



# 17. Landscape and Visual Impact Assessment

## 17.1 Introduction

The purpose of this chapter is to assess the potential landscape and visual effects associated with the proposed Gladstone–Fitzroy Pipeline (the project).

This chapter addresses some of the requirements of the Terms of Reference (ToR) for the project. Items within the ToR specifically relating to landscape and visual amenity and addressed within this chapter are:

- Discussion of significant features of the landscape, including topographical features
- A description of any special landscape values of any natural vegetation communities
- A description of the environmental values of any nature conservation areas that may be impacted in terms of conservation of resources and integrity of landscapes and places including wilderness and similar natural places
- Discussion within the context of major topographic features and any measures taken to avoid or minimise impact to such (if required)
- Objectives for re-contouring and *landscaping*, including consideration for the use of Threatened plant species during any landscaping and re-vegetation
- Discussion of potential impacts to scenic amenity
- Provision for the protection and reasonable restoration of the visual amenity of the locale prior to the pipeline implementation, should the pipeline or any associated infrastructure be situated above ground.

The chapter is structured to include the following:

- A description of the methodology adopted for the assessment of effects upon landscape and visual amenity
- A description of the assumptions and limitations of this method
- A description of the relevant consultation, legislation, policies and guidelines that have been used to inform the assessment
- An evaluation of the baseline landscape and visual context
- Discussion of visual receptor sensitivity within the project area through the use of representative publicly accessible viewpoints
- An assessment of the significance of effects upon landscape and visual amenity as a direct result of the proposal based upon an evaluation of publicly accessible viewpoints
- Proposed mitigation strategies
- Discussion of residual impacts
- Discussion of cumulative and interactive effects
- A summary of the results of the assessment.

The assessment process aims to be objective and describe the changes factually. Potential changes as a result of the project have been defined however the significance of these changes requires qualitative (subjective) judgements to be made. The conclusions of this assessment therefore combine objective measurement and subjective professional interpretation. As with other chapters in the EIS, the baseline and impact assessment are described for the project area in two sections: Fitzroy to Bajool; and Bajool to Gladstone.

Generally, the pipeline will follow a narrow linear corridor - the right-of-way (ROW) and remain largely underground. Views of the project will be limited to close receptors, and users crossing the pipeline corridor on roads and/or railways. Landscape and visual impacts will be prevalent in a few key areas (intake site, water treatment plant, pump stations and storage facilities) where structures will be above ground and/or vegetation clearance will be required. There are also likely to be temporary visual impacts during construction as a result of storage yards, site facilities and construction works.

The project area for this chapter includes all areas directly within the project footprint and any surrounding lands within the zone of visual influence (ZVI, defined in Section 17.2.1.1).

## 17.2 Methodology

This section describes the methodology adopted to establish the baseline environment in the project area and then to assess the potential landscape or visual impacts that could result from the project during the construction and operational phases.

### 17.2.1 Establishment of Baseline

#### 17.2.1.1 Zone of Visual Influence (ZVI)

An indicative ZVI, defined as the area from which the project may be viewed, was initially determined through a desktop study examining aerial photographs and topographic maps where landform and land cover (screening) were considered in tandem.

#### 17.2.1.2 Site Survey

A site survey was undertaken by two landscape planners in order to build consensus and thus limit subjectivity. The site visit was conducted in August 2007 during conditions of good visibility. A further site visit was conducted in June 2008 at the site of the Alton Downs Water Treatment Plant (WTP).

The survey verified the desktop study, and provided more detailed information about the site and likely impacts.

#### 17.2.1.3 Selection of Representative Viewpoints

Representative publicly accessible viewpoints have been identified in a range of locations. These have been recorded, photographed and included in the appraisal of significance. Photographs of viewpoints within Section 17.6 represent a range of typical views possible from that locality to the project (e.g. Viewpoint one from the Rockhampton Waterskiing and Powerboat Club describes views from the water, recreational grounds and jetty). These viewing situations reflect particular landscape and/or visual features of importance within the visual environment. Generally, they represent views from key visual receptors (residents and road users) where potentially significant changes in view may occur.

#### 17.2.1.4 Description of Existing Conditions

The description of existing landscape and visual environment establishes a baseline situation against which the project has been assessed. This has been based upon a desktop study of relevant published documents and site surveys. The principal data sources used are set out in the bibliography, referenced within relevant sections of the text, and include:

- Survey mapping
- Aerial photographs
- Information from local planning authorities
- Site survey, comprising a photographic record of landscape features, key views and receptors
- Observations on the way in which the public realm (open space, roads etc.) is used.

### 17.2.2 Impact Assessment

A qualitative assessment of landscape and visual impacts has been undertaken. The effect of the proposal has been evaluated on the basis of a combination of two factors that inform the significance of the impact: *visual modification*; and *visual sensitivity*. Their definitions and use in identifying severity of the impacts are outlined in Sections 17.2.2.1 and 17.2.2.2.

#### 17.2.2.1 Visual Modification

Visual modification refers to the extent of change to the landscape and visual amenity that would occur as a direct result of the project from a given viewpoint. Assessment of these changes includes identification of:

- The nature of the change (i.e. degree of contrast, or integration of, any new features with existing features)
- Context and quality of the views including the extent to which the proposals will be visible in the wider landscape (with consideration of the presence of intervening vegetation or features)
- The scale or degree of change i.e. obvious/imperceptible with respect to loss or addition of features
- The nature of the impact (adverse or beneficial).

For the purposes of this assessment the definitions in Table 17.1 are used to describe visual modification.

Table 17.1 Visual Modification Definitions

Visual Modification Level	Definition
Large Reduction or Improvement	A substantial/obvious change to the view due to total loss of, or change to, elements, features or characteristics of the landscape.
Moderate Reduction or Improvement	Discernible changes in the view due to partial loss of, or change to the elements, features or characteristics of the landscape so that alteration to the view is clearly visible.
Small Reduction or Improvement	Minor changes in the view due to minor loss of, or change to the elements, features or characteristics of the landscape. The proposals are either not visible, or the change in the view is not clearly visible.
No Perceivable Reduction or Improvement	Almost imperceptible or no change in the view as there is little or no loss of/or change to the elements, features or characteristics of the landscape.

### 17.2.2.2 Visual Sensitivity

Visual sensitivity refers to visual receptors (e.g. residents, users of transport routes) and their sensitivity to their visual environment. Generally, this is dependent upon:

- Receptors' interest in the visual environment (i.e. high, medium or low interest in their everyday visual environment)
- Receptors' duration and viewing opportunity (i.e. prolonged, regular viewing opportunities)
- Number of viewers and their distance from the source of the effect, where relevant.

For the purposes of this assessment, the terminology set out in Table 17.2 has been used to describe visual sensitivity.

Table 17.2 Visual Sensitivity

Sensitivity	Definition
High	Large number of viewers with a passing interest in their surroundings and momentary viewing periods.
Medium	Medium number of viewers with moderate interest in their environment, and/or discontinuous and/or irregular viewing periods. or Small number of viewers with proprietary/high interest in their everyday visual environment and/or with prolonged and regular viewing opportunities.
Low	Small number of viewers with a passing interest in their surroundings and momentary viewing periods.
Neutral	Few viewers with minimal or no interest/awareness in their environment.

### 17.2.2.3 Impact Assessment

Representative viewpoints are described qualitatively, with the severity of residual impacts (following mitigation) assessed in accordance with the impact significance criteria applied across this EIS but made specific to this Chapter (described in Table 17.3).

Table 17.3 Impact Significance Criteria for Landscape and Visual Assessment

Impact Significance Level	Description
Major Adverse	Large reduction (modification) in the amenity of a view of high visual sensitivity.
High Adverse	Large reduction (modification) in the amenity of a view of medium visual sensitivity.
Moderate Adverse	Moderate reduction (modification) in the amenity of a view of a medium level visual sensitivity. or Large reduction (modification) in the amenity of a view of a low visual sensitivity.
Minor Adverse	Moderate reduction (modification) in the amenity of a view of low sensitivity. or Small reduction (modification) in the amenity of a view of moderate sensitivity.
Negligible	Small reduction (modification) in the amenity of a view of low sensitivity.

## 17.3 Assumptions and Limitations

This chapter is based upon the following assumptions:

- As the pipeline component of the project would be primarily located underground, most landscape and visual impacts relate to the visual appearance of the construction works that would be phased, temporary, and restricted to the construction period, and would be either direct or indirect. This type of impact would generally be consistent across the site and are therefore assessed on a site-wide basis.
- The impact of the WTP is based on the detailed design for costing prepared in June 2008.
- Some areas along the pipeline route would be required on a temporary basis to provide storage areas (stockpiles and equipment) to support construction.
- The intake, water treatment plant and pump stations will have some security lighting at night.
- During operation, maintenance and repair works will only occur on small sections of the pipeline at any one time, and will occur predominately during daylight hours.
- Design of the infrastructure is ongoing. Assumptions regarding the design of the intake site, water treatment plant, pump stations, storage areas and associated infrastructure are based on the best available information at the time of reporting, and likely outcomes of good design principles.
- The pipeline corridor will be kept free of trees during operation.

There are also a number of limitations associated with the assessment. These include:

- There is no guidance on the assessment of landscape and visual effects specific to Australia. Therefore, United Kingdom (UK) publications have been referenced where relevant for Landscape and Visual Impact Assessment (LVIA).
- This chapter responds directly to the requirements of the ToR specifically relating to landscape and visual amenity and as such utilises relevant sections of UK LVIA assessment guidelines (Landscape Institute 2002).
- The exact method of construction and range of equipment that will be used is still to be determined. Informed assumptions have been made based on the best available information in order to appraise the impact of the construction works upon landscape resources and visual amenity (see Chapter 2, Project Description).

## 17.4 Relevant Legislation and Policy

This section outlines the legislation and policy relevant to the project.

### 17.4.1 Queensland Legislation

#### ***Coastal Protection and Management Act 1995 (Qld)***

The main objectives of the *Coastal Protection and Management Act 1995* are to:

- Provide for the protection, conservation, rehabilitation and management of the coast, including its resources and biological diversity
- Have regard to the goal, core objectives and guiding principles of the National Strategy for Ecologically Sustainable Development in the use of the coastal zone
- Provide, in conjunction with other legislation, a coordinated and integrated management and administrative framework for the ecologically sustainable development of the coastal zone
- Encourage the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone.

Coastal management is to be achieved by coordinated and integrated planning and decision-making, involving, among other things, the following: Coastal Management Plans; Coastal Management Districts; and through use of other legislation. This project falls within the Curtis Coast Coastal Management District, which under the *Coastal Protection and Management Act 1995* requires special controls and management practices.

#### ***State Coastal Plan***

The State Coastal Plan (EPA and QPWS 2006) describes how the coastal zone will be managed as required by the *Coastal Protection and Management Act 1995*. The State Coastal Plan provides State-wide direction and guidance through policies for coastal management which are detailed under several topic areas. Of relevance to this chapter are coastal landscapes and conserving nature. The State Coastal Plan provides coastal management policy direction and defines how these directions should be implemented by government, industry and the community.

### **Development Scheme for the Gladstone State Development Area (GSDA)**

The GSDA Development Scheme sets out the objectives and guidelines for future land use in the area as well as establishing procedures for assessment of applications. There is no specific policy within the Scheme that relates to the visual impact of development within the GSDA; however, the policy identifies that there are visual amenity benefits from having a dedicated heavy industry estate as opposed to having industry located at various sites throughout the region.

### **Development Scheme for the Stanwell – Gladstone Infrastructure Corridor (SGIC) State Development Area**

A SGIC Development Scheme sets out the objectives and guidelines for future land use in the area as well as establishing procedures for assessment of applications (see Chapter 1, section 1.9). Among the outcomes that are sought to be achieved, the scheme states that infrastructure should not be visually intrusive. It also states a potential solution is that infrastructure should be located underground, with the exception of limited locations where it is either impractical or operationally necessary for the proper functioning of the infrastructure (for example pump station and balance tank locations) (Policy 1 of the Scheme). In this regard, the project is consistent with the Scheme.

### **Curtis Coast Regional Coastal Management Plan**

The Curtis Coast Regional Coastal Management Plan (EPA and QPWS 2005) (Curtis Coastal Plan) is an area requiring special development controls and management practices (s. 4 and schedule 2) and has been developed under the *Coastal Protection and Management Act 1995*. Implementation of the Curtis Coastal Plan is also a key mechanism for achieving the State Coastal Plan's coastal management outcomes, principles and policies. The plan describes how the coastal zone of the Curtis Coast region is to be managed. Key initiatives within the plan developed in response to the key challenges of relevance to this chapter include: identification and protection of significant scenic coastal landscapes in the region; and identification and protection of habitat for significant species.

### **Rockhampton City Plan**

The Rockhampton City Plan (Rockhampton City Council 2005) is a planning scheme prepared under the *Integrated Planning Act 1997* and aims to advance the purpose of the Act. The Rockhampton City Plan states a number of Desired Environmental Outcomes (DEOs) parts of which are of relevance to this study. DEOs considered within this chapter include: DEO 3 Nature Conservation; DEO 4 Environmental Management; DEO 8 Cultural and Urban Heritage; and DEO 14 Open Space and Recreation.

### **Fitzroy Shire Council Planning Scheme**

The Fitzroy Shire Council Planning Scheme (Fitzroy Shire Council 2005) is a planning scheme prepared under the *Integrated Planning Act 1997* and aims to advance the purpose of the Act. The Planning Scheme states a number of DEOs, parts of which are of relevance to this study. DEOs considered within this chapter include Social Elements and Environmental Elements.

### **Calliope Shire Council Planning Scheme**

The Calliope Shire Council Planning Scheme (Calliope Shire Council 2007) is a planning scheme prepared under the *Integrated Planning Act 1997* and aims to advance the purpose of the Act. This Planning Scheme under Part 3 Desired Environmental Outcomes Division 1 Preliminary states that development should not adversely affect the Shire's natural environment. This desired environmental outcome is to be achieved, amongst other means, via the protection, maintenance and enhancement of a number of items of relevance to this study detailed under: Environment and Conservation; Community Development; and Development Patterns and Infrastructure.

## **17.4.2 Standards and Guidance**

There is no guidance on the assessment of landscape and visual effects specific to Australia. However, the industry typically refers to guidance offered by the British Institute of Landscape Architects in the United Kingdom (UK). This assessment has been conducted in response to the ToR and in accordance to the LVIA published by The Landscape Institute and the Institute for Environmental Management and Assessment in the UK.

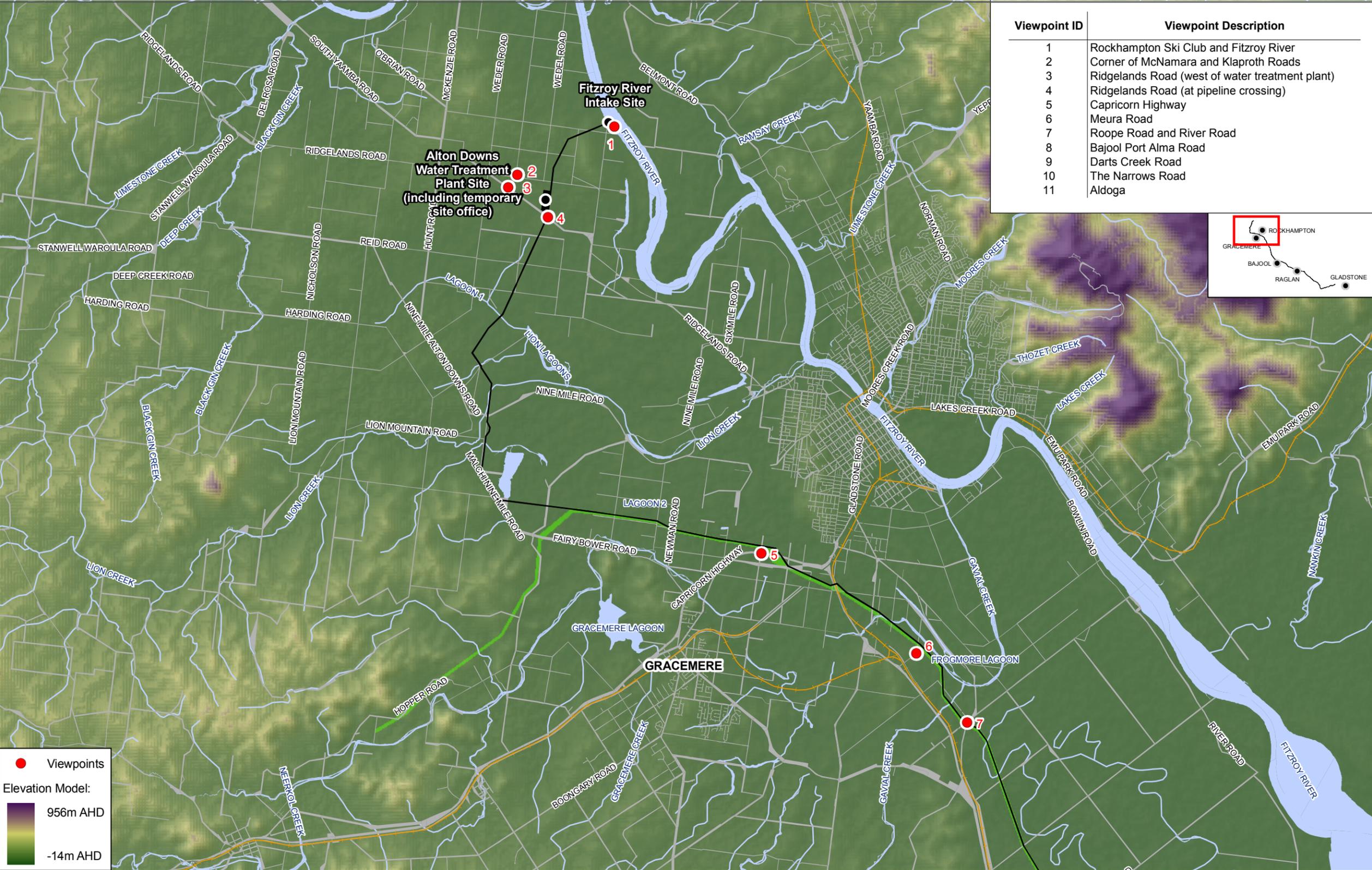
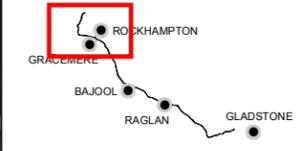
## **17.5 Baseline (Existing Conditions)**

### **17.5.1 Regional Landscape Character**

The project traverses approximately 115 km of landscape between Rockhampton and Gladstone. Creeks dissect the landscape which is primarily rural in character and utilised as an agricultural resource, with a predominance of beef cattle grazing. The topography is generally gently undulating landform of low hills and flat plains, rising to the northeast of the project area to coastal ranges providing a prominent and scenic green backdrop to the project area (see Figure 17.1).

Major urban centres occur at Rockhampton to the north of the project, and Gladstone to the south, with small settlements and individual rural residential properties scattered throughout.

Viewpoint ID	Viewpoint Description
1	Rockhampton Ski Club and Fitzroy River
2	Corner of McNamara and Klaproth Roads
3	Ridgелands Road (west of water treatment plant)
4	Ridgелands Road (at pipeline crossing)
5	Capricorn Highway
6	Meura Road
7	Roope Road and River Road
8	Bajool Port Alma Road
9	Darts Creek Road
10	The Narrows Road
11	Aldoga



● Viewpoints  
 Elevation Model:  
 956m AHD  
 -14m AHD

Gladstone - Fitzroy Pipeline Project

**Figure 17.1 - Topography and Visual Viewpoints Assessment of the Project Area**

Sheet 1 of 4

The Right of Way	Road Reserve	SGIC
Project Infrastructure	Waterways	GSDA
Railway Line	LGA Boundary	

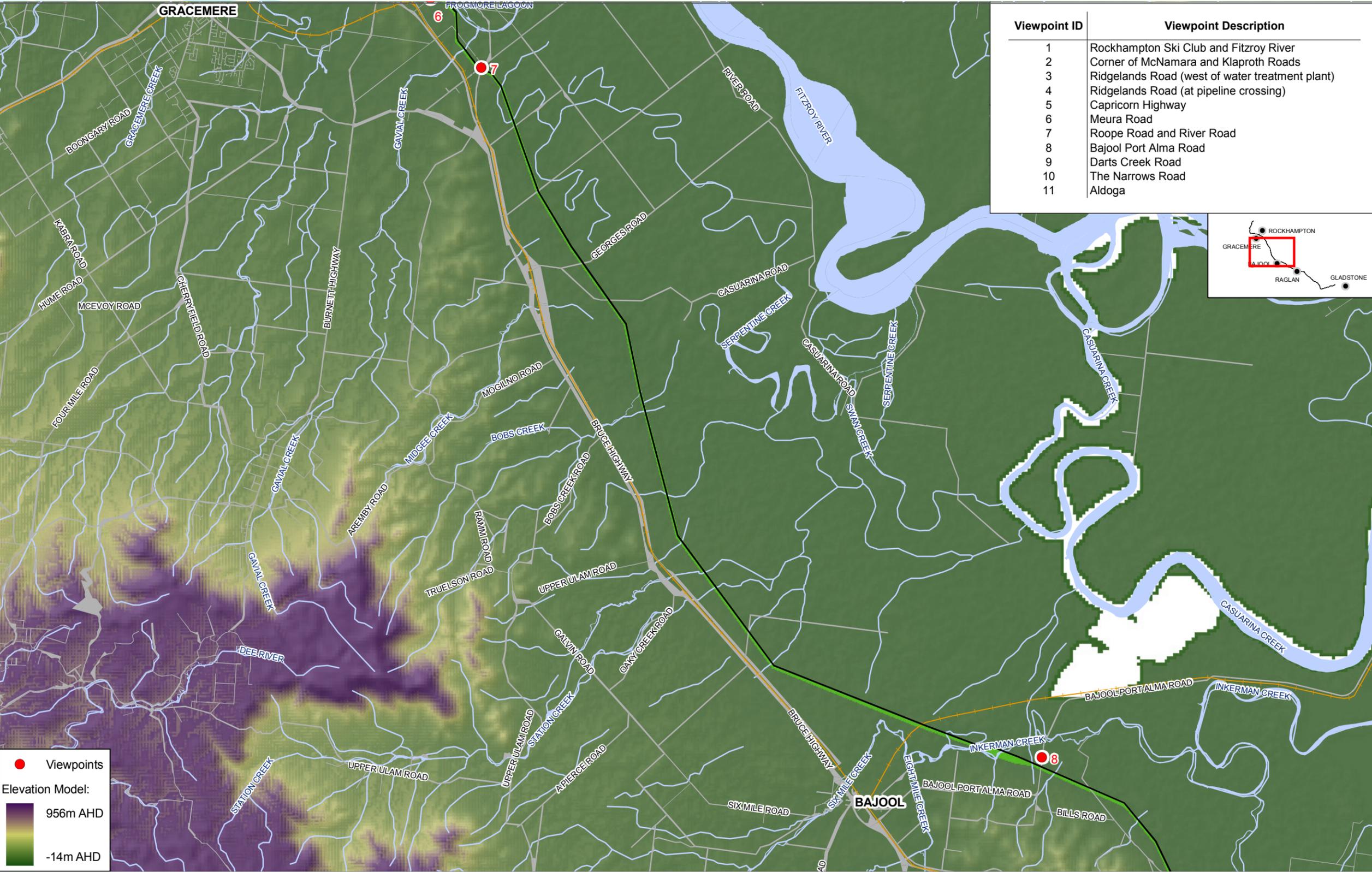
0 2 4 6 8 km

1:100,000 at A3

N

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9	Darts Creek Road
10	The Narrows Road
11	Aldoga



● Viewpoints

Elevation Model:

956m AHD

-14m AHD

Gladstone - Fitzroy Pipeline Project

**Figure 17.1 - Topography and Visual Viewpoints Assessment of the Project Area**

Sheet 2 of 4

— The Right of Way    ● Project Infrastructure    — Road Reserve    — Waterways    — LGA Boundary

— SGIC    — GSDA

— Railway Line

0 2 4 6 8 km

1:100,000 at A3

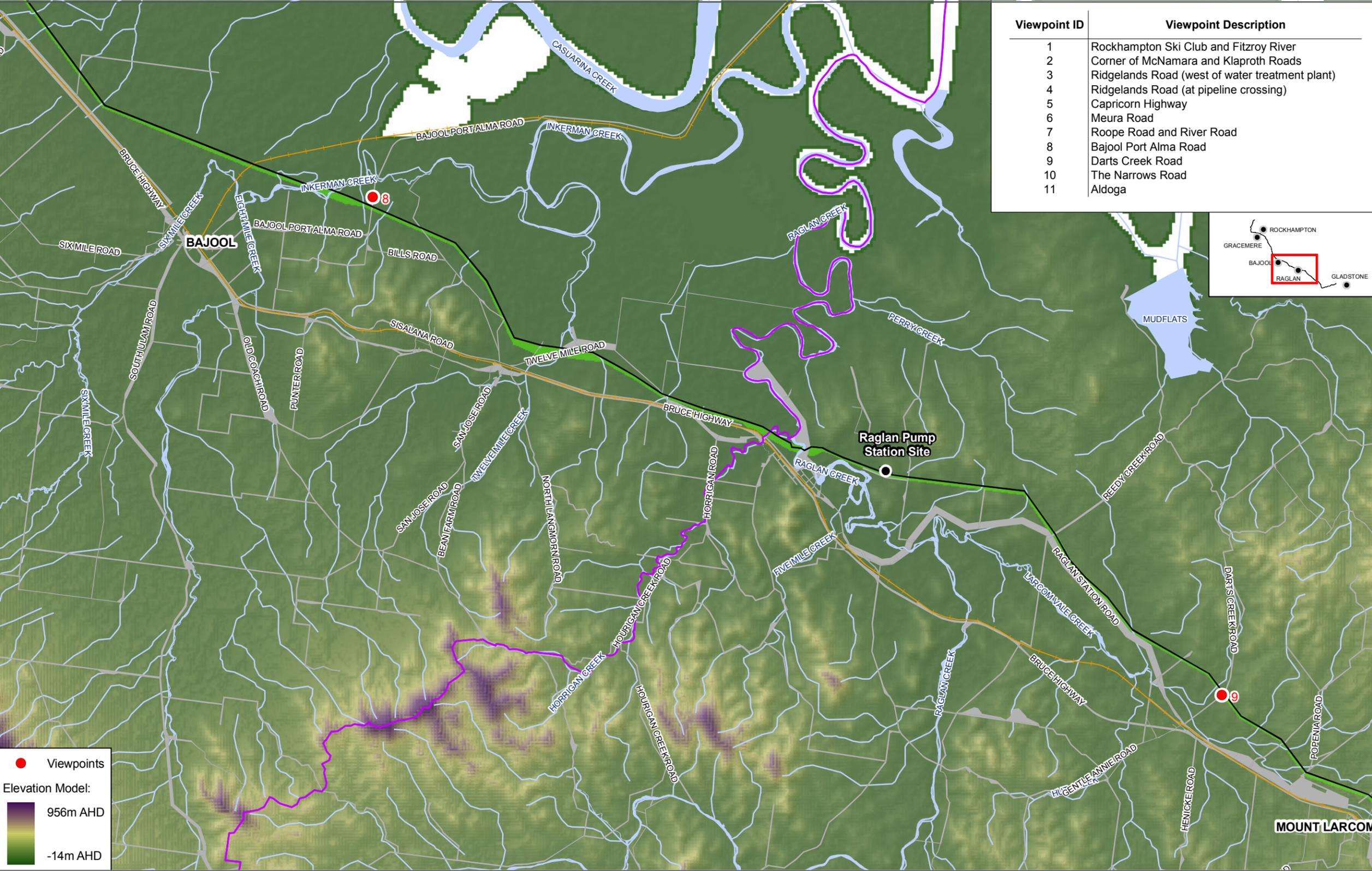
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Gladstone Area Water Board

ARUP

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● Viewpoints  
 Elevation Model:  
 956m AHD  
 -14m AHD

Gladstone - Fitzroy Pipeline Project

**Figure 17.1 - Topography and Visual Viewpoints Assessment of the Project Area**

Sheet 3 of 4

The Right of Way	Road Reserve	SGIC
Project Infrastructure	Waterways	GSDA
Railway Line	LGA Boundary	

0 2 4 6 8 km

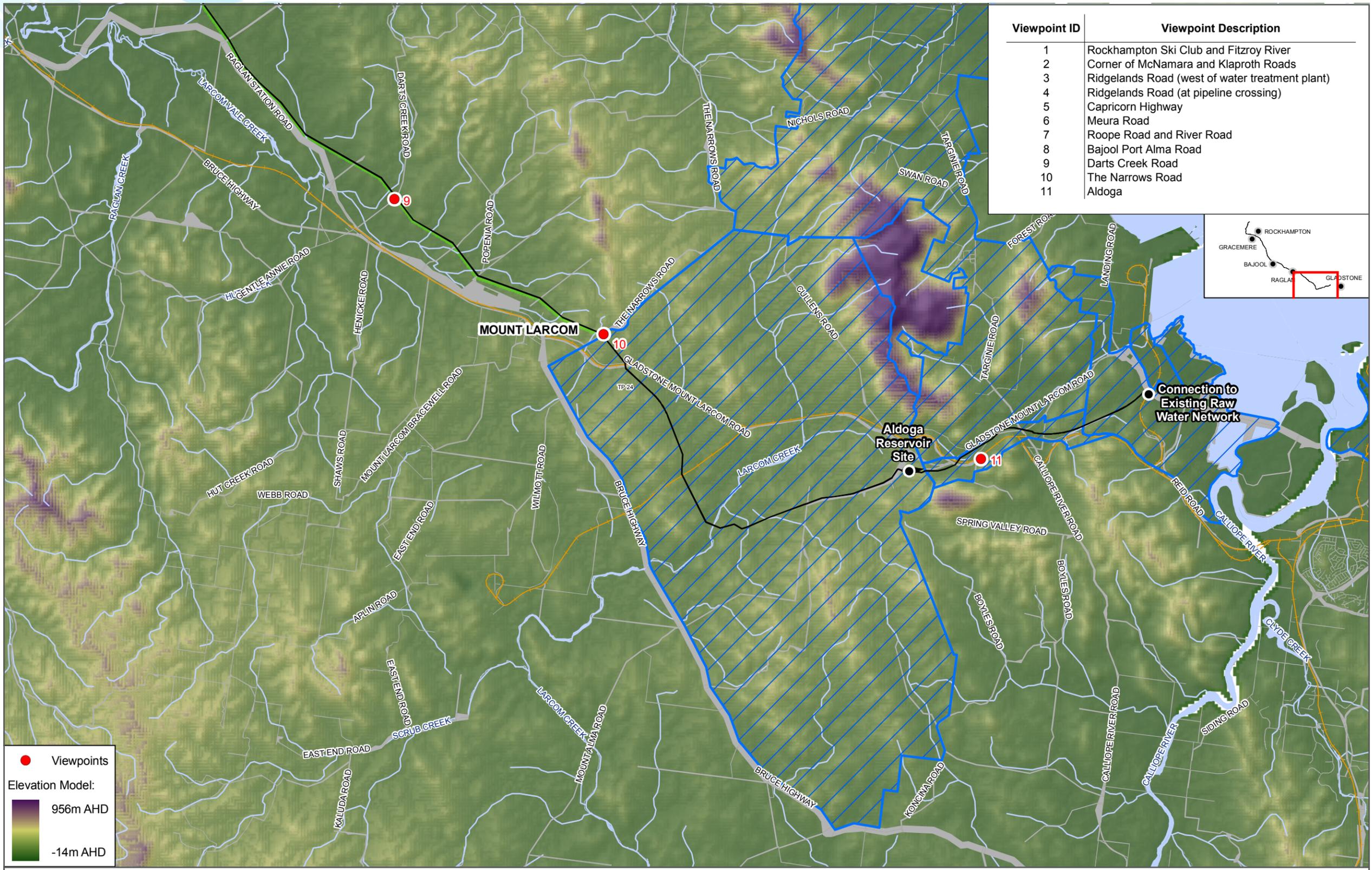
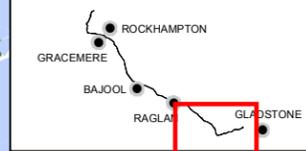
1:100,000 at A3

N

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9	Darts Creek Road
10	The Narrows Road
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● Viewpoints  
 Elevation Model:  
 956m AHD  
 -14m AHD

Gladstone - Fitzroy Pipeline Project

**Figure 17.1 - Topography and Visual Viewpoints Assessment of the Project Area**

Sheet 4 of 4

The Right of Way	Road Reserve	SGIC	
Project Infrastructure	Waterways	GSDA	1:100,000 at A3
Railway Line	LGA Boundary		

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Grazing land is sparsely vegetated throughout the region, with individual trees, some scrub and grazing fodder. The agricultural weed *Parthenium* is prevalent across the majority of the project area. Coastal foothills and ranges tend to be densely vegetated with native bushland.

The southern area of the pipeline route falls within the Curtis Coastal Plan from Raglan Creek to Gladstone. It also forms part of the Calliope and Fitzroy River coastal catchments and the GSDA. The Curtis Coastal Plan states that elements of the Curtis Coast landscape have been identified as contributing to the scenic coastal landscape values of the region and are identified as the 'areas of State significance (scenic coastal landscapes)' and include: riverine corridors and creeks; coastal mountain ranges; urban/industrial settings and edges.

The GSDA to the south of the project is composed of major industrial development and associated infrastructure. It is used for urban development, primary industries, mining, heavy and light manufacturing industries, port activities, residential and public facilities, tourism and recreation (EPA and QPWS 2005).

The area from which the various elements of the project are likely to be seen, while not including large numbers of residential areas, is sensitive in parts due to the route's visibility within a predominantly sparse, flat landscape. Visual impacts resulting from the project will be derived primarily from non-pipeline infrastructure (potentially including the WTP, pumping stations, intake point and storage reservoirs) as the pipeline itself will be mainly underground. Construction activities including the clearing of vegetation, earthworks and construction vehicles use and movement are likely to cause the most significant visual intrusion.

## 17.5.2 Local Landscape Context

### 17.5.2.1 Fitzroy to Bajool

The project commences at the intake point on the Fitzroy River, approximately 15.5 km upstream of Rockhampton Bridge, northwest of the major urban centre of Rockhampton.

The Fitzroy River is one of Queensland's largest river systems. Its catchment area includes natural assets such as waterways, wetlands, and natural reserves which contribute to local biodiversity, recreational, landscape and scenic quality. The area local to the Fitzroy River forms part of a unique local recreation, landscape and viewing experience. It is characterised by expansive, long views northwest and southeast along the river which are generally framed by riparian vegetation, including native trees and scattered scrub. Aquatic plants line parts of the river margins. The area adjacent to the intake point is the most significant area of recreational land identified within the project area and is associated with leisure facilities comprising of informal open space, a water sports club, a jetty, and walking tracks and well managed naturalistic native planting.

Due to its close proximity to Rockhampton, the area provides an important leisure facility and open space resource for the local community. It is recognised as a key resource within the Fitzroy Planning Scheme and is valued due to its attractive features, distinctiveness and recreational function.

Also within the Rockhampton City limits are the Berserker Ranges and Mt Archer National Park which provide a prominent and scenic green backdrop to the local area.

Small rural settlements occur along and/or adjacent to this section of the route including Alton Downs, Gracemere, Midgee, and Bajool. This region is generally broadacre grazing land, with scattered vegetation on gently undulating topography and rural properties/residences scattered throughout. Creeks (or dry creek beds) lined with riparian vegetation, dams, fences and irregular bush blocks dissect the landscape in parts. A number of minor roads connecting isolated properties and small communities to larger urban centres also cross the landscape. There is also an important rail freight corridor and the Bruce Highway. The gently undulating topography and scattered vegetation provides a variety of framed and/or open views from distant, middle distance and close locations. The vegetation structure, height and form are valuable, contributing to landscape character (local and regional) and sense of place.

### 17.5.2.2 Bajool to Gladstone

South of Bajool, small settlements along the pipeline route include Marmor, Raglan, Epala, Ambrose, Mt Larcom and Yarwun.

From Bajool to Mt Larcom the landscape is sparsely vegetated, gently undulating, with rural residential properties scattered throughout. The agricultural landscape is divided by creeks/dry creek beds lined with riparian vegetation, dams and irregular bush blocks. Primarily, the agricultural land is broadacre grazing land, with expansive paddock structures. The area is crossed by a number of minor roads connecting isolated properties and small communities to larger urban centres. There is also an important freight rail corridor and the Bruce Highway that traverse the landscape. The gently undulating topography and sparse vegetation provides a variety of framed and/or open views from distant, middle distance and close locations. The vegetation structure, height, form and composition are valuable, as they contribute to the character (local and regional) of the landscape, and to a sense of place.



Surrounding Yarwun, the landform provides a transition between the foothills and steep escarpments of Mt Larcom and the lower lying grazing land to the northwest. Ridge slopes of Mt Larcom give way to dense native bushland, restricting and enclosing views. This change in topography provides a buffer to the broader agricultural landscape from the Gladstone industrial area edge. It aids in increased levels of tranquillity and quiet enjoyment of the landscape and may be a respected resource for the local community.

The project terminates adjacent to Yarwun, northwest of the Gladstone major urban centre, inland of Fisherman's Landing. In this area, large industrial developments become predominant. However, the Gladstone area is identified as a coastal resource with values of coastal landscape, scenic amenity, recreational amenity, habitat for plants and animals.

The Curtis Coastal Plan states that coastal mountain ranges including the landscapes of the Rundle Range and Mt Larcom Range to the northeast contribute to scenic coastal landscape values by providing a prominent and scenic green backdrop to the local (and project) area. Rundle Range and Mt Larcom form State owned land, with Rundle Range also being a National Park and part of the Rundle Range Resources Reserve Management Plan. Mt Larcom is a distinctive focal point in the landscape. Mt Stowe is recognised within the Calliope Planning Scheme as a State Forest. The vegetated escarpments are highly significant in the landscape and form prominent backdrops to all views. Their landform contrast and naturalness are major contributors to scenic quality.

The Curtis Coastal Plan also addresses riverine corridors and creeks. It recognises the landscape values of riverine creeks and corridors from elevated lookouts and from recreational use on the water (e.g. fishing, boating etc.). Creek systems and riparian vegetation cross the coastal plain and provide a visual contrast in an otherwise largely modified rural landscape. These areas often form the visual edge and link to local views (EPA and QPWS 2005).

In addition, the Curtis Coast Plan discusses the value of the urban/industrial setting and edge – "The settings and edges of all coastal towns and major developments are important to the character and identity of the Curtis Coast Region". The edges of the places often have distinct character as seen from approach roads, lookouts and other viewpoints. It states that the city of Gladstone itself is unique as an industrial landscape providing a strong visual contrast to the adjacent natural areas, such as Mt Larcom.

However, it must be noted that the landscape character of the coastline has also been greatly modified through vegetation disturbance for residential and industrial development.

### 17.5.3 Visual Character of the Project

The majority of viewers will be motorists travelling along roads that cross the proposed pipeline corridor. Other receptors may include residents, rail users, agricultural workers, industrial workers and users of recreational open space.

During operation, the pipeline will generally be an underground linear feature within a largely rural environment. Landform surrounding the project and elevation of structures are the key determinants of visibility of the project. Vegetation, built form and environment have a localised influence. Views of the project will generally be limited to close receptors, and those crossing the pipeline corridor from roads and/or rail. Aboveground elements or processes that will be visible from a limited number of locations will include:

- Intake structure, pump station and associated security fencing and access road
- Water treatment plant and security fencing
- Storage reservoirs
- Valve and valve pits
- Storage facilities and associated infrastructure at Raglan and Aldoga
- The treeless pipeline corridor width – during operations, some of the ROW will be maintained to keep it clear of vegetation and to provide access for maintenance
- Access by maintenance vehicles and workers (vegetation, weed and pest management and repair works) and by deliveries and workers at the WTP
- Replacement planting and any landscape mitigation works (including earthworks).

During construction, areas that will be affected are likely to be viewed from a distance, as prescribed by the gently undulating topography defining the route corridor. However, at Yarwun the steeper topography and dense bushland of the Mt Larcom Ranges will restrict and screen scope of views to the site. The main visual impacts during construction are likely to include:

- Stockpiles (pipe, vegetation, soil)
- Construction vehicles and workers
- Vegetation clearance
- Fencing removal and construction
- Lighting during night time construction activities (if required)
- Additional vehicular traffic generated by construction workers, materials delivery and disposal along adjacent transport routes.

## 17.6 Assessment of Impacts

The following sections describe the assessment of landscape and visual impacts for the construction and operation of the project.

Due to their short-term duration and similarity of impacts across the project area, construction impacts are assessed for the entire route and are not split into two sections (Fitzroy to Bajool and Bajool to Gladstone) as with the assessment of operational impacts.

Impacts during operation are assessed from individual representative viewpoints.

### 17.6.1 Construction Phase

The construction of the project would create short-term impacts. These impacts would primarily relate to the visual appearance of the construction works that would be temporary, restricted to the construction period. Some areas would be used on a temporary basis for storage areas to support the construction.

General assumptions (Section 17.3) have been made in order to make a site-wide assessment of the impact of the construction works. Generally during construction the project is likely to impact the same areas as those affected by the operational phase, however construction impacts will be short-term in nature.

#### 17.6.1.1 Visual Modification

Activities that would constitute the greatest intrusion into receptors' views as a result of changes within the landscape during construction would include:

##### Site clearance works

- Removal of vegetation
- Demolition of existing structures (e.g. structures at road and rail crossings)
- Earthworks

##### General construction activities

- Temporary traffic management
- Movement of construction machinery and large scale construction equipment
- Presence of construction workers
- Presence of equipment storage compounds
- Presence of hoarding and protective fencing
- Presence of temporary signage
- Excavations; earthworks
- Site preparation
- Construction of the pipeline
- Construction and fit out of concrete structures and reservoirs
- Soil stripping
- Installation of new pipeline infrastructure and landscaping elements

- The presence of major and minor site facilities
- Temporary offices and washrooms
- Laydown areas
- Pipe stockpiles and associated hard standing

Off-route impacts on landscape may also arise from physical changes to surrounding road network utilised during construction (e.g. traffic calming measures, road upgrades). Additional vehicles using these roads could potentially have a visual impact to normal users, including:

- Vehicles moving materials to/from site, and between construction sites
- Workers travelling to/from work, and moving between different areas of the site.

Impacts to traffic in the project area are assessed in Chapter 13, Transport and Access Arrangements.

The prominence of the site wide construction works and loss of some landscape elements suggests that there would be a Moderate Reduction in visual amenity during this phase.

#### 17.6.1.2 Visual Sensitivity

The construction site will generally be experienced by a range of viewers including:

- Small numbers of residents with a high interest in their visual environment
- Large numbers of motorists with a passing interest in their visual environment
- Small numbers of outdoor workers (including farmers and maintenance workers) with a moderate interest in their environment
- Small numbers of recreation-site or activity-focused users (i.e. fishing, nature conservation, water-based activities, social clubs) with a high interest in their visual environment.

Although the site is not of particularly high scenic quality, the variety and number of people experiencing it suggests that it contains views of medium sensitivity.

#### 17.6.1.3 Significance of Impact

The significance of the landscape and visual impact during construction and without mitigation measures has therefore been assessed as moderate adverse in accordance with the significance criteria in Table 17.3.

### 17.6.2 Operational Phase – Fitzroy to Bajool

Impacts are described below in terms of an assessment of each of the identified representative viewpoints. The process of selecting representative viewpoints is described in Section 17.2.1.3. The location of the viewpoints is shown in Figure 17.1.

