Development Permit Conditions			

Mitigation measures for construction activities have also been included in the existing WICET Soil and Water Quality Management Plan (SWQMP) (refer Appendix 23.15) which has been approved by DEHP. This includes site water retention and treatment measures to achieve water quality guidelines before release and ongoing monitoring for compliance with discharge criteria, during construction and operation. New stormwater ponds have also been designed on the new stockyard proposed for Reclamation Area B as part of WEXP1 to account for sedimentation and runoff. In addition the southern stormwater pond for WICET Stage 1 will be extended twice for WEXP1 and WEXP2 as the stockyard catchment areas progressively expand.

Sedimentation and runoff

Measures to mitigate sedimentation and runoff are outlined in the approved WICET SWQMP (refer Appendix 23.15).

Hydrocarbon and chemical management

Hydrocarbon and chemical management are outlined in the approved WICET Dangerous Goods Management Plan and WICET Waste Management Plan (refer Appendix 23.9 and Appendix 23.17, respectively).

9.8.3 Operational

The alteration of the expanses phases for the WICET Project will not impact on the operational mitigation measures outlined in the SEIS. These mitigation measures are already in place and include:

- Maintenance dredging
- Infrastructure
  - The inclusion of a new stockyard on Reclamation Area B will require erosion and sedimentation controls.
- Stormwater discharge and flow redirection
  - Stormwater on Reclamation Area B will be mitigated by the inclusion of new stormwater sedimentation ponds (refer Section 9.8)
  - Also see attached SWQMP (refer Appendix 23.15)
- Abrasive blasting (consistent with the WICT SEIS and ERA approval conditions)

Water storage and dewatering

Stage 1 reclamation areas have designed bunds and settlement basins where water will be monitored prior to discharge. The WEXP1 stockyard will be drained by a system of concrete lined open channels, consisting of four lines of longitudinal drains feeding into two main transverse drains. There will be a drain along the bottom edge of the stacker reclaimer

bunds as shown on Drawing H337300-2B534-C-DR-0322 (refer Appendix 9.2). Water collected in the transverse drains will then flow through sedimentation basins before entering a stormwater storage pond. The northern half of the WEXP1 stockyard grades to the south stormwater pond while the southern half grades to the WEXP1 stormwater pond. Water from both ponds will be recycled and used as process/dust suppression water as required.

9.9 Monitoring and reporting

Water discharged from the Project area to the receiving environment will be monitored and reported in accordance with the requirements of the WICET DMP and SWQMP (refer Appendix 23.18 and Appendix 23.15, respectively) which have been approved or currently being assessed by DEHP.

9.10 Conclusion

The altered expansion phases for the Project will be wholly contained within the Project area approved under the EIS and are not expected to impact on additional watercourses, or introduce any additional impacts on watercourses/receiving waters not already discussed in the WICT EIS and SEIS.

These works will involve minimal additional excavation and associated erosion and sediment control risks, however, this is offset by the reduced volume of excavation in Stockyard Area A, due to omission of the stockyard reclaim tunnels on the eastern half of Golding Point. Any potential water quality impacts from the proposed changes to the expansion phases are considered minor and represent minimal to no change to the potential impacts addressed in the WICT EIS process.

The potential impacts of dredging works on water quality have been outlined in the WICET DMP (refer Appendix 23.18) which was approved in April 2012 by DEHP. The DMP specifies the performance objectives, actions and procedures to be carried out to minimise and mitigate identified potential environmental impacts of dredging activities and meet WICT EIS commitments and approval requirements for the WICET staged dredging works.

Mitigation measures for construction activities have been included in the existing WICET SWQMP (refer Appendix 23.15) which has been approved by DEHP. This includes site water retention and treatment measures to achieve water quality guidelines before release and ongoing monitoring for compliance with discharge criteria, during construction and operation.

Conclusion 1: Dredging remains consistent with the approved WICT EIS and all dredging activities will comply with the approved DMP.

Conclusion 2: The additional minimal excavation associated with Stockyard Area B infrastructure has potential to increase erosion and water quality degradation. However, this is offset by the reduced volume of excavation in Stockyard Area A, due to omission of the stockyard reclaim tunnels on the eastern half of Golding Point. Any impacts will be managed in accordance with the WICET SWQMP approved by DEHP.

Conclusion 3: Potential impacts to water quality resulting from the additional stormwater outfall will be managed in accordance with mitigation measures outlined in the SWQMP.

10. Groundwater

10.1 Summary

The changes proposed as part of WEXP1 and WEXP2 will not result in an increase to potential impacts on groundwater quality.

The addition of the new stormwater storage pond and outfall within Stockyard Area B and the proposed extension of the southern stormwater storage pond in Stockyard Area B will not intrude upon the water table and as such are unlikely to impact upon the groundwater regime in the region.

The change in yard type at Golding Point from a Bridge Stacker, to a Stacker-Reclaimer will reduce previously proposed impacts to the water table as the reclaimer tunnels will no longer be required.

10.2 Introduction

This chapter describes the groundwater within the Project area and potential impacts as a result of the Project changes associated with WEXP1 and WEXP2. Potential impacts to groundwater quality were originally outlined in the WICT EIS and SEIS (Appendix 1). Based on a review of available information and field investigations, this Change Request aims to provide an updated assessment to address potential changes to the Project.

This Request for Project Change provides an updated assessment to address changes to the Project which were assessed in the Coordinator-General's (CG) Report (January 2008) and EPBC Act controlled action approval (April 2008). Proposed changes to the Project as part of WEXP1 and WEXP2 (previously Stage 2 and Stage 3) are wholly contained within the Project footprint approved under the EIS and areas subsequently approved for WICET Stage 1

10.3 Existing environment

10.3.1 Regional Setting

Topography and drainage

The topography of the site has been described in detail in Chapter 4 and is summarised below.

The south-western extremity of the site consists of undulating to hilly terrain featuring north-west trending ridges of resistant cherts that rise to elevations of about 150 m AHD.

The terrain grades gently to the south-east to coastal plains which vary between 1 m and 3.5 m AHD and form the majority of the Project area. There are also minor alluvial floodplains associated with the Calliope River.

The coastal plains which occur to the west and north-west of the Calliope River are predominantly composed of estuarine channels and banks, supratidal flats and coastal grasslands. Areas adjacent to the mouth of the river comprise of mangrove swamps, fringed by areas of salt couch.

Areas of elevated land (5 m to 43 m AHD) comprising shallow bedrock form "islands" within the coastal plain. These "islands" include Wiggins Island and Golding Point.

The alluvial floodplains are located either side of the river at the southern end of the Project area and grade seawards into the coastal plains. There are also two sets of alluvial terraces at the southern end of the Project area associated with down-cutting of the river and deposition over geological time.

A number of previous studies were undertaken in the vicinity of the Project area that has previously addressed groundwater issues, including:

- Comalco Alumina Refinery EIS (Dames and Moore Pty Ltd 1998)
- Stuart Oil Project EIS (SKM 2002)
- Gladstone Pacific Nickel (GPN) groundwater assessment (URS Australia Pty Ltd 2006)

Chapter 10 of the WICT EIS (refer Appendix 1) contains further details on the findings of these studies.

10.3.2 Geological setting

The stratigraphic sequence across the Project area comprises three distinct geological units as indicated by the "Gladstone Special" 1:100,000 geological maps. In summary, these include:

- Quaternary alluvial sediments associated with the Calliope River floodplain and river terraces
- Quaternary coastal sediments associated with estuarine channels and banks, supratidal flats, mangrove flats and coastal grasslands
- The Late Devonian/Early Cretaceous Curtis Island Group of meta-sediments that form the basement or bedrock. They underlie, or protrude through, the alluvial and coastal sediments and outcrop in the hilly terrain along the western margin of the Project area and beyond

Chapter 10 of the WICT EIS (refer Appendix 1) contains further information regarding the geological setting of the region.

10.4 Groundwater use

A search of the DNRMW (now DNRM) database of registered bores and wells within a radius of 6 km of the Project area was undertaken during the WICT EIS process. The data indicated that there are about 67 registered bores in the area. A search of the DNRM database undertaken in September 2011 indicated that these bores are still registered with no new additional bores being registered in the interim period. The locations of these registered bores are displayed in Figure 10.1.

A summary of information obtained from each registered bore within the region is contained in Chapter 10 the WICT EIS (refer Appendix 1).

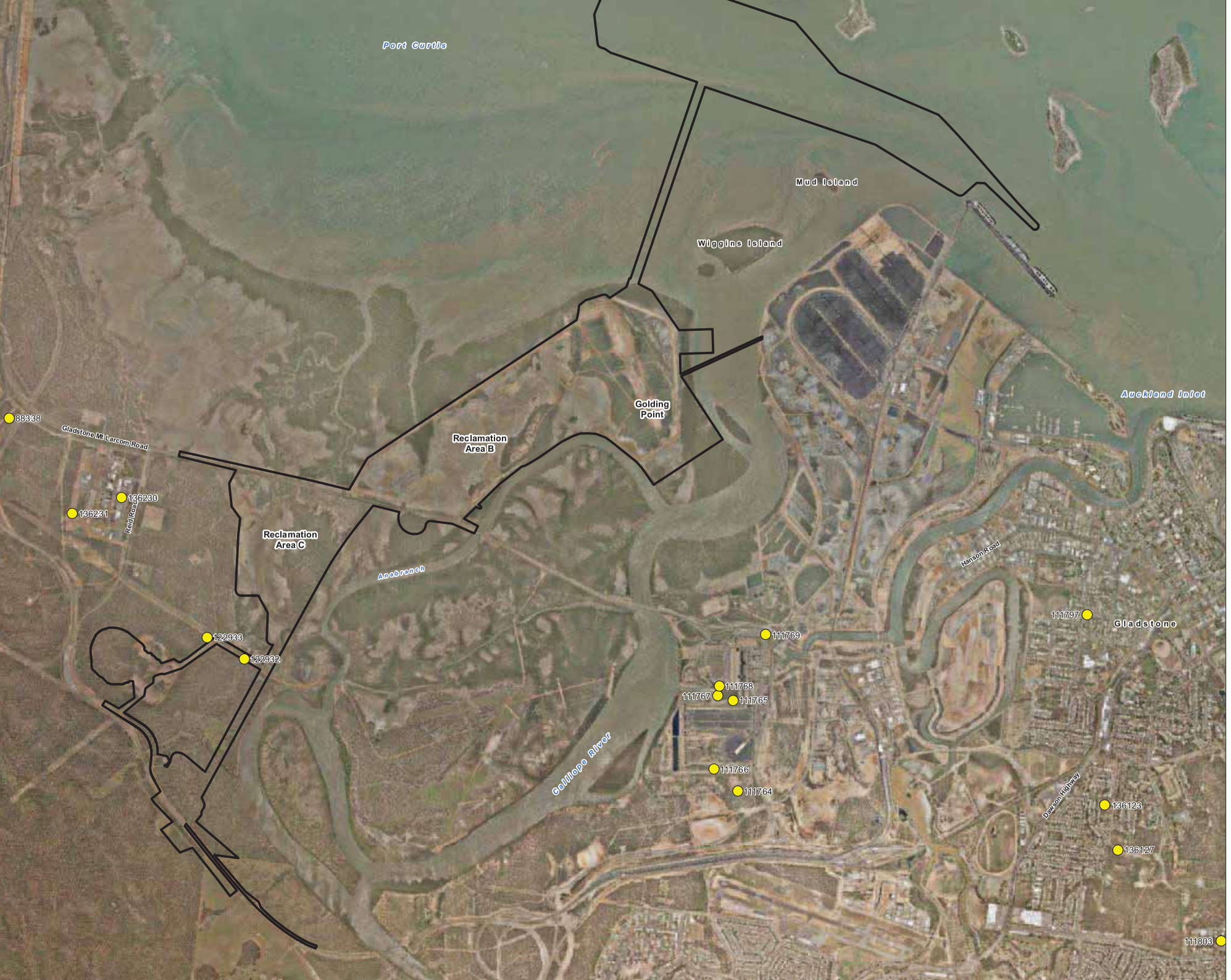
10.5 Groundwater regime and groundwater quality

10.5.1 Current background monitoring

As a requirement of the CG Report and the Stage 1 ASS Management Plan for the WICET Project, background groundwater monitoring is currently being conducted onsite for groundwater levels and water quality. A total of five bores are currently being monitored for water levels to determine the likelihood of oxidation of PASS due to potential lowering of the water table during construction activities. It is a condition of the CG Report that groundwater level monitoring be continued during construction.

The following parameters are currently being monitored as part of the background groundwater monitoring process:

- pH
- Dissolved anions
- Dissolved cations
- Dissolved metals



Legend

- Project Area
- DERM Ground

Source:
Bore Locations: DERM 200

10.5.2 Groundwater regime description

The WICT EIS (Appendix 1) indicated that two types of aquifer systems existed within the Project area and surrounds.