### 17.6.2.1 Viewpoint - 1 Rockhampton Ski Club and Fitzroy River



<b>Location</b>	<p>Photo direction northwest along Fitzroy River approximately 300 m upstream from the intake point at the Rockhampton Water Ski and Power Boat Club approximately 15.5 km upstream from Rockhampton Bridge.</p> <p>GIS coordinates Lat -23.297045 Long 150.438516.</p>
<b>Modification</b>	<p>This view is of an attractive, semi-natural landscape with distinctive landscape elements that contribute to high degrees of amenity and tranquillity. The nature of this view is unique to the local and regional area, and is characterised by expansive, long views northwest and southeast along the river. Views are generally framed by riparian vegetation (approximately 15 m buffer zone to the river) including native trees and scattered scrub. Aquatic plants line parts of the river margins.</p> <p>This view has a strong sense of place as a managed, green recreational 'oasis' within a surrounding sparsely vegetated, dry, flat landscape. The scenic amenity forms part of the recreational experience as the Fitzroy River and adjacent open space is used for outdoor recreational pursuits (boating, water skiing, fishing, picnics etc.).</p> <p>The project will not be a prominent feature in this view, but will cause localised change to the existing landscape. Project elements would be visible within the landscape, but would be seen within the context of the existing SunWater pump station. The intake and pump station will consist of a combined single structure located in the river bank, with a separate plant room adjacent to the existing SunWater pump station and at the same level. Although the intake point is submerged, associated pipeline infrastructure (pipe, pumping station, etc.) are likely to be visible from the water and from the bank opposite. The ultimate form, material and colour of the infrastructure would play some role in determining its influence on visual amenity. Vegetation removal would also constitute an obvious change in view.</p> <p>The project would cause change through minor loss of landscape elements (trees), inclusion of infrastructure and maintenance activities. However, there is scope for mitigation, in the short- to medium-term</p> <p>It is anticipated that the project would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Small number of residents with a high interest in their visual environment and prolonged viewing opportunities. However, and views that do occur would be filtered through scattered vegetation and are located approximately 150–200 m in distance away from the pipeline, intake point and pump station</li> <li>• Small numbers of recreational users both on the water and within recreation facilities at the ski club with a high interest in their visual environment on a regular basis</li> <li>• Small numbers of outdoor workers (maintenance workers, gardening) with a medium interest in their visual environment on a regular basis.</li> </ul> <p>This view is of locally high scenic quality, and although a small number of people experience it, it is for prolonged periods, and is rare in the local and regional area suggesting that this is a view of minor sensitivity.</p>
<b>Significance of Impact</b>	<p>Minor adverse</p>

### 17.6.2.2 Viewpoint 2 - Corner of McNamara and Klaproth Roads



*Photographic simulation of the view to the proposed water treatment plant*

<b>Location</b>	View southeast to the proposed water treatment plant from near the corner of Corner of McNamara and Klaproth Roads. GIS coordinates -23.309226° Long 150.410268°.
<b>Modification</b>	<p>This view is of flat grazing country with scattered trees, rural residences and other rural structures such as sheds and fences. The corridor of semi-mature and mature Eucalypts along Ridgeland Road provides an immediate backdrop, while the Berserker Range to the east of Rockhampton forms much of the horizon and adds to the overall variety and quality of the view.</p> <p>The water treatment plant would be approximately 1 km from this viewpoint. It would be prominent in the view because of its scale and the openness of the landscape. Most components of the water treatment plant would be clearly visible, including the control building, clarifier, sludge dewatering building, sludge balance tanks, and reservoir. Other features such as fencing and parked vehicles are not likely to be prominent because of the distance from the viewpoint.</p> <p>It is not anticipated that the pipeline would create a discernable change in the view from this location, other than the removal of several trees on the side of Ridgeland Road.</p> <p>There are opportunities to integrate the plant into the landscape to some degree with strategic planting. Planting of native tree species, once mature would potentially screen a large proportion of the visible elements of the water treatment plant.</p> <p>The ultimate choice of materials and colour for each structure would play some role in determining its influence on visual amenity. Darker, less reflective tones would be more likely to recede into the landscape.</p> <p>It is anticipated that the project would result in a moderate reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by residences of several rural properties on McNamara and Klaproth Roads. It could be expected that these residents place a high value on their rural outlook.</p> <p>It is also experienced for short durations by vehicle users travelling on these two roads. The vehicle users are predominantly residents of rural properties to the north.</p> <p>Although a small number of people experience this view, the presence of residential views and the associated importance placed on the view suggests that this viewpoint is of medium sensitivity.</p>
<b>Significance of Impact</b>	Moderate Adverse

### 17.6.2.3 Viewpoint 3 - Ridgeland Road (west of WTP)



*Photographic simulation of proposed water treatment plant*

<b>Location</b>	View east to the proposed water treatment plant from Ridgeland Road. GIS coordinates -23.312482° Long 150.407546°.
<b>Modification</b>	<p>This view is from Ridgeland Road heading east. It is dominated by the informal avenue of semi-mature and mature native trees that have established within the road reserve. It also includes expanses of flat grazing country with scattered trees and rural structures such as sheds and fences. The view is backdropped by the Berserker Ranges which adds to the overall variety and quality of the view.</p> <p>The WTP would be approximately 1 km from this viewpoint. Despite its scale, the plant would be partially screened by foreground trees.</p> <p>This view represents one of the more likely locations on Ridgeland Road from where the plant would be able to be clearly seen. For the most part closer views on Ridgeland Road are subject to greater levels of screening from the roadside vegetation.</p> <p>It is not anticipated that the pipeline would create a discernible change in the view from this location. The removal of trees at the Ridgeland Road crossing point would be obscured by intervening roadside vegetation.</p> <p>There are opportunities to integrate the plant into the landscape to some degree with strategic planting. Planting of native tree species, once mature would potentially screen the water treatment plant to the point where it would be difficult to discern from this viewpoint for viewers that were not specifically focusing on the plant.</p> <p>The ultimate choice of materials and colour for each structure would play some role in determining its influence on visual amenity. Darker, less reflective tones would be more likely to recede into the landscape.</p> <p>It is anticipated that the project would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is primarily experienced by a moderate number of road users with a passing interest in their visual environment.</p> <p>This moderate numbers and short duration of views suggests that this is a view of low sensitivity.</p>
<b>Significance of Impact</b>	Negligible

#### 17.6.2.4 Viewpoint 4 - Ridgелands Road (at pipeline crossing)



<b>Location</b>	View east on Ridgелands Road pipeline intersection. GIS coordinates Lat -23.320563 Long 150.418904.
<b>Modification</b>	<p>This view is of flat to gently undulating agricultural grazing country with scattered trees, rows of trees along fence lines and road sides, and bushland blocks. The landscape is intersected by minor gravel roads, main roads and fence lines. Occasional houses and sheds are scattered throughout. The nature of this view is unique to the local and regional area, and is characterised by expansive, open views across the landscape with some topographical features (Berserker Ranges/Mt Archer National Park) in the distance.</p> <p>The pipeline will not be a prominent feature in this view, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees within the route corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification.</p> <p>There would be an overall local reduction in the quantity of trees, grassland and dense scrub within the pipeline corridor as a result of the project. Grass would naturally regenerate to earthworks areas over time.</p> <p>It is anticipated that the project in this location would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is primarily experienced by a moderate number of road users with a passing interest in their visual environment.</p> <p>This moderate numbers and short duration of views suggests that this is a view of low sensitivity.</p>
<b>Significance of Impact</b>	Negligible

### 17.6.2.5 Viewpoint 5 - Capricorn Highway



<b>Location</b>	View northeast on the Capricorn Highway pipeline intersection. GIS coordinates Lat -23.410513 Long 150.478942.
<b>Modification</b>	<p>This view is of flat to gently undulating agricultural grazing country with scattered trees, rows of trees along fence lines and road sides, and bushland blocks. The landscape is intersected by minor gravel roads, main roads and fence lines. Occasional houses and sheds are scattered throughout. The nature of this view is unique to the local and regional area, and is characterised by expansive, open views across the landscape with some topographical features (Berserker Ranges/Mt Archer coastal ranges) in the distance.</p> <p>The pipeline will not be a prominent feature in this view, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees within the pipeline corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification.</p> <p>There would be an overall local reduction in the quantity of trees, grassland and dense scrub within the pipeline corridor as a result of the project. Grass would naturally regenerate to earthworks areas over time.</p> <p>It is anticipated that the project would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Large number of road users with a passing interest in their visual environment</li> <li>• Small numbers of outdoor workers (farmers, maintenance workers) with a medium interest in their visual environment on a regular basis.</li> </ul> <p>The interest and distance from the pipeline of the viewers, and the project's nature from this viewpoint within the landscape suggests that this is a view of medium sensitivity.</p>
<b>Significance of Impact</b>	Minor adverse

### 17.6.2.6 Viewpoint 6 - Meura Road



<b>Location</b>	View north along Meura Road easement to pipeline intersection. GIS coordinates Lat -23.437614 Long 150.523167.
<b>Modification</b>	<p>This view comprises flat to gently undulating agricultural grazing, low scattered scrub and tussocks. The landscape is intersected by minor gravel roads and fence lines. Occasional houses and sheds are scattered throughout. The nature of this view is unique to the local area, and is characterised by filtered views through open bushland. In this location, views are restricted by vegetative cover.</p> <p>The pipeline will not be a prominent feature in this view, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees from the bushland within the pipeline corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification.</p> <p>There would be an overall local reduction in the quantity of trees, grassland and dense scrub within the pipeline corridor as a result of the project. Grass would naturally regenerate to earthworks areas over time.</p> <p>It is anticipated that the project in this location would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Small numbers of residents with a high interest in their visual environment and prolonged viewing opportunities. However, views would be heavily filtered through vegetation and approximately 350 m in distance away from the pipeline route</li> <li>• Small numbers of road users with a passing interest in their visual environment</li> <li>• Small numbers of outdoor workers (farmers, maintenance workers) with a medium interest in their visual environment on a regular basis.</li> </ul> <p>The interest, distance and filtered views of the pipeline from this viewpoint, and the project's nature within the landscape suggests that this is a view of low sensitivity.</p>
<b>Significance of Impact</b>	Negligible

### 17.6.2.7 Viewpoint 7 - Roope Road and River Road



<b>Location</b>	View north along Roope Road (at intersection of River Road) and pipeline intersection. GIS coordinates Lat -23.456068 Long 150.537543.
<b>Modification</b>	<p>This view comprises flat to gently undulating agricultural grazing land, scattered trees, low scattered scrub and tussocks. The landscape is intersected by minor roads and fence lines. Occasional houses and sheds are scattered throughout. The nature of this view is unique to the local area, and is characterised by filtered views across grazing land through scattered trees and bushland blocks. Distant topographical features (Berserker Ranges/Mt Archer coastal ranges) form a backdrop to the view.</p> <p>The pipeline will not be a prominent feature in this view, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees from the bushland and scattered trees within the pipeline corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification.</p> <p>There would be an overall local reduction in the quantity of trees, grassland and dense scrub within the pipeline corridor as a result of the project. Grass would naturally regenerate to earthworks areas over time.</p> <p>It is anticipated that the project in this location would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Small numbers of residents with a high interest in their visual environment and prolonged viewing opportunities. However, views would be filtered through vegetation and range from approximately 400 m distance away from the pipeline route</li> <li>• Small numbers of road users with a passing interest in their visual environment</li> <li>• Small numbers of outdoor workers (farmers, maintenance workers) with a medium interest in their visual environment on a regular basis.</li> </ul> <p>The interest, distance and filtered views of the pipeline from this viewpoint, and the project's nature within the landscape suggests that this is a view of low sensitivity.</p>
<b>Significance of Impact</b>	Negligible

## 17.6.3 Operational Phase – Bajool to Gladstone

### 17.6.3.1 Viewpoint 8 - Bajool Port Alma Road



<b>Location</b>	View south along Bajool Port Alma Road to pipeline intersection. GIS coordinates Lat -23.640647 Long 150.696287.
<b>Modification</b>	<p>This view comprises flat to gently undulating agricultural grazing, low scattered scrub and tussocks. The landscape is intersected by minor roads, rows of trees along road edges and fence lines. Occasional houses and sheds are scattered throughout, with a steel works adjacent to the pipeline route. The nature of this view is unique to the local area, and is characterised by open views across grazing land.</p> <p>The pipeline will not be a prominent feature in this view, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees from the road side within the pipeline corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification.</p> <p>There would be an overall local reduction in the quantity of trees, grassland and dense scrub within the pipeline corridor as a result of the project. Grass would naturally regenerate to earthworks areas over time.</p> <p>It is anticipated that the project would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Small numbers of residents with a high interest in their visual environment and prolonged viewing opportunities. However, views would be filtered through scattered vegetation. The closest residence is approximately 500 m in distance away from the pipeline route</li> <li>• Small numbers of road users with a passing interest in their visual environment</li> <li>• Small numbers of outdoor workers (farmers, maintenance workers) with a medium interest in their visual environment on a regular basis.</li> </ul> <p>The interest, distance and filtered views of the pipeline from this viewpoint, and the project's nature within the landscape suggests that this is a view of low sensitivity.</p>
<b>Significance of Impact</b>	Negligible

### 17.6.3.2 Viewpoint 9 - Darts Creek Road



<b>Location</b>	View northeast along Darts Creek Road to pipeline route intersection. GIS coordinates Lat -23.775616 Long 150.939982.
<b>Modification</b>	<p>This view comprises flat to gently undulating bushland, low scrub and tussocks with some areas cleared for agricultural grazing land. The landscape is intersected by minor roads, rows of trees along road edges and fence lines. A small residential subdivision exists to the northeast of the pipeline route. This view would be seen within the context of an existing easement along which the pipeline route will follow that is already clear of vegetation. The nature of this view is unique to the local area, and is characterised by views filtered and enclosed by vegetation.</p> <p>The pipeline will not be a prominent feature in this view, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees from the road side, bushland, and from within the pipeline corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification.</p> <p>Natural vegetation regeneration may be encouraged locally along the pipeline corridor margins to screen adjacent residents. Initially, regeneration would be immature. However, over time planting would mature, and vegetation would re-establish (including self-seeded growth) aiding in screening of the project from residents. However, there would still be an overall local reduction in the quantity of trees, grassland and dense scrub within the pipeline corridor as a result of the project.</p> <p>It is anticipated that the project in this location would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Small numbers of residents with a high interest in their visual environment and prolonged viewing opportunities. However, views would be filtered through vegetation. One residence is located approximately 100 m from the route, with others 250 m or greater distance away</li> <li>• Small numbers of road users with a passing interest in their visual environment</li> <li>• Small numbers of outdoor workers (farmers, maintenance workers) with a medium interest in their visual environment on a regular basis.</li> </ul> <p>The interest, distance and filtered views of the pipeline from this viewpoint, and the project's nature within the landscape suggests that this is a view of medium sensitivity.</p>
<b>Significance of Impact</b>	Minor adverse

### 17.6.3.3 Viewpoint 10 - The Narrows Road



<b>Location</b>	View southwest along The Narrows Road to pipeline intersection. GIS coordinates Lat -23.812308 Long 151.000514.
<b>Modification</b>	<p>This view comprises undulating bushland, low scrub and tussocks and is unique to the local area character. In parts, areas have been cleared for agricultural grazing land. A billabong in the valley floor is directly north of the route. The landscape is intersected by minor gravel roads, bushland, rows of trees along road edges and fence lines. The nature of this view is unique to the local area, and is characterised by views filtered and enclosed by vegetation.</p> <p>The pipeline will not be a prominent feature in this view, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees from the road side, bushland, and from within the pipeline corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification.</p> <p>Natural vegetation regeneration may be encouraged locally along the pipeline corridor margins to screen adjacent residents and maintain the local landscape character. Initially, regeneration would be immature. However, over time planting would mature, and vegetation would re-establish (including self-seeded growth) aiding in screening of the project from residents. However, there would still be an overall local reduction in the quantity of trees, grassland and dense scrub within the pipeline corridor as a result of the project.</p> <p>It is anticipated that the project in this location would result in a small reduction in visual amenity from this viewpoint.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Small numbers of residents on hilltops with clear views southwest over the route with a high interest in their visual environment and prolonged viewing opportunities. However, views would be filtered vegetation and local undulating topography. One residence is located approximately 150 m from the route, with others 300 m, or greater, distance away</li> <li>• Small numbers of road users with a passing interest in their visual environment</li> <li>• Small numbers of outdoor workers (farmers, maintenance workers) with a medium interest in their visual environment on a regular basis.</li> </ul> <p>The interest, distance and filtered views of the pipeline from this viewpoint, and the project's nature within the landscape suggests that this is a view of medium sensitivity.</p>
<b>Significance of Impact</b>	Minor adverse



### 17.6.3.4 Viewpoint 11 - Aldoga



<b>Location</b>	View northeast across proposed Aldoga Reservoir. GIS coordinates Lat -23.846962 Long 151.110313.
<b>Modification</b>	<p>This view comprises undulating to steep slopes covered with bushland, low scrub and tussocks. A large quarry site is adjacent. The landscape is intersected by major roads, railways, above ground pipelines, overhead power lines and fence lines. The nature of this view is unique to the local area, on the industrial outskirts of Gladstone and is characterised by views filtered and enclosed by vegetation and topography.</p> <p>The storage facility and associated infrastructure will form a prominent component of this view due to its hill top location. It will cause localised change due to: the removal of trees and vegetation; new site access; earthworks; and inclusion of new infrastructure (it is expected that the detailed design for construction shall be two circular shaped structures, approximately 90 m diameter.). The project in this location would be seen within the context of the existing industrial facilities in close proximity to the site and large infrastructure (road, rail, etc.). The ultimate form, material, colour and layout of the proposed infrastructure would play some role in determining its influence on visual amenity.</p> <p>There is some scope for mitigation through orientation, form, location and various forms of screening (vegetation/earthworks), but the proposal cannot be completely mitigated for because of its nature and location within the landscape.</p> <p>It is anticipated that this part of the project would be seen within the existing context of an industrial zone, but due to its hill top location would result in a moderate reduction in visual amenity.</p>
<b>Sensitivity</b>	<p>This view is experienced by:</p> <ul style="list-style-type: none"> <li>• Small numbers of road users with a passing interest in their visual environment</li> <li>• Small numbers of outdoor workers (quarry workers, maintenance workers) with a low interest in their visual environment on a regular basis.</li> </ul> <p>The interest and filtered/enclosed views of the storage facility from this viewpoint, and that the project would be viewed within the context of an existing industrial environment suggests that this view is of low sensitivity.</p>
<b>Significance of Impact</b>	Minor adverse

## 17.7 Mitigation

### 17.7.1 General

The pipeline will be buried for the majority of its length. Generally, the project will have a minor impact upon landscape character and visual amenity altering parts of the local environment. Impacts vary according to local context, and construction and operational phases. The aim of this section is to highlight project wide, general mitigation measures that would reduce and/or manage adverse impacts of construction work and operation upon landscape and visual amenity.

Specific measures for key areas, including the WTP, Raglan Pump Station and Reservoir and the Aldoga Reservoir will be considered once detailed design for construction is completed and are likely to include the measures outlined below for the construction and operational phases. Any mitigation measures for the WTP would be discussed with the landowner and adjacent landowners and may include:

- Screening of the site with vegetation
- Design of the WTP to sit within existing topography
- Use of appropriate colours and finishings to minimise the visual impact.

### 17.7.2 Construction Phase

The construction of the pipeline would create short-term impacts. These impacts would primarily relate to the visual appearance of the construction works that would be phased, temporary, and restricted to the construction period. Some areas along the project (and within the project boundary) would be required on a temporary basis to provide compounds and storage areas to support the construction.

Specific objectives and methodologies for mitigation during construction will be further developed within the construction strategy and Environmental Management Plan (EMP) developed prior to construction. Mitigation measures are also proposed in Chapter 20, Planning Environmental Management Plan which forms the precursor to the Construction EMP.

For the purpose of this chapter, general assumptions (Section 17.3) have been made in order to appraise the impact of the construction works upon landscape resources and visual amenity. Essentially, the construction of the project would impact upon the same areas as those affected by the operational phase of the project. However the landscape and visual impacts from construction activities are likely to be similar across the project and occur on a temporary basis.

For the purposes of this assessment, construction phase mitigation strategies will include:

- Existing trees and vegetation to the pipeline corridor margins, or trees identified as important to retain, would be protected prior to construction
- Vegetation clearance at sensitive sites would be minimised
- Temporary hoardings, barriers, traffic management and signage would be removed when no longer required
- Work on site would be restricted to agreed working hours
- Lighting of compounds and works sites would be restricted to low impact lighting for security purposes, where and when required
- Storage facilities would be located away from residential areas
- Materials and machinery would be stored tidily during the works, and where possible behind solid hoardings
- Roads providing access to site compounds and works areas would be maintained free of dust and mud as far as reasonably practicable
- Upon completion of construction, all construction materials would be removed to a suitable location.

### 17.7.3 Operational Phase

Mitigation of landscape and visual impacts as a result of the project would strive to achieve a balance between all other design disciplines including engineering, ecology, hydrology/hydrogeology and noise to achieve an optimum design outcome. The mitigation strategy for this project would primarily focus on screening the various elements from view, and designing the pipeline components in a way that minimises detrimental effects on visual amenity. Measures will include:

- The design of above ground structures (i.e. WTP, Aldoga Reservoir) to be considered to achieve the best fit with the existing contours, vegetation and earthworks features (mounding) to assist in screening and integration
- Optimise visual protection of residential properties and rural settlements
- Seek to achieve a cut and fill balance of material on site, with reuse of excess material on site as part of the landscape mitigation proposals where appropriate
- Avoid loss or damage to landscape features, including minimisation of the width of vegetation clearance in bushland areas. Where possible, trim trees to avoid total removal, particularly in environmentally sensitive areas and at creek crossings
- Screen planting and encouragement of natural regeneration around the pipeline corridor, particularly where structures are above ground and where the pipeline corridor is in close proximity to residences
- Screen planting and/or encouragement of natural vegetation regeneration at key locations outside the pipeline corridor, particularly where the alignment is in close proximity to residences and trees have been removed for construction (i.e. Viewpoint 8 and Viewpoint 9 described in Section 17.6.3)
- Careful consideration of the form and finish of structures, including minimisation of the bulk of the WTP and supply structures, including use of darker colours for the structures and less reflective materials
- Consideration of the appearance of other features such as signs and fencing
- Careful consideration of any lighting requirements and any potential increase in light pollution.

## 17.8 Residual Impacts

### 17.8.1 General

Some impacts resulting from the project are unavoidable and cannot be mitigated. The project would alter the surrounding landscape and the visual experience of receptors. However, these changes would be seen within the context of the existing local environment. Foremost amongst residual impacts is the addition of non-pipeline infrastructure (intake point, WTP, pumping stations, storage facilities), permanent removal of trees along the pipeline corridor, and new planting primarily impacting upon visual amenity.

This assessment of residual impacts assumes that mitigation measures described in the section above would be implemented. Impacts are outlined in Section 17.8.2 and 17.8.3, with significance of residual impacts at specific viewpoints outlined within Table 17.4 and Table 17.5.

### 17.8.2 Construction Phase

With the implementation of suitable mitigation measures as described in Section 17.7, the construction of the proposed development is considered to have a low environmental risk with regard to landscape and visual effects. However, although the significance of impacts would be reduced, they would still occur and elements that would still be visible include:

- Tree and vegetation removal
- Temporary hoardings, barriers, traffic management and signage
- Onsite works and workers, stored facilities, materials, and machinery
- Mud and dust resulting from works
- Spoil and construction materials storage.

Contractors would be required to 'make good' all work sites prior to/at the end of the construction period. The extent of landscape and visual impacts arising from 'making good' would be dependent upon the level of disturbance required for construction of the project.

In terms of the significance criteria described in Section 17.2.2, residual landscape and visual impacts arising from the construction phase have been assessed as negligible to minor adverse.

### 17.8.3 Operational Phase

Initially, the new pipeline elements, access roads and landscaping at key sites (WTP and Aldoga Reservoir) would have an impact upon the viewing experience of visual receptors. The visual amenity of the area would be, in parts, affected by the project intruding into views. As the pipeline itself will be largely underground the visual impact of this aspect of the project will be limited to the loss of vegetation in the ROW. Residential receptors near the WTP site would experience the most significant changes due to their respective viewing opportunities and proximity to the project. The change in view would be permanent and initially prominent, but would become less dominant over time as the project would become part of the existing view as vegetation naturally regenerates, or screening matures. In terms of the significance criteria this equates to a minor adverse to negligible impact, with the exception of the WTP which, based on the current understanding of its design, may have a moderate adverse impact even after mitigation.

### 17.9 Cumulative and Interactive Impacts

There is potential for cumulative effects, with regard operational effects. It is known that there may be other pipeline projects implemented within the same corridor as this project. However, operationally, this is not likely to be significant (depending on the number of vehicle movements anticipated during operation along the corridor, the width of clearance, and earthworks required). It is also known that there are no significant aboveground structures proposed by other projects (in planning at present) within the project area, except for the Powerlink-proposed high voltage powerlines in the Alton Downs area. As far as reasonable, the pipeline and other infrastructure has been located in the vicinity of this infrastructure. Significant adverse effects may be avoided through the implementation of mitigation measures as outlined in Section 17.7.

### 17.10 Summary and Conclusions

The construction effects of the project on landscape and visual amenity will primarily be related to site clearance and general construction activities that would occur during the limited duration of the construction activities. These will be controlled through mitigation measures set out within the Construction EMP to ensure that most adverse effects resulting from the construction of the project on landscape and visual amenity are minimised or avoided.

The landscape and visual impacts once the project becomes operational are generally likely to be minor, with the exception of the WTP. This is considered to have a moderate impact. Mitigation measures in relation to operation are proposed in order to minimise these impacts, as set out above, and would be further detailed following the completion of detailed design for construction.

Table 17.4 Summary of Impacts – Construction Phase

EIS Area: Landscape and Visual Impact Feature/Description/ Viewpoint	Current value + Substitutable Y:N	Description of Impact		
		Description in Words	Mitigation Inherent in Design/Standard Practice Amelioration Who?/Why?/Scale?	Residual Impact using Significance Criteria
All Viewpoints (site-wide)	Locally and regionally valued views with capacity to accept some change.	Site clearance and general construction activities.	Retain and protect vegetation; hoardings; restricted work hours; tidy storage; dust free access routes; removal of spoil and construction materials upon completion; compounds off-site.	Minor, -ve, D, T, ST

Table 17.5 Summary of Impacts – Operational Phase

EIS Area: Landscape and Visual Impact Feature/Description/ Viewpoint	Current Value + Substitutable Y:N	Description of Impact		
		Description in Words	Mitigation Inherent in Design/Standard Practice Amelioration Who?/Why?/Scale?	Residual Impact using Significance Criteria
1. Rockhampton Ski Club	Regionally and locally valued. In parts substitutable.	Clearing of vegetation and introduction of built elements into the landscape.	Avoid significant vegetation; screen planting; built form to sit within existing topography; built element designed to reduce visibility within landscape.	Minor; –ve; D; P; LT.
2. Corner of McNamara and Klaproth Roads	Locally valued with capacity for the landscape to accept limited change.	Introduction of built elements and associated infrastructure into open landscape. Minor clearing of vegetation and earth works. Movement of workers.	Screening; built form to sit within existing topography; built elements form and design to reduce visibility within landscape.	Moderate; –ve; D; P; LT.
3. Ridgелands Road (west of WTP)	Locally valued with capacity for the landscape to accept limited change.	Introduction of built elements and associated infrastructure into landscape. Partial screening by existing vegetation. Minor clearing of vegetation and earth works. Movement of workers.	Screening; built form to sit within existing topography; built elements form and design to reduce visibility within landscape.	Minor; –ve; D; P; LT.
4. Ridgелands Road (at pipeline crossing point)	Locally valued with capacity for the landscape to accept some change.	Clearing of vegetation. New access road and movement of vehicles and workers.	Encourage natural regeneration of grass and vegetation to pipeline corridor margin.	Negligible
5. Capricorn Highway	Locally valued with capacity for the landscape to accept some change.	Clearing of vegetation. New access road and movement of vehicles and workers.	Encourage natural regeneration of grass and vegetation to pipeline corridor margin.	Negligible
6. Meura Road	Locally valued with capacity for the landscape to accept some change.	Clearing of vegetation. New access road and movement of vehicles and workers.	Encourage natural regeneration of grass and vegetation to pipeline corridor margin.	Negligible
7. Roope Road	Locally valued with capacity for the landscape to accept some change.	Clearing of vegetation. New access road and movement of vehicles and workers.	Encourage natural regeneration of grass and vegetation to pipeline corridor margin.	Negligible
8. Bajool Port Alma Road	Locally valued with capacity for the landscape to accept some change.	Clearing of vegetation. New access road and movement of vehicles and workers.	Encourage natural regeneration of grass and vegetation to pipeline corridor margin.	Negligible

EIS Area: Landscape and Visual Impact Feature/Description/ Viewpoint	Current Value + Substitutable Y:N	Description of Impact		
		Description in Words	Mitigation Inherent in Design/Standard Practice Amelioration Who?/Why?/Scale?	Residual Impact using Significance Criteria
9. Darts Creek Road	Locally valued with capacity for the landscape to accept some change.	Clearing of vegetation. New access road and movement of vehicles and workers.	Encourage natural regeneration of grass within corridor, and vegetation and trees adjacent to corridor to form a screen to properties.	Minor; -ve; D; P; LT.
10. The Narrows Road	Locally valued with capacity for the landscape to accept some change.	Clearing of vegetation. New access road and movement of vehicles and workers.	Encourage natural regeneration of grass within corridor, and vegetation and trees adjacent to corridor to form a screen to properties and maintain local character.	Minor; -ve; D; P; LT.
11. Aldoga Reservoir	Locally valued with capacity for the landscape to accept some change.	Introduction of built elements and associated infrastructure into the landscape. Minor clearing of vegetation and earth works. Movement of workers.	Reduce visual intrusion through; vegetation screening and earthworks; sensitive built form to sit within existing topography; built elements form and design to reduce visibility within landscape.	Minor; -ve; D; P; LT.
<b>KEY:</b> Significance criteria: Major, High, Moderate, Minor, Negligible +ve = positive; -ve = negative impacts D = direct; I = indirect C = cumulative; P = permanent; T = temporary ST = short-term; MT = medium-term; LT = long-term		<b>Relative Duration of Environmental Effects</b> Temporary: Up to one year Short-term: From one to seven years Medium-term: From seven to 20 years Long-term: From 20 to 50 years Permanent: Period in excess of 50 years		



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GLADSTONE – FITZROY  
**PIPELINE PROJECT**  
Environmental Impact Statement

Summary of Impacts  
and Cumulative Effects



Gladstone Area  
Water Board



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This information has been prepared by, or on behalf of, the Gladstone Area Water Board (GAWB) regarding the Gladstone-Fitzroy Pipeline Project. Care has been taken to ensure that the information is accurate and up to date at the time of publishing.





## 18. Summary of impacts and cumulative effects

### 18.1 Introduction

Each chapter of the EIS contains a summary of the impacts relevant to that subject area. That summary information is not repeated here, however high level summary and conclusions are provided in relation to the impacts of the project.

This chapter also provides a summary of the likely cumulative effects that could occur as a consequence of the project in conjunction with the development of other proposals that are currently under study and any interactive effects that may occur as a result of the interrelationship of impacts.

### 18.2 Summary of impacts

Throughout the site selection and design processes for the project, attention has been paid to the minimisation of adverse effects on the environment and communities during construction and operation of the project. For example, the alignment of the pipeline and siting of infrastructure has taken into account sensitive environmental sites such as Yellow Chat habitat and remnant vegetation, and has avoided residential areas where possible.

Iterations of the design process have allowed environmental factors to be considered, for example in the selection of creek crossing methods. Where possible, creeks with permanent water or significant vegetation will be crossed through trenchless methods, reducing in-stream disturbance and disturbance to riparian vegetation.

Community engagement has also been undertaken as part of the project, to inform landowners and the public about the project. This has included a free call 1800 information line and project email to answer queries from interested stakeholders, and newsletters to landowners and GAWB's customers.

The EIS describes the baseline environment in the project area for each topic area considered. This information has been gathered through fieldwork, review of existing mapping, aerial photography, published records and data obtained from statutory and non-statutory bodies such local councils, government departments or local interest groups.

The potential impacts identified in the EIS relate mainly to the following aspects of the project:

- The clearing of the 30 m construction width for the pipeline (the right-of-way (ROW)), with some direct impacts to vegetation and associated habitat areas
- Construction activity (for example clearing and trenching) in the ROW with the potential for temporary dust and noise generation, disruption to land uses, and reduction in visual amenity
- Construction at creek crossings with potential impacts to riparian vegetation, stream banks and water quality
- Traffic generation during construction and operation and the potential impacts to roads in the project area
- The operation of the water treatment plant (WTP) with the potential for noise generation, impacts to visual amenity and transport of waste residue
- The generation of testing water during the commissioning of the WTP and pipeline and the disposal of this water to land or waterways
- Potential for weed and weed seed spread during construction and operation.

Where adverse impacts have been identified, mitigation measures have been proposed to manage the impact. The Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines has been used as a guide for the development of mitigation measures. The residual impact has then been assessed taking into account the proposed mitigation measures. The residual impacts have been assigned a significance using significance criteria developed for each topic area, and can also be beneficial. The majority of impacts arising from the project have been assessed as negligible to minor adverse significance once mitigation measures are considered.

In the case of vegetation clearing, it is not possible to completely mitigate the adverse effects, however vegetation offsets may be secured through the vegetation clearing permit process under the *Vegetation Management Act 1999*.

Carbon emissions from the construction and operation of the project have been assessed as having a negligible impact (see Chapter 10 Air Environment). However, there is the potential for these emissions to be offset through the carbon offsetting program that GAWB is investigating for the whole of its operations.

Two historical cultural heritage sites have been identified as likely to be impacted by the project – the Woolwash to Frogmore Pipeline and Twelve Mile Road. Both sites will be photographically recorded prior to construction commencing, to contribute to the cultural heritage record.

Importantly, the potential impacts to matters of National Environmental Significance (Threatened Species and Ecological Communities) have been assessed against the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* criteria and found that the project is not likely to have a significant impact on these matters.

The mitigation measures described in each chapter have also been included in the Environmental Management Plan (EMP), with other measures where necessary. This EMP included in the EIS (Chapter 20, Planning Environmental Management Plan), forms the basis for the development of the Construction and Operations EMPs which will be developed in those phases of the project.

The economic assessment has assessed the project as having a contribution to the local and regional economy and the provision of employment opportunities during construction and operation. The project also contributes to the continued economic growth of the region through the provision of water to GAWB's Gladstone customers. Consideration has also been given in the design of the pipeline for possible bulk water supply to local authorities along the pipeline, contributing to water supply security in the region.

### 18.3 Cumulative Effects

The following assessment of cumulative effects is limited by the level of information currently available on the other proposed projects. The proposed projects identified for the area are the Stanwell - Gladstone Infrastructure Corridor (SGIC) and the Gladstone State Development Area (GSDA) described in Chapter 1, Introduction. There are currently no committed projects within the SGIC, limiting the information available for a comprehensive assessment to be undertaken. The assessment predicts the main effects which are likely to occur using the available information and assumptions which have been made in the absence of definitive information are based on best practice and project team experience.

The purpose of the SGIC is to reduce the potential cumulative effects of multiple projects in the fast-growing region by locating infrastructure in one purposely chosen location that will minimise impacts on the environment and community. It is intended to lessen the disruption caused by investigation and construction such as noise, air and transport impacts on individual landowners, surrounding communities and the environment that would otherwise occur if access to multiple pipeline routes was sought on a project-by-project basis. Future infrastructure projects within this corridor will be required to adequately manage its impacts, which will include consideration of potential cumulative impacts relating to concurrent projects.

Similarly, within the GSDA the land is currently being used for, or is planned for, large-scale industrial development. Again, there are no committed projects within this area with sufficient detail available to enable a comprehensive assessment of cumulative impacts to be undertaken. The use and planning of the area for that purpose will reduce cumulative impacts to other land uses.

The co-location of projects within the GSDA and the SGIC should limit potential cumulative impacts to within their respective boundaries even though it is possible for the impacts of construction or operation of more than one project to occur concurrently. With the exception of the Gladstone Pacific Nickel slurry pipeline which is proposed to align within SGIC, the details of these future projects are not known. It is assumed any future pipeline projects in the SGIC are likely to have similar impacts to those described for this project and when occurring at the same time can have a greater effect on the surrounding environment. The impacts that may potentially have a cumulative effect with other projects include:

- Land use disturbances during construction and maintenance of the project would occur over a greater area and time period as more projects progress
- The potential for erosion and sedimentation, or impacts from the disturbance of acid sulfate soils (ASS) are increased if construction activities occur over a greater area
- The area of vegetation cleared for each project would have a cumulative effect on the loss of habitat for flora and fauna and on the loss of visual amenity
- The area of disturbance to creeks and waterways would increase as future projects are constructed in the same alignment. To some extent this is minimised through the selection of appropriate creek crossing methods
- Air quality impacts from dust generation would be worsened if multiple projects are constructed in similar timeframes
- Noise arising from construction and operation activities of several projects may have a cumulative effect on adjacent sensitive receptors (residential areas)
- Traffic volumes on local and regional roads would increase with each project constructed
- There is greater potential for the loss or damage to items of cultural heritage significance during construction over a wider area
- The economic benefits of many projects occurring at once would have a cumulative benefit in the economic growth and employment in the region
- Increased construction activity in the local area has the potential to increase the pressure on the already strained accommodation market as new workers are attracted to the region.



The management of these types of effects is to be implemented through individual project EISs and Construction and Operational EMPs. As future projects are progressed, cumulative impacts are unavoidable; however the severity of these effects will depend on the environmental management practices of each future project that is to be implemented. These impacts will generally be confined to the width of the SGIC – approximately 100 m.

## 18.4 Interactive Effects

Interactive effects arise where effects from one environmental element bring about changes in another environmental element. The potential interactive effects identified in the EIS are summarised below:

- There is the potential for noise, air quality, visual amenity and traffic impacts during construction and operation to have an interactive effect on the amenity of residential areas surrounding the WTP. Mitigation measures implemented as part of this project would reduce the severity of these impacts.
- Disturbance to ASS or contaminated land during construction may have an interactive effect by impacting surface or groundwater quality. The implementation of an ASS Management Plan and management of potentially contaminated sites would reduce the risk of this occurring.
- Removal of vegetation during construction could increase erosion and sedimentation of surface or groundwater. Measures to reduce vegetation clearing and implement erosion and sediment controls during construction are described in Chapter 20, Planning Environmental Management Plan, and would reduce this impact.

Appendix G –  
Potential Impacts on  
Matters of National  
Environmental  
Significance



**Gladstone Area  
Water Board**

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## **G Potential Impacts on Matters of NES**

### **G.1 Introduction**

This report forms an appendix to the EIS for the Gladstone–Fitzroy Pipeline project (the project) and describes the likely significant impacts of the project on matters of National Environmental Significance (NES) as defined in the *Environment Protection Biodiversity Conservation Act 1999 (Cth) (EPBC Act)*.

There is one matter of NES that functions as a controlling provision for this action. This is the controlling provision on listed Threatened species and communities (*EPBC Act*, Sections 18 and 18a). Hence, the Terms of Reference (ToR) for the EIS require that information be provided specifically on Threatened Species and Ecological Communities.

The assessment of potential impact to *EPBC Act* listed Threatened Species and Ecological Communities has been undertaken through desktop research and detailed fieldwork. The chapters of the EIS that address these matters are Chapter 6 Terrestrial Flora, Chapter 7 Terrestrial Fauna and Chapter 8 Aquatic Flora and Fauna. The findings of these chapters are summarised in this report.

The TOR outlines that information be provided on the following list of *EPBC Act* listed species and threatened ecological communities (however it should be noted that EIS chapter 6, 7 and 8, and therefore this report, covers more *EPBC Act* listed threatened flora and fauna species than specified in the TOR):

#### Fauna

- Yellow Chat (*Epithianura crocea macgregorii*);
- Fitzroy Tortoise (*Rheodytes leukops*);
- Brigalow Scaly Foot (*Paradelma orientalis*);
- Squatter Pigeon (*Geophaps scripta scripta*);
- Yakka Skink (*egernia rugosa*).

#### Flora

- Semi evergreen vine thickets of the Brigalow belt;
- Brigalow (*Acacia harpophylla* dominant and co-dominant) (note that this refers to brigalow communities, and not individual plants)
- *Atalaya collina*;
- *Cycas megacarpa*;
- *Cycas ophiolitica (Cth)*;

- *Quassia bidwillii*.

As this report covers this controlling provision only, other matters of NES are not discussed here, but are assessed within the EIS itself (e.g. the impact upon migratory species is assessed in Chapter 7).

## **G.2 Description of Proposed Action (as it would impact on NES matters)**

GAWB has been planning for the future water needs of the Gladstone region by preparing contingency plans to secure water within a suitable timeframe if and when additional water supply is required, either through drought or an increase in industrial demand for water.

As part of this forward planning, and although the recent drought urgency has reduced, GAWB is carrying out preparations for the project to ensure a two year construction phase can commence as soon as low dam level or increased demand indicates the need.

The project will be capable of delivering up to 30 GL of water each year (approximately 100 ML/day) from the Fitzroy River at Laurel Bank, providing an additional water source to Awoonga Dam, currently GAWB's sole source of water.

Project works include:

- Underground pipeline of 115 km length and 1 metre diameter from Alton Downs to Gladstone (construction works will occur within a 30.5 – 34.5m Right of Way (ROW));
- River intake pumping station;
- Water treatment plant, reservoir and pumping station at Alton Downs;
- Booster pumping station and reservoir at Raglan;
- Reservoir at Aldoga; and
- Connection works at Yarwun.

The pipeline route from Laurel Bank will traverse mainly freehold land up to the Stanwell Gladstone Infrastructure Corridor (SGIC), in which the pipeline will be located for most of its length, before entering the Gladstone State Development Area (GSDA) where it will terminate at existing water infrastructure.

The pipeline alignment and proposed sites for the associated infrastructure are shown in Figure 1.3 of the EIS [Locality Map]. A detailed description is provided in Chapter 2 of the EIS [Project Description].

The activities associated with the project that have the potential to impact upon *EPBC Act* listed threatened species and threatened ecological communities include:

- Vegetation clearing and habitat disturbance;
- Habitat fragmentation and disturbance to wildlife movement corridors;
- Disturbance to wetlands and waterways; and
- Introduced fauna and flora.

Mitigation measures have been proposed in the EIS to address the identified impacts and these are also included in this Matters of NES Report in Sections G.7.1.3 and G.7.2.5.

### **G.3 Methodology for Terrestrial Fauna Study**

#### **G.3.1 Existing Information Review**

Existing information regarding the terrestrial fauna of the project area and surrounding area was collated and reviewed. The following documents and database information were considered in the preparation of this report:

- Fauna databases of the Commonwealth Government (*EPBC Act* Protected Matters database), the Queensland Museum, Birds Australia and Queensland Environment Protection Agency's (QEPA) Wildlife Online database. Note: search area based on a 30 kilometre buffer from the extent of the project area;
- Fauna data and background information derived from relevant studies for the wider area (e.g. Longmore 1978, Driscoll 1997, Sattler and Williams 1999, Young *et al.* 1999, McFarland *et al.* 1999, CZEWM CRC 2003a and 2003b, DEH 2005d, Houston *et al.* 2004a and b, Jaensch *et al.* 2004, RLMS 2006a and 2006b, HLA 2006, Houston *et al.* 2006, Houston 2006);
- QEPA Regional Ecosystem mapping and Essential Habitat mapping;
- Aerial photography to identify vegetation in the local area, comparing patterns observed with existing vegetation mapping;
- QEPA Brigalow Belt Biodiversity Planning Assessment mapping and database; and
- Commonwealth Government's Directory of Important Wetlands database.

#### **G.3.2 Target Species**

The findings of the desktop assessments indicated that a number of species of conservation significance may use habitats of the project area and surrounding lands. Consequently, consideration was given to these species (termed *target species*) in the design and implementation of the field survey program and habitat assessments. *EPBC Act* listed threatened target species considered as part of these investigations for the project area are listed in Table 3.

#### **G.3.3 Field Survey Program**

The review of existing information assisted in prioritising the variety of habitats and locations for field surveys (e.g. HLA 2006, Houston *et al.* 2006, and Houston 2006). These primarily assisted in the consideration of priority habitat areas for field surveys for *EPBC Act* listed threatened species.

The field survey program was initiated in April 2007 and comprised of the following survey events:

- A preliminary biodiversity investigation undertaken between 1 and 5 April 2007 by Lindsay Agnew and Dr. Ed Meyer;
- A series of monthly surveys to monitor known and potential habitat areas for the *EPBC Act* listed threatened Yellow Chat (*Epthianura crocea macgregori*). The program began in June 2007 and continued through until the final monitoring event undertaken in December 2007. These surveys were conducted by Lindsay Agnew and Dr. Ed Meyer;
- A spring-season avifauna survey conducted on 2–6, 27 and 28 September 2007 by Lindsay Agnew; and
- A comprehensive target species and biodiversity survey undertaken between 18 and 31 November 2007 by Lindsay Agnew and Dr. Ed Meyer.

The field investigators for this study have had extensive experience in surveying the suite of target species and applying the relevant survey methodologies.

#### **G.3.3.1 Preliminary Biodiversity Surveys**

The preliminary biodiversity field survey was conducted between 1 and 5 April 2007 by Lindsay Agnew and Dr. Ed Meyer. The latter part of the program was undertaken in conjunction with the project botanist, Derek Johnson (BMT WBM). This work involved morning and afternoon area searches for avifauna, active ground searches for reptiles and amphibians, census of wetlands for waterbirds, and general searches for indirect evidence of fauna occurrence (e.g. scats, tracks, nests, etc.). The full extent of the project area (including several route options) was covered. The location of each survey site is shown in Figure 7.1 and 7.2 of the EIS.

#### **G.3.3.2 Monthly Yellow Chat Habitat Monitoring**

As a result of the existing information review and an initial ground-truthing exercise (April 2007), a number of areas were selected to investigate for the presence of the *EPBC Act* listed threatened Yellow Chat (*Epthianura crocea macgregori*). The areas were either part of a wider area of known Yellow Chat habitat, or were considered as potentially suitable habitat (within the species' known range) based on reference to habitat characteristics and local studies (e.g. Houston (2006) and HLA (2006)).

The monitoring program was undertaken over a period of two to three days each month from June 2007 through to December 2007 (inclusive) to assess any seasonal pattern of habitat usage. The amount of time dedicated to surveying each area varied according to the size of the area, though typically ranged from 30 to 90 minutes. These areas were surveyed using either binoculars and/or a spotting scope. The full extent of each area was surveyed during each monitoring event. These surveys were conducted by Lindsay Agnew and Dr. Ed Meyer.

Table 1 identifies each area monitored and the frequency and timing of the monitoring events. A variety of other fauna species were recorded incidental to the survey for Yellow Chat. Those records have been incorporated within the main fauna database results in Chapter 7 of the EIS. The location centroid for each monitoring site is provided in Figure 7.1 and 7.2 of the EIS. The mapped areas considered potentially suitable as habitat for the Yellow Chat are provided in Figure 7.1 and 7.2 of the EIS.

**Table 1 Summary of Yellow Chat Investigation Sites**

Site #	Central GPS reference	Summary description	Monitoring events
1	248120E 7404586S	Seasonal wetlands associated with Gavial Creek in the vicinity of Roope and Port Curtis Roads. Adjacent to eastern side downstream of corridor.	April, August, September, October, November, December
2	248938E 7403192S - 250173E 7400309S	Seasonal wetlands associated with Serpentine Creek. Adjacent to eastern side and downstream of corridor.	No property access granted.
3	253008E 739693S	Seasonal wetland habitat to the near south of Casuarina Road, Midgee. Eastern sectors transected by corridor. The majority of this site is adjacent and to east of corridor. Downstream of corridor.	April, August, September, October, November, December
4a	250763E 7395925S	A small, semi-permanent constructed wetland. Approximately 1km to west and upstream of corridor.	April, June, July, August, September, October, November, December
4b	251453E 7394380S	A small, semi-permanent constructed wetland. Approximately 1km to west and upstream of corridor.	April, June, July, August, September, October, November, December

Site #	Central GPS reference	Summary description	Monitoring events
5	256251E 7389205S	Seasonal and semi-permanent wetland habitats associated with Station Creek and its tributary Oakey Creek. Includes constructed and semi-natural wetland features. Adjacent and to east of corridor. Downstream of corridor.	No property access granted.
6a	261091E 73848155S	Seasonal wetland habitats comprised of a series of swales and depressions to the near north of disused Port Alma rail link. Part of the Six and Eight Mile Creek systems. Corridor transects area, though largest part is east of corridor.	April, June, July, August, September, October, November, December
6b	262895E 7384194S	Seasonal wetland habitats comprising of a series of swales and depressions to the near south of disused Port Alma rail link. Corridor transects habitat area, though largest part is east of corridor.	April, June, July, August, September, October, November, December
7	265744E 7384554S	Cheetham drain area comprising estuarine/saltmarsh/clay pan habitat complex. Extends to north and south of Toonda Port Alma Road. Approximately 1.3 to 2km east and downstream of corridor.	April, June, July, August, September, October, November, December
8a	270679E 7379990S	Twelve Mile Creek Reserve. An extensive mosaic of large seasonal pools, clay pans and saltmarsh. Adjacent and to east of corridor. Downstream of corridor.	April, June, July, August, September, October, November, December
8b	270530E 7379259S	Bulrush-lined freshwater section Twelve Mile Creek downstream of Twelve Mile Road and contiguous with Twelve Mile Creek Reserve. A series of large pools fringed with <i>Typha</i> and <i>Eleocharis</i> sp. Corridor traverses this habitat area.	April, June, July, August, September, October, November, December

Site #	Central GPS reference	Summary description	Monitoring events
8c	270111E 7378801S	Freshwater section Twelve Mile Creek upstream of Twelve Mile Road. Includes pools fringed with <i>Typha</i> and <i>Eleocharis</i> sp. Approximately 800m upstream of corridor crossing of Twelve Mile Creek.	April, June, July, August, September, October, November, December
9a	273668E 7377863S	Seasonal wetlands (both artificial and natural) associated with Pelican Creek. Corridor transects upstream section of wetland. The majority of wetland habitat extends to east.	April, June, July, August, September, October, November, December
9b	273585E 7377768S	Small, semi-permanent constructed wetland fringed with <i>Typha</i> and <i>Eleocharis</i> sp. On western side of Twelve Mile Road and approximately 100m west and upstream of corridor.	April, June, July, August, September, October, November, December
10a	276457E 7377847S	Saltmarsh environs associated with the Raglan Creek oxbow. Also includes semi-permanent constructed wetlands, adjacent and to the south and southwest. This site is directly to the north of site 10b. Approximately 600m north and downstream of corridor.	April, June, July, August, September, October, November, December
10b	276551E 7377043S	A series of seasonal wetlands associated with Horrigan Creek. Includes natural saltmarshes and shallow, seasonal natural and constructed wetlands and levees. Corridor traverses eastern edge of area. Downstream of corridor.	April, June, July, August, September, October, November, December
11	291225E 7366997S	A large, vegetated semi-permanent billabong associated with Darts Creek. Remnant vegetation surrounds site and includes <i>Eucalyptus tereticornis</i> .	April, June, July, August, September and December

Site #	Central GPS reference	Summary description	Monitoring events
12	268699E 7379374S	Two small vegetated freshwater dams adjacent and to the east and west of the Toonda Port Alma Road. Approximately 500m to west and upstream of corridor.	April, June, July, August, September, October, November, December

### G.3.3.3 Spring-season Avifauna Surveys

For terrestrial habitats, surveys were undertaken on foot along transects through selected areas representative of the variety of habitat types along the corridor. At each location, surveys were undertaken for a minimum of 30 minutes and the time spent at a location was determined by factors including habitat extent and level of bird activity at the time. Birds were identified from either direct observation and/or their vocalisation.