The recognised aquifer system types are:

- Alluvial aquifers consisting of Quaternary sediments associated with the Calliope River floodplain and river terraces, and of Quaternary coastal sediments associated with the estuarine channels and banks, supratidal flats, mangrove flats and coastal grasslands
- Fractured rock aquifers associated with the Late Devonian/Early Carboniferous Doonside and Wandilla Formations that underlie the site at depth and outcrop on the western side and as “islands” protruding through the coastal plain

The data obtained during the WICT EIS process indicated that groundwater in the alluvial sediments (that covers the majority of the Project area) is brackish to highly saline, with a pH varying from slightly acidic to slightly alkaline. In comparison, the water in the Calliope River adjacent the Project area, has a consistent electrical conductivity (EC) of about 64,000 μS/cm, indicating that it is sea water.

Groundwater in the alluvium is of generally poor quality due to the proximity of the Project area to the coast, the presence of tidal creeks that cross the site and the general marine environment of deposition of the aquifer sediments. In some locations the groundwater is of slightly better quality, although brackish, probably due to local recharge or groundwater flow conditions. Chapter 10 of the WICT EIS (Appendix 1) contains a detailed summary of the groundwater regime and groundwater quality within the region.

Based on the data available, it is believed that there are no industrial users of groundwater adjacent the Project area.

Industrial users generally have the capital required to drill and equip bores and if necessary to treat the water before use. However, industry tends to require large volumes of groundwater, which is not available from the aquifers in the area.

10.6 Potential impacts

10.6.1 New Stacker-Reclaimer yard and settlement ponds

A new Stacker-Reclaimer yard is proposed to be constructed on Reclamation Area B (Stockyard B) as part of the Project changes during the WEXP1. This Stacker-Reclaimer will require the construction of a new stormwater storage pond at the south-western extent of Stockyard B. The Stage 1 southern stormwater storage pond will be constructed on the northern extent of Stockyard B and will be extended twice during WEXP1 and WEXP2.

Description

The southern stormwater storage pond is proposed to be constructed to the north-eastern end of Stockyard B during the WICET Stage 1 process. The design for this stormwater storage pond has changed due to the proposed Project changes for the construction of the WEXP1. The new and existing approved (southern) stormwater storage ponds have similar design parameters. Both ponds will be constructed with a base existing surface at approximate RL 2.0 m and surrounding bund wall heights between RL 4.3 m to 5.4 m and will be clay lined to prevent dispersion of settled material.

Table 10.1 contains a list of drawings for various components of Reclamation Area B including information on the stormwater storage ponds and bund designs.

Table 10.1 Drawing references for Project Components within Reclamation Area B

Drawing Number (refer Appendix 2)	Project Component
1530-C-DR-0316_rev1	WICET Stage 1 (southern) stormwater storage pond design
2B251-M-DR-0001_revA	Stage 1 stormwater storage pond extension design/design of the stormwater outfall systems
2B534-C-DR-0313_revA	WEXP1 (new) stormwater storage pond design
2B534-C-DR-0301_revA	Stockyard B design including the locations of the two stormwater storage ponds
2B534-C-DR-0383_revA	Bund design for the internal wall of the new stormwater storage pond
2B534-C-DR-0384_revA	Bund design for the external wall for the new stormwater storage pond
2B534-C-DR-0321_revB	Bund design for the southern stormwater storage pond
2B534-C-DR-0280_revB	General expansion during WEXP1 construction
153-C-DR-0220_rev1	Tertiary stormwater storage pond outfall section

Impacts to groundwater regime

The Stacker-Reclaimer stockyard on Stockyard B will be constructed on existing fill material disposed to the area during the Stage 1 dredging and WEXP1 (Berths 2 and 3) campaigns. Excavation for ground improvement may be required during the construction of the Stacker-Reclaimer system, and may intrude upon the water table within the area.

Any potential environmental impacts associated with excavations and construction that may impact upon groundwater will be managed in accordance with mitigation measures outlined in the WICET CEMP (refer Appendix 23.2).

Both stormwater storage ponds will be lined with a clay material and are envisaged to be semipermeable preventing dispersion of settled material.

The base of the each pond will be constructed at RL 2.0 m and as such, will not intrude upon the water table. The relative levels (RLs) of each stormwater storage pond wall are contained in Drawings: 2B534-C-DR-0210_revA, 2B534-C-DR-0230_revB, 2B534-C-DR-0301_revA, 2B534-C-DR-0313_revA and 2B534-C-DR-0314_revA (refer Appendix 2).

The storage ponds will be designed to store a 10 year; 24 hour runoff event and the maximum water level in the pond will be 3.5 m AHD (ie the water in the pond will have a maximum depth of 1.5 m). The water may be slightly acidic as much of it will be derived from runoff and seepage from the coal stockpiles.

It is concluded under this scenario that construction of the Stacker-Reclaimer Stockyard Area B and the stormwater storage ponds within Reclamation Area B will have no impact on the groundwater regime.

Any unforseen impacts arising from construction of the Stacker-Reclaimer Stockyard Area B on Reclamation Area B or from the development of the stormwater storage ponds will be managed in accordance by measures outlined in the existing Construction Environmental Management Plan (CEMP) for the WICET Project (refer Appendix 23.2).

10.6.2 Development of a Stacker-Reclaimer yard on Golding Point

Description

A change in yard type on the eastern half of Golding Point from a Bridge Stacker to a Stacker-Reclaimer yard is proposed. This change does not alter the disturbance footprint that was approved under the WICT EIS (refer Appendix 1).

It is envisaged that this change will require minimal additional excavation to accommodate the footings for the Stacker-Reclaimer stockyard. However, the proposed reclaimed tunnels

in the original EIS are no longer required on the eastern half of Golding Point and hence, disturbance to groundwater in this area will decrease.

Impacts to groundwater regime

Excavation for ground improvement on the stockyard may intrude upon the water table during construction at Golding Point. Any potential environmental impacts associated with excavations and construction that may impact upon groundwater will be managed in accordance with mitigation measures outlined in the WICET CEMP (refer Appendix 23.2).

10.6.3 Placement of dredge spoil

Description

During Stage 1 dredging, dredged material will be pumped into the reclamation areas. The spoil and borrow material will raise the level of the mud flats from approximately RL 2 m to RL 5-7 m. The WEXP1 dredging and disposal is proposed to occur immediately after completion of the Stage 1 dredging and disposal to ensure scheduled Project milestones are achieved.

Compartmentalised reclamation during Stage 1 and WEXP1 is proposed to occur within Reclamation Area B. Up to four internal ponds per disposal area within Reclamation Area B (including Golding Point) will be constructed during the reclamation process, these being:

- Primary Pond
- Secondary Pond
- Tertiary Pond
- Quaternary Pond

Ponds within Reclamation Area C are proposed to be constructed in a similar process to Reclamation Area B, and will typically include three internal ponds; the primary, secondary and tertiary ponds. Drawing 2B534-C-DR-0210_revB and Drawing 2B534-C-DR-0211_revB in Appendix 2 show the layout of typical internal bund systems within Reclamation Areas B and C, respectively.

The primary and secondary ponds within Reclamation Area B will be primarily filled with gravel and sand. The tertiary and quaternary ponds will be filled with a mix of silt, sand and clay fines. All ponds within Reclamation Area C will be primarily filled with silt and/or clay fines.

Compartmentalised reclamation allows for a staged filling process of the primary and secondary ponds allowing dewatering to occur in each pond after they are filled. Dewatering allows for the consolidation of silts and fines, reducing ground improvement volumes.

Further detail on the dredge spoil disposal methodology is included in Section 3.6.1.

Impact on groundwater regime

Saline water that does not infiltrate to the water table will run off as surface flow across the Reclamation Areas. It is envisaged that channels will be constructed with sediment traps to collect and direct the surface runoff to well-located discharge areas. Surface water quality and management is further discussed in Chapter 9 of this request.

Any seepage that may infiltrate through to the water table from the stormwater storage ponds will move with the normal groundwater flow and discharge to the mud flats and mangrove areas to the north, and to the Anabranch of the Calliope River to the south. The envisaged impact of this saline seepage to the water table is:

- The water table in the area will be temporarily raised from its existing level

- The brackish groundwater beneath the mud flats impacted by the seepage will become more saline
- Groundwater discharge to the mangroves, coast and estuary will increase in the short term

It is considered that there should be no adverse impact as the environment is naturally saline. The increase in groundwater discharge flux will be minimal in comparison to the tidal flushing volumes that occur in the groundwater discharge zones.

10.6.4 Summary of potential impacts

It is expected that construction of the WEXP1 and WEXP2, in addition to Stage 1, will have a relatively minor impact on the groundwater regime. The extent of impact with respect to groundwater levels will generally be confined to less than 50 m from each excavation. The sections below provide a summary of the potential construction impacts of the WICET Project on specific aspects of the groundwater regime.

Significance with respect to groundwater depletion and recharge

Recharge of the groundwater system occurs primarily by infiltration through the mud flats during periods of tidal inundation and by direct rainfall infiltration to the soils in topographically higher areas. The construction of the WICET Project will have minimal impact on recharge with the exception of the stockyard area at Golding Point, where a large expanse of impervious cover will prevent infiltration. Groundwater levels in this area however, will be maintained at approximately 0 m AHD by inflow from the surrounding estuaries and the sea.

Construction of the new Stacker-Reclaimer and storage pond on Stockyard Area B is not expected to impact upon groundwater recharge in the region. It is likely that stormwater within the storage pond will infiltrate the water table in this region, but this effect is expected to be minimal as storage levels within the pond will be managed by the stormwater release system into the Calliope River Anabranch and the stormwater ponds are designed to be semi-permeable.

In summary, it is assessed that the WEXP1 and WEXP2 will have little impact on groundwater depletion and recharge.

Groundwater dependent ecosystems (aquatic ecosystems)

It is considered unlikely that there are any aquatic ecosystems in the area that are totally dependent on groundwater. Rather the aquatic ecosystems will be dependent on the general saline environment of the mudflats and mangroves, and tidal inundations.

There are no recorded natural springs in the higher topographic area to the west that would support groundwater dependent ecosystems. The colluvial deposits that have developed at the foot of the hills are generally dry with the exception of short periods after rainfall and runoff.

Groundwater contamination

The WICET Project footprint (including Stage 1, WEXP1 and WEXP2) prior to Stage 1 WICET construction was relatively undeveloped and therefore unlikely that historical land use activities have been undertaken that would result in contamination of groundwater.

Potential contaminants will be stored or handled during construction and operation with the potential to spill, leak or leach and impact the groundwater regime.

Any potential impacts arising from construction and excavation will be avoided, mitigated or managed in accordance with measures outlined in the CEMP for the WICET Project (refer Appendix 23.2).

Management of acid sulfate soils

The low-lying alluvial areas of the Project area, particularly the mudflats, are PASS (refer Chapter 4). Dewatering of an excavation will locally lower the water table leading to the potential oxidation of ASS in the area of depletion. This may in turn lead to acidification of groundwater that comes in contact with the oxidised material. Groundwater inflow to the excavations during dewatering and groundwater flow through the oxidised zone post dewatering is therefore likely to have a low pH.

The pH of groundwater that flows into the dewatering operations within the bunded areas will be monitored as part of the surface water monitoring program detailed with the WICET DMP (refer Appendix 23), The relatively small fluxes of discharge to the estuary and ocean post dewatering should be neutralised by the large volume of saline water.

The WICET CEMP and DMP contains further measures that will be implemented during excavation and dewatering activities onsite to prevent contamination of the water table from ASS/PASS.

Impacts on other groundwater users

There are no registered bores on the DNRMW (now DNRM) bore database within the WICET footprint, primarily due to the saline environment of the coastal flats and the low yield of the rock formations that form the western hills. It is therefore assessed that construction of the WICET Project will not impact on groundwater users.

10.7 Summary of potential impacts resulting from Project changes

10.7.1 Change to include Stacker-Reclaimer yard on Stockyard B

The proposed new Stacker-Reclaimer yard will be wholly contained within the approved Project footprint. The works will involve minimal excavation and is not expected to result in interception of groundwater and as such, will not impact upon the groundwater regime in the area.

10.7.2 New settlement pond and stormwater outfall from Stockyard B to the anabranch

The new stormwater settlement pond and stormwater outfall will be contained within the approved Project footprint. The settlement pond works will involve excavation of previously deposited dredged materials and the outfall will require excavation of some soils however, the potential impacts from this change are considered minor, and are not expected to impact upon the groundwater regime within the area.

Construction of both stormwater settlement ponds within Stockyard B are not proposed to intrude upon the water table within the region and is therefore unlikely to result in impacts to the water table level or potential contamination. Furthermore, the settlement ponds are proposed to be lined with a clay lining material which will prevent the redistribution of settled material from the pond base.