A variety of wetlands were surveyed for waterbirds. Each census was undertaken using binoculars and/or a tripod mounted spotting scope (25–60 times magnification). In the main, visual coverage of the full extent of the site was completed at least once with the survey duration dependent on factors like size of waterbody and number of birds present. At each location, surveys were conducted for a minimum of 20 minutes.

These surveys were conducted by Lindsay Agnew on 2–6, 27 and 28 September 2007. The location of each survey site is provided in Figure 7.1 and 7.2 of the EIS.

### G.3.3.4 Target Species and Biodiversity Survey

A series of rapid biodiversity assessments and target species surveys were undertaken in a range of representative and/or distinctive habitat types throughout the project area. The survey program was undertaken between 18 and 31 November 2007 and implemented by Lindsay Agnew and Dr. Ed Meyer. Greg Ford provided assistance with Anabat call recording analysis.

The timing of the survey program was designed to coincide with warmer conditions when bioactivity is typically higher for all vertebrate fauna groups. The timing was considered particularly important as it enhanced the ability to detect target species, especially reptiles.

The field survey targeted a full suite of remnant, remnant regrowth and cleared habitats representative of those occurring throughout the extent of the project area. These areas were determined from the results of a review of aerial photography and vegetation mapping and

field observations from the previous survey activities (i.e. preliminary biodiversity surveys, monthly Yellow Chat monitoring and spring-season avifauna surveys). The variety of field methodologies deployed and the survey effort applied at each survey area was influenced by the following:

- The presence, extent and condition of preferred habitat types for species of conservation significance;
- The potential of an area to support higher biodiversity values, e.g. those areas forming part of a notably larger wetland or forested habitat area;
- The potential of an area to support higher fauna movement values, e.g. riparian environments.

Survey activities undertaken to assess target species and biodiversity were applied on each survey night and survey day and included:

- *Diurnal ground searches.* These dedicated searches were undertaken for reptiles at selected sites (of approximately two hectares (0.02 km<sup>2</sup>) in area) and surveyed for a minimum of one survey person hour. Surveys were undertaken mid-morning to mid-afternoon of each survey day. Active ground searches were undertaken to locate active/inactive reptiles. Ground searches included rolling logs and rocks, raking soil at the base of trees and shrubs, searching under exfoliating bark on logs and standing dead or live trees and examination under debris.
- *Morning and afternoon bird surveys.* Surveys were undertaken along foot transects through selected habitats, typically for a minimum of a 30 minutes. Surveys were conducted within three hours of sunrise and sunset of each survey day. Birds were identified from either direct observation and/or their vocalisation.
- *Call playback surveys.* These surveys were undertaken for owls and a variety of cryptic wetland birds. For nocturnal birds, the procedure included playback of calls in a specified order with each species' call separated by several minutes of listening for responses and visual scanning (in the dark) of the immediate surrounds for birds. After all calls were broadcast, the call site and close vicinity were scanned by spotlight for approximately five to ten minutes. Once a species was detected, no further calls of that species were broadcast for the remainder of the survey program. The procedure included playback of calls for three to five minutes per species. Each species call was separated by several minutes of listening for responses and visual scanning of the immediate surrounds of the call site. Call recordings for wetland avifauna were sourced from Stewart (1999) and those for nocturnal birds were sourced from Stewart (1998)
- *Anabat ultrasonic call detection surveys.* The survey program for insectivorous bat fauna was undertaken using electronic bat detectors. Remote detection techniques with Anabat II detectors were used to record the ultrasonic signals of active bats.

- Remote detection (i.e. equipment programmed for unattended, fixed point, overnight detection of microbat calls) was conducted on six survey nights (dusk to dawn).
- *Walking spotlight surveys.* These surveys were undertaken at a variety of potentially suitable forested and wetland sites. Spotlighting surveys on foot were undertaken using 30-Watt spotlights and low-wattage headlamps. Depending on the habitat characteristics, approximately half of the search effort was dedicated to arboreal searches with the remaining time spent on ground searches for nocturnal herpetofauna and ground mammals (e.g. bandicoots). Where applicable, arboreal surveys targeted mammals (e.g. possums and gliders), nocturnal birds (e.g. owls and nightjars), reptiles (e.g. snakes and geckos) and flying mammals (e.g. flying foxes).
  - *Driving spotlight surveys.* Driving spotlight searches were undertaken from a 4WD vehicle along the track system within the project area (i.e. driver plus one observer with 100-Watt spotlight). These were conducted for a minimum of 30 minutes on each of the survey nights. Driving spotlight searches were undertaken primarily to survey for larger arboreal and ground mammals (e.g. macropods, foxes, cats and dogs). Additional road transects were also conducted specifically to survey for herpetofauna.
  - *Waterbody/wetland surveys.* A variety of waterbodies/wetlands were surveyed for waterbirds, waders and freshwater turtles. For avifauna, a census was undertaken using binoculars and/or a tripod mounted spotting scope (25–60 times magnification). Visual coverage of the full extent of the site was completed at least once with the census duration dependent on factors like the size of the waterbody and number of birds present. At each site, an additional inspection of the waterbody surface and margins was undertaken to assess the presence of freshwater turtles. Binoculars and/or a tripod mounted spotting scope were used to confirm turtle identification.
  - *Inferential evidence.* Inferential evidence of fauna occurrence was sought and found throughout the project area. This included: visual inspections of trees for trunk scratches/rubbings; searches for both predator and non-predator scats; fauna tracks; and other signs of fauna occurrence (e.g. feeding debris, shed skins and nests). Only evidence, which could be categorised as definitive, was used to record a species occurrence on the study site. Scats or pellets found were either identified in the field (using Triggs 1996) or collected and sent for identification and content analysis by Barbara Triggs, 'Dead Finish', Victoria (faeces analyst). Results were subsequently categorised into one of three reliability classes: definite; probable; or possible.

The location of each survey site and associated survey activities (e.g. call playback and Anabat surveys) is provided in Figure 7.1 and 7.2 of the EIS.

QEPA was consulted regarding the abovementioned survey program and considered it suitable (including specifically the non-trapping approach) given the nature and condition of habitat within the project area and the nature of the project. Consultation with QEPA was undertaken through the Central Region Planning Division, QEPA Rockhampton.

### G.3.4 Assumptions and Limitations for the Fauna Study

All habitat assessments and fauna surveys were conducted during the period April to November 2007. Although there were moderate amounts of rainfall in late winter and early November 2007, rainfall coverage was patchy, and only the early November rainfall promoted reasonable vegetative growth (particularly in relation to diversity and biomass of grasses) in areas where rainfall was heaviest. Much of the region still exhibited the effects of having experienced drought conditions for an extended period (>5 years).

Consequently, there was a scarcity of permanent to semi-permanent waterbodies within the project area at the time of sampling and conditions sampled here should not be considered as representative of conditions at other times. In respect of water birds, whilst aquatic habitats were restricted in number and size, recorded species diversity was considered sound, though abundance was considered depressed.

Several native fauna groups were poorly represented within the recorded assemblage and/or in low abundance. These were the arboreal mammals, bats, frogs (arboreal, ground-dwelling and burrowing taxa) and elapid snakes. A variety of factors may be linked to these results and include:

- the effect of prolonged dry conditions on the presence and/or extent of favourable conditions and resources (e.g. very limited areas of surface water and depressed frog activity); and
- the condition, absence or scarcity of certain key structural habitat resources in parts of the project area, e.g. suitable tree hollows (arboreal mammals), fallen timber (mainly herpetofauna) and sparse ground cover conditions (small ground mammals and skinks).

Several target species for the field investigations are cryptic and difficult to detect (e.g. Yakka Skink [*Egernia rugosa*]). Under optimal conditions, surveys undertaken at multiple time periods would be required to confirm the absence (or otherwise) of these species from a site. This survey limitation has been minimised by the use of previous records, in conjunction with habitat assessment, to predict which species are likely to occur.

It is probable that additional species would be detected with more survey effort, particularly those species whose activity (and thus chances of detection) is higher during wetter periods. Potential limitations of the fauna survey were primarily associated with:

- Several years of dry to very dry (drought) field conditions prior to survey period. Such conditions are likely to have resulted in generally lower abundance of most fauna groups overall and significantly constrained the opportunity to determine the

occurrence of a number of cryptic amphibian and reptile species that are more readily detected at other times of the year or weather conditions; and

- A low abundance of flowering plants throughout the project area, in particularly canopy trees which is linked to the above point. Blossom provides an important source of food (e.g. nectar and pollen) and invertebrate prey for birds, microbats, flying foxes and small glider species. The diversity and abundance of small insectivorous birds (e.g. honeyeaters) are likely to be lower than could be expected as a result.

There were no notable or permanent impediments to accessing the extent of the project area, and where individual property access was not granted, surveys were undertaken at adjacent sites or public areas.

## **G.4 Methodology for Terrestrial Flora Study**

### **G.4.1 Review of Existing Information**

#### **G.4.1.1 Spatial Data**

A number of Geographical Information System (GIS) datasets, including the project corridor, were overlaid on rectified aerial photography. The datasets were:

- Rectified aerial photo mosaic (average age of component photos 2005);
- Cadastre (produced by the Department of Natural Resources and Water);
- Regional Ecosystem (RE) vegetation mapping by the Queensland Herbarium (Version 5.0 with December 2006 Amendments) (EPA 2005b); and
- Biodiversity Planning Assessment (BPA) mapping (Version 3.4 – 7 March 2005) (EPA 2005c).

#### **G.4.1.2 Existing Reports**

A number of reports pertaining to the project area and surrounds were assessed for relevance and were used for general background information (see bibliography at the end of Chapter 6 of the EIS).

#### **G.4.1.3 Desktop Review of Mapping**

Regional Ecosystem mapping (EPA 2005b) was used to locate the larger patches of native vegetation intersected by the corridor. Air-photo interpretation was used to identify any other unmapped patches of native vegetation. Representative remnant Regional Ecosystems were sampled along the entire length of the proposed corridor, with the exception of those private properties where access was not granted. Each vegetation remnant shown in Regional Ecosystem mapping (EPA 2005b) and intersected by the corridor was sampled in detail at least once. Unmapped remnants of sufficient size or width to be mappable according to Queensland Herbarium mapping methodology (EPA 2005a) were also sampled<sup>1</sup>. This was done to verify the mapping, and to check for targeted *EPBC Act* listed threatened flora species known to occur in the area.

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<sup>1</sup> According to Herbarium methodology the remnant size can be as small as 0.25 Ha and/or 25m wide.

#### **G.4.1.4 Existing Field Data**

Brief site data collected in April 2007 by BMT WBM for a preliminary assessment of the corridor were incorporated into this study and used as the main source of background information. Brief site data included the recording of dominant plant species at each site, and other relevant information such as condition, soil type etc. Conspicuous *EPBC Act* listed threatened species were also targeted as part of the preliminary assessment. For example, for the threatened species listed in the *EPBC Act*, *Cycas* spp. were conspicuous in eucalypt forest during reconnaissance, and *Atalaya* spp. in softwood scrub were also relatively distinctive. Publicly accessible roads were mostly used in this stage of the study, and site data is presented in Appendix E2 of the EIS.

#### **G.4.1.5 Databases**

Two publicly accessible databases with restricted locational precision were searched to identify *EPBC Act* listed threatened flora known to occur, or likely to occur, in the project area and surrounds. Both searches were done by specifying coordinates (defining a rectangle) that contained the entire project area:

- Wildlife Online – a Queensland EPA internet database accessible to the public which stores records of plant collections (and other groups including algae and fungi) for a search area defined by the user. This search was used to identify species which are simultaneously listed under the *EPBC Act* as threatened.
- *EPBC Act* Protected Matters Report – a Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) internet database accessible to the public which lists threatened species for a search area defined by the user.

The likelihood of occurrence of individual *EPBC Act* listed threatened flora species (strictly, they are *taxa*, since sub-species levels can apply) was assessed in two ways:

- firstly whether the species was considered likely to occur within close proximity to the corridor (creating a risk of disturbance); and
- secondly whether the species was considered likely to be consistently associated with one or more of the categories defined by the GIS coverages (e.g. a particular RE on the RE mapping).

#### **G.4.2 Field Investigation**

A field survey for *EPBC Act* listed threatened species was done concurrently with a Detailed site survey as described below for vegetation community sampling, for which both conspicuous and inconspicuous species were searched. Conspicuous *EPBC Act listed*

*threatened* species were also searched for during the entire course of survey work, particularly during brief site surveys.

Field surveys were undertaken to assess the following:

- To determine where the mapped remnant vegetation communities would be directly intersected by the corridor, by intensive 50 m x 10 m site survey in a representative location, identifying structure, condition and usually all species (depending on appropriate level of detail). These data were then used to verify the accuracy of the RE mapping and if necessary, revise the mapping in the adjacent area (i.e. approximately a 200 m radius), by broader reconnaissance and/or air-photo interpretation. Vegetation sampling was done in accordance with Queensland Herbarium vegetation survey methodology (EPA 2005a).

Sample types were either:

- Detailed – all plant species present on-site were recorded within a 50 m x 10 m plot, along with structural details such as height and cover. This type of site is consistent with a Queensland Herbarium Secondary site, except stem counts were not included. It is more comprehensive than a Queensland Herbarium Tertiary site, in that all plant species in the plot are recorded. Every Regional Ecosystem (each type, not each remnant) which occurred along the corridor was intended to be sampled at least once, so that correct RE allocation for the RE mapping could be verified. Detailed sites were only considered in remnants of good condition, so that structural data and complete species lists were meaningful, and could be applied (extrapolated) to other remnants within the corridor of the same RE.
- Short – mid-way between a Detailed site and a Brief site. A short list of the most common species was made of the site but structural details were not formally recorded. Like a Detailed site, a Short site was usually strategically placed, and was often a site that was originally intended to be Detailed. Detailed sites were not done where, on initial field assessment, site conditions indicated that a Detailed site was not necessary or not possible (e.g. due to disturbance such as a selectively thinned canopy, or weed infestation). A Short site was also used to confirm an RE when a Detailed site had been done in a nearby remnant of the same RE, especially to consolidate a detailed species list for the local variation of any particular RE.
- Brief – only the dominant and indicator plant species present on-site were recorded. This type of site is consistent with a Queensland Herbarium Quaternary site, but some Brief sites were extended species lists similar to a Short site. The data were usually recorded without leaving the vehicle. Brief sites were done to confirm RE mapping, and get an overview of the project area. Brief sites were essential for checking mapped RE polygons.

- To visually check for the presence of *EPBC Act* listed threatened flora as identified by relevant legislation, which may have been identified as occurring somewhere in the area of the proposed corridor. Any *EPBC Act* listed threatened species seen *ad hoc* during the vegetation survey were also recorded.
- To visually check for small remnants of vegetation which may not feature on the RE mapping due to error or scale, and to assess the value of those remnants based on any or all of the criteria in these methods. These unmapped remnants included stands of trees, or other communities (including grasslands and wetlands) and significant trees (e.g. old growth).

Photographs were taken of each site to illustrate vegetation structure (see Appendix E2), and the position was recorded, where possible, with a hand-held GPS. Flora species unable to be identified in the field were collected for later identification. Individual unknown plants were not collected if whole plant removal was required, and instead, close-up photographs and descriptions were taken, along with highly specific location information for return to site if necessary. Public roads and reserves were used to visit all possible publicly accessible sampling points along the corridor, and relevant areas adjacent to the corridor. When areas of interest were on private property, sampling was conducted where permission was granted by land-owners.

The location of each sample site is shown overlaid on the RE mapping in Figure 6.1 of the EIS. Sites are identified by arbitrary numerical allocation, in order (north to south) along the corridor, but with subsequent additions of alphabetical characters to allow for insertion of new sites. Some site numbers have been omitted, indicating that a proposed site was subsequently considered redundant or unnecessary, in the light of further information becoming available (e.g. a revision of the proposed corridor alignment).

#### **G.4.3 Assumptions and Limitations for the Terrestrial Flora Study**

Preliminary site survey using Brief site observations was done in April 2007, with subsequent Detailed site survey done from 27 August to 7 September 2007. There was little rainfall before and during surveys resulting in drought conditions throughout the study region. Recent rainfall events in the catchment in January 2008 are likely to have had a positive impact on ground layer flora, but it is not expected that any additional *EPBC Act* listed threatened species would establish following the rain.

Regional Ecosystem mapping (EPA, 2005b) in the study area is relatively coarse and suitable for general planning only. It is not suitable for precise location of infrastructure, and errors of tens or hundreds of metres can occur. The exact extent of some existing vegetation communities is still uncertain due to the age of the aerial photography used in the study. Sources of error that may cause planning problems are:

- *Scale*. Base mapping relies on satellite images in many areas and this is coarser than the aerial photography.
- *Time lapse*. A considerable amount of clearing or disturbance can occur between the time the remote sensing was done and when the planning begins.
- *Remote sensing interpretation error*. This can lead to incorrect REs being applied to vegetation types (due to inability to access ground-truthing areas); and
- *Local variation in vegetation type*. This can render RE classification too coarse to be correct. Sub-REs are developed for this purpose but they are being continually developed.

It was assumed for the purposes of the EIS that the right-of-way for the project is generally 30 m wide, but can be reduced in sensitive areas.

## **G.5 Methodology for Aquatic Flora and Fauna**

### **G.5.1 Review of Existing Data**

#### **G.5.1.1 Information Review**

The following key information sources were reviewed:

- Vegetation and Fauna Habitat Assessment for the Stanwell to Gladstone Infrastructure Corridor (SGIC), prepared by HLA Envirosciences (2007) on behalf of the Coordinator-General;
- Queensland Environmental Protection Agency (EPA 2002) Biodiversity Assessment and Mapping Methodology (BAMM). This reference outlines threatened and near-Threatened Species (priority species) within Queensland; and
- Freshwater fish and aquatic macroinvertebrate records for the Fitzroy and Calliope River catchments. Important data sources include Byron *et al.* (1992); Conrick *et al.* (1997); DNR (1998); Duivenvoorden and Roberts (1996); Long and Berghuis (1996); Pusey *et al.* (2004).

All information sources used are referenced in the document, and are documented in the references section at the end of this report.

#### **G.5.1.2 Spatial Data**

Several Geographical Information System (GIS) datasets were used:

- Rectified aerial photo mosaic of the project area and surrounds;
- Cadastre;
- Regional Ecosystem (RE) vegetation mapping (Version 5.0 with Dec 2006 Amendments);
- Biodiversity Planning Assessment (BPA) mapping (Version 3.4 – 7 March 2005);
- Ramsar wetland areas; and
- Queensland EPA estate (National Parks etc).

#### **G.5.1.3 Public Database Records of Listed EVR Species**

Two public access databases with restricted locational precision were searched to identify Endangered, Vulnerable and Rare (EVR) aquatic flora and fauna known to occur, or to have occurred, in the project area:

- Wildlife Online (EPA 2007) database. This is a Queensland EPA internet-based database that stores records of plant collections and fauna sightings (and other groups such as algae and fungi) for a search area defined by the user. EVR and other notable flora and fauna species can be selected from the search outputs. Search results are included in Appendix E4; and

- *EPBC Act* Protected Matters Report (DEWHA 2007). This is a Commonwealth Department of Environment and Water Resources (DEWHA) internet-based database, and its associated search tool enables the user to generate a report that will assist with determining whether matters of national environmental significance or other matters protected by the *EPBC Act* are likely to occur in the area of interest. This includes *EPBC Act*-listed EVR species, migratory and other notable species of national significance, Threatened Ecological Communities, and other features of national environmental significance (i.e. Ramsar Wetlands, Commonwealth Marine Areas, World Heritage Places, National Heritage Places, Commonwealth Lands). Search results are included in Appendix E4.

Searches were done in both public domain databases by specifying coordinates (defining a rectangle) that contained the entire project area. Note that these database outputs should be considered as indicative only, and have been considered in this chapter in the context of habitat conditions present within the project area, and the potential for these habitats to support listed species and communities.

### **G.5.2 Field Investigation and Data Analysis**

On the basis of a review of spatial data, six main drainages were identified within the project area, namely Fitzroy River, Gavial Creek, Inkerman Creek, Twelve Mile Creek, Raglan Creek and Larcom Creek (see Figure 8.2 of the EIS). Furthermore, two semi-permanent floodplain lagoons and approximately 24 ephemeral drainages of varying size were identified within the project area.

Of these streams and minor drainages, a total of 16 sites were selected for site assessments (see figure 8.1 of the EIS). Sites were selected on the basis that: (i) they were considered to be representative of the main aquatic meso-habitat types<sup>2</sup> found within the project area; (ii) they encompassed all major creeks within the project area; and/or (iii) they encompassed habitat types utilised by aquatic species of conservation significance (i.e. *EPBC Act* listed) (Table 2).

Marine and aquatic habitat surveys undertaken by BMT WBM ecologists at 16 representative sites situated within the project area. These were undertaken between 23<sup>rd</sup> to 28<sup>th</sup> August 2007 inclusive. Note surveys were used to determine presence of available habitat for aquatic Threatened Species listed under the *EPBC Act*.

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<sup>2</sup> Meso-habitats are broad habitat types that are roughly the same scale as the channel width and delineated by localised slope, channel shape, and structure. Riffles, runs, glides, shoals, pools, and off-stream wetlands/anabranches represent potential types of meso-habitats.

**Table 2 Location (Projection: WGS 84) and Types of Waterbodies Investigated at Representative Sites Located within the Project Area**

Section	Catchment	EASTING	NORTHING	Creek name	Description	Water present (> 5 m <sup>2</sup> surface area)
<i>Fitzroy to Bajool</i>	Fitzroy	237757.6	7421346.8	Fitzroy River	Perennial River - Permanent pool	✓
	Fitzroy	234722.3	7415613.7	Lagoon 1	Semi-permanent lagoon	✓
	Fitzroy	234247.0	7411906.5	Lion Creek	Ephemeral drainage	✗
	Fitzroy	238770.8	7409818.3	Lagoon 2	Semi-permanent lagoon	✓
	Fitzroy	248222.3	7404730.1	Gavial Creek	Semi-permanent waterbody	✗
	Fitzroy	253897.5	7388885.4	Station Creek US	Ephemeral drainage	✗
	Fitzroy	254704.2	7388278.4	Oakey Creek US	Ephemeral drainage	✗
<i>Bajool to Gladstone</i>	Fitzroy	263824.2	7383895.9	Inkerman Creek	Macro-tidal creek	✓
	Fitzroy	270515.3	7379234.3	Twelve Mile Creek	Permanent pool	✓
	Fitzroy	271564.6	7378956.2	Marble Creek	Ephemeral drainage	✗
	Fitzroy	273718.1	7377870.7	Pelican Creek	Ephemeral drainage	✓
	Fitzroy	276719.8	7376800.5	Horrigan Creek	Ephemeral drainage	✗
	Fitzroy	277873.1	7376388.1	Raglan Creek	Macro-tidal creek	✓
	Fitzroy	292145.7	7367585.7	Unnamed tributary of	Ephemeral	✗

Section	Catchment	EASTING	NORTHING	Creek name	Description	Water present (> 5 m <sup>2</sup> surface area)
				Larcom Vale Creek	drainage	
	Calliope	299816.4	7359922.2	Larcom Creek	Permanent pool	✓
	Calliope	307680.8	7362046.9	Sandy Creek	Ephemeral drainage	×

### G.5.3 Aquatic Habitat Survey

To determine the suitability of the habitat for habits for *EPBC Act* listed threatened species, a survey of the habitat characteristics of each site was undertaken, documenting riparian vegetation characteristics, stream substrate composition and profile, adjacent land uses and several other indicators of habitat 'condition'.

Sampling sites were all located on main watercourses within the project area and numerous representative ephemeral drainages and wetlands intersecting the proposed pipeline corridor, as shown in Table 2. Photographs were taken of representative features at each site, and the position was recorded with a hand-held GPS.

Sampling methods were based on Arthington (1996). 50 m long transects (fibreglass tapes) were placed parallel to the littoral edge on each riverbank, with the transect origin (0 m) set at the upstream extent of the site. Two separate but related methods were used to sample habitats and aquatic flora on these transects.

*Method 1.* The first method involved dividing the stream into five equal segments (perpendicular to the transect line), consisting of two bank segments, a centre-of-stream segment and two segments either side of the centre-of-stream and the banks. Four random points were selected along each of the five sub-transects, to give a total of 20 points.

The following parameters were measured within 1 m<sup>2</sup> quadrats placed at each sample point along each transect:

- Wetted stream width
- Percentage riparian cover (projected foliage cover)
- Depth
- Mean water velocity
- Substrate composition (mud/sand/fine gravel/coarse gravel/cobble/rock/bedrock)
- Percentage cover of each macrophyte species
- Percentage cover of filamentous algae
- Percentage cover of overhanging vegetation

- Percentage cover of emergent vegetation
- Percentage cover of leaf litter
- Percentage cover of large woody debris (more than 15 cm diameter)
- Percentage cover of small woody debris (less than 15 cm diameter).

*Method 2.* Pusey *et al.* (2004) suggests that Method 1 does not provide an adequate sample of bank and littoral habitats, hence an alternate method was used to supplement the information obtained in Method 1. 50 m long by 1 m wide belt transects were sampled on each stream bank. Each transect was divided into 12.5 m long segments to gain an appreciation of within-site variability and to assist data collection. Sampling was restricted to the littoral zone, and excluded terrestrial vegetation except for the immediate riparian strip. The percentage cover of each of the following parameters was measured within each segment:

- Canopy cover
- Aquatic macrophytes
- Filamentous algae
- Periphyton
- Overhanging vegetation
- Submergent vegetation
- Emergent vegetation
- Leaf litter
- Large woody debris (more than 15 cm diameter)
- Small woody debris (less than 15 cm diameter)
- Undercut banks
- Overhanging roots.

Macrophyte sampling was done by hand due to the shallow nature of the sites. Substrate composition was estimated by eye from hand-gathered samples in shallow areas and by an extended scoop in deeper sections. Depth was measured using a graduated pole. Macrophyte samples were identified in the field or were collected for later identification in the laboratory.

#### **G.5.4 Assumptions and Limitations for the Aquatic Flora and Fauna Study**

All habitat and water quality sampling was conducted between 23 and 27 August 2007 between 07:00 and 18:00 hours. Although there were moderate amounts of recent rainfall occurring prior to the survey period, the area is recognised as having experienced drought conditions for an extended period (more than five years) at the time of the survey. Consequently, there was a scarcity of permanent to semi-permanent waterbodies within the project area at the time of sampling, and conditions sampled here should not be considered

as representative of conditions at other times. Drought conditions would directly affect factors such as the distribution and extent of aquatic macrophytes, for example, which were extremely sparse during the field investigations conducted for this EIS.

Note that assessments of aquatic fauna species and communities within the project area were derived from reviews of existing information from the wider area, together with habitat surveys and knowledge of the known habitat requirements of these species. Note that with the exception of the translocated populations of some fish species (e.g. Mary River Cod (*Maccullochella peelii*)) no species of aquatic invertebrates or freshwater fish listed as threatened under the *EPCB Act* are known to occur in the project area. Other listed species known from catchments encompassing the project area include the Fitzroy River Turtle (*Rheodytes leukops*), which is endemic in the Fitzroy River catchment. The project area does not represent optimal habitat for this species, hence targeted surveys were not undertaken for this species.

## **G.6 Description of the Affected Environment Relevant to the Controlling Provisions**

This section describes the *EPBC Act* listed Threatened Species and Threatened Ecological Communities that have been identified as potentially occurring within the project area. The section is divided into *EPBC Act* listed threatened fauna (see G.6.1), and also into *EPBC Act* listed threatened flora and Threatened Ecological Communities (see G.6.2).

### **G.6.1 *EPBC Act* Listed Threatened Fauna (Terrestrial and Aquatic)**

#### **G.6.1.1 Review of Existing Information Sources**

The review of existing information sources (including an *EPBC Act* Protected Matters database search) for the wider area within 30 kilometres of the project area provided records for a variety of threatened species as listed under the *EPBC Act*. These species, with relevant conservation status and notes on habitat and distribution are provided in Table 3.

**Table 3 List of EPBC Act listed Threatened fauna derived from review of existing information**

<b>Status:</b>	CE = Critically Endangered; E = Endangered; V = Vulnerable
<b>Primary Sources:</b>	QEPA Wildlife Online Extract and EPBC Act Online Protected Matters Report (August 2007)

Species	EPBC status	Species profile notes and regional context
<b>Terrestrial Species</b>		
Semon's Leaf-nosed Bat ( <i>Hipposideros semoni</i> )	E	Core distribution from Cape York Peninsula to Cooktown, though tentative records suggest that it may also occur in disjunctive populations further south in the Mt. Windsor Tableland area, Kroombit Tops National Park, or even as far south as St. Mary's State Forest near Maryborough (Thomson <i>et al.</i> 2002, Schulz and de Oliveira 1995, de Oliveira and Pavey 1995, and Coles <i>et al.</i> 1996 cited in Thomson <i>et al.</i> 2002). Roosts in cavernous sites and may be an obligate cave dweller, though recorded from other man-made structures, e.g. abandoned mines (Hall 1995). May favour rock escarpment country where it roosts under rock overhangs and in shallow caves (Thomson <i>et al.</i> 2002). North Queensland habitats described as rainforest, forest, open woodland and vine thickets (Hall <i>et al.</i> 2000).
Grey-headed Flying-fox ( <i>Pteropus poliocephalus</i> )	V	Occurs along the east coast of Australia, from Gladstone to southwest Victoria and within sub-tropical and temperate forests, including rainforest, tall sclerophyll forest and woodlands, heath, paperbark swamps and also occurs within urban and agricultural areas where food trees are cultivated (Churchill 1998, Duncan <i>et al.</i> 1999). Favours fruits of rainforest trees, nectar and pollen of <i>Myrtaceae</i> , <i>Proteacea</i> and rainforest tree species, though also feeds on fruit from introduced species (Eby 1991 Tidemann 2002). Roost sites (camps) are usually traditional, regularly used and occupied when suitable food resources are available in the surrounding area (Hall and Richards 2000).

Species	EPBC status	Species profile notes and regional context
Large-eared Pied Bat ( <i>Chalinolobus dwyeri</i> )	V	Northern range limits to about Blackdown Tableland/Rockhampton (Hoye and Dwyer 2000). In region, only recorded from extensive areas dry and wet sclerophyll forest, i.e. Carnarvon Gorge National Park ( <i>pers comm.</i> G. Ford 2004). Cave dwelling species, though also known to roost in mine tunnels and abandoned Fairy Martins nests (Hoye and Dwyer 2000).
Greater Long-eared Bat ( <i>Nyctophilus timoriensis</i> )	V	Known current northern range limits in Theodore/Moura district. Few records in southern Brigalow Belt, mainly from shrubby open forest and woodland habitats (McFarland <i>et al.</i> 1999). Roost in tree hollows, fissures in branches, and under sheets of bark (Churchill 1998, Parnaby 2000).
Collared Delma ( <i>Delma torquata</i> )	V	Endemic to SEQ. Highly restricted, disjunct populations from outer Brisbane western suburbs to Blackwater, central Qld (DEH 2005b). A cryptic reptile known from mainly open, rocky terrain on basalt and lateritic soils with open <i>Eucalyptus</i> and <i>Acacia</i> woodland with a sparse cover of tussock grass and shrubs or semi-evergreen vine thicket (Wilson 2005a, Ryan 2006).
Brigalow Scaly-foot ( <i>Paradelma orientalis</i> )	V	Endemic to region. Brigalow forest and <i>Eucalyptus</i> woodland with tussock grass ground cover (Cogger <i>et al.</i> 1993). Ground micro-habitat diversity appears to be an important habitat attribute (Wilson and Knowles 1998).
Yakka Skink ( <i>Egernia rugosa</i> )	V	Lives in communal burrows within dry open forest and woodland, often featuring coarse gritty soils near low rocky outcrops (Cogger 2000, Wilson 2005a).
Ornamental Snake ( <i>Denisonia maculata</i> )	V	Endemic to region. Specialist frog predator (Shine 1983). Seasonally inundated areas (esp. gilgai in Brigalow) with deep cracking soils of woodland, shrubland and natural levees (Ehmann 1992, Wilson 2005a, DEH 2005c).
Dunmall's Snake ( <i>Furina dunmali</i> )	V	Few records in region (e.g. Expedition Range National Park; DEH 2005a). Open forest and woodland (including brigalow, belah and cypress pine) on cracking black clay and clay loam soils (Cogger <i>et al.</i> 1993, Wilson 2005a). <i>Eulamprus</i> skinks may form an important component of diet (Shine 1981).

Species	EPBC status	Species profile notes and regional context
Ornamental Snake ( <i>Denisonia maculata</i> )	V	Endemic to region (Cogger <i>et al.</i> 1993). Specialist frog predator diet (Shine 1981). Seasonally inundated areas (especially gilgai in Brigalow) with deep cracking soils of woodland, shrubland and natural levees (Ehmann 1992, Cogger 2000, Wilson 2005a).
Red Goshawk ( <i>Erythrotriorchis radiatus</i> )	V	These raptors require a very large home range. Distribution uncertain in region, though known from the eastern sector. Very large home ranges (e.g. 50–220km <sup>2</sup> (Debus 2001)) including open forests and woodlands, tropical savannas traversed by riverine vegetation (Garnett and Crowley 2000). In partially cleared areas of eastern Queensland associated with gorge and escarpments (Czechura and Hobson 2000).
Painted Snipe ( <i>Rostratula benghalensis</i> )	V	Occurrence erratic and unpredictable, seldom remaining long in any locality (Marchant and Higgins 1993). Well-vegetated shallow, permanent or seasonal wetlands where it forages on soft muds and in shallow water for invertebrates (Marchant and Higgins 1993, Geering <i>et al.</i> 2007).
Squatter Pigeon (sth. subsp.) ( <i>Geophaps scripta scripta</i> )	V	Ground-dweller of drier <i>Eucalyptus</i> woodland with sparse grass cover in close proximity to permanent water (Frith 1982a). Known to use improved pasture, though always near permanent water (Garnett and Crowley 2000, Higgins and Davies 1996).

Species	EPBC status	Species profile notes and regional context
<p>Yellow Chat (<i>Epthianura crocea macgregori</i>)</p>	<p>CE</p>	<p>Endemic to area and known from Curtis Island, the Torilla Plain and Fitzroy River delta, though seasonally mobile and possibly also occurs in other localities (Jaensch <i>et al.</i> 2004, Houston <i>et al.</i> 2004a). Known from freshwater and saline wetlands on marine plains including swampy grassland, saline herbland, saltmarshes, <i>Cyperus</i> sedgeland (Houston <i>et al.</i> 2004b). All sites where the Yellow Chat has are known to persist year-round are associated with drainage channels on coastal marine plains connected to tidally influenced wetlands (Houston <i>et al.</i> 2004a, Houston 2004). Typical breeding habitat is a network of braided channels flanked by rank vegetation (rushes, sedges or grass) that provides shelter adjacent to muddy substrates for foraging (Houston <i>et al.</i> 2004b). Dry season habitat requirements are under investigation and may be critical to the Chat's conservation (Houston <i>et al.</i> 2004b, QEPA 2005).</p>
<p>Black-throated Finch (sth. subsp.) (<i>Poephila cincta cincta</i>)</p>	<p>E</p>	<p>Currently only considered to be locally common near Townsville and Charters Towers (DEC and QWPS 2004). A seedeater known from a variety of grassy savannah woodland habitats dominated by <i>Eucalyptus</i> and/or <i>Corymbia</i>, though also woodlands dominated by <i>Melaleuca</i> and/or <i>Acacia</i> tree species (DEC and QWPS 2004, Higgins <i>et al.</i> 2006). On the coastal plains, grassy <i>Pandanus</i> savannah is also used (Pizzey 1991 in TSSC 2005). An open understorey of seeding perennial and annual grasses and available surface water are essential resources (Zann 1976, Higgins <i>et al.</i> 2006). Riparian woodland habitat is thought to be of particular importance (DEC and QWPS 2004, TSSC 2005). Nests in trees, sometimes in hollows (Zann 1976).</p>

Species	EPBC status	Species profile notes and regional context
Star Finch (sth. subsp.) ( <i>Neochmia ruficauda ruficauda</i> )	E	<p>A seedeater of grassy woodlands and grasslands close to fresh water, though also recorded in cleared or suburban areas such as along roadsides and in towns (Holmes 1996 and 1998). Sites where recent records have been obtained have been dominated by grasses or have been in areas where the native vegetation has been partially cleared (DEWHA 2007a). Studies at nine former sites found that the habitat consisted mainly of woodland and dominated by trees that are typically associated with permanent water or areas that are regularly inundated; the most common species being <i>Eucalyptus coolabah</i>, <i>E. tereticornis</i>, <i>E. tessellaris</i>, <i>Melaleuca leucadendra</i>, <i>E. camaldulensis</i> and <i>Casuarina cunninghamii</i> (Holmes 1996). Population estimates of about 50 mature individuals in four confirmed sub-populations scattered across central Queensland (e.g. Wowan and Aramac districts) (Garnett and Crowley 2000, DEWHA 2007a).</p>
<b>Aquatic Species</b>		
Fitzroy River Turtle ( <i>Rheodytes leukops</i> )	V	<p>Restricted to Fitzroy River catchment. Prefers combination of deep pools connected by shallow riffles, high water quality and extensive beds of Ribbon Weed (<i>Vallisneria</i> sp.) on which it feeds (Legler and Cann 1980, Cogger <i>et al.</i> 1993).</p> <p>Most of this section of the project area represents marginal habitat for the vulnerable Fitzroy River Turtle as this species prefers permanent freshwater riverine reaches and large, isolated permanent waterholes. Within the Fitzroy to Bajool project area, the Fitzroy River at the extraction point, and possibly Gavial Creek and the two off-stream lagoons (Lagoons 1 and 2), represent potential but low quality (i.e. not typically fast-flowing or clear waters) habitat for this species. Within the Bajool to Gladstone project area, the larger freshwater waterbodies (Twelve Mile Creek and Larcom Creek) represent only marginal habitat for this species as their waters are typically not clear or fast-flowing.</p>

Species	EPBC status	Species profile notes and regional context
Mary River Cod ( <i>Maccullochella peelii</i> )	E	This species has been translocated into the Fitzroy River catchment, although it is thought that the translocation attempt failed (Pusey <i>et al.</i> 2004). Note that the Wildlife Online (QEPA, 2007) database and the <i>EPBC Act</i> Protected Matters Report (DEWHA, 2007) did not identify any listed fish species within the project area.
Green Turtle ( <i>Chelonia mydas</i> )	V	The most common species in the coastal region is the Green Turtle. Green Turtles are known to feed directly on seagrasses and algae (Kuiper-Linley <i>et al.</i> 2007), while Loggerhead Turtles are known to feed on bivalve molluscs from seagrasses and hard bottom areas (Limpus <i>et al.</i> 1994). Changes to seagrass and/or reef communities for some turtles) can therefore impact on turtles. No seagrass or major reef communities exist within the estuary reaches of the project area. While their distribution is not physically limited to areas where, for example, seagrasses grow, marine turtles are likely to be only transient visitors (if at all) to these creeks.
Flatback Turtle ( <i>Natator depressa</i> )	V	
Loggerhead Turtle ( <i>Caretta caretta</i> )	E	The project area does not contain suitable nesting sites for marine turtles. The project area contains mangrove-lined creeks, whereas turtles typically nest in sandy beach/dune environments, where they can excavate a nest for their eggs. No particular sites are known as major nesting areas, since nesting intensity is highly variable between years.
Hawksbill Turtle ( <i>Eretmochylus imbricata</i> )	V	

### G.6.1.2 Field Survey Results

#### G.6.1.3 Fitzroy to Bajool

The Aquatic Fauna Survey did not directly sample for fauna species listed in Table 3 (see section G.5.4); however the terrestrial field investigation program provided records for 185

vertebrate fauna species (both listed as threatened under the *EPBC Act* and not listed) either recorded within the mapped corridor and/or recorded from similar habitats within approximately one kilometre either side of the project area corridor. The recorded assemblage comprised two *EPBC Act* listed threatened fauna species:

- The Squatter Pigeon (sth. subsp.) (*Geophaps scripta scripta*), which is listed as Vulnerable; and
- The Ornamental Snake (*Denisonia maculata*), which is also listed as Vulnerable.

A summary of these recorded *EPBC Act* listed threatened species is provided in Table 4 and the locations are identified in Figure 7.3 of the EIS. The location of each fauna survey site is provided in Figure 7.1 of the EIS. In regards to such data, it should be noted that the data represents records over a wide survey period (April to December) and may include records of the same individuals, though recorded during two separate sampling periods (especially Squatter Pigeon records). Table 4 does not represent a list of individuals, rather a list of sightings.

Habitats (which exhibit lower levels of disturbance and/or support higher values to the widest cross-section of the fauna assemblage of this section of the project area) are primarily associated riparian vegetation along the Fitzroy River and smaller waterways, small and scattered patches of native remnant and regrowth vegetation, and wetlands (including variety of large swales and depressions). Key habitat resources and areas of ecological sensitivity are listed in Table 5 and depicted in Figure 7.4 of the EIS.

**Table 4 *EPBC Act* listed Threatened fauna survey records for Fitzroy to Bajool section**

<b>Status:</b>	CE = Critically Endangered; E = Endangered; V = Vulnerable
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Species	EPBC status	GPS location	Number of individuals	Month	Comments
Ornamental Snake ( <i>Daenisonia maculata</i> )	V	253155E 7397039S	1	November	Sub-adult located under large ground log. Large ground logs common in area; large hollow-bearing <i>E. coolabah</i> trees common; cracking clays; adjoining

Species	EPBC status	GPS location	Number of individuals	Month	Comments
					seasonal wetland (southern side of Casuarina Road).
Ornamental Snake	V	252815E 7397005S	1	November	Adult foraging within large hollow ground log. Large ground logs common in area; large hollow-bearing <i>E. coolabah</i> trees common; cracking clays; adjoining seasonal wetland (southern side of Casuarina Road).
Squatter Pigeon (sth. subsp.) ( <i>Geophaps scripta scripta</i> )	V	255069E 7397139S	2	April	<i>Eucalyptus coolabah</i> grassy open woodland.
Squatter Pigeon	V	255737E 7388795S	2	April	Open grassland.
Squatter Pigeon	V	261132E 7384477S	3	June	Railway through grazing country with scattered forest red gums and poplar box.
Squatter Pigeon	V	253184E 7396940S	16	June	Seasonal wetland to south of Casuarina Road, fringed with mature hollow-bearing eucalypts. Dry when pigeons sighted. Ground cover sparse, predominantly <i>Salsola</i> .
Squatter Pigeon	V	243424E 7408131S	2	September	Pasture to south of Capricorn Highway.
Squatter Pigeon	V	249529E 7399792S	2	November	Alongside bush track in dry swale in open grassland (east of Kime Road).

Species	EPBC status	GPS location	Number of individuals	Month	Comments
Squatter Pigeon	V	249137E 7401882S	2	November	<i>E. coolabah</i> remnant within road reserve; sparse understorey and grass cover (east of Kime Road).
Squatter Pigeon	V	251647E 7397168S	4	December	Along side dirt Casuarina Road; open paddock adjoins, near homestead.
Squatter Pigeon	V	252947E 7396951S	1	December	Poplar Box remnant fringe along Casuarina Road.
Squatter Pigeon	V	249529E 7399792S	3	November	Alongside bush track; scattered trees along track; open grassland adjoining (east of Kime Road).

**Table 5 Areas of fauna habitat sensitivity associated with the Fitzroy to Bajool section**

Area #	GPS reference	Comments	Primary values
1	237768E 7421569 S	Fitzroy River riparian habitats.	Fauna movement; habitat for forest birds and microbats; and hollow-bearing trees.
2	235180E 7415401 S	Northwestern extension of a series of semi-permanent vegetated billabongs to north of Nine Mile Road.	Habitat for waterbirds and waders, including rare and migratory species.
3	234490E 7413765 S	Western end of a series of semi-permanent vegetated billabongs. Extends south to Nine Mile Road.	Habitat for waterbirds and waders, including rare and migratory species.
4	234227E 7411350 S	Western end of a large semi-permanent constructed wetland.	Habitat for waterbirds and waders, including rare and migratory species.