10.7.3 Change in yard type on eastern half of Golding Point from Bridge - Stacker to Stacker-Reclaimer

The change in yard type on the eastern half of Golding Point will wholly be contained within the approved EIS footprint. This change will result in fewer disturbances within the region as the reclaim tunnels are no longer proposed. Construction of the Stacker-Reclaimer within this location will require minimal excavation of previously laid dredge material. It is unlikely that excavation will impact upon the water table within the region.

Any potential impacts arising from construction of the Stacker-Reclaimer stockyard Golding Point during WEXP2 will be avoided, mitigated or managed in accordance by measures

outlined in the Construction Environmental Management Plan (CEMP) for the WICET Project.

10.8 Mitigation measures

On the basis of the groundwater assessment undertaken, the overall potential impact of construction of the modified Project expansions (WEXP1 and WEXP2), in addition to the unmodified Stage 1 of the Project, on the groundwater regime is expected to be minor.

As it has been assessed that there will be no impact on groundwater dependent ecosystems or other groundwater users, management and mitigation options are only considered to be required with respect to groundwater drawdown and ASS, and for monitoring of potential contamination post construction.

The CEMP contains the mitigation measures that will be implemented onsite during construction and excavation activities to prevent causing environmental harm to the water table as a result of the overall WICET Project.

Current background groundwater monitoring will be continued throughout construction to monitor groundwater levels and to determine the potential for oxidation of PASS. Should oxidation of PASS occur as a result of construction activities, ASS material will be treated in accordance with the Project ASS Management Plan (refer Chapter 4 and Appendix 23.4).

10.9 Conclusions

The groundwater regime of the WICET footprint and surrounds consists of two broad aquifer types; alluvial aquifers and fractured rock aquifers. The majority of the Project area is low lying and consists of coastal alluvial sediments, generally clayey in nature, but with minor sandy and gravely lenses. These sediments contain brackish to saline groundwater. Groundwater also occurs in floodplain and river terrace alluvium associated with the Calliope River. These deposits are also generally very clayey, and as the river is tidally influenced in the area, groundwater in these deposits is also saline to brackish.

Fractured rock aquifers, which are of generally low permeability, outcrop at Golding Point and form the hills to the west. They also underlie the whole of the alluvial area. Groundwater quality in the fractured rock aquifers forming the western hills is probably fresh to slightly brackish, whereas in the Golding Point area, it is expected to be brackish.

The proposed changes, associated with WEXP1 and WEXP2, to the WICET design proposed post WICT EIS and SEIS are not expected to result in increased disturbance to groundwater resources within the area, as the expansion phases are wholly contained within the Project footprint approved under the WICT EIS (refer Appendix 1).

The addition of the new stormwater storage pond and outfall within Stockyard Area B and the proposed extension of the southern stormwater storage pond in Stockyard Area B will not intrude upon the water table in the region and as such are unlikely to impact upon the groundwater regime in the region.

A change in yard type at Golding Point from a Bridge Stacker, to a Stacker-Reclaimer will reduce previously proposed impacts to the water table as the reclaimer tunnels will no longer be required.

Conclusion 1: Changes to the WICET Project as a result of WEXP1 and WEXP2 are not expected to significantly alter the potential impact upon groundwater regimes in the region.

11. Coastal environment

11.1 Summary

The changes proposed as part of WEXP1 and WEXP2 will not result in an increase to potential impacts on the coastal environment.

There is no proposed change to the approved dredging, as included in the WICT EIS and SEIS. It is therefore expected that proposed changes will not alter the findings and conclusions of the impact assessment undertaken as part of the WICT EIS and controlled action approval process.

Total volume of sediment dispersal and settlement during construction and operation of the change Project is not expected to significantly alter potential impacts upon aquatic communities. It should be noted that the majority of impacts to the coastal environment will be addressed as part of Stage 1 works.

11.2 Introduction

This chapter provides a description of the potential impacts of the changed Project on the coastal environment. Potential impacts of the WICET Project on the surrounding coastal environment were originally outlined in the WICT EIS and SEIS. This assessment focuses on the tidal hydrodynamics, marine sediments and coastal processes of the Port Curtis coastal region. Proposed changes to the Project as part of WEXP1 and WEXP2 are wholly contained within the Project footprint approved under the WICT EIS. It should be noted that the majority of impacts to the coastal environment will be addressed as part of Stage 1 works.

11.3 General description

The Port Curtis region (refer Figures 16.1 and 16.3 in Chapter 16) is situated at the transition between the tropics and subtropics in Central Queensland on the eastern coast of Australia. The region is characterised by extensive areas of tidal flats that become exposed at low tide and large areas of mangroves fringing the estuary which act as a storage buffer for water at high tide. These mangroves and tidal flats have ecological significance, being home to numerous aquatic fauna and flora. The region also contains stands of seagrass beds, notably Rodds Bay in the south, which attracts marine mammals such as dugongs to feed. Further details of the marine and coastal ecology and potential impacts are discussed in Chapter 16.

The Port Curtis area has a very large tidal range (in excess of 4 m for large spring tides) and extensive mangrove and tidal flats which become available for tidal storage at higher tidal levels as outlined above. This generates significant current velocities particularly within the main channel, with associated tidal flushing which leads to particularly well mixed waters.

The Port of Gladstone has been established in the naturally sheltered waters of Port Curtis behind Facing and Curtis Islands to the east and north. Port Curtis is connected to the ocean via a major opening to the south of Facing Island (South Channel), a smaller opening between Facing and Curtis Islands (North Channel) and The Narrows which extend some 40 km to the north behind Curtis Island. Port Curtis is a naturally protected deep water harbour and as such, is the largest port in Queensland. The bathymetry in the harbour has been modified by the development of shipping channels, land reclamation and coastline armouring. Maintenance dredging of the shipping channels occurs regularly, with the dredged material being disposed of ashore or deposited at a location approximately 9 km south east from Facing Island. Gladstone Ports Corporation (GPC) is the governing body responsible for the management of all dredging projects within the port.

The interchange of tidal waters between the estuary and the ocean varies greatly between extreme neap and extreme spring tides. In the area between Curtis Island and Facing Island

there are large tidal flats which become exposed at low water. For very low tides, the whole area reduces to several narrow meandering channels connecting to North Entrance and to Facing Channel.

Holocene aged estuarine deposits overlying rock of the Wandilla Formation of Early Carboniferous age underlie the coastal flats on which the onshore facilities are located. The tidal flats that skirt the coastline feature mangrove swamps and muds comprised of soft organic silts and clays. Those locations situated within the proposed WICET offshore jetty, berthing and channel facility areas consist of alluvial sediments carried down the Calliope River. These typically consist of alluvial sand and gravel deposits and older silts and clays.

Geotechnical surveys commissioned to inform the design of the Project (Douglas Partners 2006) demonstrated that the gravels within the sediments are predominantly hard rock in origin and that the upper levels are likely to be alluvial. The geotechnical results are discussed in Section 11.4.1, while ASS and the potential impacts of their release to the system are included in Chapter 4.

11.4 Investigations and hydrodynamic modelling

For the purpose of the proposed development a number of geotechnical, ASS, hydrodynamic and plume dispersion modelling studies were commissioned as part of the WICT EIS and detailed design process for the Project. Additional dredging plume dispersion modelling was also undertaken in 2011 as part of the Gladstone Western Basin Dredging and Disposal Project (WBDDP). Cumulative impacts of dredging from the WICET Project and the WBDDP were contained in the EIS (refer Appendix 1). Reports relating to the coastal environment of the Project are outlined in Table 11.1.

Table 11.1 Coastal reports relevant to the WICET Project

Name	Date
Connell Hatch: Preliminary Onshore Acid Sulfate Soil Investigation and Management Plan - Wiggins Island Coal Terminal	8 November 2006
Douglas Partners: Report on Geotechnical, Environmental and Acid Sulfate Soils Investigation, Proposed Offshore Works Wiggins Island Coal Terminal Gladstone, prepared for Central Queensland Ports Authority (Volume 1&2)	24 October 2006
Douglas Partners: Report on Geotechnical, Environmental and Acid Sulfate Soils Investigation, Proposed Offshore Works – Stage 2 Wiggins Island Coal Terminal Gladstone, prepared for Gladstone Ports Corporation	18 March 2009
WBM: Numerical Modelling – Hydrodynamic, Plume Dispersion, Sediment Transport and Waves	2006
WBM: Gladstone Western Basin (including WICET Project) Dredging Plume Dispersion Modelling	25 January 2011

11.5 Description of environmental values

The proposed WICET Project is located to the north and west of the Calliope River near its downstream connection with Port Curtis. The proposed coal terminal berths are located adjacent to Targinnie Channel in the main body of Port Curtis to the north west of the Calliope River entrance. Dredging will be required for the approaches, berths and swing basin as described in Section 11.6. The proposed jetty extends out across the intertidal flats, while the dredging dewatering bunds, coal stockyards and conveyors occur predominately on the upper intertidal saltpan regions adjacent to the anabranch of the Calliope River.

Marine sediments

Section 11.3.4 of the WICT EIS focuses on the physical and chemical characteristics of marine sediments and potential impacts resulting from the dredging and operational aspects of the development. Geotechnical and environmental investigations were undertaken by Douglas Partners in 2006 and 2008.

A Dredge Management Plan (DMP) for the WICET Project has been prepared (WICET DMP Rev6, 21 September 2011, refer Appendix 23.18) for the dredging works and has recently been amended to include changes to dredging methodology, including proposed WEXP1 dredging. The DMP was approved by DEHP on 13th April 2012.

11.6 Dredging

11.6.1 History of Dredging Projects

Knowledge of the history of dredging and siltation is important with respect to the potential mobility of the sediments and likely future siltation rates. There is a long history of dredging and dredged material disposal in both onshore and offshore locations at the Port of Gladstone. All material to be dredged in recent years has had sampling and analysis undertaken prior to dredging and all material has been determined as suitable for its intended disposal location. The most recent dredging programmes were:

- Capital dredging Targinnie Channel, Berth 2 and approach apron at Fisherman's Landing
- Capital dredging of the Fourth Berth at RG Tanna Coal Terminal (2005)
- Capital dredging of Berth 1 and approach channel at Fisherman's Landing (2008 and 2009)
- Maintenance dredging of the shipping channels, swing basins and berths (annually in October/November; most recent sampling 2006)
- Maintenance dredging for the Gladstone Marina (2009)
- Western Basin Dredging and Disposal (Onshore and Offshore) Project (2011-currently ongoing, refer Section 11.6.2)

Maintenance dredging is typically carried out in the port on an annual basis in different areas as needed. From 1996 maintenance dredging of 100,000 m^3 has occurred every year (Source: Gladstone Ports Corporation). Historical dredging volumes within the Gladstone Port are summarised in Table 11.6.

Table 11.6 Historical Dredging Volumes

Date	Location	Volume
1960-66	Auckland Point berths, Barney Point berths and harbour channel	A significant volume
1968	Entrance channel	Further deepening
1980-82	Approach channels to Clinton and Fisherman's Landing, as well as the Marina	20 Mm^3
1986-87	Inner harbour channels widened and berths deepened	3 Mm^3
1987	Outer channel	2.5 Mm^3
1997	Fisherman's Landing	1 Mm^3
1997	Outer channel	1 Mm^3
1998	Inner channel swing basin	2 Mm^3
1999	Inner channel	2 Mm^3
2001-03	Berth 3 at RG Tanna Coal Terminal and Fisherman's Landing including deepening of Targinnie Channel and Clinton Bypass Channel	2 Mm^3
2005	RG Tanna Coal Terminal berth 4	0.75 Mm^3
2008-09	Fisherman's Landing berth pocket and approach	0.66 Mm^3
2009-10	Gladstone Marina	350,000 m^3

Source Gladstone Ports Corporation

The relatively small quantities of maintenance dredging results in minimal siltation. This in turn is an indicator that there is limited sediment transport and/or that the currents/ship movements are sufficient to keep the sediments in suspension and not settle out in the

dredged areas. Examination of historical hydrographic surveys also confirms minimal siltation.

11.6.2 Western Basin Dredging

GPC is currently working to establish facilities to support the emerging Liquefied Natural Gas (LNG) industry that are to be located in the Gladstone region (including APLNG, QCG, and GLNG projects). This includes the inner harbour dredging associated with deepening and widening of existing channels and swing basins, and the creation of new channels, swing basins and berth pockets.

The Western Basin Dredging and Disposal (onshore and offshore) Project (Western Basin Project) will accommodate the long term dredging and dredged material disposal required to provide safe and efficient access to the existing and proposed port facilities in Gladstone Harbour. The Western Basin Project, as approved by Commonwealth and State Governments in October 2010, specifically involves:

- The inner harbour dredging associated with deepening and widening of existing channels and swing basins, and the creation of new channels, swing basin and berth pockets
- Approximately 25 Mm³ of dredge material will be dredged from the Western Basin Project dredge area
- Disposal of the dredged material from the above dredging works in the Fisherman's Landing Northern Expansion (FL153) and Western Basin Reclamation Area
- Disposal of up to 11 Mm³ of the dredge material discussed above in the existing GPC approved offshore East Banks Sea Disposal Site (EBSDS)

11.6.3 Proposed WICET dredging works

There are no changes proposed to the approved dredging, as included in the WICT EIS and SEIS as part of the WEXP1 and WEXP2 changes.

The staged dredging works will involve the initial dredging of approximately 3.32 Mm^3 of material (excluding over-dredging) from within the Port of Gladstone, to allow for the construction of the coal terminal, comprising of three berth pockets, swing basin and departure/arrival channels for the three berths. Dredging for Berth 1 is included within the WICET Stage 1 works package. The dredging of Berths 2 and 3 and departure/arrival channels are part of WEXP1 works. The dredging of Berth 4 and departure channel is part of the WEXP2 works.

Table 11.7 details the dredge quantities for the initial dredging campaigns.

Table 11.7 Dredge quantities in relation to the Project component

Dredging component	Description	Volume (Mm³)
Stage 1	Berth 1 including swing basin and departure/arrival channel	2.28
WEXP1	Berths 2 and 3 including departure and arrival channels	1.04
WEXP2	Berth 4 including arrival channel widening	1.2
Total (excluding over-dredging)		**4.5**

Future dredging works for Berths 5 and 6 (non-coal berths), giving an ultimate dredging volume of 6.3 Mm^3, are approved through the WICT EIS and EPBC Act controlled action approvals. In the event of future dredging works, separate DMPs will be submitted to DEHP and SEWPaC for approval.

11.7 Conclusion

There is no change to the approved dredging, as included in the WICT EIS and SEIS. The staged dredging works proposed as part of the Project will involve the initial dredging of

approximately 4.8 Mm^3 of material (excluding over-dredging) from within the Port of Gladstone, to allow for the construction of the Stage 1 and WEXP1 components of the coal terminal. Dredging for Berth 1 is included in the WICET Stage 1 works package. Dredging for Berths 2, 3 and 4, including arrival and departure channels, is part of WEXP1 and WEXP2 works. Future dredging works include the Industry (non-coal) Berths 5 and 6.

The WICET DMP was approved by DEHP on 13th April 2012 and outlines potential impacts that the initial dredging works will have on the surrounding coastal environment and mitigation measures to manage these impacts. The future dredging works will be addressed through separate DMP(s).

The proposed new changes to the Project will not result in changes to the approved dredging footprint, dredged material volumes or placement location. It is therefore expected that proposed changes will not alter the findings and conclusions of the impact assessment undertaken as part of the WICT EIS and controlled action approval process.

Conclusion 1: There is no change to the approved dredging, as included in the WICT EIS and SEIS.

Conclusion 2: Total volume of sediment dispersal and settlement during construction and operation of the change Project is not expected to significantly alter potential impacts upon aquatic communities.

12. Air quality

12.1 Summary

The changes proposed as part of WEXP1 and WEXP2 are not expected to result in an increase impacts to air quality (particulate matter) with in the Gladstone region.

Air quality monitoring undertaken as part of the EIS Change Request process predicted that cumulative 24-hour average ground-level PM_{10} concentrations are predicted to exceed the EPP (Air) objective of 50 µg/m³ at the Gladstone Marina, located 2.5 km east of WICET, on seven occasions. However, this is due to existing industries and background concentrations. The contribution of the WICET Project to the exceedences is predicted to be between 0.02% and 4.1% This presents a minor increase (1.1%) in the Project contribution from the modelling undertaken in the WICET SEIS, which predicted a contribution of <3% to maximum 24-hour average PM_{10} concentrations in Gladstone.

No further cumulative exceedances of particulate matter are expected as a result of construction or operation of the changed Project (including Stage 1, WEXP1 and WEXP2).

Any impacts associated with the changes to the Project will be managed in accordance with the AQMP approved by DEHP.

12.2 Introduction

Katestone Environmental was commissioned to undertake an air quality assessment to inform the WICET Project Change Request (Appendix 12.1, Katestone Environmental: Air Quality Assessment of the Wiggins Island Coal Terminal Expansion Project (Draft), October 2011).

Katestone Environmental previously prepared an air quality assessment for the WICT EIS in 2006, and an additional assessment in the SEIS (2007) to incorporate changes to the design of the WICET.

The air quality assessment undertaken by Katestone Environmental for the Project Change Request assessed the approved WICET Stage 1 facility and the WEXP1 and WEXP2 expansion phases collectively. The air quality assessment also outlines the changes in potential air quality impacts between the Project assessed under the EIS process and WICET Project described in this Change Request. A summary of the assessment is provided below.

This Request for Project Change provides an updated assessment to address changes to the Project which were assessed in the Coordinator-General's (CG) Report (January 2008) and EPBC Act controlled action approval (April 2008).

12.3 Air Quality Assessment

The air quality assessment has used a meteorological and dispersion modelling assessment to investigate the potential for air quality impacts associated with the Project. Emission rates of TSP, PM_{10} and $PM_{2.5}$ from the Project have been calculated using emission factors published by the US-EPA and NPI and operational parameters provided from the Project Technical Feasibility Study. CALPUFF dispersion modelling has been conducted to predict the ground-level concentrations of TSP, PM_{10} and $PM_{2.5}$ and dust deposition rates at nearest sensitive receptors and across a Cartesian grid.

A cumulative assessment has been conducted to assess the impacts of the Project in conjunction with emissions from the existing RGTCT, BPCT, the coal stockpiles at Gladstone Power Station, and ambient background levels based on representative monitoring data in the region. Emissions from RGTCT, BPCT and Gladstone Power Station were modelled explicitly in the CALPUFF dispersion model.

Predicted cumulative ground-level concentrations of TSP, PM_{10} and $PM_{2.5}$ and dust deposition rates at nearest sensitive receptors were compared against the relevant Queensland air quality objectives.

An assessment of the dispersion meteorology has shown the following:

- The site is dominated by moderate to strong winds, with an average wind speed of 3.8 m/s. Approximately 46% of winds between 2 and 4 m/s and a further 34% of winds are between 4 and 6 m/s
- Dust emissions from fugitive sources are essentially zero at low wind speeds and will remain so until the wind speed exceeds a threshold that is specific to the particular source but is generally found to be above about 5 to 6 m/s. Approximately 9% of the winds at the site are predicted to be greater than 6 m/s (12 Kts)
- The prevailing wind direction at the site is from the east-northeast to south-southeast, with 66% of winds predicted to occur from these sectors

The cumulative air quality impact assessment of the WICET Stage 1, WEXP1 and WEXP2, that included emissions from the existing RGTCT, BPCT and Gladstone Power Station operations as well as ambient background levels based on monitoring data in the region, has shown the following:

- The cumulative 24-hour average ground-level PM_{10} concentration is predicted to exceed the EPP (Air) objective of 50 µg/m³ at the Marina, located 2.5 km east of WICET, on seven occasions
- The exceedances of the 24-hour average PM_{10} EPP (Air) objective of 50 $\mu g/m^3$ at the Marina are attributed to the existing industries and elevated background concentrations. The contribution of the Project to the exceedances is predicted to be between 0.02% and 4.1%. This presents a minor increase (1.1%) in the contribution to exceedences from the modelling undertaken in the WICET SEIS, which predicted a contribution of <3% to maximum 24-hour average PM_{10} concentrations in Gladstone
- The predicted cumulative maximum (6^{th} highest) 24-hour average ground-level concentrations of PM_{10} at all remaining sensitive receptors are well below the EPP(Air) objective
- The predicted cumulative annual average ground-level concentrations of TSP at all receptors are well below the EPP (Air) objective of 90 µg/m³
- The predicted cumulative maximum 24-hour and annual average ground-level concentrations of $PM_{2.5}$ at all receptors are well below the EPP (Air) objectives of 25 $\mu g/m^3$ and 8 $\mu g/m^3$, respectively
- The predicted contribution of the Project to ground-level concentrations of TSP, PM_{10} and $PM_{2.5}$ at the nearest sensitive receptors is between 0.2% and 10.7%
- The predicted cumulative maximum monthly and annual average dust deposition rates at all sensitive receptors are well below the DEHP recommended guideline of 120 mg/m^2/day (monthly average) and NSW OEH amenity guideline of 4 g/m^2/month (133 mg/m^2/day) (annual average)
- The predicted contribution of the Project to dust deposition rates at the nearest sensitive receptors is between 0.1% and 2.3%

Air quality assessment results for WICET Stage 1, WEXP1 and WEXP2 are similar to those of the assessment undertaken in the EIS and SEIS, which included assessment of the maximum capacity of 84 Mtpa.

12.4 Mitigation Measures

The proposed WICET Project (including WEXP1 and WEXP2) will employ a range of best practice measures for controlling dust emissions. These have been accounted for as far as is possible in the emissions estimation given the availability of emissions data.

12.4.1 Design

Mitigations measures that have been included as part of WEXP1/WEXP2 or are to be investigated during detailed design include, but are not limited to:

- Reclaiming system at Stage 1 facility designed to minimise bulldozing
- Stacking and reclaiming at WEXP1 and WEXP2 expansion areas to occur via rail mounted long travelling, slewing and luffing boom type stacker reclaiming machine with a rotary bucket wheel reclaim system, removing the need for bulldozing. The design of the luffing boom will minimise dust emissions from stacking by reducing effective drop height of the coal to the stockpile. Water sprays to product discharge will also be used
- Surge bins will be fully enclosed with mechanical dust extraction and bag filter. Water addition stations will also be used on elevating section prior to sample station and surge bins
- Enclosure of all transfer points and installation of dust suppression sprays. Partial enclosure of all elevated conveyors
- Extendable dust shroud or telescopic chute for stacking at Stage 1 facility. The extendable dust shroud will minimise dust emissions from stacking by reducing the effective drop height of the coal to the stockpile and by reducing the potential for fine coal particles to be entrained in the wind during stacking. The design of the WICET stackers will also ensure that bulldozing is not required for stacking – eliminating a potentially significant source of dust emissions
- Environmental bunds, with vegetated buffers have been designed, primarily for visual amenity, however are expected to result in a reduction in dust emissions leaving the Project site

12.4.2 Construction

Mitigation measures for construction air quality are detailed in the Wiggins Island Coal Export Terminal Air Quality Management Plan (Appendix 23.3). It covers all air quality related issues that are reasonably expected to arise throughout construction, including dust, odours, gas emissions and pollutants, and relates to all air quality affecting aspects at the Project construction site, including related activities of all Contractors and subcontractors. Construction air quality mitigations measures include:

- Implementation of the Air Quality Management Plan prior to construction commencing
- Applying water on all exposed areas by water cart as required to minimise dust emissions, particularly from wheel-generated dust
- Minimising significant dust generating activities during high wind speeds where practicable and unwatered
- Restricting vehicle speeds on unsealed haul roads to reduce dust generation
- Avoiding spillages and prompt cleanup of any that occur
- Covering haul vehicles moving outside the construction site
- Stockpiled material should be treated appropriately to prevent wind erosion from the prevailing easterly wind direction
- Regular cleaning of machinery and vehicle tyres will prevent track-out of dust to public roads
- Minimising licensed onsite burning or incineration
- Ensuring that roads are appropriately surfaced as soon as possible after the commencement of site activities
- Routing roads away from sensitive areas wherever possible
- Revegetating disturbed areas as soon as possible
- Vehicles and equipment are to be appropriately maintained to minimise air emissions
- Visual monitoring of dust. Dust deposition gauges will be installed at nearby residences in receipt of a dust complaint

12.4.3 Operation

Mitigations measures that will be included as part of the operation of WEXP1 and WEXP2 include, but are not limited to:

- In high winds water cannons become ineffective at dust suppression. A secondary suppression system will be used in these conditions that utilises a mist curtain. The mist curtain enhances deposition of dust by impaction of the dust particles
- Mechanical dust extraction and bag filter installed on rail dump hoppers
- Ensure high moisture content of coal arriving from mines and the ability to add between 1.5% and 2% additional moisture at each dump station through water sprays
- Wet down of stockpile surfaces. The final stockyard design will have 116 water cannons each with a radius of throw of 76 m. The water cannons will wet down the surface of the stockpiles to form a surface crust that inhibits the wind erosion of dust
- Dust emissions during shiploading will be reduced through the enclosure of shiploader boom on two sides, sealing of shiploader drive floor to capture spillage, and the insertion of the loading chute into ships hold during loading
- The environmental bunds, with vegetated buffers, primarily for visual amenity, are expected to result in a reduction in dust emissions leaving the Project site

12.5 Conclusion

12.5.1 Construction

Air quality impacts generated during construction of WEXP1 and WEXP2 are expected to be similar to that of WICET Stage 1, and as such are not expected to increase impacts on sensitive receptors.