<b>Area #</b>	<b>GPS reference</b>	<b>Comments</b>	<b>Primary values</b>
5	235178E 7410276 S	Corridor traverses centre of semi-permanent wetland. Largely natural form though surrounds cleared of remnant vegetation. North of Malchi Nine Mile Road.	Habitat for waterbirds and waders, including rare and migratory species.
6	238744E 7409836 S	Billabong of natural form though surrounds cleared of remnant vegetation.	Habitat for waterbirds and waders, including rare and migratory species.
7	239640E 7409567 S	Billabong of largely natural form though surrounds cleared of remnant vegetation. North of Titman Road.	Habitat for waterbirds and waders, including rare and migratory species.
8	247726E 7405458 S	Adjacent to Gavial Creek wetlands.	Habitat for waterbirds and waders, including rare and migratory species.
9	250022E 7400559 S	Small open seasonal wetland – part of Serpentine Creek wetland system.	Habitat for waterbirds and waders, including rare and migratory species.
10	251112E 7398611 S	Shallow seasonal wetland and part of the Serpentine Creek wetland system – north of Georges Road.	Habitat for waterbirds and waders, including rare and migratory species.
11	251788E 7397765 S	Shallow seasonal wetland and part of the Serpentine Creek wetland system – south of Georges Road.	Habitat for waterbirds and waders, including rare and migratory species.
12	252472E 7396841 S	Seasonal wetland and part of the Serpentine Creek wetland system – south of Casuarina Road.	Habitat for waterbirds and waders, including rare and migratory species.
13	253143E 7394318 S	Dingo Creek riparian vegetation.	Fauna movement; locally significant habitat corridor.
14	255015E 7389095 S	Station Creek riparian vegetation.	Fauna movement; locally significant habitat corridor.
15	255346E 7388666 S	Oakey Creek riparian vegetation.	Fauna movement; locally significant habitat corridor.
16	261106E	Seasonal wetland system comprising of	Habitat for waterbirds and

Area #	GPS reference	Comments	Primary values
	7384693 S	natural form broad swales. Part of Inkerman Creek wetland system.	waders, including rare and migratory species; potential Yellow Chat habitat.

#### G.6.1.4 Bajool to Gladstone

The field investigation program provided records for 245 terrestrial vertebrate fauna species (both listed as threatened under the *EPBC Act* and not listed) either recorded within the mapped corridor and/or recorded from similar habitats within approximately one kilometre either side of the project area corridor. The recorded assemblage comprised two *EPBC Act* listed threatened fauna species:

- The Yellow Chat (*Epthianura crocea macgregori*), which is Critically Endangered; and
- The Squatter Pigeon (sth. subsp.) (*Geophaps scripta scripta*), which is Vulnerable.

A summary of each recorded *EPBC Act* listed threatened species is provided in Table 6 and locations identified in Figure 7.5 of the EIS. The location of each fauna survey site is provided in Figure 7.2 of the EIS.

Habitats (which exhibit lower levels of disturbance and/or support higher values to the widest cross-section of the fauna assemblage of this section of the project area) are primarily associated with riparian vegetation (e.g. Raglan Creek), areas of native remnant and regrowth vegetation, and wetlands including variety of freshwater, brackish, saline habitats. Key habitat resources and areas of ecological sensitivity are listed in Table 7 and shown in Figure 7.6 of the EIS.

**Table 6 *EPBC Act* listed Threatened survey records for Bajool to Gladstone section**

<b>Status:</b>	CE = Critically Endangered; E = Endangered; V = Vulnerable
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Species	EPBC Status	GPS location	Number of individuals	Month	Comments
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Species	EPBC Status	GPS location	Number of individuals	Month	Comments
Squatter Pigeon (sth. subsp.) ( <i>Geophaps scripta scripta</i> )	V	271008E 7379403S	5	April	<i>Eucalyptus tessellaris</i> grassy woodland.
Squatter Pigeon	V	275732E 7377015S	2	April	Open grassland.
Squatter Pigeon	V	269852E 7378839S	2	April	Open grassland.
Squatter Pigeon	V	284971E 7373708S	6	April	<i>Eucalyptus coolibah</i> grassy open woodland.
Squatter Pigeon	V	288112E 7369756S	2	April	<i>Eucalyptus mollucana</i> grassy woodland.
Squatter Pigeon	V	291210E 7367065S	4	April	<i>Eucalyptus tereticornis/E. mollucana</i> grassy open woodland.
Squatter Pigeon	V	284994E 7373613S	4	April	<i>Eucalyptus coolibah</i> grassy open woodland adjacent to Reedy Creek Road.
Squatter Pigeon	V	273188E 7378272S	4	June	Grazing land (cleared poplar box woodland) with narrow linear remnant adjoining dirt road.
Squatter Pigeon	V	270947E 7379412S	2	July	Woodland patch adjacent to Twelve Mile Creek Road.
Squatter Pigeon	V	291210E 7367065S	2	September	Large billabong with aquatic vegetation (Horseshoe Lagoon wetland complex ) on Darts Creek.
Squatter Pigeon	V	267674E 7381179S	1	September	Grassy verge of Toonda Port Alma Road. Narrow linear woodland remnant adjoining.

Species	EPBC Status	GPS location	Number of individuals	Month	Comments
Squatter Pigeon	V	268408E 7380069S	1	September	Grassy verge of Toonda Port Alma Road. Narrow linear woodland remnant adjoining.
Squatter Pigeon	V	272750E 7378616S	2	September	Grassy verge of Twelve Mile Creek Road. Narrow linear woodland remnant adjoining.
Squatter Pigeon	V	273527E 7377745S	2	September	Open grassland adjoining constructed wetland – west of Twelve Mile Road.
Squatter Pigeon	V	273558E 7377878S	1	October	Mixed <i>Eucalyptus</i> woodland with grassy/shrubby understorey.
Squatter Pigeon	V	271964E 7379217S	2	October	Poplar box remnant woodland with grassy understorey.
Squatter Pigeon	V	268523E 7379656S	4	October	On unsealed road through mixed <i>Eucalyptus</i> woodland with grassy/ shrubby understorey.
Squatter Pigeon	V	267395E 7381524S	1	October	Open grassland alongside unsealed road.
Squatter Pigeon	V	252558E 7397024S	2	October	In dry swale with mid-dense to sparse cover of <i>Salsola</i> spp.
Squatter Pigeon	V	267360E 7381568S	2	November	Grassy open drain alongside Marmoor/Toonda Port Alma Road intersection.

Species	EPBC Status	GPS location	Number of individuals	Month	Comments
Squatter Pigeon	V	271356E 7379366S	2	November	Poplar box woodland remnant with grassy understorey alongside Twelve Mile Road.
Squatter Pigeon	V	270363E 7378971S	2	December	Dirt track through grazed open grassland.
Squatter Pigeon	V	266045E 7381959S	1	December	Road fringed with <i>Eucalyptus camabageana</i> and; understorey grassy.
Yellow Chat ( <i>Epthianura crocea macgregori</i> )	CE	271121E 7380255S	2	July	Saline wetlands at Twelve Mile Creek. Birds seen in close proximity to one another, out on saline flats; amidst saltwater couch and saltbush fringing inundated clay pan.
Yellow Chat	CE	270842E 7381180S	2	September	Twelve Mile Creek Reserve. Saltmarsh adjoining inundated clay pan.

**Table 7 Areas of fauna habitat sensitivity associated with the Bajool to Gladstone section**

Area #	GPS reference	Comments	Primary values
17	262098E 7384738 S	Seasonal wetland system comprising of natural form broad swales – south of Port Alma railway. Part of Inkerman Creek wetland system.	Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.

Area #	GPS reference	Comments	Primary values
18	263729E 7383889 S	Inkerman Creek and associated wetlands.	Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.
19	267056E 7382452 S	Node of <i>Eucalyptus moluccana</i> woodland.	Habitat node in largely cleared landscape
20	269977E 7379303 S	Southern extent of saline wetlands of Twelve Mile Creek Reserve.	Adjacent to potential Yellow Chat habitat.
21	270526E 7379266 S	Freshwater section of Twelve Mile Creek – adjacent and upstream of Twelve Mile Creek Reserve.	Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat..
22	271347E 7379141 S	Twelve Mile Creek tributary – riparian vegetation.	Wildlife movement corridor.
23	273562E 7377895 S	Broad seasonal wetland – part of Pelican Creek.	Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat..
24	276522E 7376943 S	Southern extent of the Horrigan Creek wetland complex.	Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat
25	276750E 7376802 S	Horrigan Creek riparian vegetation.	Wildlife movement corridor.
26	276882E 7376737	Horrigan Creek riparian vegetation.	Wildlife movement corridor.
27	277447E 7376420 S	Raglan Creek riparian vegetation (western extent).	Wildlife movement corridor.
28	277783E 7376382 S	Raglan Creek riparian vegetation (eastern extent).	Wildlife movement corridor.

Area #	GPS reference	Comments	Primary values
29	278466E 7376245 S	Remnant vegetation. Also large wetland approximately 100 m to south.	Habitat node in largely cleared landscape.
30	2900029 E 7369279 S	Darts Creek riparian vegetation – north of Darts Creek Road.	Wildlife movement corridor.
31	292431E 7367021 S	Darts Creek riparian vegetation – north of Popenia Road.	Wildlife movement corridor.
32	299229E 7360674 S	Larcom Creek tributary riparian vegetation.	Wildlife movement corridor.
33	299783E 7359955 S	Larcom Creek riparian vegetation.	Wildlife movement corridor.
34	307772E 7362081 S	Boat Landing Creek riparian vegetation.	Wildlife movement corridor.
35	310784E 7362439 S	Remnant vegetation to near north of railway line.	Large bushland node.

#### G.6.1.5 Aquatic Fauna Habitat Values for EPBC Act Listed Species

A review of the EPBC Protected Matters Report (DEWHA 2007) and the Wildlife Online (QEPA 2007) database for aquatic macrophyte species of conservation significance identified no *EPBC Act* listed Threatened Species occurring, or likely to occur within the project area.

##### G.1.1.1.1 Fitzroy to Bajool

The Fitzroy River at the intake point is located within the weir pool formed by the Fitzroy River barrage. This site represents the largest waterbody within the project area, and has a number of inherent functional ecological values, including:

- Permanent refugia for aquatic fauna that are intolerant of pool drying;
- A movement corridor for aquatic fauna, linking the high value estuarine and freshwater reaches;
- An important habitat for freshwater fish species of fisheries significance (recreational and commercial), and a locally important recreational fishing area (note that commercial fishing is prohibited at this site); and
- Potential habitat for the Fitzroy River Turtle.

Several off-stream lagoons (oxbow lakes) also occur within the project area. These environments can represent important aquatic habitats for many aquatic fauna species, and can have higher biodiversity values than other meso-habitat types. It is unlikely that the lagoons within the project area support habitat for *EPBC Act* listed threatened aquatic fauna species due to their small size, absence of optimal habitat for these species, and historical (clearing) and ongoing pressures from adjacent catchment land uses.

Most other natural waterways and drainages within the project area are ephemeral streams. Some of the more permanent waterbodies (e.g. creeks) could support seasonal refugia for aquatic fauna species. During and shortly after flow, these drainages can also support relatively rich and abundant macroinvertebrate and fish communities. It is unlikely that the ephemeral streams within this section of the project area support important habitat for *EPBC Act* listed threatened aquatic fauna species due to their small size, absence of optimal habitat for these species, and historical (clearing) and ongoing pressures from adjacent catchment land uses.

#### **G.1.1.1.2 Bajool to Gladstone**

The most significant aquatic habitat within this section of the project area is Raglan Creek. This waterway contains well developed mangrove areas that are likely to represent locally important habitat for species of direct economic (fisheries) significance (e.g. Mud Crabs, Banana Prawns, juvenile life-stages of many fish species). This site is also a locally important recreational fishing area apparent through evident fishing and boat ramps. The only listed marine fauna species that could potentially occur within the project area is the Saltwater Crocodile (*Crocodylus porosus*), however this is listed as Migratory and not as threatened under the *EPBC Act* (therefore impacts upon this species is outside of the scope of this report; however, an impact assessment concerning the species is provided in Chapter 8 of the EIS).

Inkerman Creek is also an estuarine creek system containing mangroves and saltmarsh vegetation. This creek system would have similar functional properties to Raglan Creek, albeit perhaps to a lesser degree given the smaller size of the waterway.

Most other natural waterways and drainages within the project area are ephemeral streams. These would have similar aquatic habitat values as those described for the Fitzroy to Bajool section of the project area, and are unlikely to represent important habitat for *EPBC Act* listed threatened aquatic fauna species.

## G.6.2 Threatened Terrestrial Flora and Threatened Ecological Communities

### G.6.2.1 Review of Existing Information Sources

Results of the searches of Wildlife Online (EPA 2007a) and the *EPBC Act* Protected Matters Report (DEW, 2007) for the project area are shown below in Table 8.

A search of the Wildlife Online database (EPA 2007a) for species that are simultaneously listed under the *EPBC Act* returned a list of 13 plant species (Table 8). The original extract is shown in Appendix E2 of the EIS, and is represented in two halves (west and east) due to limitations in longitudinal range of the database search. It should be noted that the search area specified needs to be a rectangle, and the number of different species is highly likely to be over-represented (i.e. some are not likely to be present in the study area).

An *EPBC Act* Protected Matters Report (DEWHA 2007) was generated from a similar search, but with a more narrowly defined search area (search area and results from original extract are shown in Appendix E2 of the EIS) and returned a list of 11 plant species and their conservation status (nine Vulnerable and two Endangered, as shown in Table 8). Five species were reported that did not occur on the Wildlife Online list, indicating that these species are expected to occur, but have not been recorded in the search area. For these species, refer to the last four entries in Table 8.

**Table 8 Wildlife Online and *EPBC Act* Protected Matters Report**

Species records within the Wildlife Online Database, with unrecorded species from EPBC Protected Matters Report at bottom of list	Wildlife Online Records*	<i>EPBC Act</i> **	<i>EPBC Act</i> Protected Matters Report (smaller defined area)***
<i>Asplenium pellucidum</i>	2	V	
<i>Atalaya collina</i>	3	E	Reported
<i>Cossinia australiana</i>	4	E	
<i>Cupaniopsis shirleyana</i>	10	V	Reported
<i>Cycas megacarpa</i>	25	E	
<i>Cycas ophiolitica</i>	14	E	Reported
<i>Denhamia parvifolia</i>	1	V	
<i>Eucalyptus raveretiana</i>	2	V	Reported
<i>Hakea trineura</i>	1	V	
<i>Marsdenia brevifolia</i>	1	V	
<i>Parsonsia larcomensis</i>	4	V	Reported
<i>Philothea acrolopha</i>	1	V	
<i>Quassia bidwillii</i>	2	V	Reported

<b>Unrecorded species:</b>			
<i>Bosistoa selwynii</i>	0	V	Reported
<i>Bosistoa transversa</i>	0	V	Reported
<i>Bulbophyllum globuliforme</i>	0	V	Reported
<i>Corymbia xanthope</i>	0	V	Reported
<i>Leucopogon cuspidatus</i>	0	V	Reported
*Records indicates the number of records of the species contained within the database for the area searched.			
**EPBC Act indicates the conservation status of each taxon under the Environment Protection and Biodiversity Conservation Act 1999. The codes are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct In The Wild (XW) And Vulnerable (V).			
***Reported by EPBC Act Protected Matters Report means that this particular species is mapped as occurring within the smaller defined area of the EPBC Act Protected Matters Report search area, in addition to Wildlife Online records.			

There are seven species listed in Wildlife Online that are simultaneously listed as threatened under the EPBC Act that are known to occur in the project area or surrounds and were not reported in the EPBC Act Protected Matters Search. These include a variety of species that occur in a variety of habitats. These species are listed in the following Table 10, with their likely habitat or area, and likelihood of occurrence within the corridor.

**Table 9 EPBC Act listed Threatened species and likelihood of occurrence**

<b>Wildlife Online species records that were not identified in the EPBC Protected Matters search</b>	<b>Likely habitat or area (rows in this table with scrub species are shaded)</b>	<b>Likelihood of occurrence of habitat</b>
<i>Asplenium pellucidum</i>	rainforest	low
<i>Cossinia australiana</i>	scrub	fair
<i>Cycas megacarpa</i>	coastal ranges	fair
<i>Denhamia parvifolia</i>	scrub	fair
<i>Hakea trineura</i>	well-drained soils	low
<i>Marsdenia brevifolia</i>	scrub	fair
<i>Philothea acrolopha</i>	heath	low

\*Likelihood of occurrence of habitat **only** within remaining scrub remnants.

### G.6.2.2 Field Survey Results

No targeted *EPBC Act* listed threatened plant species were observed during survey in either section of the corridor. However, one non-target species was observed, although it was a sterile specimen and absolute confirmation of identification was not possible. This was a Vulnerable species (listed under the *EPBC Act*), and was one individual of (probably) ooline (*Cadellia pentastylis*) found at Detailed Site 14 (Marble Creek) (see Figure 6.1 of the EIS).

Almost all of the species listed as threatened under the *EPBC Act* are scrub species (i.e. species typically found in scrub). These species were assumed to be most likely to occur within remnant patches of softwood scrub or vine thicket, so targeted survey for these species was restricted to these remnant patches. Partially cleared, or regrowth, areas of scrub were also surveyed as part of the vegetation survey. None of the listed scrub species were found during the surveys. If they were present, they are nevertheless protected by virtue of their habitat (*viz.* scrub), which is protected under the *EPBC Act*.

Black Ironbox (*Eucalyptus raveretiana*) is listed under the *EPBC Act* as Vulnerable (see Table 8) and is known to occur in riverine areas that are likely to be intersected by the corridor. It was not found during the survey, despite being specifically searched for at each of the creek crossings.

*Corymbia xanthope* is listed under the *EPBC Act* as Vulnerable (see Table 8) and is known to occur north of Rockhampton. It is considered unlikely that this species occurs in the study area, based on collection label details of this species (Botanic Gardens Trust 2004), which indicate it occurs on skeletal soils in association with *Hakea* sp. and *Triodia* sp.. This type of habitat was not observed in the study area.

The two cycads *Cycas megacarpa* and *Cycas ophiolitica* are listed under the *EPBC Act* as Endangered, but are not reported in the *EPBC Act* Protected Matters Search for the study area. They are known to occur in the study area (see Table 8, and Appendix E2 of the EIS for original Wildlife Online extract) and are likely to be in forested areas intersected by the corridor. However, neither of these species were observed during field assessments. It is possible that a young *Cycas* sp. without a trunk may be confused with *Macrozamia* sp., but nothing that looked like either genus was observed within the corridor (except, at a distance, for the marginally similar *Xanthorrhoea johnsonii*).

The overall findings of survey were also generally in accordance with those of previous survey work in the same general area by HLA Envirosciences (2006). A notable difference is that the two *EPBC Act* listed threatened species found by HLA Envirosciences survey

(*Macrozamia serpentina* and *Eucalyptus raveretiana*) were not found in the corridor, but occur in the broader study area used in the HLA survey.

### G.6.2.3 EPBC Act Referral Triggers identified from existing information

Several *EPBC Act* referral triggers were identified from preliminary data. Those triggers, based on likelihood of occurrence from habitat and distribution data, were:

- The presence of “semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar bioregions” (referred to as *scrub*), as defined in the *EPBC Act* Protected Matters Report as threatened Ecological Communities. A small unmapped patch of this scrub was observed on the Malchi Nine Mile Road at Brief site 177 (see *Map 6.1*, Short site 4), and is an *EPBC Act* referral trigger. Also, there is the possible presence of *Atalaya collina* (endangered under the *EPBC Act*) in this scrub. This scrub remnant may also contain the *EPBC Act*-listed scrub species *Quassia bidwillii*, *Cossinia australiana*, *Cupaniopsis shirleyana* and *Denhamia parvifolia*.
- *Atalaya collina* (endangered under the *EPBC Act*) could occur in the patch of scrub at Brief site 30 on the Twelve Mile Creek Road, which is closer to Yarwun. Brief site 30 is approximately 200 m to the northeast of the corridor (see *Map 6.1*), so a search for this species was made for at least two kilometres either side of that patch along the corridor in likely areas of habitat. A simultaneous search was made for the *EPBC Act*-listed scrub species *Quassia bidwillii*, *Cossinia australiana*, *Cupaniopsis shirleyana* and *Denhamia parvifolia*.
- The forest communities east of Yarwun, (sampled by Detailed site 39a, Short site 39b, and Brief sites 133 to 136 [see *Map 6.1*]) dominated by *Corymbia citriodora* and *Eucalyptus crebra*, had *Macrozamia* sp. in the understorey in places. As mentioned previously, young endangered cycads *Cycas megacarpa* or *C. ophiolitica* (i.e. without trunks) could appear to be *Macrozamia* spp. *Cycas megacarpa* or *C. ophiolitica* are endangered under the *EPBC Act*.
- Riverine crossings along the corridor may possibly have *Eucalyptus raveretiana* in places, which is listed as vulnerable under the *EPBC Act*. All river crossings within the right-of-way (approximately 12 crossings from the extraction point to Yarwun) were inspected for this species where access was granted. This species was not observed in the right-of-way, but could possibly occur within the corridor.
- A 200 m stretch of low-growing Brigalow (*Acacia harpophylla*) with extensive gilgai (a high density of small waterholes or pools, each ranging from about five to ten metres in diameter) was observed on the south side of Inkerman Creek on Lot 68 DS141. This patch of vegetation occurred between the tidal interface of Inkerman Creek, and the taller Brigalow further east towards the Toonda Port Alma Road. Brigalow (*Acacia harpophylla*) is a threatened Ecological Community under the *EPBC Act*. However, the height of the community on-site averaged approximately three metres, which does not meet the

structural requirements for the definition of remnant Brigalow (11–15 m) under the *VM Act*, and the *EPBC Act* uses the structural classification of the *VM Act* (in this case Regional Ecosystem 11.3.1 or 11.4.3). If the Land Zone in this area was interpreted as Land Zone 4 (clay plains rather than the alluvials of Land Zone 3), then the Regional Ecosystem for this Brigalow would become RE 11.4.3 (which has a defined height of 10–16 m under the *VM Act*). The vegetation at Site 9c rarely exceeded three metres in height and its remnant status was uncertain. Site 9c was typical of the whole patch. Regrowth can be considered as remnant if it reaches 70% of the height of its remnant height defined under the *VM Act*, but the three metre height of this Brigalow at Site 9c was too short for this.

## **G.7 Assessment of Impacts on NES Matters and Mitigation Measures**

### **G.7.1 Terrestrial Threatened Fauna**

The alignment of the Gladstone–Fitzroy pipeline was selected to minimise impact to native fauna habitats. In particular, alignment has been strongly influenced by the requirement to avoid traversal of as many wetland habitats (albeit seasonal or semi-permanent) and large and connected areas of native vegetation habitat as possible. This has largely been achieved, though given the length of the pipeline and topographic constraints, it is not possible to avoid all areas that may support fauna habitat.

With successful implementation of appropriate environmental management controls as recommended in Section G.7.1.3, Mitigation any potential impacts on *EPBC Act* listed threatened fauna species are likely to be limited to direct impacts associated with construction of the proposed pipeline. Potential impacts include:

- Vegetation clearing and habitat disturbance;
- Habitat fragmentation and disturbance to wildlife movement corridors;
- Disturbance to wetlands and waterways;
- Trench fall (entrapment of fauna within open trenches during construction);
- Creation of environments favourable to the colonisation and expansion of environmental weeds and pest animals.

The following provides a summary of each of these potential impacts.

#### **G.7.1.1 Potential Impact Processes**

##### **G.1.1.1.3 Vegetation Clearing and Habitat Disturbance**

Structural habitat heterogeneity is an important determinant of terrestrial fauna diversity (e.g. Beattie 1995, Agnew *et al.* 2003). Features that enhance habitat heterogeneity include hollow-bearing trees, a shrubby understorey, ground logs and fallen timber (Gilmore 1985, Bennett *et al.* 1994, Barrett 2000). Generally, greater structural and floristic diversity is associated with areas of remnant native vegetation. The removal of remnant vegetation cover results in the loss of feeding resources and shelter/breeding sites for native fauna and reduced faunal diversity.

The pipeline alignment has been selected to avoid or, where this has not been practicable (e.g. due to topographic constraints), minimise impacts to areas of remnant vegetation. Therefore, the vast majority of the construction footprint traverses cleared and highly disturbed environments and avoids as many areas of regrowth native vegetation as possible.

As a result, impacts to areas of remnant vegetation would not be substantial and the proposed loss of remnant vegetation will be minimal. It is recommended that management practices be implemented that further reduce the loss of vegetation and habitat disturbance associated with the proposed pipeline and disturbance to native fauna (see Section G.7.1.3 and G.7.2.5 for details).

A large proportion of the project area and surrounding land is subject to grazing and agricultural activities. Within this production landscape, native fauna habitat values have been greatly reduced through either complete clearing of native vegetation cover (and replacement with exotic pasture grasses) or through associated disturbances to remaining patches of native vegetation. Disturbance through simplification of habitat structure (selective clearing, grazing and inappropriate fire regimes) reduces suitable resources and conditions for native fauna and ultimately results in significant reduction in faunal diversity. Often, these simplified habitats support environments more favourable to aggressive, opportunistic native species and introduced predators and/or competitors (e.g. feral cat and cane toad) to the disadvantage of native fauna species that prefer more structurally complex habitats.

A significant threat to a variety of fauna is the potential loss of hollow-bearing trees (Bennett *et al.* 1994). A wide range of vertebrate fauna species are dependent on tree hollows for shelter and breeding, including gliders, possums, microbats, owls, parrots, ducks, and reptiles (Bennett *et al.* 1994, Phillips 2001, Gibbons and Lindenmayer 2002).

Throughout the region, the removal of mature remnant vegetation cover for the development of a production landscape has resulted in a significant reduction in the abundance of hollow-bearing trees. Throughout the project area, mature trees with either limb or trunk hollows were found to be uncommon to rare. Such trees are generally associated with patches of remnant vegetation, though also as isolated individuals within pastoral land. Those specimens within strips of riparian vegetation (surrounded by cleared lands) are considered to be particularly important in regards to their potential contribution to both habitat values and support for fauna dispersal. Even single or widely scattered mature hollow-bearing trees within a largely cleared landscape can be important habitat (Lumsden and Bennet 2003).

Although native regrowth vegetation occurs within and adjacent to the project area, most trees are too young to form hollows. The majority of this tree cover would require many decades of further growth to reach suitable maturity for hollow formation (e.g. >120 years old to form hollows suitable for occupancy of vertebrate fauna; see data in Gibbons and Lindenmayer (2002)).

All mature hollow-bearing trees will be considered a priority for retention and it is not expected that the construction of the pipeline will require removal of any individuals. A variety of the management strategies are recommended specifically to minimise any potential impacts to

hollow-bearing trees within the vicinity of the construction zone (see Section G.7.1.3 for details).

As identified previously, ground logs and fallen timber contribute to habitat heterogeneity and species diversity. Ground debris such as fallen logs and timber provide shelter and habitat for a wide range of taxa including native rodents, dasyurid marsupials, bandicoots, snakes, lizards, frogs, and birds (Barrett 2000, Nichols and Reynolds 2000, Grant *et al.* 2001, MacNally and Horrocks 2002, Michael *et al.* 2004). These resources also support suitable habitat for colonising plants and animals (e.g. insects and fungi) which are a source of food for many of these vertebrate species (e.g. Greenslade and Majer 1993, Majer and Nichols 1998).

Impacts to fauna from removal of dead timber will generally diminish over time with natural re-accumulation. Where the pipeline route transects areas of remnant or remnant regrowth vegetation, post-construction management practices will be implemented to minimise impact to ground fauna (e.g. collecting dead timber and redistribution over the alignment after construction) (see Section G.7.1.3 for details).

Clearing for infrastructure within areas of remnant vegetation will increase the boundary to area ratio of these communities and therefore increase the potential for edge effects. Edge effects can significantly influence the characteristics of a fauna assemblage. Processes associated with habitat edges may extend well into a habitat area, thus allowing impacts to reach deep into a habitat area (e.g. displacement of small-sized avifauna resulting from the presence of aggressive/competitive birds (Catterall *et al.* 1991)). Edge effects can include the establishment of weeds and alteration to micro-climatic conditions (e.g. greater light intensity, more wind penetration, lower humidity). A variety of the management strategies are recommended specifically to minimise edge effects on areas of remnant vegetation (see Section G.7.1.3 for details).

#### **G.1.1.1.4                      Habitat Fragmentation and Disturbance to Wildlife Movement Corridors**

Habitat fragmentation is a reduction in the continuity of a habitat through disturbance or loss. Isolation of fauna populations in small remnants increases their vulnerability to local extinction as a result of stochastic events (e.g. fire, drought and disease) and can decrease their genetic viability in the long-term (Soule *et al.* 1988, Laurence 1990). The capacity of a habitat area to support a range of fauna is also influenced by its extent. Very small habitat areas may be unable to sustain animals with large territories/home ranges, whilst fauna restricted to these and relatively narrow/linear habitats, which support high edge to area relationship, may be exposed to increased predation and competition from species in adjoining areas (Brooker *et al.* 1999).

Throughout the region, habitat areas have been fragmented by vegetation clearing in support of pastoral and agricultural activities. The alignment of the corridor has been selected to avoid large and connected habitat areas and where this has not been possible, to minimise the impact of fragmenting habitat areas.

The survival of species within habitat patches (whether small, large and/or isolated) depends, in part, on their ability to disperse and the capacity to disperse is not equal among species. Discontinuity of suitable habitat linkages may present physical and psychological barriers that can impede or even prevent movement between habitats (Andrews 1990, Catterall *et al.* 1991, Burnett 1992, Brooker *et al.* 1999). The most important and strategically effective initiative in regards to the maintenance of habitat connectivity will be the protection and rehabilitation of native vegetation cover associated with waterways (seasonal or otherwise). Riparian vegetation generally provides a higher diversity of plant species (and therefore feeding resources for fauna) and often denser cover which encourages fauna movement.

Whilst waterway crossings are unavoidable, the pipeline alignment avoids higher quality areas of riparian vegetation. It is recommended that management practices be implemented that further reduce the loss of vegetation and habitat disturbance at these crossing points (see Section G.7.1.3 for details). Where it has not been practicable to avoid higher quality riparian vegetation and/or where other habitat sensitivities exist, direct drilling of pipeline crossings will be implemented to avoid impacts to fauna habitats.

#### **G.1.1.1.5                      Disturbance to Wetlands and Waterways**

With the exception of habitats associated with Eight Mile/ Inkerman Creek and Twelve Mile Creek Reserve, natural wetlands throughout the project area have been highly modified by a combination of earth works and/or native vegetation clearing. Bunding works to enhance their capacity to act as ponded pastures under wet summer conditions have significantly altered many of these formerly natural systems. The majority of these wetlands are subject to ongoing disturbance by cattle. Other wetlands have been constructed and are typically small dams.

Despite these disturbances, a variety of these wetlands support habitat values for a wide variety waterbirds and waders, including rare and migratory species. South of Midgee, a number of these sites have been monitored monthly over a seven month period in respect to their potential to serve as seasonal refuges for the critically endangered Yellow Chat (*Epthianura crocea macgregori*).

As a result of the findings of the field survey program, wetland habitats were identified and the pipeline route adjusted to avoid these whenever possible. In several instances where this was not possible, trenchless crossing methods will be used to reduce the impact to flora and fauna

habitat values. Where complete avoidance or trenchless construction methods were not possible, mitigation measures will be adopted that will aim to minimise disturbance to these areas (see Section G.7.1.4 or details). It should be noted that, a distinctly precautionary approach has been adopted in relation to considerations of the pipeline alignment and potential Yellow Chat habitat.

Riparian vegetation generally provides a higher diversity of plant species and often supports mature vegetation and important resources including hollow-bearing trees. Consequently, these areas typically support habitat for a diversity of species and facilitate fauna movement. A characteristic of production landscapes, as is the case within the project area and surrounds, riparian vegetation remains as relatively linear habitats within an otherwise cleared landscape.

Clearing of riparian vegetation will be kept to the minimum required to safely construct the pipeline and meet other environmental requirements (e.g. erosion control, spoil storage). Where possible, construction of waterway crossings will only take place during the dry season (June – September). To avoid impacts to riparian communities, trenchless methods are preferred to cutting an open trench and filling as this reduces the amount of clearing of riparian vegetation. Where trenchless methods are not possible, a variety of other impact mitigation strategies will be implemented, e.g. minimising clearing widths for construction and post-construction rehabilitation (see Section G.7.1.3 for details).

#### **G.1.1.1.6 Trench Fall**

The pipeline will be located underground and trenching is required to accommodate the pipeline. Whilst the pipeline instatement will be progressive (in order to minimise the length of open trenching at any one time), sections of open trench will be present and unavoidable. Open trenching has the potential to form a temporary barrier to fauna movement. In addition, there is the potential for small ground dwelling fauna to fall into the open trench and become trapped and exposed to overheating, dehydration, predation and/or drowning. Relevant EPBC listed species are the Ornamental Snake, Collared Delma, Brigalow Scaly-foot, and Yakka Skink. A detailed list of impact mitigation measures relevant to these taxa are provided in Section G.7.1.3.5.

Research associated with a variety of major Australian pipeline projects has demonstrated that pipeline trenches can entrap significant numbers of a diverse range of native fauna (including species of conservation significance), particularly reptiles, frogs and small mammals, with the potential for high levels of mortality (Ayers and Wallace 1997, Woinarski *et al.* 2000, Doody *et al.* 2003, Wilson and Swan 2004, and Wilson 2005b). The potential for fauna entrapment and mortality is significant and has been acknowledged as a key

environmental issue by the *Australian Pipeline Industry Association Code of Environmental Practice* (APIA 2005).

To help reduce potential impacts from trench fall, the length of open trench will be the minimum practicable at any one time. It is recommended that management practices be implemented that reduce the potential for fauna to enter open trenches and prevent mortality of any individuals which may become entrapped (see Section G.7.1.3 for details).

#### **G.1.1.1.7                      Introduced Fauna and Flora**

##### *Vertebrate Fauna:*

The review of existing information and the findings of field surveys has identified a suite of introduced fauna species which are known or likely to occur within the project area and surrounds. The majority of these species have been widely acknowledged as implicit in the degradation of habitat values for both native fauna biodiversity and species of conservation significance. Threats include predation of native taxa, competition with native fauna, physical degradation of native fauna habitat, and transmission of pathogens to native fauna.

Evidence drawn from field surveys indicates that the occurrence of a variety of pest species was widespread throughout the project area and most are assumed to have resident populations, though their abundance is likely to vary throughout the project area.

As part of the operation of the project, no pest species will be deliberately introduced to the project area and measures will be implemented to reduce accidental introduction.

##### *Invertebrate Fauna:*

The invertebrate pests of most concern are introduced ants. Red Imported Fire Ants (*Solenopsis invicta*) were first recorded from Australia in 2001 when colonies were found in Brisbane. In 2006, fire ant colonies were found at Yarwun, just west of Gladstone. By September 2006, the Yarwun ants had been eradicated, but the possibility remains that other fire ant colonies may exist around Gladstone or elsewhere in central Queensland.

CSIRO climate model analysis shows that fire ants have the potential to inhabit vast areas of coastal Australia, including natural areas such as world heritage areas and national parks (DPI&F 2007). Fire ants are very aggressive and are voracious feeders and these attributes indicate that fire ants have the potential to impact on native fauna biodiversity, particularly native ground fauna, including invertebrates, skinks, frogs, birds and mammals (DPI&F 2007). There is evidence of these impacts in some fire ant infested bushland in Brisbane's southwest (DPI&F 2007). Fire ants also have the potential effect long-term changes to vegetation communities in natural areas as a result of their habit of eating or damaging native plant

seeds and predating/disturbing insects and animals which pollinate native plants (DPI&F 2007).

Red Imported Fire Ants have been declared a notifiable pest under the *Plant Protection Act 1989* (Qld). Landholders are legally obliged to inform the DPI&F if they suspect they have fire ants, and the withholding of this information can result in fines.

The National Fire Ant Eradication Program commenced in 2002 to eradicate the red imported fire ant from Queensland and is part of a nationally coordinated program involving a cooperative approach between the Commonwealth and Queensland Governments (DAFF 2007). Part of the National Fire Ant Eradication Program strategy aims to reduce the spread of fire ants through movement controls, i.e. restrictions on the disturbance or movement of high-risk materials. High-risk materials include soil, mulch, hay, turf and earth-moving machinery/vehicles/equipment.

The extreme southern extent of the project area is included within the area declared as the Yarwun Fire Ant Restricted Area (DPI&F 2007). Regulations apply to commercial activities which involve moving high-risk materials within and out of a fire ant restricted area (e.g. movement of high risk materials must be accompanied by a movement certificate or fire ant declaration form).

Red Imported Fire Ants are very small, only 2–6mm long, coppery brown in colour like beer bottles. They live mainly in dome-shaped nests with no visible entry holes. The nests can be up to 40cm tall (see illustrations at [http://www.dpi.qld.gov.au/cps/rde/xchg/dpi/hs.xsl/4790\\_4549\\_ENA\\_HTML.htm](http://www.dpi.qld.gov.au/cps/rde/xchg/dpi/hs.xsl/4790_4549_ENA_HTML.htm)), although new nests are often concealed underground or beneath debris with no mound present. Fire ants readily nest in industrial sites such as outdoor depots, where they can easily be transported along with containers or pipes that have been stored on the ground, especially if soil adheres to the base. They are easily overlooked because they often remain concealed within their nests for long periods, but will storm out when disturbed and sting fiercely. The worker ants vary greatly in size, and this characteristic, plus the lack of visible entry holes in nests, and the stinging behaviour, provides good indications that ants are fire ants. Illustrations can be found on the Department of Primary Industries and Fisheries (DPI&F) website (<http://www2.dpi.qld.gov.au/fireants/8294.html>). Construction personnel; should not try to identify ants themselves, but should mail samples of any suspicious ants to the Queensland Fire Ant Control Centre. The ants should be killed with insect spray or frozen in a fridge, then sent in a dry condition.

Another invasive ant of concern is the Yellow Crazy Ant *Anoplolepis gracilipes*. Crazy ants have been recorded at various sites along the Queensland coast, including Cairns, Hervey Bay, Brisbane and Logan City. Although crazy ants are not known from the region between

Cairns and Hervey Bay, it is considered likely by experts at Biosecurity Queensland that undetected infestations exist (*pers comm.* T. Low, 2007).

Where high populations or super-colonies form, crazy ants can directly impact on a range of native vertebrate and invertebrate fauna and flora (including *EPBC Act* listed threatened taxa), resulting in considerable losses of biodiversity, changes in habitat structure and alterations to the ecosystem processes (DECC 2005, TSSC 2005).

The Yellow Crazy Ant is declared a Class 1 pest under the *Land Protection (Pest and Stock Route Management) Act 2002* (Qld). A class 1 pest is one that is not commonly present in Queensland, and if introduced would cause an adverse economic, environmental or social impact. Class 1 pests established in Queensland are subject to eradication from the state. Landowners must take reasonable steps to keep their land free of class 1 pests. Declaration under state legislation imposes a legal responsibility for control by all landowners on land under their management and without a permit, it is an offence under the *Land Protection Act* to:

- introduce a pest animal to the state;
- feed a declared pest animal;
- keep a declared pest animal; or
- release a declared pest animal.

The declaration establishes responsibility with landholders, and gives QNR&M power to take emergency control action, including issuing emergency quarantine notices.

As with fire ants, crazy ants can be transported on vehicles, especially among soil or green waste. A lump of earth attached to a grader, truck or section of pipe could carry a queen ant and enough workers to found a new colony. Vehicle hygiene is thus important. Construction personnel will be trained to report any unusual ants detected around depots or camps.

Yellow imported crazy ants are yellowish tan, about 5 mm long, with long antennae and long legs (see DPI&F website at [http://www.nrw.qld.gov.au/pests/pest\\_animals/declared/crazy\\_ant.html](http://www.nrw.qld.gov.au/pests/pest_animals/declared/crazy_ant.html)). Crazy ants do not sting but will spray irritating formic acid from their abdomens when disturbed. This is unlikely to have serious medical consequences. Crazy ants can be spread through transportation with timber and other products, and they have been found inside kitchens on industrial premises in Queensland.

#### *Environmental Weeds:*

As identified in Chapter 6 of the EIS, Terrestrial Flora, there are a variety of exotic weed taxa within the project area and surrounds. Many of are either known to, or have the potential to

pose a significant threat to the maintenance of terrestrial biodiversity values. Weed hygiene and control protocols will be developed and implemented through a construction weed management plan (see Section G.7.1.3 for details and Chapter 6, Terrestrial Flora).

### **G.7.1.2 Potential Impacts**

As a result of the review of existing information sources, a wide variety of *EPBC Act* listed Threatened Species were initially considered in regards to potential occurrence within the project area (see Table 3). Habitat suitability assessments and a series of targeted field surveys undertaken for this chapter have provided further assistance to refining the list of taxa to include those known to occur within the project area and close surrounds or those, which have a potential to occur within the project area, and close surrounds.

The findings of that work also indicate that the project area does not support high quality preferred habitat for any of those species, though the project area does support areas of comparatively lower quality habitat in which *EPBC Act* listed threatened species have been recorded and/or could potentially occur.

In consideration of these issues, it is concluded that generally there is minimal prospect that the development and operation of the project will result in a significant impact to local populations if appropriate impact mitigation measures are implemented (see Section G.7.1.3 for details).

The following sections identify those *EPBC Act* listed threatened fauna species considered in the final analysis and a summary of the potential impact on these species.

#### **G.1.1.1.8 EPBC Act listed Threatened Fauna**

The field survey program has detected *EPBC Act* listed threatened taxa which have been recorded within the project area or on adjacent land. They are:

- *Critically endangered*: Yellow Chat (*Epthianura crocea macgregori*);
- *Vulnerable*: Squatter Pigeon (sth. subsp.) (*Geophaps scripta scripta*); and
- *Vulnerable*: Ornamental Snake (*Denisonia maculata*).

The review of fauna databases and local studies identified a variety of *EPBC Act* listed threatened species that have been recorded in, or have the potential to occur in, the broader area encompassing the project area. As determined through field surveys, habitat suitability assessments, and knowledge of habitat requirements, the project area does not support examples of quality preferred habitat for many of these species. Whilst the likelihood of occurrence within the project area for many of these taxa was determined to be possible, though

highly unlikely, a conservative precautionary approach has been adopted and those species have been included in the assessment of potential impacts.

The primary potential impacts to *EPBC Act* listed threatened taxa include loss of shelter and food resources, loss of breeding sites, trench fall (primarily herpetofauna) and possibly increased predation (primarily small ground mammals and birds) resulting from:

- Clearing of remnant vegetation and riparian communities;
- Removal of habitat trees, especially mature hollow-bearing trees;
- Removal of ground debris in the construction of the pipeline;
- Trenching operations;
- Increased ease of access for introduced predators.

Table 10 provides a summary of occurrence status and potential impacts and mitigation responses for *EPBC Act* listed threatened fauna that are known to occur, or have the potential to occur, within habitats of the project area and/or land immediately adjacent.

**Table 10 Summary of occurrence status and mitigation responses for *EPBC Act* listed Threatened fauna**

<b>Status:</b>	CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Migratory
<b>Legislation:</b>	<i>EPBC Act = Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)

Species	EPBC status	Occurrence status and summary of key impact mitigation strategies
Grey-headed Flying-fox ( <i>Pteropus poliocephalus</i> )	V	<b>No record, possible.</b> Northern extent of distribution around Gladstone, though may occur in southern parts of project area. Minimise tree clearing and impacts to remnant woodlands and forest.
Greater Long-eared Bat ( <i>Nyctophilus timoriensis</i> )	V	<b>No record, possible.</b> Northern extent of distribution around Gladstone/Mt. Larcom. Minimise impacts to remnant vegetation communities (especially those with a shrubby understorey), microtunneling or restricted clearing widths through riparian communities, protection of hollow-bearing trees, and post-construction habitat rehabilitation.

Species	EPBC status	Occurrence status and summary of key impact mitigation strategies
Collared Delma ( <i>Delma torquata</i> )	V	<b>No record, possible.</b> Minimise impacts to remnant woodland and open forest communities (especially those associated with cracking clays), open trench exclusion fencing, and trench fall rescue protocols.
Brigalow Scaly-foot ( <i>Paradelma orientalis</i> )	V	<b>No record, possible.</b> Minimise impacts to remnant vegetation communities (especially those with rocky outcrops at the southern end of the project area), open trench exclusion fencing and trench fall rescue protocols.
Yakka Skink ( <i>Egernia rugosa</i> )	V	<b>No record, possible.</b> Minimise impacts to remnant woodland and open forest communities (especially those with rocky outcrops at the southern end of the project area), trench fall rescue protocols, and post-construction habitat rehabilitation.
Ornamental Snake ( <i>Denisonia maculata</i> )	V	<b>Known.</b> Recorded from woodland adjacent to wetland (near south of Midgee). May occur in similar habitats to north and south, especially patches on heavier, cracking clay soils, in association with waterbodies. Minimise impacts to wetland areas through microtunneling, minimal clearing paths, post-construction habitat rehabilitation, open trench exclusion fencing, trench fall rescue protocols, and trench fall rescue protocols, and post-construction habitat rehabilitation.
Red Goshawk ( <i>Erythrotriorchis radiatus</i> )	V/M	<b>No record, possible.</b> Minimise impacts to remnant woodland and forest (particularly larger patches in southern sector of project area), and post-construction habitat rehabilitation. Distribution uncertain in region and these raptors require a very large home range.
Painted Snipe ( <i>Rostratula benghalensis</i> )	V,M	<b>No record, possible.</b> Occurrence erratic and unpredictable, seldom remaining long in wetlands at any locality. Minimise impacts to wetland areas through microtunneling, minimal clearing paths, and post-construction habitat rehabilitation.
Squatter Pigeon (sth. subsp.) ( <i>Geophaps scripta scripta</i> )	V	<b>Known.</b> Recorded from a variety of locations, though mainly within the central sector of the project area. Known to occur in highly disturbed cleared landscapes. Minimise impacts to drier eucalypt woodland and areas where native grasses predominate, and post-construction habitat rehabilitation.

Species	EPBC status	Occurrence status and summary of key impact mitigation strategies
Yellow Chat ( <i>Epthianura crocea macgregori</i> )	CE	<p><b>Known.</b> Recorded within one kilometre of project area though not recorded within adjacent areas along ROW (despite a seven-month monitoring program). Five areas of potentially suitable Yellow Chat habitat are traversed by the ROW (see figure 7.4 and 7.6). These include potential Yellow Chat habitat at:</p> <ul style="list-style-type: none"> <li>• Fauna Habitat Sensitivity Site 16 (see Table 12), north of Inkerman Creek</li> <li>• Fauna Habitat Sensitivity Site 17 (see Table 13), at the Inkerman Creek crossing</li> <li>• Fauna Habitat Sensitivity Site 21 (see Table 13) at the 12 Mile Creek crossing</li> <li>• Fauna Habitat Sensitivity Site 23 (see Table 13), at the Pelican Creek crossing</li> <li>• Fauna Habitat Sensitivity Site 24 (see Table 13), to the west of Raglan Creek</li> </ul> <p>Minimise impacts to wetland areas through microtunneling (see for all monitoring sites), minimal clearing paths, sediment and pollutant controls, rehabilitation of pre-construction drainage patterns, dry season construction scheduling, post-construction habitat rehabilitation, and feral animal weed control strategies.</p>

Table 11 lists those relevant taxa which are classified as threatened (i.e. endangered or vulnerable) under the *EPBC Act* and responses to the significant impact criteria as described within the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance* (May 2006). As a result of the analysis summarised in the following table, it is considered that the proposed action will not have a real chance or possibility of occurring as per the Guidelines noted above.