Air quality during construction will be managed though the Air Quality Management Plan (Appendix 23.3).

12.5.2 Operation

The air quality assessment for the EIS and SEIS included the assessment of the maximum capacity of the facility, ie 84 Mtpa. The air quality assessment results for WICET Stage 1, WEXP1 and WEXP2 are similar to those of the assessment undertaken in the EIS and SEIS, any impacts on sensitive receptors are not expected to increase.

Air quality monitoring undertaken as part of the EIS Change Request process predicted that cumulative 24-hour average ground-level PM_{10} concentrations are predicted to exceed the EPP (Air) objective of 50 µg/m³ at the Gladstone Marina, located 2.5 km east of WICET, on seven occasions. However, this is due to existing industries and background concentrations. The contribution of the WICET Project to the exceedences is predicted to be between 0.02% and 4.1% This presents a minor increase (1.1%) in the Project contribution from the modelling undertaken in the WICET SEIS, which predicted a contribution of <3% to maximum 24-hour average PM_{10} concentrations in Gladstone.

Air quality during operation will be managed through an Operational Air Quality Management Plan, to be developed prior to operation commencing.

Conclusion 1: Air quality monitoring predicted that cumulative 24-hour average ground-level PM_{10} concentrations are predicted to exceed the EPP (Air) objective of 50 µg/m³ at the Gladstone Marina on seven occasions. However, this is due to existing industries and background concentrations. The contribution of the WICET Project to the exceedences is predicted to be between 0.02% and 4.1% This presents a minor increase (1.1%) in the Project contribution from the modelling undertaken in the WICET SEIS, which predicted a contribution of <3% to maximum 24-hour average PM_{10} concentrations in Gladstone.

Conclusion 2: No further cumulative exceedances of particulate matter are expected as a result of construction or operation of the changed Project (including Stage 1, WEXP1 and WEXP2).

Conclusion 3: Any impacts associated with the changes to the Project will be managed in accordance with the AQMP approved by DEHP.

13. Waste

13.1 Summary

A modest increase in waste (of that originally predicted in the EIS and SEIS) will be generated during construction. This is largely due to the expansion phases requiring a slight increase in construction intensity compared with that estimated in the EIS and SEIS.

All waste materials generated during construction and operation will be managed in accordance with the WMP and the WICET OEMP respectively (refer Appendix 13 and 23). As such, there are no additional waste related impacts to the surrounding environment expected as part of the WEXP1 and WEXP2 changes.

There are no changes to the waste management processes approved under the WICT EIS, as a result of WEXP1 and WEXP2.

13.2 Introduction

This chapter provides a description of the potential impacts of waste generated by the changed Project. Potential impacts of waste within the WICET Project area were originally outlined in the EIS and SEIS. This Change Request provides an updated assessment to address potential changes to the Project.

This Request for Project Change provides an updated assessment to address changes to the Project which were assessed in the Coordinator-General's (CG) Report (January 2008) and EPBC Act controlled action approval (April 2008). Proposed changes to the Project as part of WEXP1 and WEXP2 (previously Stage 2 and Stage 3) are wholly contained within the Project footprint approved under the EIS and areas subsequently approved for WICET Stage 1). It should be noted that the majority of impacts from waste will be addressed as part of Stage 1 works.

13.3 Legislative Requirements

The Queensland legislation, regulations and guidelines for waste management include the following:

- *Environmental Protection Act 1994* (EP Act)
- *Environmental Protection Regulation 2008*
- *Environmental Protection (Waste Management) Policy 2000* (EPP(Waste))
- *Environmental Protection (Waste Management) Regulation 2000*
- Waste Management Strategy for Queensland 1996

The *Environmental Protection Regulation 1998* is subordinate to the EP Act. The EPP(Waste) and the *Environmental Protection (Waste Management) Regulation 2000* aim to achieve the objectives of the EP Act by providing additional strategies and guidelines. The policy sets the legislative framework outlined within the waste management strategy.

This framework includes:

- Adoption of the waste management hierarchy
- Assigning responsibility for waste management
- Outlining specific mechanisms for waste management planning
- Outlining state government responsibilities for waste management
- Implementing a review system for the policy

The objective of the EPP (Waste) is to protect Queensland's environment according to the principles of Environmentally Sustainable Development (ESD) as defined in the EP Act.

13.4 Proposed Waste Management during Construction and Operation of WICET

Wastes will be generated both during the construction and operational phases of the Project. This section describes the potential waste production and management during these phases and provides an indicative waste inventory through the identification of likely waste streams. There are no proposed changes to the waste management processes approved under the WICT EIS, as a result of WEXP1 and WEXP2.

The WICET Waste Management Plan (WMP) (refer Appendix 13.1) has been prepared to mitigate the impacts of wastes generated during the construction phase of the Project. The WMP was approved by DERM (now DEHP) in June 2011. Included in the WMP is an outline of proposed waste management strategies, having regard to the *Environment Protection (Waste Management) Policy 2000* principles of the waste management hierarchy of waste avoidance, reuse, recycling, treatment and disposal.

Where solid or liquid wastes are to be disposed of offsite, the following details are provided in the WMP:

- Typical facilities (locations) to which wastes would be sent for disposal
- Target rates of recycling
- Indication of how the transport of wastes from the site to the disposal facility will be undertaken
- Methods for the disposal of hazardous wastes and materials in the event of an accident/incident
- Onsite storage and treatment requirements for wastes, including waste receptors as per ANZECC guidelines
- The impact waste may have on the environment

The waste management strategies also consider segregation of waste, storage of waste, monitoring and reporting programmes, and cleaner production programmes.

13.4.1 Waste Streams

As outlined in the WICT SEIS (Appendix 1), the waste streams produced during the construction and operational phases of the Project will be distinctly different. During the construction phase, quantities of waste with varying compositions could be generated from activities including materials supply, maintenance of construction equipment and construction site/amenities and miscellaneous structures.

Minimal waste is expected to be generated from bulk earthworks (including cut and cover and directional drilling) as any excavated material is intended to be re-used onsite for construction and filling activities.

Ship Waste

Ship waste generated during construction and operation activities will be collected in accordance with the certified agreement between the Australian Quarantine and Inspection Service and GPC.

Demolition Wastes

Any wastes generated during the WICET expansion from demolition works, additional to those generated from WICET Stage 1, will be handled in line with the approved WMP and will be reused and recycled where possible.

Excavation Wastes

In areas that involve excavation activities, directional drilling and cut and cover will have spoil as one of the major waste streams. Management of the spoil, (eg storage, re-use and

disposal) will largely depend on spoil quality. Clean spoil will be managed through onsite reuse sites, reuse within other project areas or as engineered fill. Further waste management strategies will focus on the prevention of dust and wind erosion, sediment runoff, and the spread of weeds or other pathogens.

Regulated wastes generated during the demolition activities such as contaminated land and ASS will be reused or recycled where possible or disposed of in accordance with the WMP. The potential presence of ASS and contaminated soils has been discussed and assessed in further detail in Chapter 4.

Packaging Materials

Materials delivered to site often come with packaging materials. This consists largely of timber pallets, crates, cartons, plastics, and wrapping materials, all of which need to be disposed of once the product has been utilised. It should be noted that minimisation of packaging of raw products will be strongly encouraged.

Stormwater Runoff from the Construction Site

During periods of rainfall, runoff has the potential to become contaminated prior to its discharge from the site if not appropriately managed. Also, stormwater can result in siltation of the drainage system and offsite impacts if appropriate sediment and erosion controls are not implemented. This issue is discussed in Chapter 9.

As the rail maintenance and provisioning facility is no longer part of the WICET Project, a wastewater treatment plant will only be constructed as part of the coal Terminal requirement. The location and design of the facility will be finalised during detailed design along with the necessary license conditions.

Wastes from Operation of Construction Equipment

Various heavy vehicles and construction equipment will be utilised for the duration of the construction phase. Liquid hazardous wastes from cleaning, repairing, and maintenance of this equipment will be generated. Likewise leakage or spillage of hydrocarbons and chemicals during construction needs to be managed and disposed of appropriately. Regulated wastes such as tyres, batteries and hydrocarbons will be reused or recycled where possible or disposed of in accordance with the WMP.

Non-hazardous Liquid Wastes

Non-hazardous liquid wastes will be generated through the use of workers' facilities such as toilets and kitchen facilities. Where possible facilities will be connected to the Gladstone Regional Council sewerage system, however where this is not available an appropriate liquid waste disposal systems will be utilised.

Sewage within the operational Terminal will be processed through a packaged sewage treatment plant established during Stage 1 and the treated effluent will be irrigated to designated landscaped zones. Sewage at the rail receival will be pumped to a septic holding tank during Stage 1 which is to be periodically emptied via a vacuum truck. The Stage 1 sewage treatment plant is also capable of servicing requirements for WEXP1 and WEXP2. No direct piping to the sewage treatment plant will be provided for the permanent and temporary WEXP1 and WEXP2 crib and ablution facilities.

Sewerage will be stored at these facilities in a 5,000 L holding tank and then trucked to the sewage treatment plant when full, approximately every 3 days based on 60 L/person/day and 27 person allowance. The Stage 1 sewage treatment plant is located adjacent to the south stormwater pond. Treated wastewater will be discharged and stored within this pond.

General Wastes

General wastes include office wastes, scrap materials and biodegradable wastes. Due to the variety of waste streams likely to be generated, sorting and segregation will be undertaken. The “recyclability” of the waste, disposal method, storage requirements and volume will be taken into consideration.

The generation of a detailed waste inventory during both construction and operation will aid in monitoring the movement and correct disposal of wastes. At a minimum, the waste inventory will contain information on the volumes of waste, type of waste, location of the storage area, disposal method, frequency of disposal and any special requirements or warnings regarding the waste. Table 13.1 is a typical example of a waste inventory. Once design and construction details are finalised this inventory can be updated and completed in more detail, as well as being regularly updated during construction and operation.

General waste will be recycled where possible or disposed of in accordance with the WMP.

13.4.2 Construction

The types and quantities of construction wastes and their likely treatment/disposal methods and associated environmental impacts are listed in Table 13.1. These estimates have been adapted from the WICET EIS and SEIS and will be reassessed during detailed design of WEXP1 and WEXP2.

Where possible, the quantity of wastes generated and removed from site will be reduced, with wastes to be segregated and recycled. Onsite reuse of wastes including soil, green waste and concrete is to be undertaken, with wastes associated with materials packaging returned to suppliers wherever possible. Remaining wastes during the construction phase will be recycled or disposed at Council’s landfill where recycling is not feasible. Regulated waste will be removed by a regulated waste contractor.

Waste collection practices will be designed to prevent the site from becoming contaminated by oil or chemical spills during construction. New opportunities to reduce, reuse or recycle waste that may become available throughout the construction period will be incorporated into the waste management strategy.

Should they be required, appropriate disposal permits for the disposal of contaminated soil from site will be obtained in accordance with Section 424 of the EP Act. Disposal permits enable appropriate and legal disposal and tracking of contaminated soil or materials.

A small increase in construction waste, from that predicted in the WICT EIS (Appendix 1), is expected to be generated as a result of WEXP1 and WEXP2 Project.

13.4.3 Coal Terminal Operational Wastes

The types and quantities of coal Terminal operational wastes and their likely treatment/disposal methods and associated environmental impacts are not expected to change from those listed in the EIS and SEIS.

Wastes generated during the operation of the Terminal will be minimised where possible. Onsite reuse of wastes will be undertaken where feasible, and will include wastes such as green waste, pond sediment, concrete, bitumen and timber. Where suitable, wastes will be recycled or treated onsite with non-recyclable items sent to Council’s landfill.

Abrasive blasting has been identified as a potential ERA relevant to the Terminal, and will require approval for of a development permit granted under SPA and a Registration Certificate granted under the EP Act. Waste generated from abrasive blasting will be managed in accordance with the approval conditions.

Sewage from the proposed Terminal will be treated onsite and effluent used for landscape irrigation.

A WICET Operational EMP (OEMP) has been developed and will be implemented during the operational phase of the Project. The OEMP outlines measures to mitigate impacts of waste generated as part of project operations.

Table 13.1 WICET Waste Inventory - Construction (whole of project)

Waste type	Waste characteristic	Project Staging	Source	Estimated quantity (tonnes/annum)	Likely treatment/disposal	Potential environmental impact
Green waste	Inert	Construction	Site clearing	100 Once off	Chipped and used onsite for landscaping	Dust generation
Concrete	Inert	Construction and Operation	Left-overs from concrete pours	250 Over 5 years	Cast into moulds for future use	Transport impacts
General building materials	Inert	Construction	Construction	100 Over 5 years	Gladstone Regional Council landfill	Transport impacts and landfill space
Empty drums and containers – suitable for return to supplier	Regulated if they contain regulated waste products such as paint, oil etc Otherwise inert	Construction and Operation	Supply of chemicals, paint, oil, cleaning agents etc	20	Return to supplier	Transport impacts
Empty drums and containers – suitable for recycling	Regulated if they contain regulated waste products such as paint, oil etc Otherwise inert	Construction and Operation	Supply of chemicals, paint, oil, cleaning agents etc	20	Recycling	Transport impacts
Empty drums and containers – not suitable for recycling	Regulated if they contain regulated waste products such as paint, oil etc Otherwise inert	Construction and Operation	Supply of chemicals, paint, oil, cleaning agents etc	20	Triple rinse on site, crush and puncture prior to disposal in Gladstone Regional Council landfill	Containment and treatment of rinse water, transport impacts and landfill space
Electrical cables	Inert	Construction	Cable off cuts	50	Recycling	Recycling wastes and transport impacts
Timber crates and pallets	Inert	Construction and Operation	Supply of machinery and parts	50	Returned to supplier where possible Remainder chipped and used onsite for landscaping (where possible)	Transport impacts, dust generation
Scrap steel	Inert	Construction	Steel off cuts	200	Recycling	Transport impacts

Waste type	Waste characteristic	Project Staging	Source	Estimated quantity (tonnes/annum)	Likely treatment/disposal	Potential environmental impact
Plastics	Inert	Construction and Operation	Pipe and conduit of cuts	20	Recycle (where possible)	Transport impacts and landfill space
Oil and lubricants	Regulated waste	Construction and Operation	Machinery oil changes and lubrication	2	Recycling	Storage and transport impacts
Oil filters	Regulated waste	Construction and Operation	Vehicle servicing	0.5	Recycling	Transport impacts
Cleaning rags	Regulated waste	Construction and Operation	Vehicle servicing	0.1	Regulated waste contractor	Transport impacts and landfill space
Tyres	Regulated waste	Construction and Operation	Vehicle servicing	10	Regulated waste contractor	Storage and transport impacts, landfill space
Lead acid batteries	Regulated waste	Construction and Operation	Vehicle servicing	0.5	Recycling	Storage and transport impacts
Paints and solvents	Regulated waste	Construction	Painting	0.5	Recycling	Storage and transport impacts
Sewage	Regulated waste	Construction and Operation	Construction workforce	650 people peak	Onsite facilities or Gladstone Regional Council Wastewater Treatment Plant (Yarwun)	Transport and treatment/disposal impacts
Domestic: food, wrapping	General waste	Construction and Operation	Construction workforce	15	Gladstone Regional Council landfill	Transport impacts and landfill space
Domestic: recyclables eg cans, plastic bottles, glass	General waste	Construction and Operation	Construction workforce	15	Recycling	Transport impacts

13.5 Conclusion

The WICT EIS and SEIS (Appendix 1) outlined the various wastes that will be generated both during the construction and operational phases of the Project. These include:

- Ship waste
- Demolition wastes
- Waste water
- Excavation wastes
- Packaging materials
- Stormwater run-off from the construction site
- Wastes from operation of construction equipment
- Non-hazardous liquid wastes
- General wastes

Due to changes proposed under WEXP1 and WEXP2, it is expected that a modest increase (of that originally predicted in the EIS and SEIS) in waste will be generated during construction. This is largely due to the expansion phases requiring a slight increase in construction intensity compared with that estimated in the EIS and SEIS.

The WICET WMP will be implemented during construction to mitigate the impacts of waste generated as part of the Project. In line with the WMP, waste will be segregated and recycled where possible with the aim of reducing the amount of waste being removed offsite.

The WICET Operational EMP (OEMP) will be implemented during the operational phase of the Project. The OEMP outlines measures to mitigate impacts of waste generated as part of Project operations. In line with the OEMP, wastes generated during the operation of the coal Terminal will be minimised where possible. No change in operational waste is expected as a result of the WEXP1 and WEXP2 Project, from that outlined in the WICT EIS (refer Appendix 1).

Conclusion 1: A modest increase in waste (of that originally predicted in the EIS and SEIS) will be generated during construction. This is largely due to the expansion phases requiring a slight increase in construction intensity compared with that estimated in the EIS and SEIS.

Conclusion 2: All waste materials generated during construction and operation will be managed in accordance with the WMP and the WICET OEMP respectively (refer Appendix 13 and 23)

14. Noise and vibration

14.1 Summary

The changes proposed as part of WEXP1 and WEXP2 are expected to result in relevant noise criterion being exceeded at two sensitive receptors during neutral weather conditions, and at 19 receptors in 'worst case' temperature inversion conditions (for overland conveyors with low noise steel idlers and all other conveyors with low noise aluminium idlers)

During 'typical' operating scenarios, it is expected that noise levels at sensitive receptors will be 2-3 dBA lower than predicted in this modelling assessment as it is likely that not all infrastructure and equipment will be operating simultaneously.

Further targeted noise mitigation is likely to be required to avoid these exceedances, subject to the detailed design process and the status of the receivers as residential sites/dwellings. Mitigating measures for construction are contained within the Noise and Vibration Management Plan (NVMP) (refer Appendix 23.13).

14.2 Introduction

SLR Consulting were commissioned to undertake an assessment of the cumulative operational noise levels from WICET – Stage 1, WEXP1 and WEXP2 operation. Details of the noise assessment can be found in Appendix 14.1 (SLR WICET Expansion Project – Stage 1 WEXP1 and WEXP2 Due Diligence Noise Investigation, Rev1, 03 December 2011).

This Request for Project Change provides an updated assessment to address changes to the Project which were assessed in the Coordinator-General's (CG) Report (January 2008) and EPBC Act controlled action approval (April 2008).

Construction noise is expected to be similar to that of construction for WICET Stage 1 and as such additional modelling was not undertaken for this Change Request.

14.3 Noise assessment

The residential noise intensity receiver locations assessed in the SEIS (Appendix 1) were assessed again in the Stage 1, WEXP1 and WEXP2 Due Diligence Noise Investigation. The residential noise receiver locations are summarised in Table 14.1 and presented in Figure 14.1.

Table 14.1 Residential noise receiver locations

Receiver	Address	Suburb	Land Zoning and Use
NM-1.	12 Lord Street	Gladstone	Residential B, Dwelling
1-a.	Central Queensland University	Gladstone	Not zoned, Harbour industries-Educational
1-b.	15 Flinders Parade	Gladstone	Special Purposes, Dwelling
1-c.	1 Rollo Street	Gladstone	Residential C, Dwelling
NM-2.	68 Flinders Street	Gladstone	Residential C, Dwelling
2-a.	35 Mylne Street	West Gladstone	Residential A, Dwelling
2-b.	51 Park Street	West Gladstone	Residential C, Dwelling
2-c.	1 Starmer Court	West Gladstone	Residential A, Dwelling
2-d.	7 Dawson Hwy	West Gladstone	Special Business, Motels
2-e.	1 Paterson Street	West Gladstone	Residential C, Dwelling
NM-3.	4 Linhow Crescent	Clinton	Residential A, Dwelling
3-a.	54 Aerodrome Road	Clinton	Residential A Dwelling
3-b.	21 Dunstall Street	Clinton	Residential A Dwelling

Receiver	Address	Suburb	Land Zoning and Use
3-c.	Lot 1 Plan RP614414	Callemondah	Rural A, Large Homesite - Dwelling
3-d.	5 Julius Crescent	Clinton	Residential A Dwelling
3-e.	24 Barrine Close	Clinton	Residential A Dwelling
3-f.	27 Barrine Close	Clinton	Residential A Dwelling
3-g.	4 St Bees Court	Clinton	Residential A Dwelling
NM-4.	65 Stewart Road	Beecher	Rural A, Large Homesite -Dwelling
4-a.	7 Don Young Drive	Clinton	Not Zoned, Large Homesite - Dwelling
4-b.	808 Dawson Highway	Byellee	Rural A, Large Homesite -Dwelling
4-c.	100 Lagoon Rd	Byellee	Rural A, Large Homesite -Dwelling
NM-5.	3 Lindherr Road	Yarwun	Rural A, Large Homesite -Dwelling
5-a.	18 Lindherr Road	Yarwun	Rural A, Large Homesite -Dwelling
5-b.	339 Gladstone-Mt Larcom Road	Yarwun	Rural A, Large Homesite –Dwelling
NM-6	Tide Island	Gladstone	Rural A. Dwelling
6-a.	Turtle Island	Gladstone	Rural A. Dwelling

14.3.1 Operational noise assessment

A summary of the noise assessment undertaken by SLR is provided in the following sections. The full report is attached in Appendix 14.

Neutral weather conditions

The noise assessment found that the revised operational noise levels (for overland conveyors with low noise steel idlers and all other conveyors with low noise aluminium idlers with neutral weather conditions) for all receivers is below the noise criteria (as defined in the SEIS for each receptor) excluding receivers NM-6, which had a result of 55 LAeq (1hour) dBA and 3-c, which had a result of 42 LAeq (1hour) dBA.

This represents an increase of 2 dBA for receptor NM-6 and an increase of 5 dBA for receptor 3-c from the modelling undertaken during the SEIS.

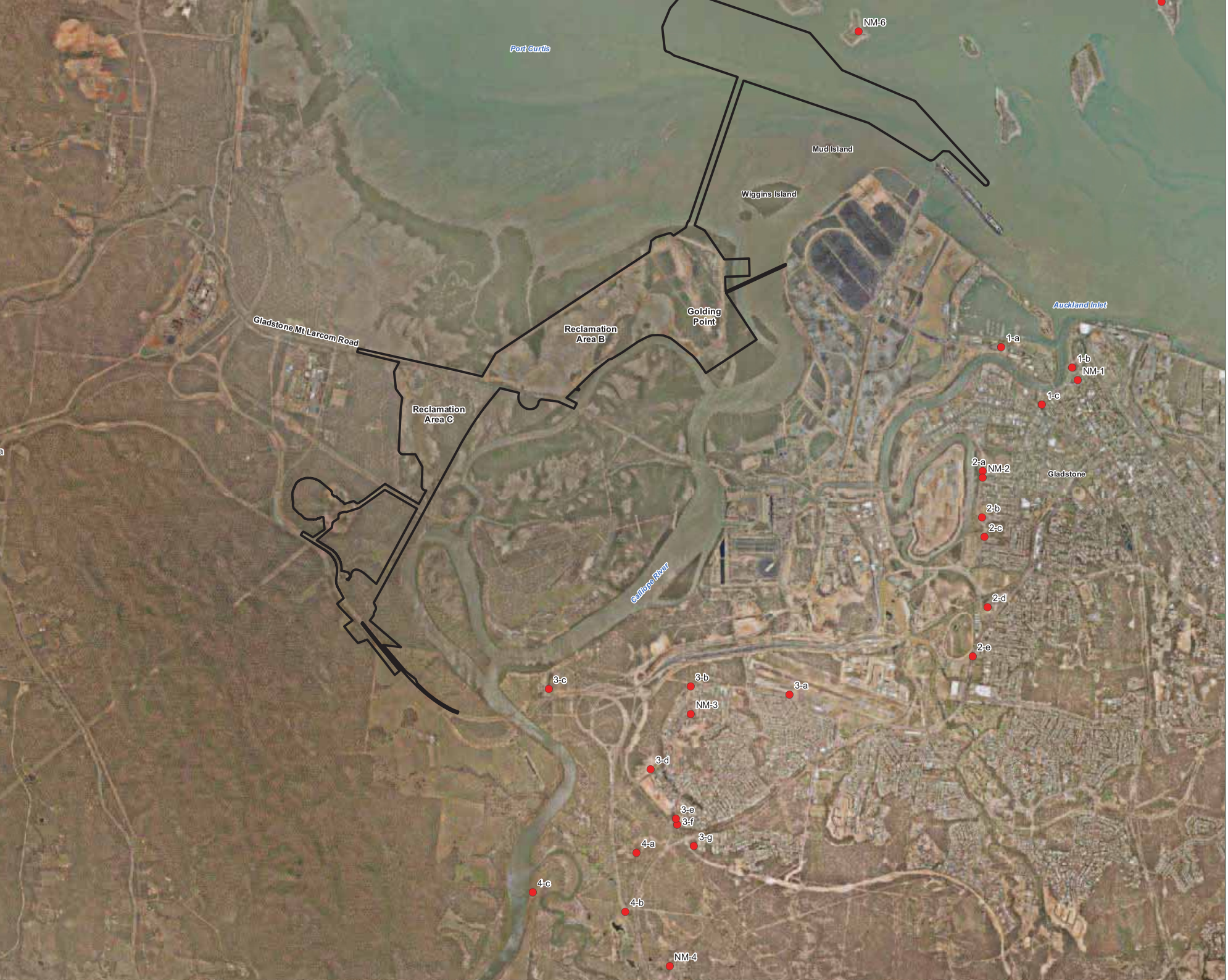
Worst case weather conditions

“Worst case” weather conditions are generally defined as when a steady light breeze blows directly across the WICET site to the receivers and when temperature inversions and atmospheric stability effects are such that noise propagation is optimal.