**Table 11 Summary of significant impact criteria for *EPBC Act* listed Threatened fauna**

<b>Significant impact criteria</b>
Criteria 1: Lead to a long-term decrease in the size of the population.
Criteria 2: Reduce the area of occupancy of the species.
Criteria 3: Fragment an existing population into two or more populations.
Criteria 4: Adversely affect habitat critical to the survival of the species.
Criteria 5: Disrupt the breeding cycle of a population.
Criteria 6: Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Criteria 7: Result in invasive species that are harmful to an endangered species becoming established in the species' habitat.
Criteria 8: Introduce disease that may cause the species to decline.

Threatened species	Status	Response to significant impact criteria								
		#1	#2	#3	#4	#5	#6	#7	#8	#9
Grey-headed Flying-fox ( <i>Pteropus poliocephalus</i> )	V	No	No	No	No	No	No	No	No	No
Greater Long-eared Bat ( <i>Nyctophilus timoriensis</i> )	V	No	No	No	No	No	No	No	No	No
Ornamental Snake ( <i>Denisonia maculata</i> )	V	No	No	No	No	No	No	No	No	No
Collared Delma ( <i>Delma torquata</i> )	V	No	No	No	No	No	No	No	No	No
Brigalow Scaly Foot ( <i>Paradelma orientalis</i> )	V	No	No	No	No	No	No	No	No	No
Yakka Skink ( <i>Egernia rugosa</i> )	V	No	No	No	No	No	No	No	No	No
Red Goshawk ( <i>Erythrotriorchis radiatus</i> )	V	No	No	No	No	No	No	No	No	No
Painted Snipe ( <i>Rostratula benghalensis</i> )	V	No	No	No	No	No	No	No	No	No
Squatter Pigeon (sth. subsp.) ( <i>Geophaps scripta scripta</i> )	V	No	No	No	No	No	No	No	No	No
Yellow Chat ( <i>Epthianura crocea macgregori</i> )	CE	No	No	No	No	No	No	No	No	No

### Alignment with the Yellow Chat Recovery Plan

In August 2008, a recovery plan for the Yellow Chat (*Epthianura crocea macgregori*) was released by the Commonwealth and Queensland governments (Houston and Melzer 2008). The recovery plan lists the following as threats to Yellow Chats:

- 1 Lack of knowledge regarding key aspects of Capricorn yellow chat ecology and habitat requirements.
- 2 Construction of barriers such as extensive levee banks for ponded pasture development or road works within tidal areas.
- 3 Construction of impoundments (weirs and dams or ponded pastures) upstream of areas supporting yellow chats.
- 4 Spread of exotic pasture grasses, particularly aleman grass and Olive hymenachne.
- 5 Increase in cattle stocking densities where chats currently occur.
- 6 Uncontrolled fire.

Field survey work undertaken to investigate potential Yellow Chat habitat within the project area will contribute to the understanding of Yellow Chat occurrence and habitat usage (thus support resolution of threat #1). In relation to threats 2 and 3, the project does not involve

development of levee banks or impoundments and is supported by a extensive range of impact avoidance and mitigation strategies in relation to construction works within or near wetlands, thus the project will not exacerbate the effects of threats 2 and 3. In relation to threat #4, a comprehensive suite of measures are to be implemented (and continually monitored) in relation to preventing the introduction of environmental weeds within the project area (see Chapter 20). Likewise, there are a suite of project controls designed to eradicate and environmental weeds which may establish within the project area and adjoining land. In relation to threat #5, the project does not involve the introduction of cattle and a comprehensive suite of measures are to be implemented (and continually monitored) in relation to preventing the introduction of introduced fauna within the project area (see Chapter 20). In relation to threat #6, protocols have been prepared to ensure minimal risk of fire emanating from the project area (See Chapter 16 and 20).

**G.1.1.1.9 Fitzroy to Bajool**

During the field survey program, habitats of comparatively higher value were identified and the pipeline route adjusted to avoid these whenever possible. However, where impacts are unavoidable, mitigation measures will be adopted that will aim to minimise disturbance to these areas (see Section G.7.1.3, Mitigation) as these areas represent indirect impacts on *EPBC Act* listed threatened fauna. Table 12 lists and describes the areas of fauna habitat sensitivity (see also Figure 7.4 of the EIS) and for each area, a summary of the key impact mitigation strategies which should be implemented.

**Table 12 Potential impacts and primary mitigation strategies for key locations within the Fitzroy to Bajool section**

Area #	Habitat and comments	Potential impacts and primary mitigation strategies
1	Fitzroy River riparian habitats. Fauna movement; habitat for forest birds and microbats; and hollow-bearing trees.	Removal of mature hollow-bearing trees; disruption to wildlife movement corridor.  Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; trench fall management protocols.

2	Northwestern extension of a series of semi-permanent vegetated billabongs to north of Nine Mile Road. Habitat for waterbirds and waders, including rare and migratory species.	<p>Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; feral animal weed control strategies.</p>
3	Western end of a series of semi-permanent vegetated billabongs. Extends south to Nine Mile Road. Habitat for waterbirds and waders, including rare and migratory species	<p>Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; feral animal weed control strategies.</p>
4	Western end of a large semi-permanent constructed wetland. Habitat for waterbirds and waders, including rare and migratory species.	<p>Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; feral animal weed control strategies.</p>
5	Corridor traverses centre of semi-permanent wetland. Largely natural form though surrounds cleared of remnant vegetation. North of Malchi Nine Mile Road. Habitat for waterbirds and waders, including rare and migratory species.	<p>Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.</p>

6	Billabong of natural form though surrounds cleared of remnant vegetation. Habitat for waterbirds and waders, including rare and migratory species.	Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.
7	Billabong of largely natural form though surrounds cleared of remnant vegetation. North of Titman Road. Habitat for waterbirds and waders, including rare and migratory species.	Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.
8	Adjacent to Gavial Creek wetlands. Habitat for waterbirds and waders, including rare and migratory species.	Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage; introduction of exotic flora.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; weed control protocols; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.
9	Small open seasonal wetland – part of Serpentine Creek wetland system. Habitat for waterbirds and waders, including rare and migratory species.	Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage; introduction of exotic flora.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; weed control protocols; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.

10	Shallow seasonal wetland and part of the Serpentine Creek wetland system – north of Georges Road. Habitat for waterbirds and waders, including rare and migratory species.	Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.
11	Shallow seasonal wetland and part of the Serpentine Creek wetland system – south of Georges Road. Habitat for waterbirds and waders, including rare and migratory species.	Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage; introduction of exotic flora.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; weed control protocols; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.
12	Seasonal wetland and part of the Serpentine Creek wetland system – south of Casuarina Road. Habitat for waterbirds and waders, including rare and migratory species	Alteration to surface hydrology; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling.
13	Dingo Creek riparian vegetation. Fauna movement; locally significant habitat corridor.	Removal of remnant vegetation; disruption to wildlife movement corridor; alteration to surface hydrology.  Strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns.

14	Station Creek riparian vegetation. Fauna movement; locally significant habitat corridor.	Removal of remnant vegetation; disruption to wildlife movement corridor; alteration to surface hydrology.  Strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns.
15	Oakey Creek riparian vegetation. Fauna movement; locally significant habitat corridor.	Removal of remnant vegetation; disruption to wildlife movement corridor; alteration to surface hydrology.  Strict vegetation clearance protocols; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns.
16	Seasonal wetland system comprising of natural form broad swales. Part of Inkerman Creek wetland system. Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.	Removal of mature hollow-bearing trees; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.

#### **G.1.1.1.10 Bajool to Gladstone**

During the field survey program, habitats of comparatively higher value were identified and the pipeline route adjusted to avoid these whenever possible. However, where impacts are unavoidable, mitigation measures will be adopted that will aim to minimise disturbance to these areas (see Section G.7.1.3) as these areas represent indirect impacts on *EPBC Act* listed threatened fauna. Table 13 lists and describes the areas of fauna habitat sensitivity and for each area, a summary of the key impact mitigation strategies which will be implemented.

These mitigation measures will include minimising disturbance widths, microtunnelling, and adopting practices for restoring areas of high habitat values.

**Table 13 Potential impacts and primary mitigation strategies for key locations within the Bajool to Gladstone section**

Area #	Habitat and comments	Potential impacts and primary mitigation strategies
17	<p>Seasonal wetland system comprising of natural form broad swales – south of Port Alma railway. Part of Inkerman Creek wetland system. Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.</p>	<p>Alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
18	<p>Inkerman Creek and associated wetlands. Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.</p>	<p>Removal of remnant vegetation; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; post-construction area-specific restoration; microtunneling; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
19	<p>Node of <i>Eucalyptus moluccana</i> woodland. Habitat node in largely cleared landscape.</p>	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; introduction of exotic flora and fauna.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; feral animal weed control strategies; trench fall management protocols.</p>

20	Southern extent of saline wetlands of Twelve Mile Creek Reserve. Adjacent to potential Yellow Chat habitat.	<p>Alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; minimal construction clearing path; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
21	Freshwater section of Twelve Mile Creek – adjacent and upstream of Twelve Mile Creek Reserve. Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.	<p>Alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; microtunneling; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies.</p>
22	Twelve Mile Creek tributary – riparian vegetation. Wildlife movement corridor.	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
23	Broad seasonal wetland – part of Pelican Creek. Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.	<p>Alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>

24	Southern extent of the Horrigan Creek wetland complex. Habitat for waterbirds and waders, including rare and migratory species; potential Yellow Chat habitat.	Alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.
25	Horrigan Creek riparian vegetation. Wildlife movement corridor.	Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; microtunnelling; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.
26	Horrigan Creek riparian vegetation. Wildlife movement corridor.	Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.  Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; microtunnelling; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.

27	Raglan Creek riparian vegetation (western extent). Wildlife movement corridor.	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; microtunnelling; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
28	Raglan Creek riparian vegetation (eastern extent). Wildlife movement corridor.	<p>Removal of remnant vegetation; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; post-construction area-specific restoration; microtunnelling; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
29	Remnant vegetation. Also large wetland approximately 100m to south. Habitat node in largely cleared landscape.	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; introduction of exotic flora and fauna.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; feral animal weed control strategies; trench fall management protocols.</p>

30	Darts Creek riparian vegetation – north of Darts Creek Road. Wildlife movement corridor.	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
31	Darts Creek riparian vegetation – north of Popenia Road.	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>

32	Larcom Creek tributary riparian vegetation	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
33	Larcom Creek riparian vegetation	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>

34	Boat Landing Creek riparian vegetation	<p>Removal of remnant vegetation; removal of mature hollow-bearing trees; habitat fragmentation; disruption to wildlife movement corridor; alteration to surface hydrology; introduction of exotic flora; disturbance to wildlife during key seasonal habitat usage.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; dry season construction scheduling; weed control strategies; trench fall management protocols.</p>
35	Remnant vegetation to near north of railway line	<p>Removal of remnant vegetation; introduction of exotic flora.</p> <p>Refine the ultimate pipeline alignment during final surveying; strict vegetation clearance protocols; respreading of logs, fallen and cleared vegetation; protection protocols for hollow-bearing trees; reuse of trimmed limb hollows; post-construction area-specific restoration; minimal construction clearing path; sediment and pollutant controls; rehabilitation of pre-construction drainage patterns; weed control strategies; trench fall management protocols.</p>

### G.7.1.3 Mitigation

#### General Requirements

All personnel shall attend environmental training prior to entering the work site. As part of this training, all personnel will be briefed about their obligations to protect fauna.

- Fauna shall not be fed and direct contact with fauna is to be avoided. This includes both native and introduced species.

#### Vegetation Clearing and Habitat Disturbance

- Minor alignment refinements that reduce impacts to areas of remnant vegetation and waterway crossings are to be investigated and adopted where possible during final surveying. An experienced botanist/ecologist is to assist.
- Refine the ultimate pipeline alignment during final surveying to avoid or minimise the clearing of mature hollow-bearing trees. An experienced botanist/ecologist is to assist.

- No vegetation removal shall occur until relevant approvals have been obtained. All permit approval conditions will be followed.
- Clearing boundaries will be delineated on all drawings and in the field to define the extent of authorised clearing.
- Installation of vegetation clearance markers (e.g. high visibility poly-web fencing) prior to the commencement of vegetation clearance. No flagged vegetation shall be removed.
- Identify and peg out intended vehicle access tracks to and along the right of way (ROW) at the commencement of the construction phase, to prevent the development of multiple access tracks.
- Vegetation clearing will be limited to within the construction footprint. Construction equipment and personnel will not be permitted outside the surveyed areas. Impact to vegetation outside the ROW will be avoided.
- Cleared vegetation is to be stockpiled so as not to impede wildlife, surface drainage and avoid damage to adjacent live vegetation.
- Locating features such as fill stockpiles, access tracks, site facilities, etc. in areas of existing disturbances.
- Within areas of remnant vegetation, limiting clearing along access tracks within the ROW to slashing to a minimum height of 200mm, to allow for the retention of ground layer and understorey vegetation elements in all areas not directly utilised for infrastructure construction or access track purposes.
- Where possible, lopping of trees within the clearing zone, in preference to completely removing them.
- If required, trimming of branches overhanging the easement will be undertaken using a chainsaw, following the 'three-cut' method.
- All mature hollow-bearing trees are to be retained and protected wherever practicable. Where this cannot be achieved, hollow limbs and/or trunks should be left on the ground adjacent to the ROW (or relocated to within areas of remnant vegetation) to provide habitat for ground-dwelling fauna.
- Clearance of ground cover vegetation shall be restricted to the construction easement. Cleared or trimmed vegetation shall be stockpiled separately from topsoil.
- No large scale burning of vegetative wastes is to be undertaken. Timber is to be chipped or stick raked into stock piles for use in revegetation and erosion control.
- Prescribed burning will only be undertaken with fire authority approval and only when it is not possible to respread the cleared vegetation (e.g. where material includes a major component of woody weed infestation).
- Construction activities shall be scheduled to minimise the time between clearing and rehabilitating the ROW.
- Topsoil and vegetation will be respread as soon as practicable after the completion of construction works.
- The surface profile shall be reinstated to ensure maintenance of local surface conditions.

- The topsoil shall be stockpiled in a manner so that it can be easily returned during reinstatement (i.e. not placed on uncleared vegetation or against tree trunks). Soil and vegetation stripped from the ROW will be stored immediately adjacent to the site where it originated. No soil or vegetation material is to be transported along the corridor.
- Trench spoil is to be stockpiled separately from topsoil. Where practicable, deep top soil from the trench will be stockpiled separately from the subsoil.
- A reseeding plan based on soil type and existing local ground layer vegetation characteristics (i.e. native or improved pastures) along the alignment will be implemented.
- Local provenance native plant seed is to be used for rehabilitation within any areas of remnant or remnant regrowth vegetation that supports a ground cover of native grasses. Where this is not possible, seed from other parts of central Queensland would be acceptable.
- Monitoring of vegetation reestablishment is to be conducted by a suitably experienced ecologist.

#### **Habitat Fragmentation and Disturbance to Wildlife Movement Corridors**

- Constraining corridor clearing widths to the minimum necessary to allow construction of infrastructure (i.e. the minimum required to safely construct the infrastructure and fulfil environmental management requirements, e.g. erosion control).
- Avoiding additional clearing of remnant vegetation for construction vehicle access tracks, truck turning areas and extra workspaces, etc.
- Logs and fallen vegetation will be pulled back over the alignment to provide habitat for native fauna.
- Where required, trees adjacent to working areas are to be lopped, with complete-to-ground clearing being avoided.
- Avoid construction of separate crossings for access tracks, as access would be able to be gained to the crossing area from both sides of all creeks.
- Any fencing necessary along the outer ROW boundary should allow passage of fauna from either side of such fencing. For new fencing, the design should incorporate a 30 cm gap between ground level and the first rail or wire strand. A chain-wire fence should also incorporate a 30 cm gap between the bottom of the chain-wire and ground level and the overall height of a chain-wire fence should be limited to maximum of 1.5 m or less. The use of barbed wire should be avoided and used only where essential to exclude stock from adjoining pastoral activities. Where the use of barbed wire can not be avoided, the fence design should incorporate alternate strands of plain wire and barbed wire, e.g. top strand plain wire, middle strand barbed wire and bottom strand plain wire. Existing boundary fences should be retrofitted to meet the above recommendations.

### **Disturbance to Wetlands and Waterways**

- Refine the ultimate pipeline alignment during final surveying to further minimise impacts to wetland and riparian habitats.
- An experienced botanist/ecologist is to assist where any alignment refinements are proposed during final surveying of wetland or riparian crossings.
- Construction should be undertaken during the dry season (i.e. June to September) wherever possible.
- Water quality protection measures (e.g. sediment and pollutant controls) are to be installed prior to the main construction works (i.e. trenching and pipeline instatement).
- Disturbance to habitat values have been minimised where possible through trenchless construction methods.
- The construction corridor and the clearing of wetland vegetation cover (native or introduced) is to be kept to the minimum required to safely construct the pipeline and comply with other environmental management safeguards (e.g. erosion control, pollutant controls, spoil storage, etc.).
- Surface drainage is to be returned to pre-construction patterns.
- Areas disturbed by constructing activities are to be rehabilitated to closely reflect pre-construction vegetation floristics and structure.
- Monitoring of vegetation reestablishment is to be conducted by a suitably experienced ecologist.

### **Trench Fall**

- Construction should be timed to take place in the coolest and driest months (i.e. June to September), when activity levels of reptiles and amphibians are lowest and when conditions are most favourable for minimising fauna mortality in open trenching.
- Construction activities will be planned so that the excavated trench will be open for the minimum practicable amount of time to install pipe sections. Trenching should occur progressively to minimise the period of time the trench is open and the length of open trench.
- Specific requirements to minimise fauna entrapment and mortality include:
  - Minimising the length of trench open at any one time.
  - The majority of the trench is to be backfilled prior to cessation of construction each day.
  - Minimising length of trench to be left open over night.
  - The ends of an open trench will ramped to a gentle incline (< 50%) so as to allow any fauna to escape.
  - Escape ramps and trench plugs (with slopes < 50%) are to be established for every 500 m of open trench. Additional methods may be adopted to create 'ladders' at

regular intervals to assist small fauna to exit the trench (e.g. branches, ramped gangplanks, etc.; see APIA (2005)).

- In addition, two damp, sawdust filled hessian bags (shelter sites) are to be placed intermediate to the escape ramps (i.e. for every 250 m of open trench). Provision of fauna refuge areas should be guided by methods successfully employed during construction of the North Queensland Gas Pipeline (NQGP) (see Wilson and Swan (2004)),
- Construction personnel will inspect the entire open length of the trench daily from sunrise. If required, wildlife handlers (spotter catchers) will be called to site to attend to fauna issues.
- Wildlife handlers will remove wildlife from the trenches, identify, record data and release the captures into nearby vegetated areas. Personnel will be legally permitted, trained in appropriate handling protocols, and will possess the necessary Personal Protection Equipment (PPE) for the handling of animals.
- Wildlife handlers must be licensed to euthanase badly injured fauna that are found within the trench. The *Australian National Health and Medical Research Council's Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (2004)* are to be followed when dealing with injured fauna.
- A permit to interfere with wildlife from the Queensland Environment Protection Agency will be required for the wildlife handling activities as will the appropriate Animal Ethics Permit from the Department of Primary Industries.
- Protocols for extracting fauna with minimal harm from open trenches should follow guidelines provided in Woinarski *et al.* (2000).

### **Introduced Flora and Fauna**

#### Vertebrate Fauna

- The proposed development will not deliberately introduce any invasive species. Companion animals are to be banned from all pipeline construction activities to ensure that no pest species are introduced.
- Feral animal control strategies will be developed and implemented under a feral animal control plan. This will include:
- Design and implementation of an ongoing eradication program which targets pest animals.
- Design and implementation of an ongoing systematic monitoring program to detect the occurrence of feral animals and to assess the success of the eradication program.
- Implementation of a program to ensure strict litter control throughout the construction site. This is to be supported by: site-wide signage; an adequate number of litter bins (which by design exclude birds and vermin); bin clearance on a regular basis; daily maintenance of crib rooms to ensure cleanliness; educational signage within crib rooms on the linkage

between poor waste management practices, increases in pest animal populations and subsequent impacts to native fauna.

- Implementation of design features for permanent structures (e.g. pump stations, water treatment plant, etc.) and temporary site facilities (e.g. construction site offices, etc.) which minimise harbourage or roost opportunities for vermin and animal pests.

### *Invertebrate Fauna*

The extreme southern extent of the project area is included within the area declared as the Yarwun Fire Ant Restricted Area (DPI&F 2007). Regulations apply to commercial activities which involve moving high risk materials within and out of a fire ant restricted area (e.g. movement of high risk materials must be accompanied by a movement certificate or fire ant declaration form).

To comply with these regulations, an Approved Risk Management Plan (ARMP) will be developed in consultation with DPI&F. The ARMP will set out strategies to be implemented to reduce the risk of spreading fire ants, including measures to reduce the potential facilities and/or equipment becoming infested with fire ants. The ARMP will include, but not be limited to, the following strategies (after DPI&F 2007):

- A site inspection must be conducted by a DPI&F inspector or approved person prior to moving or disturbing any soil.
- Vehicles, equipment and pipes will be inspected at depots before they are taken into the field to ensure they are not carrying live ants, and not carrying clods of earth that could conceivably contain ants.
- Construction activities will not move fire ant infested material outside the restricted area without the approval of a DPI&F inspector and only to approved disposal sites within a restricted area. Infested soil may only be moved to a DPI&F approved disposal site.
- All high risk materials will be treated before being moved out of the restricted area.
- Materials not infested with fire ants may be disposed within the restricted area using approved disposal sites only.
- Where the ARMP is not applicable to sub-contractor activities, a Fire Ant Declaration (FAD) form to move high risk materials will be required.
- All materials moved from within the restricted area will be accompanied by a movement certificate or Fire Ant Declaration Form.

Whilst there are no known populations of crazy ants within the region, the suite of mitigation measures to address the potential for the introduction of these pests forms a sub-set of those to be applied in respect to fire ants. As such, prevention and control strategies for crazy ants will be incorporated within the Approved Risk Management Plan outlined above, and applied throughout the project area.

## Flora

- Weed eradication programs will be implemented as required, and a weed management plan will be implemented during construction.
- Equipment and material introduced to the region, especially those from interstate, will be screened for pest species.
- Workers undertaking the following tasks will be required to fulfil all washdown requirements: surveying; fencing / gating; clearing and grading; and reinstating. The remainder of the workforce will be required to stay on project approved roads or on the construction corridor, where they will not come into contact with weeds.
- Ensure all vehicles and machinery that will access the ROW are free from soil/organic matter prior arrival on site.
- Identify on drawings and to personnel, entry and exit points to the ROW at which hygiene protocols become effective.
- Establish and maintain weed wash down bays at designated entry and exit points.
- Clean down of machinery when moving from disturbed areas to undisturbed areas during clear, grade and rehabilitation.
- No soil or vegetation material is to be taken beyond one kilometre from the point of original clearing or extraction.

## **Animal Welfare**

- Wildlife assessment/rescue services are to be engaged prior to vegetation clearing, to assess appropriate site clearing approaches to minimise deleterious impacts to fauna. Spotter/catcher services (wildlife handlers) are to be employed until all clearing has ceased.
- Wildlife handlers will follow the *Australian National Health and Medical Council's Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (2004)* when dealing with injured fauna.
- A permit to interfere with wildlife from the Queensland Environment Protection Agency will be required for the wildlife handling activities as will the appropriate Animal Ethics Permit from the Department of Primary Industries.
- Development and implementation of protocols for any displaced fauna to be relocated to more suitable similar habitat within the surrounding area.
- Establishment of fauna exclusion fences to prevent fauna inadvertently re-entering the construction areas.
- Where possible, the timing of vegetation clearance (particularly areas of remnant vegetation) will be selected in order to minimise impacts (direct and indirect disturbances) to affected fauna habitats during optimum breeding periods (e.g. May to September is the breeding season for Yellow Chat as per the Development Scheme for the Stanwell – Gladstone Infrastructure Corridor State Development Area).

- Establishment of habitat enhancements to retained remnant habitat within the project area (e.g. artificial roost boxes for microbats).

#### G.7.1.4 Residual Impacts

As previously described, the majority of the project area is highly disturbed. For these largely cleared and grazed lands, the implementation of the mitigation strategies outlined above will result in the project creating a **negligible** residual impact on *EPBC Act* listed threatened fauna species (see Table 14). However, due to the impact upon the key locations (see Section G.7.1.2), the residual impact upon *EPBC Act* listed threatened fauna species is considered **minor adverse**.

**Table 14 Project impact significance criteria for *EPBC Act* listed Threatened fauna**

Significance	Impact significance criteria for terrestrial fauna
<b>Major adverse</b>	Extensive or acute disturbance (major impact) upon a matter of national importance. These effects are generally, but not exclusively, associated with sites, species and/or communities described as matters of national significance under the <i>EPBC Act</i> . The effects, whether direct or indirect, have the potential to result in the designation of a matter of national significance being permanently compromised. Mitigation measures and detailed design work are unlikely to remove all of the impacts upon the affected communities or interests. Significant residual impacts would predominate.
<b>High adverse</b>	These effects (major impact) are likely to be important considerations at a state or bioregional scale but, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision making process. Effects are likely to manifest as irreversible loss or damage to a substantial part of the state or bioregional distribution, or the majority of the local distribution of a threatened habitat type, community or population of flora or fauna as listed under the <i>EPBC Act</i> . Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests. Residual impacts would predominate.
<b>Moderate adverse</b>	These effects (major impact) are likely to be important at a sub-regional or local scale, resulting in an extensive or acute disturbance resulting in the loss or the permanent lowering of the area's biodiversity values. In some situations, the impact will result in limited disturbance (moderate impact) to a feature or site of regional importance where recovery is anticipated following completion of the works concerned. The cumulative effects of such issues may lead to an increase in the overall effects upon a particular area or species population. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.

Significance	Impact significance criteria for terrestrial fauna
<b>Minor adverse</b>	These effects (moderate impact) are likely to be important at a local scale. Lesser loss or disturbance than moderate adverse (major impact) to a locally important site or local biodiversity values. Limited or temporary effects (minor impact) on national, bioregional or regional values. Relatively minor impacts to protected species and/or biodiversity generally, where mitigation measures are anticipated to alleviate short-term adverse impacts. Mitigation and compensation measures are generally effective in ameliorating the consequences upon affected communities or interests.
<b>Negligible</b>	Any impacts on resources considered to be of negligible ecological value, or effects on species, habitats or resources of value are likely to be imperceptible. Effects that result in minimal change or that which is beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
<b>Beneficial</b>	Any effects that are expected to result in an improvement of the quality of ecological resources following completion of works. These can, for example, include creation of new or additional habitat features which are beneficial to native fauna, or introduction of measures that would achieve improvements in quality of existing habitat. Design features or management activities, which would make a long-term contribution to ecological objectives, or measures to ensure the long-term protection of species under threat which may not be adversely affected by the project per se (e.g. feral animal controls and weed eradication).

#### G.7.1.5 Cumulative and Interactive Impacts

The concept of cumulative impacts acknowledges that a development and associated activities can combine and interact with others to cause collective effects and that the resultant effect may be different in nature or extent from the effects of the individual activities alone. Cumulative impacts can result from a number of different elements within a project as well as from a number of different projects with interacting impacts in the same area. Cumulative impacts can be viewed in terms of the relationship between introducing a new development with existing land uses and the further interaction with other developments being planned.

Fauna habitat values within the project area have been strongly influenced by a history of cattle grazing and agriculture. This has resulted in extensive areas where native vegetation has been cleared. Those areas of native vegetation which remain, though often small and isolated or poorly connected, are of significance in maintaining local biodiversity values, and in some cases, supporting the only remaining habitat for species of conservation significance.

Although, the project has the potential to generate impacts to *EPBC Act* listed threatened native fauna habitat, it is considered that the successful implementation of the recommended mitigation measures has the potential to reduce any cumulative and interactive effects to a

level of relatively low significance. Whilst the cumulative and interactive effects of the addition of the project to the suite of existing land uses is considered to be of a relatively low significance, this result must be considered in the context of other potential projects which may be implemented within the SGIC. Other infrastructure projects include gas pipelines, water pipelines, and fibre optic cabling.

Further infrastructure within in the SGIC is likely to result in the following:

- Vegetation clearance, including removal of native and remnant vegetation which may lead to further reduction in *EPBC Act* listed threatened fauna habitat areas, habitat fragmentation, and the potential for introduction of feral animals and plants.
- Widening of previous waterway crossings or establishment of new crossings with the potential to generate disruption to wildlife movement opportunities and alterations to surface hydrology.
- Additional disturbance to seasonal wetlands with the potential to generate disruption to surface hydrology, disturbance to wildlife during key seasonal habitat usage, and the introduction of exotic flora and fauna.

Concomitant with the implementation and operation of each further project, there is the potential for cumulative and interactive impacts on local *EPBC Act* listed threatened fauna to reach a higher level of significance than that which can be attributed to the current project alone. These effects may result in diminishing the capacity of the local area to support current levels of native faunal diversity and the viability of local populations of some *EPBC Act* listed threatened taxa.

Many of habitat features within the SGIC (or transected by the SGIC), because of their size and/or context, may be approaching potential thresholds where repeated disturbances to them could result in significant deterioration of values. Any future proposed developments, will be required to address the cumulative impacts of their developments with the impacts of the other existing and the currently proposed developments in the area, and would be considered by the relevant approval authorities.

## **G.7.2 Threatened Terrestrial Flora and Threatened Ecological Communities**

### **G.7.2.1 Main Potential Impact Processes**

The main potential impacting processes to *EPBC Act* listed threatened flora and Threatened Ecological Communities associated with the clearing of the 30 m right-of-way and construction of the pipeline are:

- Clearing of vegetation remnants;
- Reduction of flora species habitat;
- Removal of individual species of significance;
- Reduction of wildlife corridor functionality;
- Remnant vegetation edge effects;
- Riparian vegetation disturbance; and
- Weed introduction.

### **G.7.2.2 Activities Causing Impacts**

The activities which may cause the impacts listed in Section G.7.2.1 are:

- Felling of individual trees;
- Clear-felling of stands of trees, and increasing edge effects such as wind and weed penetration;
- Bulldozing of shrubby areas;
- Trenching across ephemeral wetlands and creeks, specifically including clearing either side of the trench;
- Digging pits on either side of wet creeks for entry and exit of underground boring; and
- Possible, accidental introduction of weeds to a site.

### **G.7.2.3 Impacts upon Ecological Communities**

Table 15 lists those relevant Ecological Communities which are classified as Endangered under the *EPBC Act* and responses to the Significant Impact Criteria as described within the

*EPBC Act* Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance (May 2006). None of the Significant Impact Criteria will be met as a result of the project, but the reduction in area of a low-growing patch of Brigalow may occur (at Site 9c). The structural form of this patch of Brigalow does not meet the requirements for classification as remnant under the *VM Act*, nor the *EPBC Act*, which uses the structural classification of the *VM Act*.

Partial clearing of the semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar bioregions at Short Site 4 (see Figure 6.1 of the EIS) would only occur if the right-of-way were extended across existing road. If the corridor is located on the other side of the road, and this is the current intention, then no scrub will need to be cleared.

**Table 15 Summary of Significant Impact Criteria for *EPBC Act* Endangered Ecological Communities**

Endangered Ecological Communities	Response to Significant Impact Criteria						
	#1	#2	#3	#4	#5	#6	#7
Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant)*	no*	no	no	no	no	no	no
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar bioregions	no	no	no	no	no	no	no
<b>Significant Impact Criteria</b>							
Criterion 1 -	reduce the extent of an ecological community						
Criterion 2 -	fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines						
Criterion 3 -	adversely affect habitat critical to the survival of an ecological community						
Criterion 4 -	modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns						
Criterion 5 -	cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting						
Criterion 6 -	cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:  – assisting invasive species, that are harmful to the listed ecological community, to become established; or						

	– causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community
Criterion 7 -	interfere with the recovery of an ecological community
*refer to discussion on the classification of Brigalow structure for Site 9c in section G.6.2.3	

#### **G.7.2.4 Direct Impacts upon EPBC Act listed Threatened Terrestrial Flora Species**

##### **Whole Right of Way**

Endangered (under *NC Act* and *EPBC Act*) scrub species are of greatest concern in regard to the impact of the corridor. These scrub species are most likely to occur in Regional Ecosystem 11.11.18, as this defines lowland scrub on metamorphic sediments. Scrub in the project area is not necessarily restricted to this RE, depending on geological substrate and species assemblage. Table 9 shows the likelihood of occurrence of **targeted** *EPBC Act* listed Threatened Species along the corridor, of which the most likely species are scrub species. Due to the species diversity within scrub remnants, it is not possible to assess the relative likelihood of impact to specific scrub species, without exact knowledge of the proposed location of the pipeline (i.e. within a few metres)<sup>3</sup>, and extensive survey of all scrub species along that line. It is considered unlikely that adult (mature) scrub species will be disturbed in the right-of-way. Scrub on Marble Creek had the greatest likelihood of impact, but the crossing point was surveyed and no *EPBC Act* listed Threatened Species were observed at that point. There are areas of scrub regrowth within the right-of-way that will be cleared, but these species are not advanced in growth (i.e. usually less than one metre high), and it is unlikely that these will be of sufficient growth form to warrant avoiding.

Black Ironbox (*Eucalyptus raveretiana*) is considered unlikely to occur in riverine locations along the corridor, but it is still possible that individuals may be encountered. These individuals are therefore at risk of removal or damage if not identified before trenching, boring or clearing operations take place.

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<sup>3</sup> Note that Table 6-4 identifies the likelihood of occurrence of habitat for specific scrub species as fair, but **only** within remaining scrub remnants.

### Fitzroy to Bajool

Wetlands are the ecosystems which will be most impacted along this section of the corridor. All wetlands in this area are to be trenched through, rather than bored under, because of their ephemeral nature (and size, in some cases). The wetlands impacted are identified in Table 6.7 of EIS Chapter 6. No threatened wetland species were identified for the project area from the *EPBC Act* Protected Matters Report, nor from Wildlife Online (see Table 8 Wildlife Online and *EPBC Act* Protected Matters Report).

Scrub species could potentially be impacted along this section of the corridor. Refer to the previous section above (Section 0) for impacts to these species.

### Bajool to Gladstone

Although Brigalow (*Acacia harpophylla*) regrowth may occur immediately south of Inkerman Creek, it constitutes a Threatened Ecological Community under the *EPBC Act* (if of sufficient structure), but the species as an individual is not listed as threatened under the act.

Two species of tree cycads (*Cycas megacarpa* and *C. ophiolitica*) are known to occur in areas that may be intersected by the proposed corridor. They are Endangered under the *EPBC Act*, and could be impacted through removal and/or disturbance of vegetation.

Scrub species could potentially be impacted along this section of the corridor, through removal and/or disturbance of vegetation. Refer to the section above regarding 'Whole Right of Way' under this section for impacts to these species.

### Summary of Significant Impact Criteria for EPBC Act Threatened Terrestrial Flora Species

Table 16 lists those relevant flora species which are listed as Threatened under the *EPBC Act* and responses to the Significant Impact Criteria as described within the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance* (May 2006). None of the Significant Impact Criteria will be met as a result of the project.

**Table 16 Summary of Significant Impact Criteria for reported EPBC Act listed Threatened flora species**

Threatened Species	Status	Response to Significant Impact Criteria								
		# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9
<i>Atalaya collina</i>	E	no	no	no	no	no	no	no	no	no
<i>Bosistoa selwynii</i>	V	no	no	no	no	no	no	no	no	no

<i>Bosistoa transversa</i>	V	no								
<i>Bulbophyllum globuliforme</i>	V	no								
<i>Corymbia xanthope</i>	V	no								
<i>Cupaniopsis shirleyana</i>	V	no								
<i>Eucalyptus raveretiana</i>	V	no								
<i>Leucopogon cuspidatus</i>	V	no								
<i>Parsonsia larcomensis</i>	V	no								
<i>Quassia bidwillii</i>	V	no								
<i>Cadellia pentastylis</i> *	V	no								
Significant Impact Criteria										
Criterion 1	lead to a long-term decrease in the size of an important population of a species									
Criterion 2	reduce the area of occupancy of an important population									
Criterion 3	fragment an existing important population into two or more populations									
Criterion 4	adversely affect habitat critical to the survival of a species									
Criterion 5	disrupt the breeding cycle of an important population									
Criterion 6	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline									
Criterion 7	result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat									
Criterion 8	introduce disease that may cause the species to decline									
Criterion 9	interfere substantially with the recovery of the species									

\* This species was not originally targeted, but was observed (identified as probably ooline) during the survey

### **Summary of EPBC Act listed Threatened Terrestrial Flora Species Impacts**

It is unlikely that *EPBC Act* listed Threatened species will be encountered along the corridor, during removal and/or disturbance of vegetation with the possible exception of ooline (*Cadellia pentastylis*). Table 16 shows that none of the Significant Impact Criteria (under the *EPBC Act*) will be met as a result of the project.

#### **G.7.2.5 Mitigation and Residual Impacts**

This section discusses the mitigation measures that will be implemented to minimise the potential impacts identified in Section G.7.2.1 to G.7.2.4, including aspects such as design (e.g. pipeline alignment), construction supervision by an environmental advisor, and the use of offsets. Further mitigation measures are identified in the Planning EMP in Chapter 20. Residual impacts and the severity of impacts are also identified.

### Assessment of Impact Severity

Table 17 defines the significance criteria used for assessing impacts and is specifically adapted here to assess impacts on *EPBC Act* listed flora and ecological communities.

**Table 17 Significance criteria for residual flora impacts**

Significance	Criteria
<b>Major adverse</b>	Extensive or acute disturbance (major impact) occurring at a site of national importance, which results in the lowering of its ecological value. Also, direct or indirect adverse impact on an Threatened Ecological Community under the <i>EPBC Act</i> to the extent that its designation is potentially compromised, or the populations it supports or represents are materially reduced. Adverse effects on nationally or internationally protected species endangering their conservation status (Threatened species under the <i>EPBC Act</i> ).
<b>High adverse</b>	Irreversible loss or damage to a substantial part of the regional distribution, or the majority of the local distribution of a habitat type, community or population of flora (Threatened Ecological Community under the <i>EPBC Act</i> ). Long-term disturbance effects to populations or plant species protected by the <i>EPBC Act</i> .
<b>Moderate adverse</b>	Limited disturbance (moderate impact) to a Threatened Ecological Community under the <i>EPBC Act</i> where recovery is anticipated following completion of the works concerned. Lesser effects than major adverse on nationally protected species where mitigation measures are anticipated to alleviate adverse impacts.
<b>Minor adverse</b>	Limited or temporary effects (minor impact) on Threatened Ecological Communities. Minor impacts on <i>EPBC Act</i> listed Threatened species where mitigation measures are anticipated to alleviate adverse impacts.
<b>Negligible</b>	Any impacts on resources considered to be of negligible ecological value, or effects on <i>EPBC Act</i> listed Threatened Species or Threatened Ecological Communities - the effects of which, when they occur, are likely to be imperceptible.
<b>Beneficial</b>	Any measures that are expected to result in an improvement of the quality of <i>EPBC Act</i> listed Threatened Species or Threatened Ecological Communities following their completion. These can, for example, include creation of new habitat features or introduction of measures that would achieve improvements in quality at an existing ecological site. Design features or management activities, which would

Significance	Criteria
	make a long-term contribution to ecological objectives, or measures to ensure the long-term protection of <i>EPBC Act</i> listed Threatened species, which may not be adversely affected by the project, are also included in this category.

### EPBC Act listed Threatened Terrestrial Flora Species and Threatened Ecological Communities Mitigation

As discussed in Section G.7.2.4, construction (and operation) of the pipeline may impact on threatened (under *EPBC Act*) scrub species that may occur within the proposed corridor, but it is not possible to assess the relative likelihood of impact to specific scrub species without exact knowledge of the pipeline location (i.e. within a few metres during construction)<sup>4</sup>.

Mitigation measures that will be implemented to minimise the potential impact to *EPBC Act* listed threatened scrub species include:

- A pre-construction survey of all scrub communities at the time the ROW is surveyed, focusing on the identification of *EPBC Act* listed Threatened Species along the proposed right-of-way (see Chapter 20 Planning EMP for proposed vegetation clearing practices);
- Areas of remnant vegetation along the alignment will be highlighted on all drawings and clearly marked in the field
- Potential minor realignment of the right-of way where possible (i.e. a few metres to go around trees or shrubs);
- Clearing boundaries will be clearly delineated on all drawings and in the field to define the extent of authorised clearing, which will not exceed the construction area.

Where these mitigation measures are implemented, along with the requirements in Chapter 20 of the EIS, there is likely to be a **negligible** impact to scrub species along the corridor.

Black Ironbox (*Eucalyptus raveretiana*) is considered unlikely to occur in riverine locations along the corridor, but it is still possible that individuals may be encountered. Mitigation measures to minimise the impact will include a pre-construction survey for Black Ironbox individuals, and potential minor realignment of the right-of way (i.e. a few metres to go around individual). There is likely to be a **negligible** impact to this species with the implementation of the above mitigation measures.

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<sup>4</sup> Note that Table Table 9 identifies the likelihood of occurrence of habitat for specific scrub species as fair, but **only** within remaining scrub remnants.

### **Fitzroy to Bajool**

Wetlands that potentially provide habitat for *EPBC Act* listed threatened wetland species and are likely to be impacted by the construction of the proposed pipeline are identified in Table 6.7 of EIS Chapter 6. While trenching is proposed for wetlands in this area because of their ephemeral nature (and size, in some cases), the implementation of the following mitigation measures will minimise the potential impact:

- When trenching across part of the wetland, topsoil will be stockpiled, and replaced after works to enable ground layer species to re-establish; and
- Wetlands will be restored, particularly for site 2.

Where these mitigation measures are implemented, along with the requirements outlined in the Planning EMP (Chapter 20 of the EIS), there is likely to be a **negligible** impact to *EPBC Act* listed threatened wetland species.

As previously mentioned, the ecological community at Site 4 will not be impacted and therefore no mitigation is provided here.

### **Bajool to Gladstone**

Section G.7.2.4 outlines the potential occurrence of, and impact to, Brigalow (*Acacia harpophylla*) regrowth (or possibly stunted remnant) immediately south of Inkerman Creek. While the species (as an individual) is not listed as threatened under the *EPBC Act*, the community may constitute a Threatened Ecological Community under the act (if of sufficient structure). Mitigation measures and residual impacts for this community (located at site 9c) are outlined in the Table 18.

### **Table 18 Mitigation Measures and Residual Impacts at Site 9c**

Mitigation	Residual Impact
<p>Minimise width of clearing of vegetation within area needed for pipeline and right-of-way. There is an existing old narrow vehicle track that will be used for the right-of-way if possible. Total length of clearing is approximately 200 m, so it will be possible to reduce the clearing width so that two vehicles can pass during construction. Clearing to be strictly kept to a maximum of 15 m, with boundaries clearly marked with 2 m lengths of high-visibility poly-web fencing, with 10 m gaps permitted.</p> <p>If EPA determines that this community is of remnant status, hence Endangered, then all Brigalow plants that are removed will be partially buried in an adjacent waterlogged area to allow suckering and consequent regrowth.</p>	<p><b>Minor adverse</b>, but could be <b>moderate adverse</b> if EPA determines that this community is of remnant status, hence Endangered.</p>

If EPA determines that this community is of remnant status, hence Endangered, then all Brigalow plants that are removed will be partially buried in an adjacent waterlogged area to allow suckering and consequent regrowth.

Two species of tree cycads (*Cycas megacarpa* and *C. ophiolitica*, Endangered under *EPBC Act*), known to occur within the proposed corridor, may be impacted through removal and/or disturbance of vegetation in the right-of-way. Mitigation measures to minimise the potential impact on these species includes the avoidance of clearing in remnant vegetation, or where this is not possible, translocation of impacted individuals (as per Forster (2007)).

Requirements outlined in the Environmental Management Plan (Chapter 20 of the EIS) will also be implemented. There is likely to be a **negligible** impact to *EPBC Act* listed threatened cycad species through implementation of these measures.

### Summary of Mitigation

While it is considered unlikely that *EPBC Act* listed Threatened Species along the corridor will be impacted by the proposed project, pre-construction surveys will be conducted. When any *EPBC Act* listed threatened individuals remain within the construction footprint, these can be translocated (or replacements planted, depending on species) resulting in a **negligible** residual impact.

### **G.7.2.6 Cumulative and Interactive Impacts**

The right-of-way is part of a larger corridor which will accommodate more services in the form of pipelines or cables. The Gladstone Area Water Board does not have control over these future additional services, and their potential impacts. The most significant issue associated with these additional services is the need for further clearing of vegetation, and the results of this study will be available to future proponents to assist with determining impacts, and devising mitigation measures.

It is considered unlikely that impacts on *EPBC Act* listed threatened flora species will accumulate over time due to additional services being installed. The corridor has been investigated as part of this assessment, and significant new findings are unlikely.

The key problems introduced by the installation of additional services are likely to be:

- Clearing of more vegetation in the form of another right-of-way, effectively widening the cleared part of the corridor. This will reduce remnant sizes and increase remnant fragmentation; and
- Introduction of more weeds, either in terms of quantity, or diversity, because of increased activity from construction, and subsequent maintenance.

Many of the environmental pressures generated by subsequent services may be greater than the current proposed project because they may occur during the rehabilitation period of this project, when damage could occur more easily to replanted areas. It is beyond the scope of this report to assess the cumulative impacts of these subsequent rights-of-way, but it is recommended that this report be used as a key source of baseline information, and as a guide to further impacts. Environmental management plans developed by other parties for additional services should be aware of the existing EMP (Chapter 20 of the EIS), so that management practices are coordinated between service operators. For example, weed management programs should be coordinated to increase effectiveness, particularly in areas infested by Parthenium and Giant Rats-tail Grass.

### **G.7.3 EPBC Act listed Threatened Aquatic Fauna and Flora**

#### **G.7.3.1 Impacts**

Potential impacts to *EPBC Act* listed threatened aquatic flora, fauna and their habitat resulting from the construction and operation phases of the Gladstone–Fitzroy Pipeline project are:

Construction phase:

- Vegetation clearing and channel disturbance
- Water quality modifications (due to changes in turbidity and the mobilisation of organic sediments, Acid Sulfate Soils and other toxicants)
- Creation of in-stream barriers (i.e. culverts)

Operational phase:

- Alterations to habitat, both surrounding the intake pipe and within the Fitzroy River weir pool
- Translocation of exotic species, especially the noxious Water Hyacinth\* (*Eichhornia crassipes*) from the Fitzroy River
- Water treatment plant (WTP) operational impacts.

Chapter 8 of the EIS describes these impacts in detail for aquatic flora and fauna.

Due to the low probability of occurrence of *EPBC Act* listed threatened aquatic flora and fauna species within the project area, significant impacts to listed Threatened Species are considered unlikely. Despite this, mitigation measures will still be implemented for non-*EPBC Act* listed species. These mitigation measures cover impacts on all aquatic flora and fauna (not only *EPBC Act* species which are listed as threatened) and hence these can be found in Chapter 8 of the EIS.