For overland conveyors with low noise steel idlers and low noise aluminium idlers for all other conveyors, and under “worst case” weather conditions the revised operational noise levels is above the respective noise criterion for 19 of the 27 receivers.

Receivers 1-b, NM-2, 2-a, 2-b, 2-c, 2-d, 2-e, 3-a, 3-c, 3-e, 3-f, 3-g, 4-b, 4-c, NM-6 and 6-a all exceed the relevant noise criteria by 4 dBA or more (refer Appendix 14.1). Targeted noise mitigation measures are likely to be required to avoid these exceedences, subject to the detailed design process and actual operating noise levels.

For overland conveyors with low noise steel idlers and super low noise aluminium idlers for all other conveyors, and under “worst case” weather conditions the revised operational noise levels 3-c, 4-b, 4-c and NM-6 exceed the respective noise criterion by 4 dBA or more. Targeted noise mitigation measures are likely to be required to avoid these exceedences, subject to the detailed design process and actual operating noise levels.



Legend

- Noise Monitorin
- Project Area

Source:
Monitoring Locations: Hegg

Tide Island was purchased by Santos/GLNG in late 2010 and depending on any planned development on the island by Santos/GLNG, or change from a residential dwelling, the relevance of Tide Island as a residential noise receiver will be reviewed during the detailed design stages of WEXP1 and WEXP2.

14.4 Mitigation measures

14.4.1 Design

Potential mitigation measures to be investigated during detailed design of WEXP1 and WEXP2 include, but are not limited to:

- Use of super low noise aluminium idlers for all conveyors other than the overland conveyor
- Acoustic enclosure (full or partial) of overland, surge bin, yard, jetty and wharf conveyors
- Acoustic treatment (such as air conditioning and/or double glazing of windows) of all private dwellings subject to agreement with property owners and land use status of the sites as residential dwellings
- Consultation and negotiation with affected residents
- Discussions to be held with Santos/GLNG regarding the future status of Tide Island as a residential location

Operational noise modelling will be conducted during the detailed design stage of WEXP1 and WEXP2 and will form part of the operational ERA50 (Coal Terminal) development application process.

14.4.2 Construction

Noise

Mitigation measures for construction noise are detailed in the WICET Noise and Vibration Management Plan, a component of the Project CEMP (refer Appendix 23.13).

Vibration

Vibrations levels for construction of WEXP1 and WEXP2 are expected to be similar to those of WICET Stage 1. Based on the predicted vibration levels and safe working distances for WICET Stage 1, no additional mitigation measures are required to reduce vibration levels at residences in the communities surrounding the Project.

During the detailed design phase of the Project building condition surveys will occur for any buildings that fall within the safe working distances for the prevention of cosmetic damage. Further investigations will be undertaken for any structures within and around the safe working distances in order to determine if the “light weight” cosmetic damage criterion (as used for this assessment), is applicable or whether a higher value may be more appropriate.

Operation

The need for mitigation will depend on the severity of impact on sensitive receivers, and the circumstances of its occurrence.

It is expected that, for the majority of noise sensitive receivers, noise emissions from WICET Stage 1, WEXP1 and WEXP2 will be acceptable. This would need to be confirmed with measurement of noise levels post-commissioning.

14.5 Conclusion

14.5.1 Construction works

Noise and vibration generated during construction of WEXP1 and WEXP2 are expected to be similar to that of the Project approved as part of the WICET EIS and controlled action approval process, and as such are not expected to result in an increased noise and vibration impact on sensitive receptors. Construction noise and vibration will be managed though the implementation of the WICET Noise and Vibration Management Plan (refer Appendix 23.13).

14.5.2 Operational noise

The noise assessment found that the revised operational noise levels (for overland conveyors with low noise steel idlers and all other conveyors with low noise aluminium idlers with neutral weather conditions) for all receivers is below the noise criteria (as defined in the SEIS for each receptor) excluding receivers NM-6 and 3-c.

For overland conveyors with low noise steel idlers and low noise aluminium idlers for all other conveyors, and under “worst case” weather conditions the revised operational noise levels is above the respective noise criterion for 19 receivers. Receivers 1-b, NM-2, 2-a, 2-b, 2-c, 2-d, 2-e, 3-a, 3-c, 3-e, 3-f, 3-g, 4-b, 4-c, NM-6 and 6-a all exceed the relevant noise criteria by 4 dBA or more.

As stated in the SEIS, a more “typical” operating scenario is expected to produce equivalent noise levels around 2-3 dBA lower than that predicted in the model as it assumes that everything within the Terminal is operating simultaneously.

Noise mitigation is likely to be required, subject to the detailed design process, actual operating noise levels and the status of the receivers as residential sites/dwellings.

Conclusion 1: Relevant noise criterion are expected to be exceeded at two sensitive receptors during neutral weather conditions, and at 19 receptors in ‘worst case’ temperature inversion conditions (for overland conveyors with low noise steel idlers and all other conveyors with low noise aluminium idlers)

Conclusion 2: During ‘typical’ operating scenarios, it is expected that noise levels at sensitive receptors will be 2-3 dBA lower than predicted in this modelling assessment as it is likely that not all infrastructure and equipment will be operating simultaneously.

Conclusion 3: Noise mitigation is likely to be required where exceedances are expected, subject to the detailed design process and the status of the receivers as residential sites/dwellings. Mitigating measures for construction are contained within the Noise and Vibration Management Plan (NVMP) (refer Appendix 23.13).

15. Terrestrial ecology

15.1 Summary

The proposed changes to the Project (resulting from WEXP1 and WEXP2) will be contained wholly within the Project footprint approved under the EIS, which already has approved clearing permits under State and Commonwealth legislation. No additional clearing (ie outside of the project footprint) is proposed as part of the WEXP1 and WEXP2 changes. Potential impacts on the terrestrial ecology as a result of the changes will be limited to indirect impacts only, and are not expected to be significant.

The changed Project alters the location of potential construction and operational noise, vibration and air quality impacts (addressed in Chapters 12 and 14) which could potentially indirectly impact a different array of adjacent or nearby terrestrial communities than the original design. However, this change is not considered to have a significant impact on terrestrial fauna as the entire development footprint has been addressed in the original WICET EIS/SEIS (Appendix 1) and the changes will not occur outside of this footprint.

Grass trees and Orchids were identified within the WEXP1 Project area. These species are listed as Type A restricted plants under the NC Act and a permit has been obtained from DEHP for their removal as part of the WICET Stage 1 works.

As the footprint of the changed Project is entirely within the existing approved footprint, no additional clearing of potential water mouse habitat will be required for these changes.

15.2 Introduction

This chapter addresses the terrestrial flora and fauna issues for the changed Project, as a result of WEXP1 and WEXP2. Potential impacts to terrestrial flora and fauna within the WICET Project area were originally outlined in the EIS and SEIS (refer Appendix 1). Whilst the Project area has not changed, this Change Request provides an updated assessment to address current legislative requirements and changes to the Terminal design which was approved under the EIS and controlled action approvals.

Reclamation approval has previously been obtained for the areas known as Reclamation Areas A, B and C. GPC has released the approval for Reclamation Area A, as well as relinquished the approval for marine plant removal (17 ha mangroves, and 22 ha seagrass) back to the State as part of the proposed offset strategy for the Project.

It should be noted that the information regarding legislation is current at the time of writing this chapter but may be subject to change. Legislative requirements covered in this request have been cited from:

- *Nature Conservation Act 1992* (NC Act)
- *Nature Conservation (Wildlife) Regulation 2006* (NC Regulation)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Vegetation Management Act 1999* (VMA)
- *Land Protection (Pest and Stock Route Management) Act 2002*
- *Land Protection (Pest and Stock Route Management) Regulation 2003*
- *Sustainable Planning Act 2009* (SPA)
- *Sustainable Planning Regulation 2009* (SPR)

The currency of such information will be checked during the detailed design stage of the Project and prior to commencement of construction activities associated with the Project area.

15.3 Site Description

The Project area is divided into three areas (refer Figure 15.1) to assist in describing the existing environment and identifying potential impacts and mitigation measures. They are:

- Stockyard Area A; including Golding Point, the proposed onshore terminal infrastructure, proposed offshore jetty, wharf infrastructure and dredge area
- Stockyard Area B; including the intertidal areas of Reclamation Areas B and C, proposed overland conveyor system, as well as Gladstone-Mount Larcom Road
- Dump stations and overland conveyor; including the proposed rail receival dump stations, and overland conveyors extending north-east to the stockyards of Reclamation Area B

15.4 Potential Impacts

15.4.1 Terrestrial Flora

The terrestrial areas of the Project's footprint are located on Reclamation Areas B and C which both have reclamation approval and marine plant removal approval (refer Appendix C2 of the EIS).

The WICET Project is contained entirely within the Project footprint approved under the EIS and as a result, will not require any additional approvals for disturbance to terrestrial flora. Some clearing will be required for the expansion of the existing settlement pond; however this clearing will occur within the existing footprint and already has development approval under the VMA and NC Act.

Regional Ecosystems

The changes to the Terminal design (as a result of WEXP1 and WEXP2) will not create any further impact to the RE disturbance area for WICET, as the infrastructure changes are occurring within the approved development footprint.

15.4.2 Terrestrial Fauna

The proposed changes resulting from WEXP1 and WEXP2 are not expected to have any additional impact on terrestrial fauna which have not already been addressed in the WICT EIS and SEIS (refer Appendix 1). The development footprint and throughput capacity have not increased as a result of the proposed changes, and no additional clearing (ie loss of habitat) outside of the already approved area is required.

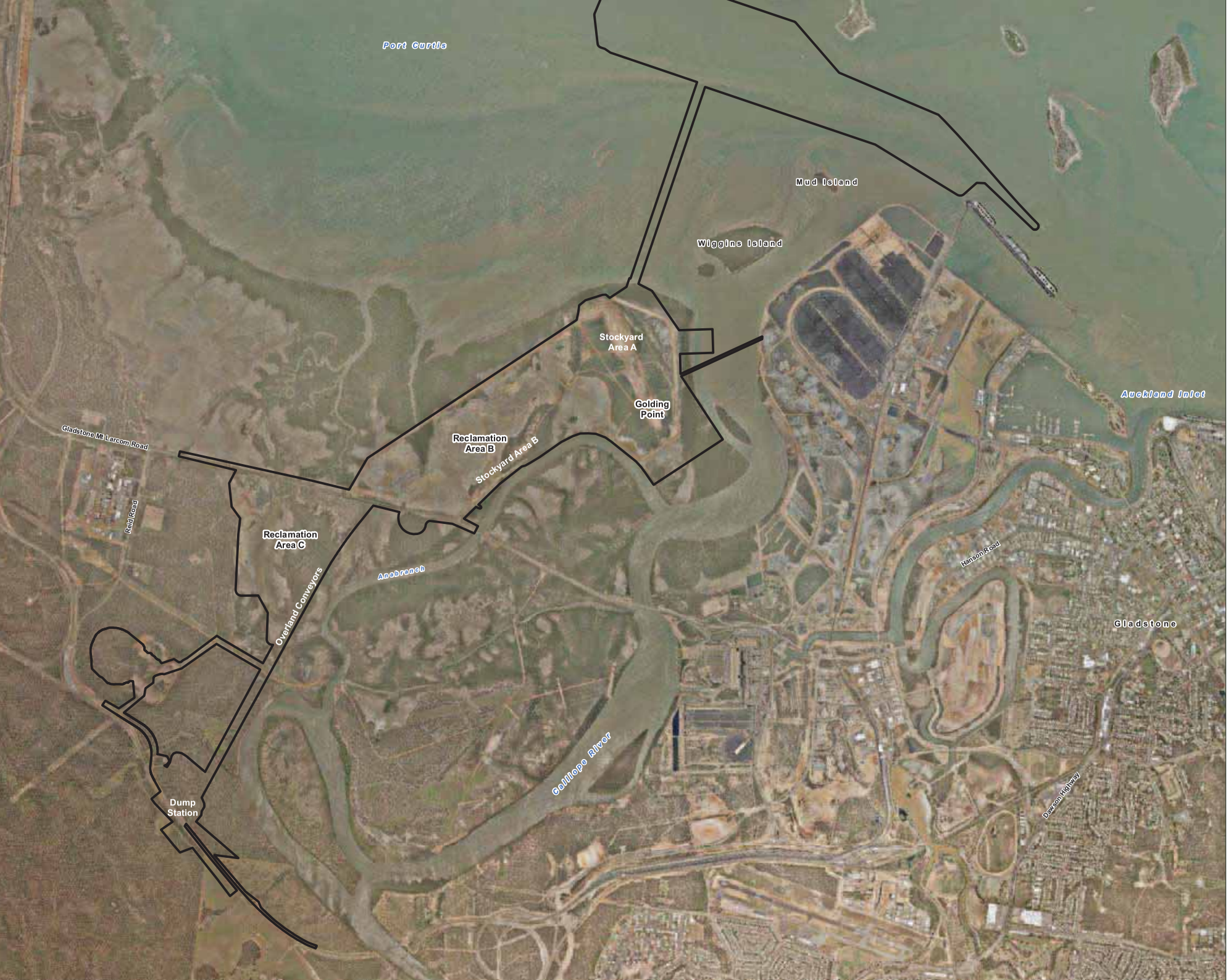
The WICET Project will change the location of potential construction and operational noise, vibration and air quality impacts (which are addressed further in Chapters 12 and 14) which may potentially indirectly impact upon a different array of adjacent or nearby terrestrial communities than the original design. However, this change is not considered to have a significant impact on terrestrial fauna as the entire development footprint has been addressed in the original WICT EIS/SEIS and the changes will not occur outside of this footprint.