#### **G.7.3.2 Residual Impacts**

The levels of residual impact described in Table 19 were considered in assigning significance to the environmental impacts identified.

After mitigation, impacts upon aquatic flora and fauna that are listed under the *EPBC Act* as threatened are considered negligible.

**Table 19 Impact Significance Criteria for Aquatic Flora and Fauna**

Impact level	Scale of impact	Assessment criteria (must meet the criteria of one or more impact categories)		
		Habitat impact	Species impacts	Ecosystem impacts
<b>Major adverse</b>	Moderate (or greater) impacts at a national or state scale	> 60% of habitat removed	Mortality of a protected species, likely to cause local extinction	Total ecosystem collapse
<b>High adverse</b>	Minor impact at national or state scale, moderate (or greater) impact at a regional scale	30–60 % of habitat removed	Mortality of a protected species affects recruitment and the capacity to increase in numbers	Measurable impact to ecosystem function: some functions are lost, declining or increasing outside an historical range, or facilitate new species to appear
<b>Moderate adverse</b>	Major or high (medium- to long-term) impact at a local scale	5–30% of habitat removed	Mortality within some species causes impacts at the maximum acceptable level.	Measurable change to ecosystem components but no loss of functions (no loss of components)
<b>Minor adverse</b>	Moderate or high (short-term) impact at a site-specific scale, or minor impact at a local	< 5% of habitat removed	Protected species affected but no impact on population status (e.g. stress or behavioural change to individuals)	Keystone species not affected and minor changes in relative abundance of other species
<b>Negligible</b>	Negligible impact at local, regional, state and national scales, or minor impact at (or below) a site-specific scale	< 1% of habitat removed	No impact to protected species	Possible changes but within the range of natural variation
<b>Beneficial</b>	Any scale	Habitat creation	Improvement in population status of protected species	Ecosystem improvements (e.g. rehabilitation)

## **G.8 Conclusion**

### **G.8.1 *EPBC Act* listed Threatened Fauna**

The terrestrial and aquatic fauna and habitat values of the project area have been assessed through a comprehensive review of existing information and a field program, which has been implemented over a seven month period.

The assessment of potential impacts to these values has generated an extensive suite of mitigation measures for the project in keeping with best management practices (also, see EMP, Chapter 20 of the EIS). With the successful implementation of the recommended mitigation measures, it is considered that the impact of the project on *EPBC Act* listed threatened fauna will be relatively low in significance.

Although, the project has the potential to generate impacts to fauna habitat, it is considered that the successful implementation of the recommended mitigation measures has the potential to reduce any cumulative and interactive effects with existing land uses to a level of relatively low significance.

Many of habitat features within the Stanwell–Gladstone Infrastructure Corridor (or transected by the SGIC), because of their size and/or context, may be approaching potential thresholds where repeated disturbances to them could result in significant deterioration of values. Any future proposed developments, will be required to address the cumulative impacts of their developments with the impacts of the other existing and the currently proposed developments in the area, and would be considered by the relevant approval authorities.

Table 20 below summarises the residual impacts upon *EPBC Act* listed threatened terrestrial and aquatic fauna for the project. Although the impact upon *EPBC Act* listed threatened aquatic fauna is considered negligible due to the low probability of occurrence of *EPBC Act* listed species in the project area, the impact upon *EPBC Act* listed threatened fauna (both aquatic and terrestrial) is considered to be minor.

**Table 20 Summary of residual impacts to EPBC Act listed Threatened fauna for the project area**

Species	EPBC status	Occurrence status within Project Area	Potential impacts	Mitigation measures	Residual impact
Grey-headed Flying-fox ( <i>Pteropus poliocephalus</i> )	V	<b>No record, possible.</b> Northern extent of distribution around Gladstone, though may occur in southern parts of project area.	Clearing of foraging habitat (open forest & woodland)	Avoiding potentially suitable habitat; minimal construction clearing path within remnant woodlands and forest; strict vegetation clearance protocols; and post-construction area-specific restoration.	<b>Negligible to minor</b>
Greater Long-eared Bat ( <i>Nyctophilus timoriensis</i> )	V	<b>No record, possible.</b> Northern extent of distribution around Gladstone/Mt. Larcom.	Clearing of foraging & roost habitat (open forest & woodland)	Avoiding potentially suitable habitat; minimal construction clearing path within remnant vegetation communities; strict vegetation clearance protocols; microtunneling or restricted clearing widths through riparian communities; protection of hollow-bearing trees; and post-construction habitat rehabilitation.	<b>Negligible to minor</b>
Collared Delma ( <i>Delma torquata</i> )	V	<b>No record, possible.</b> Northern extent of distribution around Gladstone/Mt. Larcom.	Loss of foraging/breeding habitat (open forest & woodland); trench fall mortality; and degradation of habitat (weed invasion).	Avoiding potentially suitable habitat; minimal construction clearing path within remnant vegetation communities; strict vegetation clearance protocols; habitat pre-clearing surveys/rescue; open trench exclusion fencing; trench fall rescue protocols; weed control strategies; and post-construction habitat rehabilitation.	<b>Negligible to minor</b>

Species	EPBC status	Occurrence status within Project Area	Potential impacts	Mitigation measures	Residual impact
Brigalow Scaly-foot ( <i>Paradelma orientalis</i> )	V	<b>No record, possible.</b> Remnant vegetation communities (especially those with rocky outcrops) at the southern end of the project area	Loss of foraging/breeding habitat (open forest & woodland); trench fall mortality; and degradation of habitat (weed invasion).	Avoiding potentially suitable habitat; minimal construction clearing path within remnant vegetation communities; strict vegetation clearance protocols; habitat pre-clearing surveys/rescue; open trench exclusion fencing; trench fall rescue protocols; weed control strategies; and post-construction habitat rehabilitation.	<b>Negligible to minor</b>
Yakka Skink ( <i>Egernia rugosa</i> )	V	<b>No record, possible.</b> Remnant vegetation communities (especially those with rocky areas with shrubby understorey) at the southern end of the project area	Loss of foraging/breeding habitat (open forest & woodland); trench fall mortality; and degradation of habitat (weed invasion).	Avoiding potentially suitable habitat; minimal construction clearing path within remnant vegetation communities; strict vegetation clearance protocols; habitat pre-clearing surveys/rescue; open trench exclusion fencing; trench fall rescue protocols; weed control strategies; and post-construction habitat rehabilitation.	<b>Negligible to minor</b>

Species	EPBC status	Occurrence status within Project Area	Potential impacts	Mitigation measures	Residual impact
Ornamental Snake ( <i>Denisonia maculata</i> )	V	<b>Known.</b> Recorded from woodland adjacent to wetland (near south of Midgee). May occur in similar habitats to north and south, especially patches on heavier, cracking clay soils, in association with waterbodies.	Loss of foraging habitat (seasonal wetlands) and refuge/breeding (adjacent woodland with abundant fallen timber); trench fall mortality; and degradation of habitat (changes to wetland hydrology; weed invasion).	Avoiding potentially suitable habitat; minimal construction clearing path within remnant vegetation communities; strict vegetation clearance protocols; dry season construction scheduling (wetlands); microtunneling (wetlands); habitat pre-clearing surveys/rescue; open trench exclusion fencing; trench fall rescue protocols; weed control strategies; and post-construction habitat rehabilitation; rehabilitation of pre-construction drainage patterns.	<b>Negligible to minor</b>
Red Goshawk ( <i>Erythrotriorchis radiatus</i> )	V/M	<b>No record, possible.</b> Distribution uncertain in region and these requires a very large home range.	Clearing of foraging habitat (riparian & open forests)	Avoiding potentially suitable habitat; minimal construction clearing path within remnant & riparian vegetation communities; strict vegetation clearance protocols; microtunneling (waterway habitats); and post-construction habitat rehabilitation.	<b>Negligible to minor</b>

Species	EPBC status	Occurrence status within Project Area	Potential impacts	Mitigation measures	Residual impact
Painted Snipe ( <i>Rostratula benghalensis</i> )	V,M	<b>No record, possible.</b> Occurrence erratic and unpredictable, seldom remaining long in densely vegetated wetlands at any locality.	Loss of foraging habitat (densely vegetated seasonal wetlands); degradation of habitat (changes to wetland hydrology; weed invasion).	Avoiding potentially suitable wetland habitat; dry season construction scheduling; minimal construction clearing path; strict vegetation clearance protocols; microtunneling; sediment and pollutant controls; weed control strategies; post-construction habitat rehabilitation; rehabilitation of pre-construction drainage patterns.	<b>Negligible to minor</b>
Squatter Pigeon (sth. subsp.) ( <i>Geophaps scripta scripta</i> )	V	<b>Known.</b> Recorded from a variety of locations, though mainly within the central sector of the project area. Known to occur in highly disturbed, cleared landscapes.	Loss of foraging habitat; degradation of habitat (weed invasion); introduction of introduced predators.	Avoiding potentially suitable habitat; minimal construction clearing path within remnant woodlands and forest; strict vegetation clearance protocols; feral animal and weed control strategies and post-construction area-specific restoration.	<b>Negligible to minor</b>

Species	EPBC status	Occurrence status within Project Area	Potential impacts	Mitigation measures	Residual impact
Yellow Chat ( <i>Epthianura crocea macgregori</i> )	CE	Known. Recorded within one kilometre of project area though not recorded within adjacent areas along ROW (despite a seven-month monitoring program).	Loss of foraging habitat; degradation of habitat (weed invasion); introduction of introduced predators.	Avoiding potentially suitable wetland habitat; dry season construction scheduling; minimal construction clearing path; strict vegetation clearance protocols; microtunneling; sediment and pollutant controls; weed control strategies; post-construction habitat rehabilitation; rehabilitation of pre-construction drainage patterns strategies.	<b>Negligible to minor</b>

### **G.8.2      *EPBC Act* listed Threatened Flora and Threatened Ecological Communities**

The construction of the pipeline and clearing of the right-of-way is likely to have an overall **negligible to minor adverse** impact to (aquatic and terrestrial) *EPBC Act* listed threatened flora and ecological communities. Prior to construction, a trained ecologist will identify areas within the corridor where negative impacts on flora communities (in general) and *EPBC Act* listed Threatened Species are possible. This information will be documented in the Construction EMP.

Occasional traffic and other activity that could potentially disturb vegetation are likely to occur infrequently in the right-of-way during the operational phase of this project. The main ongoing concerns will be monitoring of vegetation rehabilitation, and weed control.

Environmental management plans have been proposed which address these issues. It is expected that the information from this report will be readily available to subsequent users of the corridor when additional services are installed to assist with minimisation of cumulative impacts. It is envisaged that many of the environmental pressures generated by subsequent pipelines or services may be increased and possibly greater than this project because they may occur during the rehabilitation period, and the clearing width within the corridor will be increased.

A summary of key impacts and mitigation measures are shown in Table 21.

**Table 21 Summary of residual impacts to *EPBC Act* listed Threatened Flora for the project area**

Feature Description	Current value Substitution (yes/no)	Description of potential impacts	Mitigation measures	Residual impact
Possibly an Endangered ecological community ( <i>EPBC Act</i> ) at Site 9c	Natural ecosystems; Wildlife habitat  Not substitutable.	Clearing of 0.6 ha of <i>possibly</i> Endangered Ecological Community, depending on interpretation by EPA. Stunted Brigalow south of Inkerman Creek.	<ul style="list-style-type: none"> <li>• Minimise clearing by adjusting location and width of right-of-way.</li> <li>• Provision of offset, or rehabilitation of adjacent area.</li> <li>• If EPA determines that this community is of remnant status, hence Endangered, then all Brigalow plants that are removed will be partially buried in an adjacent waterlogged area to allow suckering and consequent regrowth.</li> </ul>	<b>Negligible to minor</b>
Impacts upon Flora species listed under the <i>EPBC Act</i>	<i>EPBC Act</i> listed Threatened Species	Removal of specimens	<ul style="list-style-type: none"> <li>• Avoidance of clearing in remnant vegetation</li> <li>• Pre-construction Surveying</li> <li>• Clearly marked areas of significance</li> <li>• Potential minor realignment of the right-of way where possible</li> </ul>	<b>Negligible</b>

Feature Description	Current value Substitution (yes/no)	Description of potential impacts	Mitigation measures	Residual impact
			<ul style="list-style-type: none"> <li>• Clearing boundaries will be clearly delineated on all drawings and in the field to define the extent of authorised clearing, which will not exceed the construction area.</li> <li>• When trenching across part of the wetland, topsoil will be stockpiled, and replaced after works to enable ground layer species to re-establish</li> <li>• Restoration of wetlands</li> <li>• Translocation of impacted individuals</li> </ul>	

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# **Appendix D**

## **Preliminary Contamination Assessment Report**



# Preliminary Contamination Assessment Report

Fitzroy to Gladstone Pipeline (FGP)  
Project

Gladstone Area Water Board

→ The Power of Commitment

**GHD Pty Ltd | ABN 39 008 488 373**

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<b>Last saved date</b>	17 December 2021
<b>File name</b>	Preliminary Contamination Assessment Report   Fitzroy to Gladstone Pipeline (FGP) Project
<b>Author</b>	Amy McCormack, Shannon Brown, Angus Hughes
<b>Project manager</b>	Susannah Margaret Simon
<b>Client name</b>	Gladstone Area Water Board
<b>Project name</b>	GAWB FGP Secondary Approvals
<b>Document title</b>	Preliminary Contamination Assessment Report   Fitzroy to Gladstone Pipeline (FGP) Project
<b>Revision version</b>	Rev 0
<b>Project number</b>	12559247

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	A McCormack S Brown A Hughes	V Wilton		S Wilson		17/12/2021

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Appendix A	Desktop search results
Appendix B	Site specific environmental setting

# 1. Introduction

Gladstone Area Water Board (GAWB) initially engaged GHD Pty Ltd (GHD) to undertake an approvals gap analysis and develop a proposed approvals program of works associated with the pre-construction phase of the Fitzroy to Gladstone Pipeline (FGP) Project (herein referred to as the Project).

The Project alignment (herein referred to as the site or alignment) and infrastructure is shown in Figure 1.1.

As part of the gap analysis (GHD 2021) it was identified that a review of the contamination status of the Project alignment had not been undertaken since publication of the Environmental Impact Statement (EIS) (Arup, 2008). Understanding of the contamination conditions and whether construction of the pipeline will intersect contaminated land would help to inform whether contamination management measures are required during design, construction and operation of the Project.

As part of the EIS (Arup, 2008) an initial contamination assessment was conducted along the alignment and five properties of interest were identified. The properties and potential contaminating activities identified were:

- Lot 101 on DS185 (waste storage and disposal)
- Lot 1 on RP911260 (landfill)
- Lot 91 on SP122250 (railway yard)
- Lot 7 on SP145439 (rifle range)
- Lot 140 on SP122252 (railway).

Design changes to the alignment have occurred since 2008 and, as such, GHD was engaged by GAWB to undertake a preliminary contamination assessment of properties that are within, and immediately surrounding, the revised alignment to assist GAWB in understanding potential contamination risks associated with historical use.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 9.

## 1.1 Project appreciation

We understand that GAWB propose to commence early works on the Project as early as practicable, likely to be sometime from April 2022.

The proposed Project consists of a 115 km pipeline, water treatment plant at Alton Downs and associated infrastructure to transport up to 30 GL of water per annum from an intake point at Laurel Bank on the Fitzroy River to GAWB's existing water infrastructure at Yarwun.

The pipeline will run within the proposed Stanwell-Gladstone Infrastructure Corridor State Development Area (SGIC SDA) for most of its length before connecting with the existing GAWB raw water network near Yarwun, in the Gladstone State Development Area (GSDA).

Key infrastructure associated with the Project will include:

- The 115 km long underground pipeline
- An intake and pump station on the Fitzroy River
- A water treatment plant (WTP), reservoir and pump station at Alton Downs
- A booster pump station and reservoir at Raglan
- A reservoir at Aldoga.

The Project received State approval under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) on 2 February 2010 and Commonwealth approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 4 November 2011.

## 1.2 Regulatory framework

This preliminary contamination assessment was undertaken with reference to the following state and/or nationally legislation and recognised publications:

- *Environmental Protection Act 1994*
- *Environmental Protection Regulation 2019*
- *National Environmental Protection (Assessment of Site Contamination) Measure 1999* including the NEPM (Assessment of site Contamination) Amendment Measure 2013 (NEPM 2013).
- Department of Environment and Science (DES), 2015. Queensland Auditor Handbook for Contaminated Land, Module 5: Contaminated land investigation documents, auditor certification and compliance assessment, 2015.

## 1.3 Objective

The objective of this preliminary contamination assessment was to assess the environmental setting and current and historical land use along the alignment to gain an understanding of likely areas of potential contamination and provide recommendations to manage identified areas of potential contamination.

## 1.4 Purpose

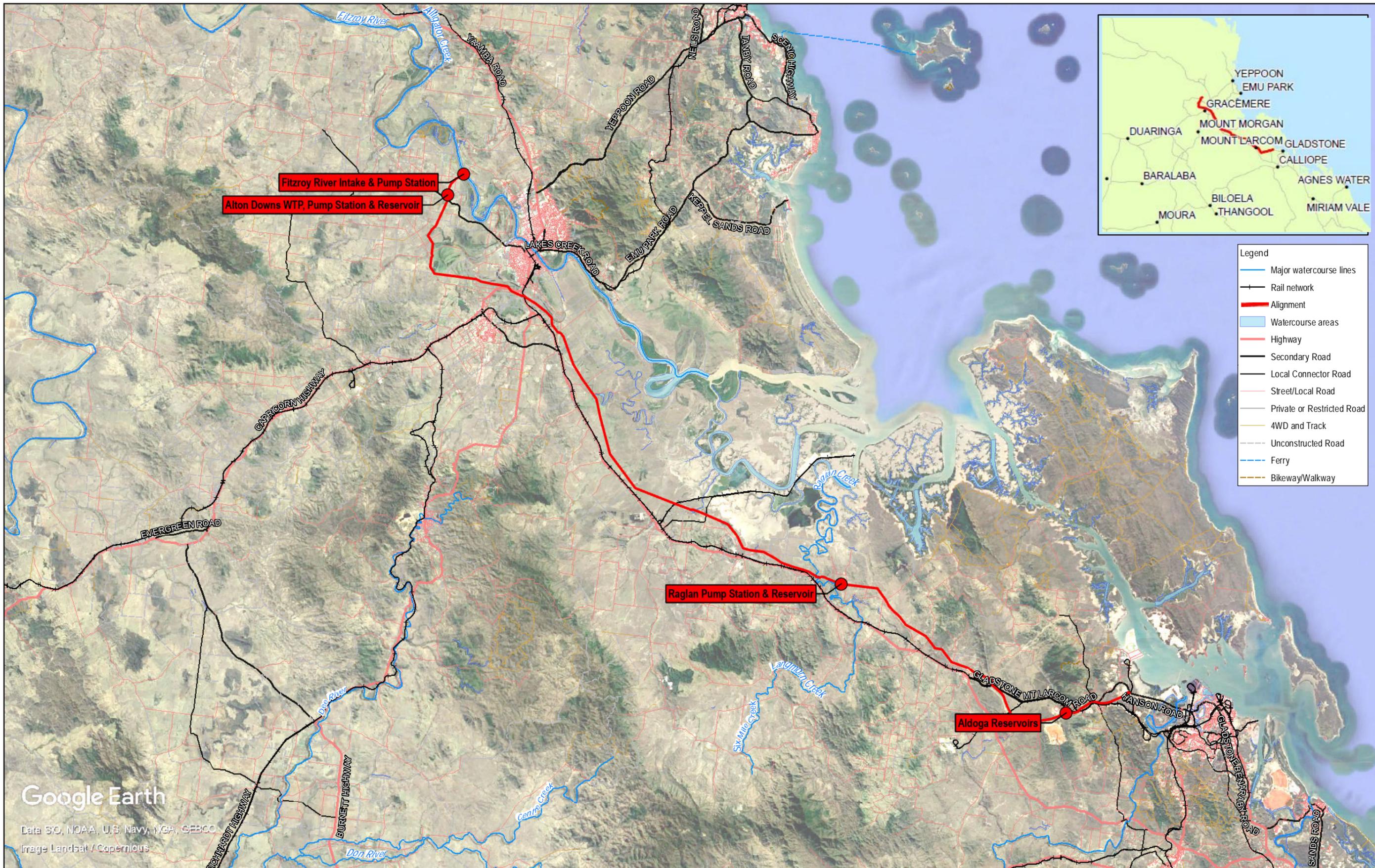
The purpose of this report is to document the approach and findings of the assessment to assist GAWB in understanding the contamination conditions along the alignment.

## 1.5 Scope of work

GHD completed the following scope of works as part of this assessment:

- High-level review of the EIS (Arup, 2008) to understand the contaminated conditions previously identified.
- Review of the Gladstone to Fitzroy Pipeline Stage 2 Detailed Assessment – Environmental Technical Report (SMEC, 2021).
- Review of land zoning along the alignment to identify possible areas of potential contamination (based on zoning and likely land use).
- Review of the general hydrogeology, hydrology and geological profile of the alignment.
- Review of current and historical aerial photographs (available on Queensland Globe) for select areas of interest identified during this assessment.
- Review of the Department of Environment and Science (DES) Environmental Management Register (EMR) and Contaminated Land Register (CLR) records for selected lots previously identified in the EIS (Arup, 2008) and other properties of interest identified during this assessment.
- A search of the DES *Environmental Protection Act 1994* public register for environment notifications and enforcement action records specific to the previously identified EMR-listed properties and other properties of interest identified during this assessment.
- Preparation of a high-level Conceptual Site Model (CSM) to identify the most likely contaminant source-pathway-receptor linkages that could be present for the FGP construction and operation.
- Preparation of this report documenting the findings of the investigation and recommendations for further investigations, if required.

Our assessment was facilitated through use of the FGPS2 OA web portal and spatial information system produced by SMEC and complemented by search of publicly available environmental databases, such as Queensland Globe and the DES environmental management registers.



- Legend
- Major watercourse lines
  - Rail network
  - Alignment
  - Watercourse areas
  - Highway
  - Secondary Road
  - Local Connector Road
  - Street/Local Road
  - Private or Restricted Road
  - 4WD and Track
  - - - Unconstructed Road
  - - - Ferry
  - - - Bikeway/Walkway

Google Earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image Landsat / Copernicus

Data Disclaimer

© 2021. Whilst every care has been taken to prepare this map, GHD and DoR make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.



Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56

GAWB  
Preliminary Contamination Assessment

Project No. 12560941  
Revision No. A  
Date 24/11/2021

Project alignment and infrastructure

FIGURE 1.1

## 2. Site details and environmental setting

### 2.1 Site details

The Project will run from the Fitzroy River to the GAWB's existing water infrastructure at Yarwun approximately 115 km north. The dominant land use along the alignment is grazing and agricultural land use. There is also a mix of extractive uses, conservation and natural environments.

Key Project elements are detailed in Table 2.1 and displayed in Figure 2.1.

For the purposes of this assessment, our desktop review was limited to land within a 300 m buffer of the proposed alignment and to the parcels of land related to Project infrastructure (as described in Table 2.1).

Table 2.1 Key project infrastructure

Element	Description
<b>Underground pipeline</b>	An underground pipeline approximately 115 km long and 1 m in diameter from Laurel Bank near Rockhampton to Yarwun just north of Gladstone. The pipe will be buried for its full length with varying cover depending upon pipe material, ground conditions and loading. The right of way (ROW) will generally be 30 m. The pipeline trench will generally be between 2 m deep, and 5 m deep depending on the design and topography. The top of the excavation trench will generally be 12 m wide but could be up to 16 m wide in some locations depending on trench wall soil stability and the design.
<b>Intake and pump station on the Fitzroy River near Laurel Bank</b>	The intake point will be on the Fitzroy River near Laurel Bank adjacent to an existing intake point operated by SunWater to provide water to the Stanwell Energy Park. A pump station associated with the intake will be located at the same site. The intake and pump station will consist of a combined single structure located in the riverbank.
<b>Water treatment plant, storage reservoir and pump station</b>	The WTP site is approximately 3 km from the intake site at Alton Downs. The total area of the Alton Downs WTP site is approximately 11.5 ha.
<b>Booster pump station and storage reservoir</b>	The booster pump station site is located in the vicinity of Raglan in Gladstone Regional Council Local Government Area (LGA). This will be located approximate at the midway of the alignment. The reservoir will have a capacity of 15 ML.
<b>Storage reservoir</b>	The main storage reservoir is to be located at Aldoga, near Mount Larcom. The reservoir will have a capacity of 100 ML.

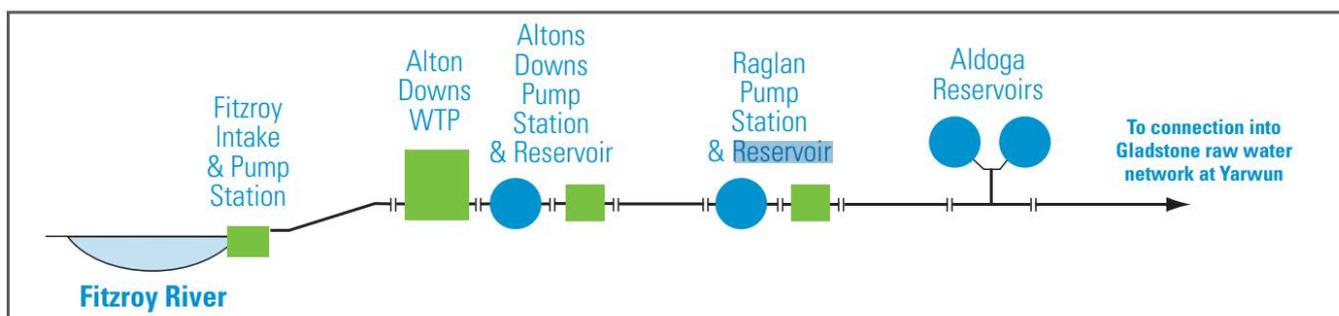


Figure 2.1 Schematic of key project infrastructure

### 2.2 Land uses

The alignment is located along, adjacent to or in the vicinity off the following:

- Infrastructure including roads, rail lines, powerlines, gas pipelines and a fibre optic line.
- Dams, pondage banks, fences and gates.
- Extractive industries are present in the vicinity of the alignment including quarrying, landfills and land where exploration permits for minerals are held.

- The racecourse reserve at Raglan, which is classified as Open Space – Recreational.
- Established agricultural properties.
- Several rural residential areas including Alton Downs, Gracemere, Bajool, Marmor, Raglan, Mount Larcom and Gladstone.
- Recreational areas used for water skiing (Fitzroy River) and boating and fishing activities (Raglan Creek).
- An existing explosives manufacturing facility located to the west of Bajool and the Port Alma salt works located to the east of Bajool.

## 2.3 Land zoning and tenure

The Project is located in the Rockhampton and Gladstone regional council LGAs. The Rockhampton and Gladstone regional council planning schemes were reviewed to identify land zoning for the Project.

For alignment within the Gladstone Regional Council LGA, land is primarily zoned as Special Purpose or Rural. The pipeline Right of Way (ROW) intersects a reserve within this LGA that is designated as Sport and Recreation (Lot 167 on CP859402).

For alignment within the Rockhampton Regional Council LGA, land is primarily zoned as Rural, with some Special Purpose. It is noted that the Special Purpose zoning is largely government owned utilities including railway and road infrastructure.

Land tenure along the alignment largely comprises easements, freehold, and leasehold. The other project infrastructure such as Fitzroy River Intake, Alton Downs WTP, pump stations and reservoirs are located in freehold land.

It should be noted a large proportion of the Project is within the SGIC SDA and GSDA managed by the Office of the Coordinator-General.

## 2.4 Topography

Based upon the Queensland Globe elevation overlay, the regional topography ranges between 10 m and 50 m Australian Height Datum (mAHD), with a peak of 110 mAHD at Mount Larcom. The topography between the Fitzroy River and Gladstone is generally a gently undulating landform of low hills and flat plains, with some coastal ranges north of the Fitzroy River and east of Mount Larcom. The alignment crosses numerous watercourses and drainage lines between the Fitzroy River and Gladstone.

## 2.5 Soil

Soil types have been mapped for the Project using the Atlas of Australian Soils dataset. The Project intersects several dominant soil types including:

- Sodosols: Sodosols are soils which display a strong texture contrast between surface and subsoils. These soils generally have a weak structure in the surface with a firm to hard setting surface condition. The subsoils are sodic in nature and are generally quite dense, coarsely structured and disperse when wet.
- Vertosol: Vertosols are clay-rich soils which display strong cracking when dry and shrink and swell during the wetting and drying phases. They are distinguished based on the nature of the surface horizon and the colour and chemical properties of the subsoil horizons.
- Tenosols: Tenosols have a weakly developed soil profile which is typically very sandy and without obvious horizons. These soils can have a range of surface conditions and textures but are generally shallow and rocky. Tenosols can be susceptible to soil creep, sheet and rill erosion.
- Ferrosol: Ferrosols do not have a strong texture contrast between surface horizons and upper subsoil horizon. They have relatively high levels of free iron oxide (Fe > 5 %). They are generally strongly acid throughout with the pH ranging from 4.5-5.6 in the surface horizon to 4.4 -5.2 in the subsoil. The clay content is considerably high (>45%).

## 2.6 Acid sulfate soils

Under the Gladstone Regional Council Planning Scheme, the Project from Raglan to the most southern extent is situated within the acid sulfate soils (ASS) trigger area. Similarly, under the Rockhampton Regional Council Planning Scheme the northern extent of the Project is situated within the ASS trigger area.

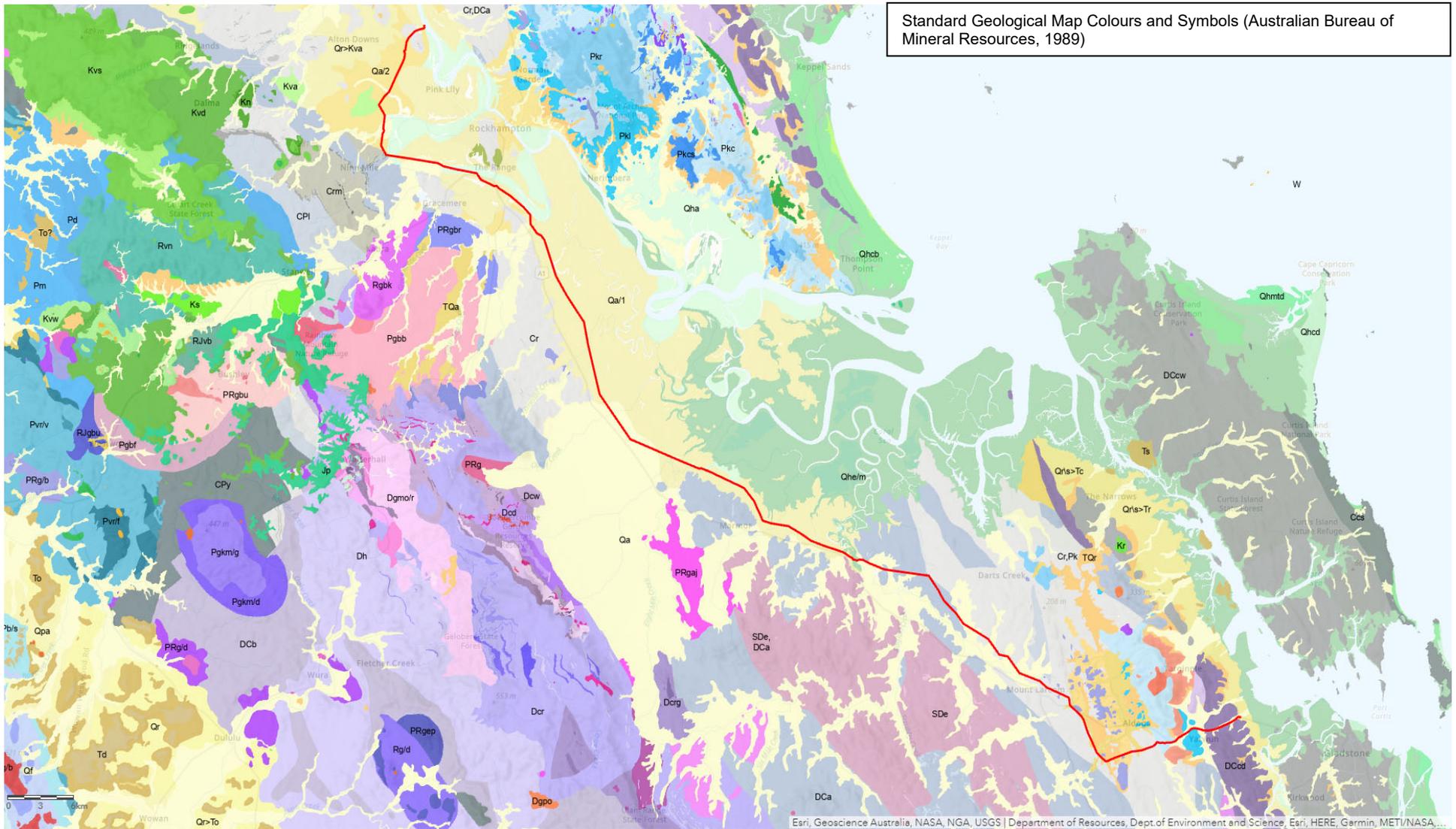
As identified in the Environmental Technical Report (SMEC, 2021) the northern extent of the alignment, in the vicinity of the Fitzroy River, is mapped as alluvial soils (Qa-WLD geology unit) and has an elevation below 10 mAHD, highlighting a potential risk of ASS. However, the majority of the corridor is mapped as having a low to extremely low probability of ASS. Near Gladstone, the Project intersects the mapped 'ASS of the Tannum Sands to Gladstone area, Central Queensland', which indicates a potential risk of ASS or potential acid sulfate soils (PASS) occurring. It is noted that a preliminary ASS investigation was undertaken for the EIS (Arup, 2008) and identified ASS near Raglan Creek, in an area with low lying mangroves. Based on the above, it is considered likely that there are additional areas that have potential for ASS due to the Project's proximity to the coast and waterways.

## 2.7 Geology

The Queensland Globe 1:100,000 detailed surface geology indicates that the alignment is underlain by a range of lithological profiles. The distribution of the geology units is described in Table 2.2 and displayed in Figure 2.2. Table 2.2 shows the units in sequence of occurrence from surface from north to south.

Table 2.2 Summary of regional geology along the alignment

Unit	Symbol	Age	Summary
Quaternary Alluvium	Qa	Quaternary	Sand, silt, mud and gravel
Stratified unit (including volcanic and metamorphic)	Qe	Quaternary	Clay, silt, sand; estuarine and deltaic deposits
Stratified unit (including volcanic and metamorphic)	Cr	Early carboniferous	Dark grey mudstone, siltstone, felsic volcanoclastic sandstone, polymictic conglomerate, ooid-bearing sandstone and conglomerate with mudstone rip-up clasts; oolitic and pisolitic limestone and minor skeletal limestone; rare rhyolitic ignimbrite
Capella Creek Group, Erebus beds, Marble Waterhole beds, Craigilee beds, Calliope beds, Munbooree beds, Dunollie beds, Pumpkin Hut Mudstone, unnamed sedimentary and volcanic units	Dc	Early devonian - middle devonian	Basaltic to rhyolitic volcanoclastic sandstone and conglomerate (and minor lavas), siltstone, mudstone, chert, jasper and fossiliferous limestone
Mount Alma Formation, Balaclava Formation, Lochenbar Formation, Mount Hoopbound Formation, Tanderra Volcanics, Channer Creek beds, Three Moon Conglomerate	DCa	Late devonian - early carboniferous	Feldspatholithic sandstone, siltstone and conglomerate and breccia with basaltic, andesitic, and (less commonly) felsic volcanic clasts; minor mafic lava and rare ignimbrite; local limestone
Arenite-mudrock	DCc	Late devonian - carboniferous	Strongly deformed arenite, mudstone, chert and minor mafic volcanics; locally grades into mica schist, gneiss, amphibolite, quartzite
Granitoid	PRg	Late permian - early triassic	Granite, granodiorite, tonalite, diorite and gabbro
Berserker Group, Double Mountain Volcanics, Peninsula Range Volcanics	Pk	Early permian	Siltstone, fine to coarse-grained lithofeldspathic sandstone, intermediate to felsic intrusive and extrusive domes and volcanic breccia with lesser conglomerate



## 2.8 Hydrogeology

Using Queensland Globe, over 200 groundwater bores were identified to be located within 1 km of the alignment. The EIS (Arup, 2008) described existing groundwater conditions and usage in project corridor as follows:

- Hydrogeology in the Fitzroy to Bajool region is characterised by the presence of medium to high-plasticity clays that extend to around 8 m to 10 m below the surface.
- Beneath the clay, there are water bearing alluvial sand aquifers in some areas.
- Depth to water in the aquifers the Bajool to Gladstone region is generally in the order of 10 m to 20 m.
- The aquifers are underlain by basalt and granitic formations.
- Groundwater is very saline and would require significant treatment to reach a potable standard.
- The spatial distribution and quantity of yields from aquifers potentially affected by the pipeline indicate a limited potential for the development of centralised urban groundwater supply system.
- Water bores in the area are used for agricultural usages and secondary residential usages.

Groundwater bores in the vicinity of the alignment indicate that the groundwater level is generally <5 m from the surface, except potentially around the Fitzroy River Intake where existing bores indicate that it may be between 5-200 m from the surface in some locations (BOM, 2019).

## 2.9 Hydrology

The Project is located within the Fitzroy River and Calliope River drainage basins. As detailed in Environmental Technical Report (SMEC, 2021), the Fitzroy River has a long and well-documented history of flooding. Major floods can result from either the Dawson or the Mackenzie Rivers, although significant flooding in the Rockhampton area can also occur from heavy rain in the local area below Riverslea. Under the Queensland Globe flood overlay, the Calliope River is also mapped as being subject to flooding hazards.

The Project crosses a number of waterways, including watercourses and drainage features mapped under the *Water Act 2000*. Other rivers, creeks and drainage lines not mapped under the *Water Act 2000* are also crossed by the alignment. Eight major creeks are traversed by the alignment, these include: Lion, Gavial, Inkerman, Twelve Mile, Marble, Horrigan, Raglan and Larcom creeks (refer to Figure 3.1).

In the EIS (Chapter 9, Water Resources and Water Quality; Arup, 2008) a surface water quality assessment was conducted at the Fitzroy River against the Queensland Water Quality Guidelines (QWQG) found consistently high concentrations of turbidity, low levels of dissolved oxygen and high levels of total nitrogen nitrates, total phosphorus and metals.

### **3. Aerial imagery and photography review**

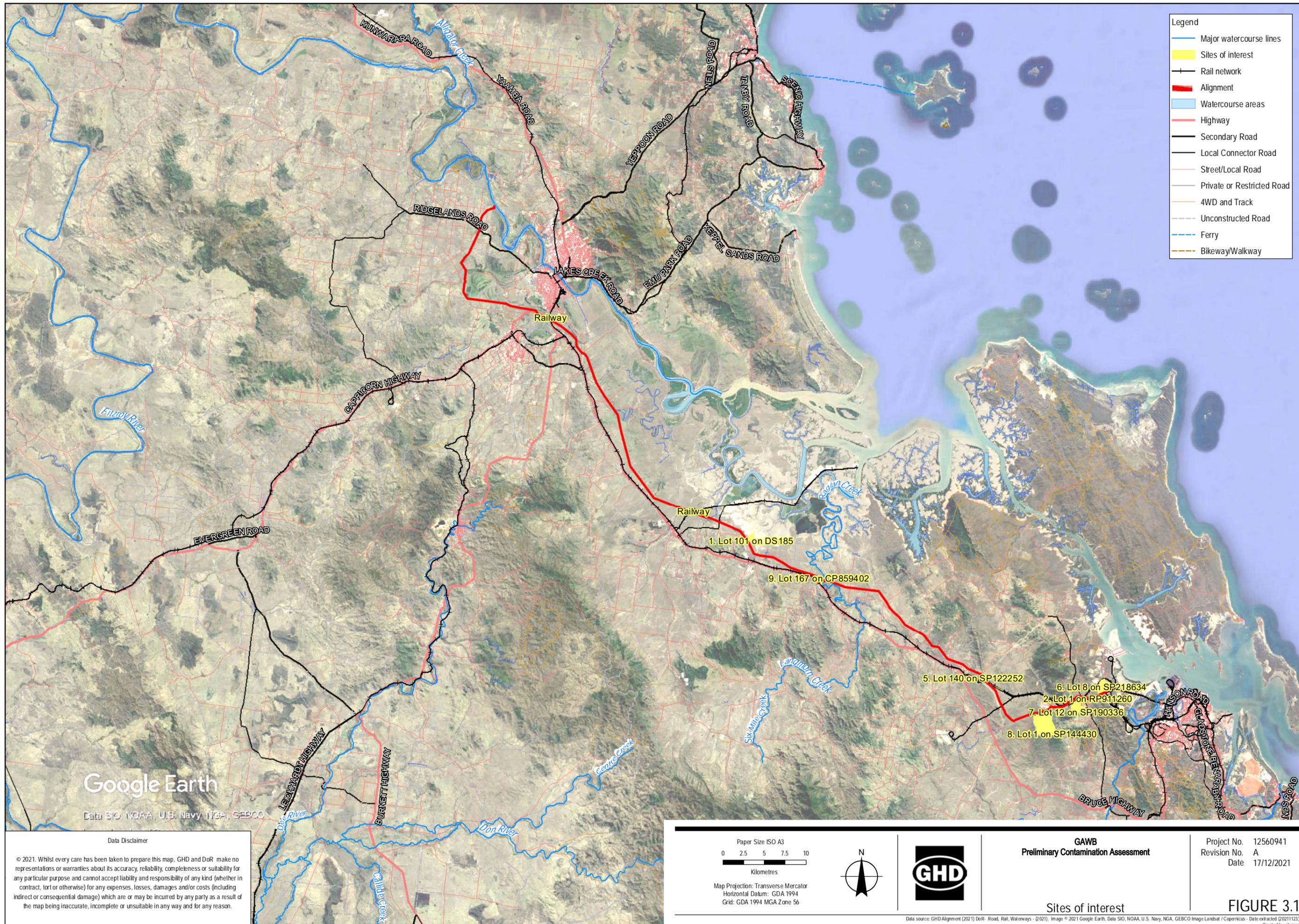
In the EIS (Arup, 2008) for the Project, a preliminary contamination assessment of the proposed alignment was undertaken and five lots of interest were identified, primarily based entries within the DES Environmental Management Register, namely:

1. Lot 101 on DS185 (Marmor) – Waste storage
2. Lot 1 on RP911260 (Yarwun) – Landfilling and waste storage
3. Lot 91 on SP122250 (Yarwun) – Railway corridor
4. Lot 7 on SP145439 (Yarwun) – Alumina refinery and firing range
5. Lot 140 on SP122252 (Mount Larcom) – Railway corridor.

As part of our current assessment, GHD firstly reviewed the current aerial imagery of the alignment to identify additional properties of interest. Four additional properties of interest, located within 400 m of the alignment, and which may pose a potential contamination risk (if contamination is confirmed to be present):

6. Lot 8 on SP218634 (Yarwun) – Yarwun Alumina Refinery
7. Lot 12 on SP190336 (Yarwun) – Yarwun Quarry
8. Lot 1 on SP144430 (Yarwun) – Rio Tinto Alcan Red Mud Repository
9. Lot 167 CP859402 and Lot 168 on CP859401 (Raglan) – Racecourse reserve.

A map of the identified sites of interest are displayed in Figure 3.1. A review of current and historical aerial imagery for these Lots is provided in Section 3.1. These nine sites are referred to herein as the 'sites of interest'.



**Data Disclaimer**

© 2021. Whilst every care has been taken to prepare this map, GHD and DoR make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

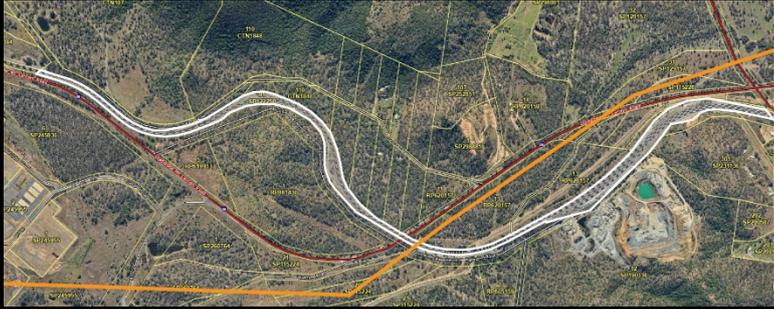
Data source: GHD Alignment (2021) DoR - Road, Rail, Waterways - (2021). Image © 2021 Google Earth, Data SIO, NOAA, U.S. Navy, NGA, GEBCO Image Landsat / Copernicus - Date extracted (2021123) Created by: sbrow4

### 3.1 Current aerial imagery

GHD firstly reviewed the current aerial imagery of the alignment to identify sites of interest from a contamination perspective. These are shown in Table 3.1. Following this initial review a more detailed historical and regulatory review was undertaken as detailed in the sections below. It is noted that in Table 3.1 the orange line indicates the approximate location of the pipeline.

Table 3.1 Aerial review of possible contamination sites

Description of site	Aerial photograph
<p><b>1. Lot 101 on DS185</b></p> <p>The alignment intersects the middle of the property previously identified in the EIS (Arup, 2008) as being listed on the EMR and a contamination risk due to waste storage.</p>	
<p><b>2. Lot 1 on RP911260</b></p> <p>The alignment intersects the middle of the property previously identified in the EIS (Arup, 2008) as being listed on the EMR and to be a contamination risk due to landfilling and waste storage.</p>	

Description of site	Aerial photograph
<p><b>3. Lot 91 on SP122250</b></p> <p>The alignment intersects the railway allotment to the west. This property has previously been identified in the EIS (Arup, 2008) as being listed on the EMR and a contamination risk from railway operations.</p>	
<p><b>4. Lot 7 on SP145439</b></p> <p>The alignment intersects the allotment directly south of the Alumina refinery. This property has previously been identified in the EIS (Arup, 2008) as being listed on the EMR and a contamination risk from being an alumina refinery and firing range .</p>	
<p><b>5. Lot 140 on SP122252</b></p> <p>The alignment intersects the railway allotment to the east. This property has previously been identified in the EIS (Arup, 2008) as being listed on the EMR and a contamination risk from railway operations.</p>	

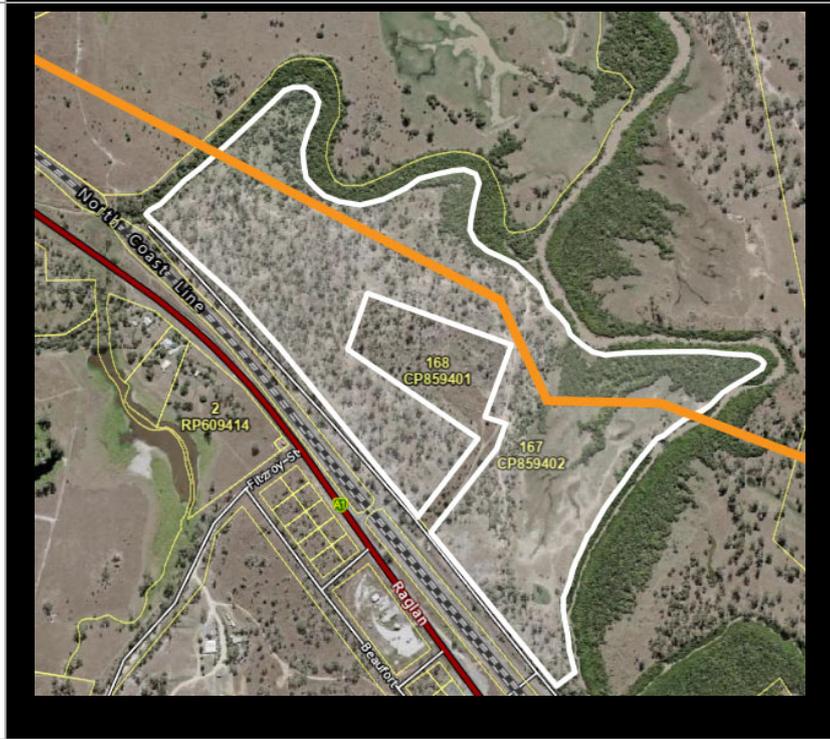


Description of site	Aerial photograph
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**8. Lot 1 on SP144430**  
 The Rio Tinto Alcan Red Mud Repository is approximately 250 m south of the alignment, as identified by GHD during our initial review of aerial photography along the alignment.



**9. Lot 167 on CP859402**  
 The alignment intersects a reserve in Raglan that is zoned as Sport and Recreation. This reserve was identified as a racecourse reserve in the EIS (Arup, 2008).



## 3.2 Historical aerial photographs

Historical aerial photographs of the identified properties were reviewed using QImagery and Queensland Globe, as summarised in Table 3.2. Historical aerial photographs of each lot on plan are included in Appendix A.

Table 3.2 Historical aerial review of possible contaminated sites

Lot on plan	Aerial review
<b>1. Lot 101 on DS185</b>  Potential contamination source: Waste Storage	<b>1956</b> The property consisted of untouched bushland. Bills road, which runs along the southwestern boundary had been constructed, however remained unsealed at this point in time.
	<b>1973</b> The property had been cleared, which is considered likely to have been for agricultural purposes. Two dams had been constructed in the northwest corner of the property.
	<b>1985</b> The property remained primarily unchanged to the 1973 aerial imagery. The two dams were inundated with water, likely due to flooding or rainfall in the region.
	<b>1990</b> Ground disturbance was noted adjacent to the dams in the northwest corner of the property.
	<b>1999</b> The 1999 historical aerial photograph appeared to be similar to the 1990 aerial photograph.
	<b>2004</b> The 2004 historical aerial photograph appeared to be similar to the 1990 and 1999 aerial photograph.
	<b>2010</b> In the 2010 aerial photograph a small industrial building had been constructed in the approximate centre of the property. No other observable changes were noted.
	<b>2014</b> In the 2014 historical aerial photograph a larger industrial building had been constructed adjacent to Bills Road. This building had two cylindrical tanks. A smaller shed to the northwest of the industrial building had also been constructed. Unsealed access tracks were evident connecting this building to the smaller building noted in 2010 and the man-made dams located to the northwest border of the property.
	<b>2020</b> In the 2020 aerial photograph no observable changes were evident from the 2014 aerial imagery.
<b>2. Lot 1 on RP911260</b>  Potential contamination source: Landfilling and Waste Storage	<b>1956</b> In 1959 the property consisted of uncleared bushland. Calliope River Road and Lindher Road, which are located to the west of the property had been constructed by this point in time, however remained unsealed. Some access tracks were visible.
	<b>1965</b> In the 1965 aerial imagery, the property primarily remained unchanged. A large area of ground disturbance related to land clearing was observable to the east of the property.
	<b>1983</b> In the 1983 aerial imagery the property primarily remained unchanged. Construction was underway for the railway line running along the southern boundary of the property.
	<b>1992</b> In the 1992 aerial imagery, ground disturbance was observable in the northern portion of the property. It is noted that access routes via both Calliope River Road and Lindher Road connected the property to the landfill southwest of the property and the Yarwun Alumina Refinery to the north.
	<b>1996</b> In the 1996 aerial imagery further ground disturbance was evident. Some stored material seemed to be present in the northern portion of the property.
	<b>2010</b>

Lot on plan	Aerial review
	<p>In the 2010 aerial imagery a large industrial building with black storage containers was evident to the northeast corner of the property.</p> <p><b>2014</b> In the 2014 aerial imagery all infrastructure from the property had been removed, access tracks still traversed the property.</p> <p><b>2020</b> In the 2020, aerial imagery the property remained primarily unchanged from the 2014 imagery. The property appeared to be vacant at this point in time.</p>
<p><b>3. Lot 91 on SP122250</b></p> <p>Potential contamination source: Railway Corridor</p>	<p><b>1959</b> In the 1959 historical aerial photograph the railway line had been constructed by this point in time. The adjacent land was primarily untouched with the exception of some clearing for agricultural purposes and ground disturbance related to landfilling to the southeast of the allotment.</p> <p><b>1965</b> In the 1965 historical aerial further clearing of the surrounding land was evident, possibly related to the construction of railway yards and storage areas. The ground disturbance related to quarrying had increased in size to the southeast of the allotment.</p> <p><b>1980</b> In the 1980 historical aerial photograph further clearing of the surrounding area had occurred.</p> <p><b>1989</b> In the 1989 historical aerial photograph, the railway line was seemingly ongoing railway upgrades. The land parcels adjacent to the railway line had undergone clearing and some storage of materials was evident. Particularly to the north of the railway line and to the west of the allotment. The quarry to the southeast had increased in size and encroached into the railway allotment.</p> <p><b>1996</b> In the 1996 historical aerial the ground disturbance previously noted to the west of the allotment had grown over. Railway yards with stored materials including metal and stockpiled gravel was evident. Some infrastructure was also evident, with some of the infrastructure being bunded.</p> <p><b>2021</b> In the 2021 aerial photograph, the property and overall landscape primarily remained unchanged.</p>
<p><b>4. Lot 7 on SP145439</b></p> <p><b>6. Lot 8 on SP218634</b></p> <p>Potential contamination source: Alumina refinery and firing range</p>	<p><b>1959</b> In the 1959 aerial photograph both lots had been subject to some clearing by this time, however the majority of the land was untouched bushland.</p> <p><b>1973</b> In the 1973 aerial photograph both lots had undergone additional land clearing. Some residential infrastructure was present to the northwest of Lot 8 on SP2186344.</p> <p><b>1981</b> In the 1981 aerial photograph ground disturbance was evident throughout both allotments. This ground disturbance was related to the development of the port and terminal to the north and coal terminal to the south.</p> <p><b>1992</b> In the 1992 aerial photograph a large man-made dam had been developed to the northeast of Lot 8 on SP218634. Road infrastructure was present running along the eastern boundaries of both allotments. Some ground disturbance was noted over Lot 8 on SP218634. This was possibly associated with the development of the Yarwun Refinery.</p> <p><b>2003</b> In the 2003 aerial photograph the Yarwun Refinery (Lot 8 on SP218634) had been established by this time. The Yarwun Refinery's infrastructure encroached onto Lot 7 on SP145439.</p> <p><b>2008</b> In the 2008 historical aerial photograph, the Yarwun Refinery had expanded and continued to encroach onto Lot 7 on SP145439. Access tracks connected the refinery (Lot 8 on SP218634) to Lot 7 on SP145439. Given that the North Coast railway line is located along the southern boundary of the property it is likely that the material generated at the refinery was loaded onto the rail carts through Lot 7 on SP145439. An electrical powerline traversed the middle of the property.</p>

Lot on plan	Aerial review
	<p><b>2015</b> In the 2015 historical aerial photograph, further clearing of Lot 7 on SP145439 was evident, this is likely associated with the expansion of the refinery (Lot 8 on SP218634). It is noted that the wastewater from the refinery is directly to the north of Lot 7 on SP145439.</p> <p><b>2021</b> In the 2021 aerial imagery the properties remained primarily unchanged. Some evidence of dumping was evident on Lot 7 on SP145439 in the approximate centre of the property along the access track exiting the property to the west.</p>
<p><b>5. Lot 140 on SP122252</b></p> <p>Potential contamination source: Railway corridor</p>	<p><b>1959</b> In the 1959 aerial imagery the railway corridor had been established at this point in time. There was a large area of ground disturbance to the west of the allotment associated with the construction of the Mount Larcom showground area. To the south of the Mount Larcom showground area, infrastructure associated with the railway was evident.</p> <p><b>1965</b> In the 1965 aerial imagery the allotment remained primarily unchanged from the 1959 imagery. Land clearing and ground disturbance was noted to the west of the allotment.</p> <p><b>1981</b> In the 1981 historical photograph land clearing and ground disturbance was observed directly adjacent to the alignment, most likely related to railway upgrades and the creation of laydown and storage areas.</p> <p><b>1994</b> In the 1994 historical aerial photograph, further ground disturbance was observable to the north of the alignment. Some stored railway infrastructure was observable to the north.</p> <p><b>2007</b> In the 2007 aerial imagery the ground disturbance previously observable had largely grown over.</p> <p><b>2017</b> In the 2017 aerial imagery, the area previously used for storage of rail infrastructure was seemingly abandoned at this point in time. Some remaining rail infrastructure was present outside the allotment.</p>
<p><b>7. Lot 12 on SP190336</b></p> <p>Potential contamination source: Quarrying</p>	<p><b>1959</b> In the 1959 aerial imagery the quarry operation had been established by this point in time. Some infrastructure was evident to the north of the property adjacent to the railway line.</p> <p><b>1969</b> In the 1969 aerial photograph, the quarry operation had expanded with further land clearing and ground disturbance noted.</p> <p><b>1979</b> In the 1979 aerial photograph the property remained primarily unchanged. The boundary between the railway corridor and quarry was not distinguishable in the aerial photograph.</p> <p><b>1996</b> In the 1996 imagery the operation had expand significantly. An onsite dam was observable, and a black cylindrical shape was evident likely related to stockpiled material. A wall of trees separated the railway corridor boundary with the quarry; however, an access track connected the quarry to the railway corridor.</p> <p><b>2012</b> In the 2012 photograph the black stockpiled material was no longer evident. The quarrying operation was once again more developed with further infrastructure present. The wall of trees separating the railway corridor with the quarry had largely been cleared. A larger dam was constructed in the approximate centre of the quarry operations.</p> <p><b>2020</b> In the 2020 aerial photograph, the property was similar to that observed in 2012. It is noted that there was limited to no distinction between the quarry and railway corridor boundary.</p>
<p><b>8. Lot 1 on SP144430</b></p>	<p><b>1959</b> In the 1959 aerial photograph the property consisted of untouched vegetation.</p> <p><b>1965</b></p>

Lot on plan	Aerial review
<p>Potential contamination source: Alcan Red Mud Repository</p>	<p>In the 1965 aerial photograph some uniform clearing was evident. Ground disturbance was noted in the centre of the allotment.</p>
	<p><b>1981</b> In the 1981 aerial photograph further clearing was evident. The ground disturbance observed in the approximate centre of the allotment had expanded in size and was observed to be more cylindrical in shape.</p>
	<p><b>1994</b> In the 1994 aerial imagery the ground disturbance had expanded slightly. Some infrastructure was noted to the north of the ground disturbance.</p>
	<p><b>2007</b> In the 2007 aerial imagery the Alcan Red Mud Repository had been established by this point in time. This repository expanded to the north of Aldoga Road, where a laydown and storage area was present.</p>
	<p><b>2014</b> In the 2014 aerial imagery the Alcan Red Mud Repository had expanded further south. The laydown and storage area located north of Aldoga Road had also expanded to include more storage infrastructure and laydown areas. Metal parts were observable within the laydown area as well as storage containers.</p>
	<p><b>2020</b> In the 2020 aerial photograph the operation had expanded to the west. The storage yard to the north had been vacated by this point in time. Limited infrastructure remained and all stored materials had been removed.</p>
<p><b>9. Lot 167 on CP859402</b>  Potential contamination source: Racecourse</p>	<p><b>1956</b> In the 1956 aerial photograph the property had largely been cleared. Some small buildings and ground disturbance was evident north of the railway line, which ran along the southwestern boundary of the property.</p>
	<p><b>1973</b> In the 1973 aerial photograph an access track traversed the centre of the property and entered the property in the southeast corner of the property connecting the property to Raglan township. A small constructed dam was noted to the southeast corner of the property.</p>
	<p><b>1985</b> In the 1985 aerial photograph ground disturbance was evident to the south of the property, likely associated with upgrades to the railway infrastructure.</p>
	<p><b>1994</b> In the 1994 aerial photographs further dirt access tracks were evident throughout the property. This is likely associated with racetrack riding.</p>
	<p><b>2004</b> In the 2004 aerial photograph further ground disturbance in a circular shape was evident in the middle of the property.</p>
	<p><b>2010</b> In the 2010 aerial photograph the property was primarily unchanged. Additional racetrack dirt roads were evident and a fenced area in the middle of the property (Lot 168) was observable.</p>
	<p><b>2020</b> In the 2020 aerial photograph the Raglan racetrack was well established at this point in time.</p>

## 4. Regulatory review

As part of the desktop review, information was obtained from a number of publicly available regulatory sources to enable a greater understanding of historical and current land use along the alignment, including former site practices which may have the potential to cause contamination.

### 4.1 EMR and CLR

A search was undertaken of the DES EMR and CLR for the sites of interest. A paid search of the EMR and CLR is done on a lot-by-lot basis.

Given the size of the Project and possible large number of individual lots, the Contaminated Land Assessment team at DES was contacted by GHD to determine if all properties listed on the EMR and CLR along the alignment could be easily identified by DES and provided without undertaking individual lot on plan searches. DES confirmed that a search of the EMR and CLR could only be undertaken on an individual lot basis, and they were unable to provide a list of all EMR/CLR listed properties along the alignment.

As such, a search of the EMR and CLR was undertaken for only the identified sites of interest, as described in Table 4.1. EMR/CLR records are provided in Appendix A.

Table 4.1 EMR and CLR search results

Lot Plan & Location	Register	Notifiable Activity Description
1. Lot 101 on DS185 (Marmor)	EMR	<b>Notifiable activity:</b> Waste storage, treatment or disposal - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50,000 persons having sludge drying beds or on-site disposal facilities.
2. Lot 1 on RP911260 (Yarwun)	EMR	<b>Notifiable activity:</b> Landfill - disposing of waste (excluding inert construction and demolition waste). Lot 1 on RP911260 was subdivided from Lot 1 on RP618672 (Boat Creek Road, Yarwun, Qld, 4694), which is included on the EMR. Subdivided new parcels will remain on the EMR unless it can be shown that they are not located near the contaminating activity.
3. Lot 91 on SP122250 (Yarwun)	EMR	<b>Notifiable activity:</b> Railway yards – operating a railway yard including goods-handling yards, workshops and maintenance areas. Lot 91 on SP122250 was subdivided from Lot 1 on RP601330 (Butler Street, Yarwun, Qld, 4680), which is included on the EMR. Subdivided new parcels will remain on the EMR unless it can be shown that they are not located near the contaminating activity.
4. Lot 7 on SP145439 (Yarwun)	EMR	<b>Notifiable activity:</b> Yarwun Alumina Refinery and Gun, pistol or rifle range – operating a gun, pistol or rifle range. Lot 7 on SP145439 was subdivided from Lot 3 on CP860100 (Mt. Miller Road 4680), which is included on the EMR. Subdivided new parcels will remain on the EMR unless it can be shown that they are not located near the contaminating activity.
5. Lot 140 on SP122252 (Mount Larcom)	EMR	<b>Notifiable activity:</b> Hazardous contaminant – this site has been subject to possible high arsenic levels along rail corridor.
6. Lot 8 on SP218634	EMR	<b>Notifiable activity:</b> <ul style="list-style-type: none"> <li>– Livestock dip or spray race – operating a livestock dip or spray race facility.</li> <li>– Smelting or refining – fusing or melting metalliferous metal or refining the metal.</li> <li>– Abrasive blasting – carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.</li> <li>– Chemical manufacture or formulation – manufacturing, blending, mixing or formulating chemicals if -</li> </ul>

Lot Plan & Location	Register	Notifiable Activity Description
		<ul style="list-style-type: none"> <li>- (a) the chemicals are designated dangerous goods under the dangerous goods code; and</li> <li>- (b) the facility used to manufacture, blend, mix or formulate the chemicals has a design production capacity of more than 1 t per week.</li> <li>- Chemical storage – (other than petroleum products or oil under item 29) - storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.</li> <li>- Coal fired power station – operating a coal fired power station.</li> <li>- Electrical transformers - manufacturing, repairing or disposing of electrical transformers.</li> <li>- Metal treatment or coating - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth).</li> <li>- Mineral processing - chemically or physically extracting or processing metalliferous ores.</li> <li>- Petroleum product or oil storage - storing petroleum products or oil – <ul style="list-style-type: none"> <li>- (a) in underground tanks with more than 200L capacity; or</li> <li>- (b) in above ground tanks with – <ul style="list-style-type: none"> <li>- (i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code - more than 2, 500L capacity; or</li> <li>- (ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code - more than 5,000L capacity; or</li> <li>- (iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia - more than 25, 000L capacity.</li> </ul> </li> </ul> </li> <li>- Waste storage treatment or disposal - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50, 000 persons having sludge drying beds or on-site disposal facilities.</li> </ul>
7. Lot 12 on SP190336	Not listed	Not listed
8. Lot 1 on SP144430	EMR	<ul style="list-style-type: none"> <li>- Waste storage treatment or disposal - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50, 000 persons having sludge drying beds or on-site disposal facilities.</li> <li>- Abrasive blasting – carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.</li> <li>- Chemical manufacture or formulation – manufacturing, blending, mixing or formulating chemicals if – <ul style="list-style-type: none"> <li>- (a) the chemicals are designated dangerous goods under the dangerous goods code; and</li> <li>- (b) the facility used to manufacture, blend, mix or formulate the chemicals has a design production capacity of more than 1 t per week.</li> </ul> </li> <li>- Chemical storage – (other than petroleum products or oil under item 29) - storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.</li> <li>- Coal fired power station – operating a coal fired power station.</li> <li>- Electrical transformers - manufacturing, repairing or disposing of electrical transformers.</li> <li>- Metal treatment or coating - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and</li> </ul>

Lot Plan & Location	Register	Notifiable Activity Description
		spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth). – Mineral processing - chemically or physically extracting or processing metalliferous ores.
9. Lot 167 on CP859402	Not listed	Not listed.

## 4.2 Environmental authorities

Environmental Authority (EA) records registered to properties within the alignment (either current or historical) were reviewed using the EAs Location overlay on the SMEC Project web portal and DES *Environmental Protection Act 1994* Public Register search. All results are provided in Table 4.2 and EA records are provided in Appendix A.

Table 4.2 EA records for past contaminated land

Lot number	Date effective	Status	EA reference	Description
6. Lot 8 on SP218634	14 Dec 2018	Granted	EA0001611	ERA: ERA 08 – Chemical storage 5. Storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d). ERA 07 – Chemical manufacturing 6(b). Manufacturing more than 100t but no more than 10,000t of inorganic chemicals. Items 1 to 4 apply to items that are not inorganic chemicals.
7. Lot 12 on SP190336	12 Dec 2013	Granted	EPPR00325413	ERA 16 – Extraction and Screening 3(c). Screening more than 1,000,000 tonnes of material in a year. ERA 16 – Extracting and Screening 2(c). Extracting (other than dredging) more than 1,000,000 tonnes of material in a year.
2. Lot 1 on RP911260 3. Lot 91 on SP122250 4. Lot 7 on SP145439 8. Lot 1 on SP144430  Lot 6 on SP235022 Lot 7 on SP145439, Lot 54 on SP137048 Lot 1 on RP911260 Lot 27 on SP115227 Lot 79 on CP911258 Lot 23 on SP115225 Lot 13 on RP620157 Lot 91 on SP122250	5 June 2020	Granted	EPPR00926513	EA 62 – Resource recovery and transfer facility operation 1(d). Operating a facility for receiving and sorting, dismantling, baling or temporarily storing Category 1 regulated waste. ERA 08 – Chemical Storage 5. Storing 200+ cubic metres of liquid chemicals (other than chemical mentioned in items 1 to 3, under subsection (1)(d). ERA 16 – Extraction and Screening 3(c). Screening more than 1,000,000 tonnes of material in a year. ERA 31 – Mineral processing 2(b). Processing more than 1,000,000 tonnes of mineral material (other than coke) in a year. ERA 60 – Waste disposal 1(d). Operating a facility for disposing more than 200,000 tonnes of waste mentioned in subsection (1)(a) in a year. ERA 14 – Electricity generation 1. Generation electricity by using gas at a rated capacity of 10 MW+ electrical. ERA 50 – Mineral bulk material handling 2. Loading or unloading 100 tonnes + of bulk materials in a day (other than loading or unloading mention in item 3 or storing bulk materials). ERA 15 – Fuel burning. Using fuel burning equipment that is capable of burning at least 500 kg of fuel in an hour.

Lot number	Date effective	Status	EA reference	Description
Lot 21 on SP115224 Lot 7 on SP177782 Lot 20 on SP115224 Lot 7 on SP228453				<p>ERA 08 – Chemical storage 3. Storing 500 cubic metres + of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c).</p> <p>ERA 08 – Chemical storage 4. Storing 200 tonnes + of chemicals that are solids or gases (other than chemicals mentioned in items 1 to 3 under subsection (1)(d).</p> <p>ERA 62 – Resource recovery and transfer facility operation 1(c). Operating a facility for receiving and sorting, dismantling, baling or temporarily storing category 2 regulated waste.</p> <p>ERA 16 – Extraction and Screening 2(c). Extracting (other than by dredging) 1,000,000 tonnes + of material in a year.</p> <p>ERA 50 – Mineral and bulk material handling 1(a). Loading or unloading 100 tonnes + of minerals in a day (other than loading or unloading mentioned in item 3 or storing 50,000 tonnes + of minerals within 5 km of the highest astronomical tide or 1 km of a watercourse.</p>

### 4.3 Statutory enforcement actions

Statutory enforcement actions are issued by DES to an individual or company for non-compliance with a condition of an EA or the *Environmental Protection Act 1994*. The DES *Environmental Protection Act 1994* Public Register search was undertaken for the sites of interest to determine any statutory enforcement actions issued. These findings are displayed in Table 4.3.

Table 4.3 Statutory enforcement actions

Lot on Plan	Enforcement number and type	Issued to	Issued date	Comments
8. Lot 1 on SP144430	STAT915: Environmental Evaluation	RTA Yarwun Pty Ltd	15/04/2015	<p>An environmental evaluation notice was issued by the DES in regard to groundwater expression outside the boundary of the residue management area (tailings dam). Following this Yarwun Pty Ltd submitted an environmental report which addressed the departments concern.</p> <p>DES concluded that given the water quality results obtained contamination was evident within the groundwater (high salinity, low pH and high total dissolved solids).</p>
8. Lot 1 on SP144430	STAT1072: Environmental Protection Order	RTA Yarwun Pty Ltd	19/08/2016	<p>Two areas outside the boundary of RTA Yarwun Pty Ltd residue management area had groundwater expressions as a result of the tailings dam. The lots effected were as followed: Lot 68 on SP272417, Lot 8 on SP245936 and Lot 7 on SP177782. It is noted that the Project is proposed to intersect Lot 68 on SP272417.</p>

## **4.4 Defence related disturbance**

### **4.4.1 Unexplained ordnance (UXO)**

Unexploded ordnance (UXO) has not been identified within or near the Project area.

### **4.4.2 Defence PFAS Investigation & Management Program**

The alignment is not located within the Department of Defence's PFAS investigation and management sites database.

## 5. Areas of environmental interest

### 5.1 Site risk rating

A preliminary risk ranking exercise was undertaken to classify whether the potential contaminated sites identified during our assessment are likely pose a high, moderate or low risk to human health or the environment based on the preliminary contamination assessment.

In the absence of sampling data to confirm the presence or absence of contamination at the sites of interest, the risk ranking provided should be considered of a preliminary nature. To provide consistency in ranking the sites, the following decision rules were used to form the basis of the ranking system:

- On the basis of the findings of this assessment, what is the ‘likelihood’ that land contamination may be present within the bounds of the alignment.
- The ‘consequence’ that potential contamination may have a significant impact on potential receptors during construction and operation of the Project, and subsequent requirements for further assessment, management and/or remediation of contamination.

A summary of the risk categories is provided in Table 5.1.

Table 5.1 Risk rating

Classification	Definition
High Risk	<p>Previous use of the site includes storage, use or handling of fuel and/or chemicals, often in above or below ground storage tanks, and areas of extensively disturbed ground possibly indicating the presence of buried fill material of unknown origin, or stockpiled material of unknown origin.</p> <p>A high potential risk exists for construction of the Project should contamination be present in the subsurface at significant concentrations.</p>
Moderate Risk	<p>Previous uses of the site or area includes industrial land use, storage of vehicles, industrial equipment or scrap metal, general unclassified minor dumping or stockpiling of unknown origin, and some localised evidence of site surface disturbance indicating potential fill material of unknown origin.</p> <p>A moderate potential risk exists for construction of the Project should contamination be present in the subsurface at significant concentrations. The area of contamination is likely to be limited to the immediate vicinity of the source and is likely to be present within a smaller footprint than that potentially present at the high-risk sites.</p>
Low Risk	<p>Sites or areas that are vacant and/or have shown no obvious significant development or potentially contaminating current or historical uses. Significant contamination is unlikely to be present at these sites.</p>

### 5.2 Areas of environmental interest

Based on the review of available site information, historical aerial photographs, and understanding of site and surrounding area land uses, the following potential areas of environmental interest (AEI), from a contamination perspective, have been identified and summarised in Table 5.2. To provide a context on the potential significance and relative contamination risk posed by each AEI for the sites along the alignment, a risk rating for each AEI has been allocated.

Table 5.2 Areas of environmental interest (contamination)

Area of Concern	Activity	Potential contaminants of concern	Description	Risk rating
1. Lot 101 on DS185	Waste storage	Residues from industrial waste, heavy metals, solvents, acid, ash, polyfluoroalkyl substances (PFAS), and asbestos.	<p>This Lot is listed on the EMR for the waste storage, treatment or disposal - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated). Based on review of historical aerials it is likely that this allotment has been subject to this land use since 2004.</p> <p>The alignment intersects the property approximately 100 m to the north of the infrastructure identified (via aerial imagery). As such, it is considered the historical waste storage at this site could be encountered during construction works.</p>	Moderate risk
2. Lot 1 on RP911260	Landfilling and waste storage	Heavy metals, asbestos, organic acids, nutrients, polyfluoroalkyl substances (PFAS), and hydrocarbons	<p>This Lot is listed on the EMR as Lot 1 on RP911260, which was subdivided from Lot 1 on RP618672 (Boat Creek Road, Yarwun, Qld, 4694), which is included on the EMR for landfill activities. This parcel will remain on the EMR unless it can be shown that the site is not located near the contaminating activity. It is noted that as the Lot was previously connected to the landfill, ERA's currently exist over the site.</p> <p>A review of aerial imagery illustrates some historical ground disturbance and possibly waste storage from 1992. A large industrial building with black storage containers was also evident to the northeast corner of the site in 2010. The Lot is currently vacant.</p> <p>The alignment intersects the centre of the Lot. Given the previous industrial use of the land, there is potential for contamination to be present that could be encountered during construction of the Project.</p>	Moderate risk
3. Lot 91 on SP122250 5. Lot 140 on SP122252  Other railway crossings (Lot 3 on SP101558 and Lot 1 on SP234061) and areas adjacent to railway crossings where the alignment intersects	Railway yards/corridor	Hydrocarbons, phenolics, heavy metals (inc. arsenic), pesticides, herbicides and asbestos	<p>Both Lot 91 on SP122250 and Lot 140 on SP122252 are identified on the EMR. Lot 91 on SP122252 is listed on the EMR as a railway yard including goods-handling yards, workshops and maintenance areas. Lot 140 on SP122252 is listed on the EMR for hazardous contaminant as it has been subject to possible high arsenic levels along the rail corridor.</p> <p>Where the Project intersects the North Coast Line, there is a higher risk for encountering potential contamination due to historical railway corridor management practices. Particularly as there are a number of potential contamination sources from the railway corridor's previous land use (i.e., scrap metal storage, potential storage and use of fuels and chemicals, use of herbicides/pesticides on the site and surrounding areas). In addition, the corridor is near industrial use on the approach to Gladstone, including the quarry and landfill operation (Lot 91 on SP122250) and Alumina refinery (Lot 140 on SP122252). It is noted that Lot 91 on SP122250 currently has ERAs that exist over the area due to its connection with the landfill operation to the northeast of the Lot.</p>	High risk

Area of Concern	Activity	Potential contaminants of concern	Description	Risk rating
			The alignment intersects Lot 91 on SP122250 in the western portion of the site and Lot 140 on SP122252 in the eastern portion of the site. It is noted that the alignment also intersects railway networks on two other occasions.	
4. Lot 7 on SP145439 6. Lot 8 on SP218634	Alumina refinery  Gun, pistol or rifle range	Heavy metals, radioactive material, polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), organochlorine (OC), polyfluoroalkyl substances (PFAS), and hydrocarbons  Heavy metals i.e., Lead	The Yarwun Alumina Refinery is located on Lot 8 on SP218634 and has historically encroached into Lot 7 on SP145439. There are two ERAs that currently exist over Lot 8 on SP218634, these being: ERA 08 – Chemical storage and ERA 07 – Chemical manufacturing.  Ground disturbance was evident over both allotments since 1981. This disturbance was largely related to the development of the refinery. However, there was also some ground disturbance related to the development of the port and terminal to the north and coal terminal to the south in the early 1980s.  The alignment directly intersects Lot 7 on SP145439, which has been subject to ground disturbance from the alumina refinery. Both lots are currently listed on the EMR: <ul style="list-style-type: none"> <li>– Lot 8 on SP218634 is listed on the EMR for a number of notifiable activities (Section 4.1) including livestock dips, smelting, abrasive blasting, chemical manufacture and storage, electrical transformers, metal treatment or coating, mineral process and petroleum storage.</li> <li>– Lot 7 on SP145439 is listed on the EMR for Yarwun Alumina Refinery and Gun, pistol or rifle range – operating a gun, pistol or rifle range (Lot 7 on SP145439 was subdivided from Lot 3 on CP860100, which is included on the EMR).</li> </ul>	Moderate risk
7. Lot 12 on SP190336	Quarrying	Heavy metals, hydrocarbons, herbicides, pesticides	Lot 12 on SP190336 has been subject to quarrying as early as 1959. Quarrying can have a direct impact on water quality within the area. There are two ERA's that currently exist over Lot 12 on SP190336, these being: 16 – ERA 16 – Extraction and Screening 2(c) and 3(c).  The Yarwun Quarry is approximately 300 m south of the alignment. Although historically it has encroached into the railway corridor it is unlikely that this will pose a gross contamination risk.	Low risk
8. Lot 1 on SP144430	Red mud repository	Heavy metals, hydrocarbons	The Rio Tinto Alcan Red Mud Repository is approximately 2.7 km x 2.2 km and is approximately 250 m from the alignment. In historical aerial photographs, the Lot had encroached to the north and in approximately 2004 the repository had expanded north of Aldoga Road to include storage infrastructure and laydown areas.  Metal parts were observable within the laydown area as well as storage containers. As such, there may be contaminated soils within the vicinity of the Lot as a result of the red mud residues and storage infrastructure  The Lot is listed on the EMR for waste storage treatment or disposal, abrasive blasting, chemical manufacture formulation, chemical storage,	Moderate risk

Area of Concern	Activity	Potential contaminants of concern	Description	Risk rating
			<p>coal fired powered station, electrical transformers, metal treatment or coating and mineral processing.</p> <p>Two statutory enforcement actions for Lot 1 on SP144430 have been issued by DES. Both related to groundwater expressions as a result of pressure from the tailings dam. The lots effected were as followed: Lot 68 on SP272417, Lot 8 on SP245936 and Lot 7 on SP177782.</p> <p>DES concluded that given the water quality results obtained in the 2015 and 2016 inspections contamination was evident within the groundwater (high salinity, low pH and high total dissolved solids). It is noted that the alignment will intersect Lot 68 on SP272417.</p>	
9. Lot 167 on CP859402	Racecourse reserve	Hydrocarbons, metals	Historical aerial photographs show the Lot being used for racetrack riding since the 1980s. Some ground disturbance was evident to the south of the site, adjacent to the railway corridor and most likely related to railway upgrades. The Lot was not identified on the EMR and/or CLR.	Low risk
Other – Surrounding land uses	Surrounding land uses	Pesticides, herbicides, arsenic, DDT and OC	Historical aerial photographs of the Project are generally consistent with agricultural use, including grazing and cropping. Activities likely to be associated with these land uses include the use of pesticides, presence of cattle dips and unidentified dump sites.	Low risk
Other – Acid Sulfate Soils (ASS)	Disturbance of ASS	Sulfuric acid	<p>In the Environmental Technical Report (SMEC, 2021) it was noted the majority of the corridor is mapped as having a low to extremely low probability of ASS.</p> <p>Near Gladstone, the alignment intersects the mapped 'ASS of the Tannum Sands to Gladstone area, Central Queensland', which indicates a potential risk of ASS or PASS occurring. However, a preliminary ASS investigation was undertaken for the EIS (Arup, 2008) and identified ASS near Raglan Creek, in an area with low lying mangroves. Based on the above, it is considered likely that there are additional areas that have potential for ASS due to the Project's proximity to the coast and waterways.</p>	Moderate risk

## 6. Preliminary conceptual site model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The development of a CSM is an essential part of all contamination investigations and provides the framework for identifying contamination sources and how potential receptors may be exposed to contamination.

Based on the information collected as part of this desktop assessment, the following high level CSM has been developed to identify the most likely potential sources of contamination, contaminant pathways, receptors and exposure pathways for the Project, as summarised in Table 6.1. It should be noted that individual Lots may have separate source-pathway-receptors linkages that have not been identified below; however, the high level CSM provides a basic overview of the most likely linkages.

Table 6.1 Preliminary conceptual site model

<b>Potential sources of contamination</b>	Potential contamination sources: <ul style="list-style-type: none"> <li>– Waste storage – Residues from industrial waste, heavy metals, solvents, acid, PFAS and ash.</li> <li>– Railway yards / corridors – Hydrocarbons, phenolics, heavy metals (inc. arsenic), nutrients, pesticides, herbicides and asbestos</li> <li>– Alumina refinery – Heavy metals, radioactive material, PCB's, DDT, OC, PFAS and hydrocarbons</li> <li>– Gun, pistol or rifle range – Heavy metals i.e., lead</li> <li>– Quarrying - Heavy metals, hydrocarbons, herbicides and pesticides</li> <li>– Racecourse reserve – Hydrocarbons, metals</li> <li>– Surrounding land uses – Pesticides, herbicides, arsenic, DDT and OC.</li> </ul>
<b>Potential Receptors</b>	Potential receptors are considered to be: <ul style="list-style-type: none"> <li>– Future site users and workers (including maintenance works of utility services) and construction workers involved in the Project.</li> <li>– Groundwater beneath the alignment.</li> <li>– Off-site groundwater receptors (if contamination is disturbed and travels offsite)</li> <li>– Waterways intersected by the alignment.</li> <li>– Down-gradient waterways.</li> <li>– Adjacent site users including the local community or adjacent land users, flora and fauna (in the instance that contamination has migrated off site).</li> <li>– Protected environmental values as per the <i>Environmental Protection Act 1994</i> and Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP).</li> </ul>
<b>Potential Exposure Pathways</b>	Potential exposure pathways of contamination are considered to be: <ul style="list-style-type: none"> <li>– Leaching of soil contaminants into shallow / perched groundwater (if present).</li> <li>– Lateral migration of contamination in the groundwater.</li> <li>– Vapour intrusion from the volatilisation of soil or groundwater impacts to indoor or outdoor air both on and off site.</li> <li>– Ingestion or dermal contact with contaminated soil and/or groundwater during construction or maintenance works.</li> <li>– Ingestion of impacted groundwater if extracted for beneficial use down-gradient of the area.</li> <li>– Impact on aquatic ecosystems from discharge of potentially contaminated surface water and groundwater into down-gradient surface water bodies.</li> </ul>

# 7. Conclusions and recommendations

## 7.1 Conclusions

The objective of this preliminary contamination assessment was to assess the environmental setting and current and historical land use along the alignment to gain an understanding of likely areas of potential contamination, as well as to provide recommendations to manage identified areas of potential contamination.

Based on the results of the scope of works presented in Section 1.5 of this report, and in accordance with the limitations presented in Section 9, several AEIs along the alignment have been identified as having potential for contamination to be present as listed in Table 7.1.

Each of the sites have been allocated a risk rating based on the desktop information review and likelihood of contamination being present and posing a risk of harm to human health or the environment for construction and operation of the Project.

Whilst the sites/areas detailed in Table 7.1 have been identified as having a potentially moderate or high risk of contamination being present, the presence or absence of contamination has not been confirmed as no sampling data has been collected or reviewed as part of this assessment.

**Table 7.1** Summary of potentially moderate and high-risk sites

ID	Activity and potential contaminant(s) of concern	Reasoning	Risk
1. Lot 101 on DS185	Waste storage	<p>This Lot is listed on the EMR for the waste storage, treatment or disposal - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated). Based on review of historical aerials it is likely that this allotment has been subject to this land use since 2004.</p> <p>The alignment intersects the property approximately 100 m to the north of the infrastructure identified (via aerial imagery). As such, it is considered the historical waste storage at this site could be encountered during construction works.</p>	Moderate risk
2. Lot 1 on RP911260	Landfilling and waste storage - Heavy metals, asbestos, organic acids, nutrients, PFAS and hydrocarbons	<p>This Lot is listed on the EMR as Lot 1 on RP911260, which was subdivided from Lot 1 on RP618672 (Boat Creek Road, Yarwun, Qld, 4694), which is included on the EMR for landfill activities. This parcel will remain on the EMR unless it can be shown that the site is not located near the contaminating activity. It is noted that as the Lot was previously connected to the landfill, ERAs currently exist over the site.</p> <p>A review of aerial imagery illustrates some historical ground disturbance and possibly waste storage from 1992. A large industrial building with black storage containers was also evident to the northeast corner of the site in 2010. The Lot is currently vacant.</p> <p>The alignment intersects the centre of the Lot. Given the previous industrial use of the land, there is potential for contamination to be present that could be encountered during construction of the Project.</p>	Moderate risk
3. Lot 91 on SP122250 5. Lot 140 on SP122252 Other railway	Railway yards/corridor - Hydrocarbons, phenolics, heavy metals (inc. arsenic), nutrients, pesticides, herbicides and asbestos	<p>Both Lot 91 on SP122250 and Lot 140 on SP122252 are identified on the EMR. Lot 91 on SP122252 is listed on the EMR as a railway yard including goods-handling yards, workshops and maintenance areas. Lot 140 on SP122252 is listed on the EMR for hazardous contaminant as it has been subject to possible high arsenic levels along the rail corridor.</p> <p>Where the alignment intersects the North Coast Line, there is a higher risk for encountering potential contamination due to historical railway corridor management practices. Particularly as there are a number of potential contamination sources from</p>	High risk

ID	Activity and potential contaminant(s) of concern	Reasoning	Risk
crossings (Lot 3 on SP101558 and Lot 1 on SP234061) and areas adjacent to railway crossings where the FGP intersects		<p>the railway corridors previous land use (i.e., scrap metal storage, potential storage and use of fuels and chemicals, use of herbicides/pesticides on the site and surrounding areas). In addition, the corridor is near industrial use on the approach to Gladstone, including the quarry and landfill operation (Lot 91 on SP122250) and Alumina refinery (Lot 140 on SP122252). It is noted that Lot 91 on SP122250 currently has ERAs that exist over the area due to its connection with the landfill operation to the northeast of the Lot.</p> <p>The alignment intersects Lot 91 on SP122250 in the western portion of the site and Lot 140 on SP122252 in the eastern portion of the site. It is noted that the alignment also intersects railway crossings on two other occasions.</p>	
<p>4. Lot 7 on SP145439</p> <p>6. Lot 8 on SP218634</p>	<p>Alumina refinery - Heavy metals, radioactive material, PFAS and hydrocarbons</p> <p>Gun, pistol or rifle range - Heavy metals i.e., Lead</p>	<p>The Yarwun Alumina Refinery is located on Lot 8 on SP218634 and has historically encroached into Lot 7 on SP145439. There are two ERAs that currently exist over Lot 8 on SP218634, these being: ERA 08 – Chemical storage and ERA 07 – Chemical manufacturing.</p> <p>Ground disturbance was evident over both allotments since 1981. This disturbance was largely related to the development of the refinery. However, there was also some ground disturbance related to the development of the port and terminal to the north and coal terminal to the south in the early 1980s.</p> <p>The alignment directly intersects Lot 7 on SP145439, which has been subject to ground disturbance from the alumina refinery. Both lots are currently listed on the EMR.</p> <ul style="list-style-type: none"> <li>– Lot 8 on SP218634 is listed on the EMR for a number of notifiable activities (Section 4.1) including livestock dips, smelting, abrasive blasting, chemical manufacture and storage, electrical transformers, metal treatment or coating, mineral process and petroleum storage.</li> <li>– Lot 7 on SP145439 is listed on the EMR for Yarwun Alumina Refinery and Gun, pistol or rifle range – operating a gun, pistol or rifle range (Lot 7 on SP145439 was subdivided from Lot 3 on CP860100, which is included on the EMR).</li> </ul>	Moderate risk
8. Lot 1 on SP144430	Red mud repository - Heavy metals	<p>The Rio Tinto Alcan Red Mud Repository is approximately 2.7 km x 2.2 km and is approximately 250 m from the alignment. In historical aerial photographs, the Lot had encroached to the north and in approximately 2004 the repository had expanded north of Aldoga Road to include storage infrastructure and laydown areas.</p> <p>Metal parts were observable within the laydown area as well as storage containers. As such, there may be contaminated soils within the vicinity of the Lot as a result of the red mud residues and storage infrastructure</p> <p>The Lot is listed on the EMR for waste storage treatment or disposal, abrasive blasting, chemical manufacture formulation, chemical storage, coal fired powered station, electrical transformers, metal treatment or coating and mineral processing.</p> <p>Two statutory enforcement actions for Lot 1 on SP144430 have been issued by DES. Both related to groundwater expressions as a result of pressure from the tailings dam. The lots effected were as followed: Lot 68 on SP272417, Lot 8 on SP245936 and Lot 7 on SP177782.</p> <p>DES concluded that given the water quality results obtained in the 2015 and 2016 inspections contamination was evident within the groundwater (high salinity, low pH and high total</p>	Moderate risk

ID	Activity and potential contaminant(s) of concern	Reasoning	Risk
		dissolved solids). It is noted that the alignment will intersect Lot 68 on SP272417.	
Other – Acid Sulfate Soils	Disturbance of ASS	In the Environmental Technical Report (SMEC, 2021) it was noted the majority of the corridor is mapped as having a low to extremely low probability of ASS. Near Gladstone, the Project intersects the mapped 'ASS of the Tannum Sands to Gladstone area, Central Queensland', which indicates a potential risk of ASS or PASS occurring. However, a preliminary ASS investigation was undertaken for the EIS (Arup, 2008) and identified ASS near Raglan Creek, in an area with low lying mangroves. Based on the above, it is considered likely that there are additional areas that have potential for ASS due to the Project's proximity to the coast and waterways.	Moderate risk

It is also important to note that other areas of contamination may be present within the alignment that have not been identified by our assessment and, as such, an Unexpected Finds Protocol should be included in the Contaminated Land Plan to be prepared by a Suitably Qualified Person (SQP) (as prescribed in the EP Act 1994) and implemented by the Contractor during construction of the Project.

## 7.2 Recommendations

Based on the findings of this assessment, the following is recommended:

- Undertake a detailed site investigation (DSI) during the pre-construction phase of moderate and high risk sites, including soil and/or water sampling, of the AElS and confirm their contamination status. These investigations should assess the requirement for site remediation and/or management of contamination prior to bulk earthworks being undertaken. At a minimum, investigations should consider sampling and analysis for all relevant contaminants of potential concern. The investigation should be undertaken with consideration of the general framework described in the National Environment Protection (Assessment of Site Contamination) Measure 1999 (Amended 2013).
- Prior to undertaking the DSI, a Sample Analysis and Quality Plan (SAQP) should be prepared by an SQP to describe the aim of the investigation, methodology, sampling techniques, laboratory analysis schedule, and quality control measures to be implemented during the DSI.
- Depending on the findings of the DSI, and whether significant contamination is encountered that would impact the Project, a Remediation Action Plan (RAP) should be prepared to describe the remedial and / or management measures to be adopted for the Project to ensure contaminations do not pose an unacceptable risk of harm to human health or the environment.
- An Unexpected Findings Protocol should be prepared and included in the Construction Environmental Management Plan, specific for contamination management and which should be implemented during earthworks and construction.
- An investigation of ASS/PASS should also be undertaken during the pre-construction phase to confirm the ASS conditions prior to construction. This includes the collection of soil samples in areas identified by geotechnical investigations as high risk ASS areas. The ASS investigation should be undertaken with reference to the *National ASS Manual 2018* and *Queensland ASS Management Guideline 2014*. Depending on the results of the ASS investigation, an ASS Management Plan should then be prepared and implemented during construction.
- Where contaminated soil is identified on an EMR-listed property, a Disposal Permit is required prior to removal and offsite disposal of any contaminated soil, with reference to the *DES (2020) Guidelines on the disposal permit to remove, treat and dispose of contaminated soil*.

## 8. References

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## 9. Limitations

This report has been prepared by GHD Pty Ltd (GHD) for the Gladstone Area Water Board (GAWB) and may only be used and relied on by GAWB for the purpose agreed between GHD and GAWB as set out in Section 1.4 of this report. No other person may use or rely on this report for any purpose. It is not intended to be copied or provided to any other person.

GHD disclaims all liability and responsibility to any person other than GAWB arising in connection with this report and excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in this report and are subject to the scope limitations set out in this report. The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of this report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that this report was prepared.