Potential coal terminal impacts to the adjacent estuarine and marine environments are discussed in Chapter 16.

Significant Areas

The land based terminal component does not encroach upon any protected areas as defined in the *Nature Conservation (Protected Areas) Regulation 1994* (Calliope Conservation Park) or a State Forest listed under the *Forestry Regulation 1998* (Mount Stowe State Forest).

New essential habitat mapped (post SEIS) within the Project area is for the Koala (Southeast Bioregion). It is important to note that the Gladstone LGA is outside of the areas protected under the *South East Queensland Koala Conservation State Planning Regulatory Provision*



Legend

Project Area

(SPRP) and the *State Planning Policy 2/10: Koala Conservation in South East Queensland* (SPP). It is unlikely that the loss of habitat will have a significant impact on this species as no Koala populations were recorded within the Project footprint.

The changed Project will not require any additional clearing of essential habitat areas, as it has remained within the development footprint approved under the WICT EIS.

Other significant areas (ie GBRWHA and GBRMP) within the vicinity of the Terminal are discussed in Chapter 16.

Significant Species under NC Act

The Water mouse (*Xeromys myodies*) was identified during pre-clearing surveys in 2011 undertaken as part of the WICET Stage 1 development. The Water mouse is listed as Vulnerable under the provisions of the NC Act.

Surveys have been conducted in accordance with Commonwealth's Significant Impact Guidelines to determine the presence or absence of Water mouse nesting sites within the WICET Project area. Mitigation measures and construction surveys have been implemented as part of WICET Stage 1, in order to mitigate the Project's potential impact on this species.

No other significant species under the NC Act have been identified within the Project footprint post SEIS.

Significant Species under EPBC Act

The Water mouse, which is discussed in the previous section, is also listed as Vulnerable under the provisions of the EPBC Act.

No other significant species under the EPBC Act have been identified within the Project footprint post SEIS.

Migratory Species

Potential impacts to migratory species include dust, noise and light generation associated with the construction activities, contamination, reduction in the buffering capacity of the area (removal of mangroves) and changes to the drainage patterns (freshwater/tidal influx). These factors can directly and/or indirectly impact on species behaviour. Potential impacts on migratory species associated with dredging activities, lighting, pile-driving and shipping are discussed in Chapter 16.

However, it is unlikely that the Project will have a significant impact on migratory species. Under the EPBC Act, a migratory species is significantly impacted on if a proposal will or is likely to:

- "Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species
- Result in invasive species that are impactful to the migratory species becoming established in an area of important habitat of the migratory species
- Seriously disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species

Information on impacts of historical operations on species behaviour within Port Curtis is also limited (ie the intertidal banks are in close proximity to the RGTCT). This information would assist in determining species recovery (time lags and population size).

Vegetation Clearing

The additional changes being proposed in this request as part of WEXP1 and WEXP2, post WICET Stage 1 will be contained within the original development footprint, therefore no additional clearing beyond the approved Project footprint is required.

15.4.3 Mitigation Measures

The construction activities have the potential to impact on the fauna assemblage inhabiting the Project area. This includes a number of significant species under the NC Act and the EPBC Act. However, the implementation of environmental management and mitigation measures during the design and construction phases of the Project will limit these potential impacts to acceptable levels. The mitigation measures proposed are outlined in Section 15.7.

15.5 Potential Operational Impacts

Activities associated with the operation of WICET have the potential to increase the risk of environmental impacts, including:

- Hazardous substances entering the environment (fuels and chemicals)
- Air emissions (dust and gases)
- Noise and light sources
- Maintenance activities
- Exotic/pest species
- Mortality as a result of vehicles and machinery
- Waste generation
- Waste water/stormwater

The proposed WEXP1 and WEXP2 infrastructure design changes will not change the extent of disturbance; however there will be an alteration in location and source output of the operational noise, vibration and dust sources. These changes are not considered to have a significant increase or change to the impacts on terrestrial ecology.

Mitigation Measures

The operational activities of the WICET Project have the potential to impact on the fauna assemblage inhabiting areas adjoining the Project area. This includes a number of significant species under the NC Act and the EPBC Act. However, the implementation of environmental management and mitigation measures during the operational phase of the Project will limit the impacts to acceptable levels. The mitigation measures are detailed in Section 15.7.

15.6 Clearing Vegetation Approvals

Table 15.7 summarises the vegetation clearing approvals obtained for the Project, and cover the entire Project footprint.

Table 15.7 Summary of vegetation clearing approvals within the Project area

Purpose	Legislation	Subject Land	Details of Approval
Clearing of Native Vegetation	*Vegetation Management Act 1999*	Lots 107/SP241807, 108/SP238408, 110/SP238409, 4/SP200842, 5/SP200840	Approved by DEHP on 4 May 2011 – Permit 2009/011262
Clearing of Protected Flora	*Nature Conservation Act 1992*	Lots 1/SP225922, 100/CTN279, 104/SP228177, 105/SP228177, 107/SP241807, 108/SP238408, 110/SP238409, 2/SP218648, 2/SP225922, 28/CTN279, 4/SP200842, 4/SP218648, 5/SP200840, 98/CTN279, 99/CTN279, Road Reserve, Reid Road	Approved by DEHP on 12 October 2011 – Permit WICL09765211

The remaining remnant vegetation within Reclamation Areas B and C is exempt from requiring a permit for clearing, as it meets the definition of an 'urban purpose' in an 'urban area' under the provisions of the SPR. Therefore it is exempt from requiring a permit under the VM Act.

No additional vegetation clearing approvals will be required as a result of the proposed infrastructure design changes outlined in this request. The changes will occur within the area designated as Reclamation Area B, which is covered by existing vegetation clearing permits outlined in Table 15.7.

15.7 Mitigation Measures

The mitigation measures proposed are provided in Chapter 23 (Coal Terminal EMP), and detailed construction mitigation measures are contained in the WICET CEMP attached in Appendix 23.2.

15.7.1 Design Phase

The following mitigation measures will be implemented during the detailed design phase of WEXP1 and WEXP2 to minimise the impact on the fauna assemblage within the area:

- Coal terminal lighting design to minimise visual impact on adjoining habitats
- Completion of a Landscape and Rehabilitation Management Plan (LRMP) and approval by State and Local Government
- Maximise use of local native species in landscape design

15.7.2 Construction Phase

The mitigation measures contained in the WICET CEMP (refer Appendix 23.2) and below will be implemented during the construction phase to mitigate impacts on flora and fauna assemblages within and adjacent to the Project area.

- Intertidal batters to be stabilised as soon as possible and graded to allow recolonisation by marine plants
- Implement the approved Species Management Plan (SMP) (refer Appendix 23.11)
- Implement the LRMP
- Implement the WICET Pest Management Plan (PMP)
- Disturbed areas including riparian zones, wetlands, significant species, steep slopes and mapped REs to be revegetated and rehabilitated with suitable native species after construction activities have been completed (in accordance with LRMP)

- Suitable native flora species to be used in rehabilitation works
- Monitor the success of the rehabilitation strategies
- Maintenance works are to be carried out within designated area(s) and/or offsite
- Maintenance contractors are to remain on designated tracks and not disturb surrounding vegetation
- Exclude parking of vehicles, storage of plant and equipment and stockpiling from the drip zone of trees where possible
- Heavy machinery and equipment is stored in designated pre-cleared area(s) only
- Machinery and heavy equipment is inspected prior to entering site as per the PMP
- Ensure any imported soil is uncontaminated (abiotic and biotic)
- An Environmental Officer is onsite to address potential issues as required
- Ensure dust suppression mechanisms are in place
- Prepare and implement a Bushfire Management Plan (BMP)
- Implement the WICET ASS Management Plan
- Comply with the conditions of the reclamation approvals
- Mangrove communities adjoining the Terminal will be protected and managed (ie implement a monitoring programme)
- Appropriate signage in prominent positions and site rules modified to reduce speed within the Project area to promote awareness and provide safety for fauna crossing or inhabiting the area
- Site works, such as trenches and excavations, will be designed to ensure fauna are not trapped or likely to be impacted by construction activities
- Construction employees have been made aware of the species inhabiting the area and potential risk
- All native fauna is protected and shall be actively protected as part of construction activities

Operational Phase

The following measures will be implemented to mitigate impacts on flora and fauna assemblages within and adjacent to the Project area:

- Implement a LRMP
- Monitor the success of the rehabilitation strategies
- Maintenance works are to be carried out within designated areas and/or offsite. This should be an area that has been disturbed and/or cleared within the Project area
- Maintenance contractors are to remain on designated tracks and not disturb surrounding vegetation
- Exclude parking of vehicles, storage of plant and equipment and stockpiling from the drip zone of trees where possible
- Heavy machinery and equipment is stored in designated area(s) only
- Machinery and heavy equipment is inspected prior to entering site as per the PMP requirements
- Implement a BMP
- All native fauna is protected and shall be actively protected as part of operations

15.8 Conclusions

The proposed changes to the Project (resulting from WEXP1 and WEXP2) will be contained wholly within the Project footprint approved under the EIS, which has approved clearing permits under State and Commonwealth legislation. Potential impacts on the terrestrial ecology as a result of the changes will be limited to indirect impacts only, and are not expected to be significant.

The Project will change (post Stage 1) the location of potential construction and operational noise, vibration and air quality impacts (addressed in Chapters 12 and 14) which could potentially indirectly impact a different array of adjacent or nearby terrestrial communities than the original design. However, this change is not considered to have a significant impact on terrestrial fauna as the development footprint has been addressed in the original WICT EIS/SEIS (Appendix 1) and the changes will not occur outside of this footprint.

Grass trees (*Xanthorrhoea sp.)* and Orchids (*Cymbidium*, *Docknilia* and *Sarcochilus*) were identified within the WEXP1 Project area. These species are listed as Type A restricted plants under the NC Act and a permit has been obtained from DEHP for their removal. No threatened flora species under the NC Act or EPBC Act were identified within the Project area.

Pre-clearing surveys undertaken in 2011 as part of the WICET Stage 1 development, in the supralittoral and littoral habitat areas, have identified the presence of the Water mouse (*Xeromys myodies*). Surveys are currently being conducted in accordance with Commonwealth's Significant Impact Guidelines to determine the presence or absence of Water mouse nesting sites within the WICET Project area.

As the footprint of the changed Project is entirely within the existing approved footprint, no additional clearing of potential Water mouse habitat will be required for these stages. As such, post Stage 1 WICET construction; no further construction mitigation measures for the Water mouse are proposed.

The implementation of mitigation and management measures during the design, construction and operation of the Terminal should ensure that potential impacts to terrestrial flora and fauna within the area are minimised.

Conclusion 1: The changed Project is wholly contained within the existing Project footprint approved under the WICT EIS, which already has approved clearing permits under State and Commonwealth legislation. No additional clearing (ie outside of the project footprint) is proposed as part of the WEXP1 and WEXP2 changes.

Conclusion 2: Grass trees and Orchids were identified within the WEXP1 Project area. These species are listed as Type A restricted plants under the NC Act and a permit has been obtained from DEHP for their removal as part of the WICET Stage 1 works.

Conclusion 3: As the footprint of the changed Project is entirely within the existing approved footprint, no additional clearing of potential Water mouse habitat will be required for these stages.