GHD has prepared this report on the basis of information provided by GAWB and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD disclaims liability in connection with such unverified information, including errors and omissions in this report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on assumptions and exclusions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

In preparing this report, GHD has assumed the following in relation to the material it received, unless otherwise specifically stated, and this report is therefore subject to these assumptions and to the other limitations and assumptions which appear in the body of this report (“the Assumptions”):

- the information provided in the material was true and accurate in all respects and contained no material errors or omissions
- the persons, officers and advisors who provided advice to GHD and/or assisted at the site visit were competent to answer the questions that they answered.
- all documents and records examined by GHD were genuine, complete and up to date.
- there are no defaults or contraventions under any permit or licence conditions, agreement or instrument other than those set out in the material reviewed by GHD.
- all employees of GAWB who are aware of any information which has not otherwise been specifically made known to GHD and which could affect the correctness of the opinions expressed in this report, have communicated that information to GHD.

Nothing has come to the attention of GHD that has led it to believe that such Assumptions are not correct or that it would be unreasonable to rely on the Assumptions in the circumstances. However, if any of our assumptions are not accurate or the advice GHD has relied on is incorrect, the opinions GHD has expressed will need to be re-examined and may need to be changed.

The opinions, conclusions and any recommendations in this report are based on a search and review of desktop information in connection with the site and specific site conditions. Site conditions at other parts of the site may be different from the site conditions identified during our review. Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, infrastructure and vegetation. As a result, not all relevant site features and conditions may have been identified in this report. GHD disclaims responsibility for any matter that could not be identified.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the Site conditions. GHD is also not responsible for updating this report if the site conditions change.

GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of this report.

# Appendices

# **Appendix A**

**Desktop search results**

# **Environmental Authorities**

# Permit

Environmental Protection Act 1994

## Environmental authority EA0001611

*This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.*

**Environmental authority number: EA0001611**

**Environmental authority takes effect on a date to be decided later.**

### Environmental authority holder(s)

Name(s)	Registered address
Air Liquide Australia Ltd	9th Floor 380 St Kilda Road MELBOURNE VIC 3004

### Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Prescribed ERA, ERA 07 - Chemical Manufacturing, 6: Manufacturing, in a year, the following quantities of inorganic chemicals, other than inorganic chemicals to which items 1 to 4 apply, (b) more than 1000t but not more than 10,000t	Lot 8/SP218634
Prescribed ERA, ERA 08 - Chemical Storage, 5: storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	Lot 8/SP218634

### Additional information for applicants

#### Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the Environmental Protection Act 1994 (EP Act).

#### Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

## Environmental authority

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- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website [www.qld.gov.au](http://www.qld.gov.au), using the search term 'duty to notify'.

### Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

- a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or
- b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or
- c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the Planning Act 2016 or an SDA Approval under the State Development and Public Works Organisation Act 1971), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

Tristan Roberts  
Department of Environment and Science  
Delegate of the administering authority  
Environmental Protection Act 1994

**Enquiries:**  
Extraction, Energy and Chemical Industries  
Assessment  
Department of Environment and Science  
Phone: 1300 130 372  
Email: [palm@des.qld.gov.au](mailto:palm@des.qld.gov.au)

**Date issued: 14 December 2018**

## Environmental authority

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### Obligations under the Environmental Protection Act 1994

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

### Conditions of environmental authority

Agency interest: General	
Condition number	Condition
G1	Any breach of a condition of this environmental authority must be reported to the <b>administering authority</b> as soon as practicable within 24 hours of becoming aware of the breach. <b>Records</b> must be kept including full details of the breach and any subsequent actions taken.
G2	<b>Activities</b> under this environmental authority must be conducted in accordance with the following limitations: <ul style="list-style-type: none"> <li>a) The amount of chemicals manufactured in a year must not exceed 10,000t;</li> <li>b) The chemicals authorised to be manufactured under this environmental authority are liquid oxygen and liquid nitrogen.</li> </ul>
G3	All reasonable and practicable <b>measures</b> must be taken to prevent or minimise environmental harm caused by the <b>activities</b> .
G4	All <b>records</b> must be kept for a period of at least five years and provided to the <b>administering authority</b> upon request.
G5	Chemicals, fuels and oils in containers of greater than 15 litres must be stored within a <b>secondary containment system</b> .
G6	All analyses required under this environmental authority must be carried out by a laboratory that has National Association of Testing Authorities ( <b>NATA</b> ) certification, or an equivalent certification, for such analyses.
G7	When required by the <b>administering authority</b> , monitoring must be undertaken in the manner prescribed by the <b>administering authority</b> to investigate a complaint of <b>environmental nuisance</b> arising from the <b>activity</b> . The monitoring results must be provided within 10 business days to the <b>administering authority</b> upon its request.
G8	The holder of this environmental authority must record the following details for all environmental complaints received: <ul style="list-style-type: none"> <li>a) Date and time complaint was received</li> <li>b) Name and contact details of the complainant</li> <li>c) Nature of the complaint</li> <li>d) Investigations undertaken</li> <li>e) Conclusions formed</li> <li>f) Actions taken</li> </ul>
G9	All plant and equipment must be maintained and operated in their proper and effective condition. Records must be kept of plant operating conditions.
Agency interest: Air	
Condition number	Condition

A1	Other than as permitted within this <b>environmental authority</b> , odours or airborne contaminants must not cause <b>environmental nuisance</b> to any <b>sensitive place</b> or <b>commercial place</b> .
A2	The holder of this approval is authorised to release oxygen, nitrogen and other inert atmospheric components to the atmosphere when carrying out <b>normal operations</b> .
<b>Agency interest: Land</b>	
<b>Condition number</b>	<b>Condition</b>
L1	Contaminants must not be released to land.
L2	A stormwater management plan must be developed and implemented by 18 March 2019 which must provide for, as a minimum, the following functions: <ul style="list-style-type: none"> <li>a) Prevent or minimise the contamination of stormwater;</li> <li>b) Diverting uncontaminated run off around areas disturbed by the activity, or where contaminants or wastes are stored or handled; and</li> <li>c) Contaminated stormwater is collected and treated or disposed of in accordance with the conditions of this authority.</li> </ul>
<b>Agency interest: Acoustic</b>	
<b>Condition number</b>	<b>Condition</b>
N1	Other than as permitted within this environmental authority, noise generated by the <b>activity</b> must not cause <b>environmental nuisance</b> to any <b>sensitive place</b> or <b>commercial place</b> .
<b>Agency interest: Waste</b>	
<b>Condition number</b>	<b>Condition</b>
W1	All waste generated in carrying out the <b>activity</b> must be lawfully reused, recycled or removed to a facility that can lawfully accept the waste.
W2	<b>Incompatible wastes</b> must not be mixed in the same container or waste storage area.
<b>Agency interest: Water</b>	
<b>Condition number</b>	<b>Condition</b>
WT1	Contaminants must not be released to any waters.
WT2	If the holder of this environmental authority gives or transfers ownership of the cooling tower blowdown water to another person(s), the holder of this environmental authority must: <ul style="list-style-type: none"> <li>(a) prior to giving such cooling tower blowdown water or transferring ownership of such cooling tower blowdown water to that person(s), obtain from that person and record details of how that person intends to comply with the general environmental duty in respect of the use and disposal of such cooling tower blowdown water, particularly in relation to environmental sustainability of any cooling tower blowdown water disposal, protection of public health and protection of environmental values of waters;</li> </ul>

	<p>(b) only give or transfer ownership of such cooling tower blowdown water in accordance with a written agreement between the person carrying out the activities under this environmental authority and that person(s);</p> <p>(c) upon becoming aware that the person is not or is not likely to comply with the general environmental duty, and/or the written procedure in condition WT2 (a), cease the giving and transferring ownership of such cooling tower blowdown water, as the case may be.</p>
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## Definitions

Key terms and/or phrases bolded in this environmental authority are defined in this section. Where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

Term	Definition
<b>Administering authority</b>	means the Department of Environment and Science or its successors or predecessors.
<b>Appropriately qualified person(s)</b>	means a person or persons who has professional qualifications, training, skills and experience relevant to the EA requirement and can give authoritative assessment, advice and analysis in relation to the EA requirement using the relevant protocols, standards, methods or literature.
<b>Commercial place</b>	means a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.
<b>Environmental nuisance</b>	as defined in Chapter 1 of the <i>Environmental Protection Act 1994</i> .
<b>Environmental value</b>	as defined in Chapter 1 of the <i>Environmental Protection Act 1994</i> .
<b>General waste</b>	means waste other than regulated waste.
<b>Incompatible waste</b>	means waste that may chemically react when: <ol style="list-style-type: none"> <li>1. placed in proximity to other wastes; and/or</li> <li>2. mixed with other wastes.</li> </ol>
<b>Normal operations</b>	means 24 hour operation and includes start up and shut down of the equipment.
<b>Measures</b>	have the broadest interpretation and includes plant, equipment, physical objects, monitoring, procedures, actions, directions and competency.
<b>NATA</b>	means National Association of Testing Authorities.
<b>Receiving environment monitoring program</b>	means a monitoring program designed to monitor and assess the potential impacts of controlled and/or uncontrolled releases of contaminants to the environment from the <b>activity</b> .
<b>Records</b>	include breach notifications, written procedures, analysis results, monitoring reports and monitoring programs required under a condition of this authority
<b>Secondary containment system</b>	means a system designed, installed and operated to prevent any release of contaminants from the system, or containers within the system, to land, <b>groundwater</b> , or surface waters.
<b>Sensitive place</b>	includes the following and includes a place within the curtilage of such a place reasonably used by persons at that place: <ol style="list-style-type: none"> <li>1. a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or</li> <li>2. a motel, hotel or hostel; or</li> <li>3. a kindergarten, school, university or other educational institution; or</li> </ol>

	<ol style="list-style-type: none"> <li>4. a medical centre or hospital; or</li> <li>5. a protected area under the <i>Nature Conservation Act 1992</i>, the <i>Marine Parks Act 2004</i> or a World Heritage Area; or</li> <li>6. a public park or garden; or</li> <li>7. for noise, a place defined as a sensitive receptor for the purposes of the Environmental Protection (Noise) Policy 2008.</li> </ol>
<b>Waters</b>	includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water, natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and <b>groundwater</b> and any part thereof.

**Appendices**

**END OF ENVIRONMENTAL AUTHORITY**

### Environmental authority EPPR00325413

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

**Permit<sup>1</sup> number: EPPR00325413**

The amended environmental authority takes effect on the date the delegate signs this document

The anniversary date of this environmental authority is 25 October. An annual return and the payment of the annual fee which is currently will be due each year on this day.

#### Environmental authority holder(s)

Name	Registered address
Earth Commodities Gladstone Pty Ltd	Level 1, 23 Chapman Place EAGLE FARM QLD 4009

#### Environmentally relevant activity and location details

Environmentally relevant activities	Location(s)
16-(2c) <b>Extractive</b> - extracting, other than by dredging, in a year, more than 1000000t of material	Lot 11 Plan SP190336 Lot 12 Plan SP190336
16-(3c) <b>Screening</b> - screening, in a year, more than 1000000t of material	94 Quarry Road, YARWUN QLD 4680

#### Additional information for applicants

##### Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority is issued is a restatement of the ERA as defined by legislation at the time the approval is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an environmental authority as to the scale, intensity or manner of carrying out an ERA, then the conditions prevail to the extent of the inconsistency.

An environmental authority authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the authority specifically authorises environmental harm.

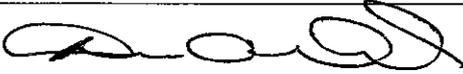
A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

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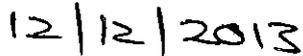
<sup>1</sup> Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation

Contaminated land

It is a requirement of the EP Act that if an owner or occupier of land becomes aware a notifiable activity (as defined in Schedule 3 and Schedule 4) is being carried out on the land, or that the land has been, or is being, contaminated by a hazardous contaminant, the owner or occupier must, within 22 business days after becoming so aware, give written notice to the chief executive.



Signature



Date

Don Arnold  
Department of Environment and Heritage Protection  
Delegate of the administering authority  
*Environmental Protection Act 1994*

**Enquiries:**  
Kell Cleary  
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Facsimile + 61 7 4972 1993  
Website [www.ehp.qld.gov.au](http://www.ehp.qld.gov.au)

**Obligations under the *Environmental Protection Act 1994***

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

**Conditions of environmental authority**

The environmentally relevant activity(ies) conducted at the location as described above must be conducted in accordance with the following site specific conditions of approval.

<b>Agency interest: General</b>	
<b>Condition number</b>	<b>Condition</b>
A1	This environmental authority permits the operation of extracting (other than by dredging) and screening a maximum of 1,500,000t of material at the authorised place in a year.
A2	All reasonable and practicable <b>measures</b> must be taken to minimise the likelihood of environmental harm being caused.
A3	Any breach of a condition of this environmental authority must be reported to the <b>administering authority</b> as soon as practicable, or at most, within 24 hours of the registered operator becoming aware of the breach. Records must be kept including full details of the breach and any subsequent actions undertaken.
A4	Other than as permitted by this environmental authority, the <b>release of a contaminant into the environment</b> must not occur.
A5	All information and records that are required by the conditions of this environmental authority must be kept for a minimum of five (5) years. Environmental monitoring results must be kept until surrender of this environmental authority. All information and records required by the conditions of this environmental authority must be provided to the <b>administering authority</b> upon request.
A6	An <b>appropriately qualified person(s)</b> must monitor, record and interpret all parameters that are required to be monitored by this environmental authority and in the manner specified by this environmental authority.
A7	All analyses required under this environmental authority must be carried out by a laboratory that has <b>NATA</b> certification, or an equivalent certification, for such analyses, or as authorised by the administering authority.

A8	When required by the <b>administering authority</b> , monitoring must be undertaken in the manner prescribed by the <b>administering authority</b> to investigate a complaint that is not considered by the <b>administering authority</b> to be frivolous or vexatious, of environmental nuisance arising from the <b>activity</b> . The monitoring results must be provided to the <b>administering authority</b> upon request.
A9	The <b>activity</b> must be undertaken in accordance with written procedures that: <ul style="list-style-type: none"> <li>(a) identify potential risks to the environment from the activity during routine operations, closure and an emergency;</li> <li>(b) establish and maintain control measures that minimise the potential for environmental harm;</li> <li>(c) ensure plant, equipment and measures are maintained in a proper and effective condition;</li> <li>(d) ensure plant, equipment and measures are operated in a proper and effective manner;</li> <li>(e) ensure that staff are trained and aware of their obligations under the <i>Environmental Protection Act 1994</i>; and</li> <li>(f) ensure that reviews of environmental performance are undertaken at least annually.</li> </ul>
A10	Within three (3) months of this environmental authority taking effect, the registered operator must provide financial assurance in the amount and form required by the administering authority.
A11	The financial assurance is to remain in force until the administering authority is satisfied that no claim on assurance is likely.

**Agency interest: Air**

<b>Condition number</b>	<b>Condition</b>
B1	Odours or airborne contaminants which are <b>noxious</b> or <b>offensive</b> or otherwise unreasonably disruptive to public amenity or safety must not cause environmental nuisance to any <b>nuisance sensitive place</b> or <b>commercial place</b> .
B2	The release of dust and/or particulate matter resulting from the activity must not cause environmental nuisance to any <b>nuisance sensitive place</b> or <b>commercial place</b> .
B3	Release of dust or particulate, exceeding the following levels, when measured at any <b>nuisance sensitive place</b> , is considered as an environmental nuisance: <ul style="list-style-type: none"> <li>(a) dust deposition of 120 mg/m<sup>2</sup>/day, when measured in accordance with Australian Standard AS 3580.10:2003 <i>Methods of sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric method</i> (or more recent edition); or</li> <li>(b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24 hour averaging period, at a <b>nuisance sensitive place</b> downwind of the site, when monitored in accordance with:             <ul style="list-style-type: none"> <li>i. Australian Standard AS 3580.9.6:2003 <i>Ambient Air – Particulate Matter – Determination of suspended particulate PM10 high-volume sampler with size –</i></li> </ul> </li> </ul>

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	<p><i>selective inlet – gravimetric method; or</i></p> <p>ii. Any alternative method of monitoring PM10 that may be permitted by the <i>Air Quality Sampling Manual</i> as published by the administering authority.</p>
B4	<p>When requested by the administering authority, dust and particulate monitoring must be undertaken within a reasonable timeframe nominated by the administering authority, to investigate any complaint of environmental nuisance caused by dust and/or particulate matter.</p> <p>The results of the monitoring must be notified to the administering authority within 14 days following completion of the monitoring.</p>
B5	<p>Monitoring must be carried out at a place(s) relevant to the potentially affected <b>nuisance sensitive place</b> and at upwind control sites and must include:</p> <p>(a) for a complaint alleging dust nuisance, dust deposition; and</p> <p>(b) for a complaint alleging adverse health effects caused by dust, the concentration per cubic metre of particulate matter with an aerodynamic diameter of less than 10 micrometre (<math>\mu\text{m}</math>) (<math>\text{PM}_{10}</math>) suspended in the atmosphere over a 24 hour averaging time.</p>
<b>Agency interest: Water</b>	
<b>Condition number</b>	<b>Condition</b>
C1	There must be no release of contaminants to waters.
C2	The stormwater runoff from disturbed areas, generated by (up to and including) a <b>24 hour storm event with an average recurrence interval of 1 in 10 years</b> must be retained on site or managed to remove contaminants before release.
<b>Agency interest: Noise</b>	
<b>Condition number</b>	<b>Condition</b>
D1	Noise resulting from the activity must not cause an environmental nuisance at any <b>nuisance sensitive place</b> .
D2	<p>When required by the <b>administering authority</b>, noise monitoring must be undertaken in accordance with the associated AS 1055.1:1997 <i>Acoustics – Description and measurement of environmental noise</i>, and the results notified within 14 days to the <b>administering authority</b>.</p> <p>Monitoring must include:</p> <p>(a) <math>L_{\text{Aeq, adj, T}_i}</math></p> <p>(b) <b>Background</b> noise (Background) as <math>L_{\text{Aeq, adj, T}_i}</math></p> <p>(c) <math>\text{Max}L_{\text{pA, T}_i}</math></p> <p>(d) the level and frequency of occurrence of any impulsive or tonal noise;</p> <p>(e) atmospheric conditions including wind speed and direction;</p>

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	<p>(f) effects due to extraneous factors such as traffic noise; and</p> <p>(g) location, date and time of recording.</p>						
D3	<p><b>Blasting</b> activities must not exceed the limits for peak particle velocity and air blast overpressure in <i>Table 2—Blasting noise limits</i> when measured at any <b>sensitive place</b> or <b>commercial place</b> in accordance with the associated monitoring requirements.</p> <p style="text-align: center;"><b>Table 2—Blasting noise limits</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Blasting criteria</th> <th>Blasting limits</th> </tr> </thead> <tbody> <tr> <td>Airblast overpressure</td> <td>115dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120dB (Linear) Peak at any time</td> </tr> <tr> <td>Ground <b>vibration</b> peak particle velocity</td> <td>5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10mm/second peak particle velocity at any time</td> </tr> </tbody> </table>	Blasting criteria	Blasting limits	Airblast overpressure	115dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120dB (Linear) Peak at any time	Ground <b>vibration</b> peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10mm/second peak particle velocity at any time
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Ground <b>vibration</b> peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10mm/second peak particle velocity at any time						
D4	<p><b>Blasting</b> must be carried out in accordance with the current edition of the <b>administering authority's</b> <i>Noise and Vibration From Blasting Guideline</i> and with Australian Standard AS 2187.2:2006 <i>Explosives – Storage and use – Use of explosives</i>.</p>						
D5	<p>Unless prior approval is obtained from the <b>administering authority</b>:</p> <p>(a) <b>blasting</b> is only permitted during the hours of 9am to 3pm Monday to Friday, and from 9am to 1pm on Saturdays;</p> <p>(b) blasting is not permitted at any time on Sundays or public holidays.</p>						
D6	<p>When required by the <b>administering authority</b>, a blast monitoring program must be developed and implemented to monitor compliance with <i>Table 2—Blasting noise limits</i> at any <b>nuisance sensitive place</b> or <b>commercial place</b>.</p>						
<b>Agency interest: Land</b>							
<b>Condition number</b>	<b>Condition</b>						
E1	<p>Treatment and management of acid sulfate soils must comply with the current edition of the <i>Queensland Acid Sulfate Soil Technical Manual</i>.</p>						
E2	<p>The holder must complete an investigation into rehabilitation of disturbed areas and submit a site rehabilitation plan at least two (2) years before the closure of the site and its activities for review, comment and acceptance by the <b>administering authority</b>. The plan must be reviewed every two (2) years while operations are being undertaken on site.</p> <p>The rehabilitation management plan must, at a minimum:</p> <p>(a) map existing areas of rehabilitation;</p> <p>(b) include a staged rehabilitation of disturbed areas plan;</p> <p>(c) develop design objectives for rehabilitation of disturbed areas and post quarry land uses</p>						

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	<p>across the site;</p> <ul style="list-style-type: none"> <li>(d) specify soil characteristics, soil analysis, soil separation for use on rehabilitation;</li> <li>(e) detail rehabilitation methods applied to areas;</li> <li>(f) contain landform design criteria including end of quarry design;</li> <li>(g) detail how landform design will be consistent with the proposed future use;</li> <li>(h) identify success criteria for areas and itemise revegetation criteria;</li> <li>(i) explain planned native vegetation rehabilitation areas and corridors;</li> <li>(j) identify at least a minimum of one (1) reference and three (3) rehabilitation sites to be used to develop rehabilitation success criteria;</li> <li>(k) describe rehabilitation indicators and the monitoring program to be used;</li> <li>(l) develop a contingency plan for rehabilitation maintenance or redesign; and</li> <li>(m) describe end of quarry landform design plan and post quarry land uses across the site.</li> </ul>
E3	<p>Maintenance of rehabilitated areas must take place to ensure:</p> <ul style="list-style-type: none"> <li>(a) erosion control measures remain effective;</li> <li>(b) plants show healthy growth;</li> <li>(c) any weed infestations are removed and prevented from recurring;</li> <li>(d) plants that have not taken, died or have become diseased are removed and replaced as soon as practical;</li> <li>(e) significant plant losses are examined for possible causes;</li> <li>(f) the rehabilitated land should be capable of withstanding normal disturbances such as fire or flood; and</li> <li>(g) rehabilitated ecosystems must be sustainable in the long-term.</li> </ul>
E4	<p>For excavations that are to remain at the completion of extraction activities, the registered operator must:</p> <ul style="list-style-type: none"> <li>(a) provide safe access to the excavation;</li> <li>(b) ensure that the excavated areas are surrounded by a rock bund and/or fences to make the area safe to the general public; and</li> <li>(c) ensure that water quality in any remaining excavation or from seepage released from the site, complies with the <i>Queensland Water Quality Guidelines</i>; however, if the quality of waters in the vicinity of the extraction does not comply with those Guideline values due to the occurrence of natural minerals sourced from the undisturbed geological setting, (c) does not apply to the extent of the natural contamination.</li> </ul>
E5	<p>Topsoil must be:</p> <ul style="list-style-type: none"> <li>(a) removed, where practicable, from areas to be significantly disturbed prior to the commencement of extraction activities;</li> <li>(b) stockpiled in a manner that will preserve its biological and chemical integrity; and</li> </ul>

	(c) used for onsite rehabilitation purposes.
<b>Agency interest: Waste</b>	
<b>Condition number</b>	<b>Condition</b>
F1	All waste generated in carrying out the <b>activity</b> must be reused, recycled or removed to a facility that can lawfully accept the waste.

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## Definitions

Key terms and/or phrases used in this document are defined in this section and **bolded** throughout this document. Applicants should note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

**Activity** means the environmentally relevant activities, whether resource activities or prescribed activities, to which the environmental authority relates.

**Administering authority** means the Department of Environment and Heritage Protection or its successor or predecessors.

**Airblast overpressure** is the energy transmitted from the blast site within the atmosphere in the form of pressure waves. As these waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations. The pressure wave consists of both audible (noise) and inaudible (concussion) energy. The maximum excess pressure in this wave is known as the peak air overpressure, generally measured in decibels using the linear frequency-weighting.

**Appropriately qualified person(s)** means a person or persons who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

**Background** means noise, measured in the absence of the noise under investigation, as  $L_{A90,T}$  being the A-weighted sound pressure level exceeded for 90 per cent of the time period of not less than 15 minutes, using Fast response.

**Blasting** is the use of explosives to fracture:

- rock, coal and other minerals for later recovery; or
- structural components or other items to facilitate removal from a site or for reuse.

**Commercial place** means a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.

$L_{Aeq\ adj,T}$  means the adjusted A weighted equivalent continuous sound pressure level measures on fast response, adjusted for tonality and impulsiveness, during the time period T, where T is measured for a period no less than 15 minutes when the activity is causing a steady state noise, and no shorter than one hour when the approved activity is causing an intermittent noise.

$Max_{L_{pA,T}}$  means the maximum A-weighted sound pressure level measured over a time period T of not less than 15 minutes, using Fast response.

**Measures** has the broadest interpretation and includes plant, equipment, physical objects, bunding, containment systems, monitoring, procedures, actions, directions and competency.

**NATA** means National Association of Testing Authorities.

**Noxious** means harmful or injurious to health or physical well-being.

**Offensive** means causing offence or displeasure; is unreasonably disagreeable to the sense; disgusting, nauseous or repulsive.

**Prescribed contaminants** means contaminants listed within Schedule 9 of the Environmental Protection Regulation 2008.

**Release of a contaminant into the environment** means to:

- deposit, discharge, emit or disturb the contaminant
- cause or allow the contaminant to be deposited, discharged, emitted or disturbed
- fail to prevent the contaminant from being deposited, discharged emitted or disturbed
- allow the contaminant to escape
- fail to prevent the contaminant from escaping.

**Nuisance sensitive place** includes the following and includes a place within the curtilage of such a place reasonably used by persons at that place:

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area under the Nature Conservation Act 1992, the Marine Parks Act 1992 or a World Heritage Area; or
- a public thoroughfare, park or gardens; or
- for noise, a place defined as a sensitive receptor for the purposes of the Environmental Protection (Noise) Policy 2008.

**Substantial low frequency noise** means a noise emission that has an unbalanced frequency spectrum shown in a one-third octave band measurement, with a predominant component within the frequency range 10 to 200Hz. It includes any noise emission likely to cause an overall sound pressure level at a sensitive place exceeding 55dB(Z).

**24 hour storm event with an average recurrence interval of 1 in 10 years** means the maximum rainfall depth from a 24 hour duration precipitation event with an average recurrence interval of once in 10 years.

**Vibration** is the oscillating or periodic motion of a particle, group of particles, or solid object about its equilibrium position.

**Waters** includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water, natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part thereof.

**END OF PERMIT**

# Permit

## Environmental Protection Act 1994

### Environmental authority EPPR00926513

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

**Environmental authority number: EPPR00926513**

**Environmental authority takes effect on 02 March 2020**

**Environmental authority holder(s)**

Name(s)	Registered address
RTA Yarwun Pty Ltd	123 Albert St BRISBANE CITY QLD 4000 Australia

### Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
ERA 31 - Mineral processing 2: Processing, in a year, the following quantities of mineral products, other than coke (b) more than 100,000t	Lot 1 on RP911260, Lot 1 on SP144430, Lot 1 on SP144433, Lot 13 on RP620157, Lot 14 on SP147866, Lot 20 on SP115224, Lot 21 on SP103896, LOT 21 on SP115224, Lot 22 on SP103896, Lot 23 on SP103896, Lot 23 on SP115225, Lot 27 on SP115227, Lot 503 on SP144788, Lot 54 on SP137048, Lot 7 on SP145439, Lot 7 on SP147726, Lot 7 on SP177782, Lot 7 on SP228453, Lot 79 on CP911258, Lot 8 on SP218634, Lot 9 on SP147866, Lot 91 on SP122250
ERA 50 - Mineral and bulk material handling 2: Loading or unloading 100t or more of bulk materials in a day or stockpiling bulk materials	Lot 1 on SP144433, Lot 14 on SP147866, Lot 21 on SP103896, Lot 22 on SP103896, Lot 23 on SP103896, Lot 502 on SP224189, LOT 502 on SP252988, Lot 6 on SP235022, Lot 7 on SP147726, Lot 8 on SP218634, Lot 9 on SP147866
ERA 16 - Extraction and Screening 2: Extracting, other than by dredging, in a year, the following quantity of material (c) more than 1,000,000t	Lot 1 on SP144430, Lot 503 on SP144788, Lot 7 on SP228453, Lot 8 on SP218634

## Environmental authority EPPR00926513

Environmentally relevant activity/activities	Location(s)
<p>ERA 62 - Resource recovery and transfer facility operation 1: Operating a facility for receiving and sorting, dismantling, baling or temporarily storing- (c) category 2 regulated waste</p> <p>ERA 62 - Resource recovery and transfer facility operation 1: Operating a facility for receiving and sorting, dismantling, baling or temporarily storing- (d) category 1 regulated waste</p>	Lot 1 on SP144430, Lot 7 on SP228453, Lot 8 on SP218634
ERA 15 - Fuel burning Using fuel burning equipment that is capable of burning at least 500kg of fuel in an hour	Lot 1 on SP144430, Lot 7 on SP228453, Lot 8 on SP218634
ERA 50 - Mineral and bulk material handling 1: Loading or unloading 100t or more of minerals in a day or stockpiling 50,000t or more of minerals (a) within 5km of the highest astronomical tide or 1km of a watercourse	Lot 1 on SP144433, Lot 14 on SP147866, Lot 21 on SP103896, Lot 22 on SP103896, Lot 23 on SP103896, Lot 502 on SP224189, LOT 502 on SP252988, Lot 6 on SP235022, Lot 7 on SP147726, Lot 8 on SP218634, Lot 9 on SP147866
ERA 08 - Chemical Storage 5: storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	Lot 1 on SP144430, Lot 502 on SP224189, LOT 502 on SP252988, Lot 7 on SP228453, Lot 8 on SP218634
ERA 08 - Chemical Storage 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	Lot 1 on SP144430, Lot 502 on SP224189, Lot 7 on SP228453, Lot 8 on SP218634
ERA 08 - Chemical Storage 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	Lot 1 on SP144430, Lot 502 on SP224189, Lot 7 on SP228453, Lot 8 on SP218634
ERA 16 - Extraction and Screening 3: Screening, in a year, the following quantity of material (c) more than 1,000,000t	Lot 1 on SP144430, Lot 6 on SP235022, Lot 7 on SP228453, Lot 8 on SP218634

## Environmental authority EPPR00926513

Environmentally relevant activity/activities	Location(s)
ERA 14 - Electricity Generation 1: Generating electricity by using gas at a rated capacity of 10MW electrical or more	Lot 1 on SP144430, Lot 7 on SP228453, Lot 8 on SP218634
ERA 60 - Waste disposal 1: Operating a facility for disposing of, in a year, the following quantity of waste mentioned in subsection (1)(a) (d) more than 200,000t	Lot 1 on SP144430, Lot 7 on SP228453, Lot 8 on SP218634
ERA 08 - Chemical Storage 4: storing 200t or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	Lot 1 on SP144430, Lot 502 on SP224189, Lot 7 on SP228453, Lot 8 on SP218634

**Additional information for applicants**Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website [www.qld.gov.au](http://www.qld.gov.au), using the search term 'duty to notify'.

**Environmental authority EPPR00926513**

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Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

- a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or
- b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or
- c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Planning Act 2016* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

Filiz Tansley  
Department of Environment and Science  
Delegate of the administering authority  
*Environmental Protection Act 1994*

**Enquiries:**  
Minerals Business Centre  
Department of Environment and Science  
Phone: 07 4222 5352  
Email: ESCairns@des.qld.gov.au

**Date issued: 02 March 2020**

**Obligations under the *Environmental Protection Act 1994***

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

## Legislative Requirements and Conditions of Environmental Authority

### Condition

#### General

- G1 In carrying out the activities, all reasonable and practicable measures must be taken to prevent and/or to minimise the likelihood of environmental harm.
- G2 Maintenance of measures, plant and equipment  
The **holder** must:
- (a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this **environmental authority**;
  - (b) maintain such measures, plant and equipment in a proper and efficient condition; and
  - (c) operate such measures, plant and equipment in a proper and efficient manner.
- G3 Records  
The **holder** must record, compile and keep all monitoring results and reports required by this **environmental authority** and present any monitoring results or reports to the **administering authority** when requested, including in an electronic form if requested.
- G4 All records required by this **environmental authority** must be kept for at least five (5) years unless otherwise stated in this **environmental authority**.
- G5 Environmental Management System  
An Environmental Management System (EMS), that includes all the requirements of and conforms with AS/NZS ISO 14001:2004 (Environmental Management Systems - requirements with guidance for use) or more recent versions must be implemented that provides for the effective management of the actual and potential environmental impacts resulting from the carrying out of the activities. Documentation relating to the EMS must be kept.
- G6 The **holder** must not implement or amend an EMS (including any associated environmental plan) in a manner that contravenes any condition of this **environmental authority**.
- G7 Notification  
The **holder** must notify the **administering authority** by telephone as soon as practicable, but within six (6) hours of becoming aware, of any emergency, event or incident which may:
- (a) result in the release of contaminants not in accordance with, or reasonably expected not to be in accordance with, the conditions of this **environmental authority**; and
  - (b) have the potential to cause material or serious environmental harm.
- Note: The Pollution Hotline is the most appropriate after-hours contact.*
- G8 All other releases of contaminants not in accordance or reasonably expected not to be in accordance with the conditions of this **environmental authority** must be reported to the **administering authority** in accordance with (G10).
- G9 Written advice detailing the below information must be provided to the **administering authority** within fourteen (14) days following any notification in accordance with condition (G7); and with the monthly compliance report mentioned in condition (G10) following any notification required by condition (G8).
- (a) the name of the **holder** of the activities to which this **environmental authority** relates, including the **environmental authority** number;
  - (b) the name and telephone number of a designated contact person;
  - (c) the location of the release/event;

- (d) the time and date of the release/event;
- (e) the time the **holder** became aware of the release/event;
- (f) the suspected cause of the release/event;
- (g) details of the quantity of substance released;
- (h) details of the area of impact;
- (i) a description of the resulting effects of the release/event;
- (j) the results of any sampling performed in relation to the release/event;
- (k) actions taken to mitigate any environmental harm (including **environmental nuisance**) caused by the release/event; and
- (l) proposed actions to prevent a recurrence of the release/event.

G10 Monthly compliance report

A monthly compliance report outlining the following must be submitted the **administering authority** within twenty (20) days of the end of each month;

- (a) a summary of the months monitoring undertaken as required by this **environmental authority** including details of any non-compliance with the **environmental authority**;
- (b) instances of **impeded operational performance of pollution control equipment** within the month;
- (c) complaint information as required by condition (C1) received in the month;
- (d) written advice regarding releases of contaminants not in accordance or reasonably expected not to be in accordance with the conditions of this **environmental authority** required by condition (G8) within the month; and
- (e) a list of release (overflow) events for all release points except W1 during the month.

G11 Monitoring

A **competent person(s)** must conduct any monitoring required by this **environmental authority**.

G12 Equipment calibration

All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this **environmental authority** must be calibrated, and appropriately operated and maintained.

G13 Records must be kept of calibration data for all instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this **environmental authority** and submitted to the administering authority when requested.

G14 Trained and experienced operator(s)

All persons engaged in the conduct of the activities, including but not limited to employee(s) and contract staff must:

- (a) be trained in the procedures and practices necessary to:
  - i. comply with the conditions of this **environmental authority**; and
  - ii. prevent environmental harm during normal operation and emergencies;
- (b) be under the close supervision of a trained person as required in (G14)(a); and
- (c) maintain records of training required by this condition.

- G15 Within eighteen (18) months of the date of this **environmental authority** the **holder** must develop a dispersion model and commence to apply the modelling to any air emission incident that the **holder** reasonably considers (based on available information) may have caused, or has the potential to cause, serious or material environmental harm beyond the **site** boundary. The:
- (a) modelling must have the capacity to report within two (2) hours of an incident; and
  - (b) modelling report must be made available to the **administering authority** within two (2) hours of the model results being available.
- G16 Third Party Environmental Auditing  
Compliance with conditions of this **environmental authority** must be audited within forty (40) days of completion of **commissioning** and every three (3) years thereafter and for the EMS required by condition (G5) must be audited within six (6) months of the date of this **environmental authority** and every three (3) years thereafter.
- G17 The audit(s) required by condition (G16) must be conducted by a **suitably qualified third party auditor**, nominated by the **holder** and accepted by the **administering authority**.
- G18 For the audit(s) required by condition (G16) the **holder** must submit a final version of the auditor's report to the **administering authority** within fourteen (14) days of receiving the audit report. The report must be accompanied by a statutory declaration from the auditor, stating that the report accurately represents the findings of the auditor and that the report has been prepared independently of the **holder** and is the independently held opinion of the auditor.
- G19 The total financial cost of the audit(s) required in condition (G16) will be the responsibility of the **holder**.
- G20 The **holder** must within a reasonable period of time agreed to in writing by the **administering authority** take steps to respond to any recommendations arising from the audit report, including:
- (a) investigating any non-compliance issues identified;
  - (b) as soon as practicable, implementing measures or taking necessary action to ensure compliance with the **environmental authority**; and
  - (c) provide written advice to the **administering authority** regarding the above.
- G21 Scale and intensity of use of the activities  
The scale of the alumina refinery and associated ERA(s) authorised under this **environmental authority** is that scale and intensity indicated in the application information titled "RTA Yarwun Pty Ltd - Supporting Information for a MCU ERA development permit application – Environment report for expansion of the refinery dated February 2012, GHD" and the production of not more than 4.0 million tonnes of alumina per year.

**Condition****Acoustic**

- N1 Noise release  
All noise from the activities must not exceed an  $L_{Aeq, adj}$ , 1 hour value of 43 dB(A), when measured outside at any **nuisance sensitive place** other than those located on Lot 11 plan SP108408 and Lot 1 plan MPH32292.
- N2 If the outside measured noise from activities exceeds an  $L_{Aeq, adj}$ , 1 hour value of 44 dB(A), and noise complaints are received from residents at a **nuisance sensitive place** located on Lot 11 plan SP108408 and Lot 1 plan MPH32292, then remedial measures must be taken that are acceptable to those residents, or noise attenuation measures must be installed, to reduce

measured noise levels at the relevant **nuisance sensitive place(s)** to a **maximum**  $L_{Aeq, adj, 1 \text{ hour}}$  value of 44 dB(A).

**N3** Noise monitoring

When requested by the **administering authority**, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the **administering authority** to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of **environmental nuisance** at any sensitive or **commercial place**, and the results must be notified within fourteen (14) days to the **administering authority** following completion of monitoring. Monitoring must include:

- (a) airblast overpressure (dB (Lin) Peak)-when relevant;
- (b)  $L_{Aeq, adj, 1 \text{ hour}}$ ;
- (c)  $L_{A1, adj, 1 \text{ hour}}$ ;
- (d) the level and frequency of occurrence of any impulsive or tonal noise from the activities;
- (e) atmospheric conditions including wind speed and direction and atmospheric stability;
- (f) if there were any effects due to extraneous factors such as traffic noise;
- (g) location, date and time of recording; and
- (h) location of complainant (if relevant).

**N4** The method of measurement and reporting of noise levels must comply with the latest edition of the **administering authority's** Noise Measurement Manual.

**N5** Blasting

A person must not conduct blasting if:

- (a) the airblast overpressure is more than 115dB Z Peak for 4 out of any 5 consecutive blasts;
- (b) the airblast overpressure is more than 120dB Z Peak for any blast;
- (c) the ground vibration is:
  - i. for vibrations of more than 35Hz—more than 25mm a second ground vibration, peak particle velocity; or
  - ii. for vibrations of no more than 35Hz—more than 10mm a second ground vibration, peak particle velocity.

**N6** Within 5km of a **nuisance sensitive place** when blasting is carried out, a monitoring program must be implemented to measure air blast overpressure & vibration and when requested by the **administering authority**, airblast overpressure & vibration monitoring and recording must be undertaken to investigate any complaint of nuisance.

**Condition**

**Air**

**A1** Weather Monitoring Program

A weather monitoring station must continually measure and record the following meteorological parameters:

- (a) air temperature;
- (b) relative humidity;
- (c) wind direction;
- (d) wind speed; and

(e) rainfall.

A2 Releases to the atmosphere

Contaminants must only be released to the atmosphere from the release points and in compliance with the limits identified in Schedule 3, Air - Table 1 (Source description).

A3 Contaminants must not be released to the atmosphere at a concentration or a mass emission rate calculated over the averaging period, as measured at a monitoring point, in excess of that stated in Schedule 3, Air - Table 2 (Contaminants release limits to air), with the exception of:

- (a) a **cogeneration exemption**, relating to oxides of nitrogen; and
- (b) a **boiler exemption**, relating to sulphur dioxide.

A4 Contaminants must be monitored not less frequently than as set out in Schedule 3, Air - Table 3 (Required release point determinations).

A5 Complaint monitoring

When requested by the **administering authority**, monitoring must be undertaken to investigate any dust, particulate matter, odour or other noxious/offensive environmental complaint of environmental nuisance caused by a release to the atmosphere from the site at any sensitive receptor. The request may outline:

- (a) when the monitoring must be commenced;
- (b) the duration of the monitoring;
- (c) the location of the monitoring;
- (d) the methods and relevant standard to be complied with;
- (e) any evaluation, inspection and review of potential dust, particulate matter, odour or other noxious/offensive emission sources and associated pollution control systems;
- (f) any review and interpretation of monitoring results;
- (g) any modelling required; and
- (h) the date the results and analysis is to be submitted to the **administering authority**.

A6 If monitoring in condition (A5) indicates that **environmental nuisance** is caused or threatened from the activities, then the **holder** must as soon as practicable implement abatement measures such that the releases from the activities will not result in further **environmental nuisance**.

A7 Monitoring of any releases to the atmosphere required by a condition of this **environmental authority** must be carried out in accordance with the following requirements:

- (a) all determinations must be made by a person or body registered by the **NATA** unless otherwise approved by the **administering authority**;
- (b) monitoring provisions for the release points listed in Schedule 3, Air - Table 2 (Contaminant release limits to air) must comply with the Australian Standard AS 4323.1 - 1995 'Stationary source emissions Method 1: Selection of sampling positions' (or more recent editions);
- (c) all determinations of contaminant releases to the atmosphere must be made in accordance with methods prescribed in the most recent version of the

**administering authority's** Air Quality Sampling Manual or any other method approved by the **administering authority**;

- (d) samples must be taken when emissions are expected to be **representative of actual operating conditions** for the sample frequency period; and
- (e) during the sampling period, the following additional information must be gathered:
  - i. process plant production rate at the time of sampling and detailed commentary on the stability and phasing of the processes leading up to (at least 24 hours) and through the time of sampling; and
  - ii. raw materials used; and
  - iii. production rates for the frequency period; and
  - iv. any other factors that may influence air emissions (e.g. changes to auxiliary air supplies).

A8 Fuel burning

The only type of fuel to be burnt in the gas turbine (co-generation plant) is **natural gas**.

A9 Air Pollution Control Systems

The **holder** must maintain a current inventory of design data and maintenance requirements, including maintenance history for all air pollution control devices operated at the **site**.

A10 Where pollution control systems are installed to treat exhaust gases, dust and vapours from the activities:

- (a) they must be maintained and operated in accordance with the manufacturer's operating instructions or manufacture's specifications;
- (b) for fabric filter dust collectors, replacement bags must be available and the collectors must, at all times:
  - i. be fitted with a device (e.g. differential pressure sensor) operational to detect filter medium breakthrough installed across the boundary of the active filter bags;
  - ii. have a monitoring system including an alarm, installed and operating to alert of filter medium breakthrough, and
  - iii. be designed and maintained to treat flue gases at maximum rates when one cell is isolated.
- (c) or flue gas desulphurisation, the equipment must monitor and record parameters that indicate effective performance, for example scrubber liquor pH and scrubber liquor pump recirculation; and
- (d) a standby power supply system must be installed to ensure continuous operation of the air pollution control equipment.

A11 Where monitoring of air pollution control equipment indicates impaired operational performance, standby systems must operate to ensure continuous operation of the air pollution control system or the plant serviced by the air pollution control systems must be safely shut down as soon as practicable, unless otherwise agreed by the **administering authority**.

A12 Emissions Verification Study

The **holder** must undertake a **site-wide** Emissions Verification Study in consultation with the **administering authority** to identify point sources and fugitive emissions to the atmosphere from the activities.

- A13 The Emissions Verification Study mentioned in condition (A12) must;
- (a) in relation to point sources outlined in Schedule 3, Air-Table 1 (source description) be submitted to the **administering authority** within (1) one year of the date of this **environmental authority**; and
  - (b) in relation to all other fugitive and point source emissions be submitted to the **administering authority** within (5) five years of the date of this **environmental authority**.
- A14 Dust and particulate matter nuisance  
The release of dust and/or particulate matter resulting from the activities must not cause an **environmental nuisance** at any **nuisance sensitive place**.
- A15 Odour nuisance  
The release of noxious or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the activities must not cause any **environmental nuisance** at any **nuisance sensitive place**.
- A16 The **holder** must when requested in writing by the **administering authority** contribute to the undertaking of an ambient air monitoring program in consultation with the **administering authority**
- A17 By **5 December 2017**, the **holder** must conduct and document an assessment to demonstrate that actual ground level concentrations of non-condensable gases produced as a result of the activities do not present a risk of harm to the receiving environment.  
*Note: This will involve the analysis of existing data to avoid the need for unnecessary venting of non-condensable gases for the purposes of this assessment, unless otherwise agreed with the administering authority.*
- A18 The **holder** must conduct and document an assessment of actual ground level concentrations of sulphur dioxide released during a boiler exemption permitted under condition A3, using the Gladstone Regional Air Monitoring Network, to ensure compliance with the relevant air quality objectives for SO<sub>2</sub> specified in the Queensland Environmental Protection (Air) Policy 2008.

**Condition****Land**

- L1 Except as otherwise authorised by condition (L2) activities on **site** must be conducted in a way that prevents any potential or actual release of contaminants to land.
- L2 There must be no release of contaminants to land other than:
- (a) Any **non-continuous spill** of process contaminants in areas identified in **Schedule 2 - Figure 1** known as the 'refinery first flush system' provided that removal of the process contaminants commences within 24 hours of the **holder** becoming aware of the **non-continuous spill**.
  - (b) Any non-continuous spill of process contaminants in areas identified in **Schedule 2 - Figure 5** provided that removal of the process contaminants commences within 24 hours of the **holder** becoming aware of the **non-continuous spill**.
  - (c) Any **non-continuous spill** of hydrocarbons provided that removal of the hydrocarbons commences within 24 hours of the **holder** becoming aware of the **non-continuous spill**.
  - (d) Seawater return spills not exceeding 100 litres.
  - (e) Thickener underflow or overflow where it is directed to the RMA via the designated channel as shown in **Schedule 2 - Figure 5**.

- L3 Rehabilitation of extraction areas  
As soon as practicable, but no later than 6 months after completing the extraction activities areas disturbed as a result of extractive and screening activities must be rehabilitated by:
- (a) remediation of contaminated **land** caused by the **activity** in accordance with Environmental Protection Act 1994 requirements;
  - (b) undertaking works to establish a safe, **stable**, non-polluting landform similar to that of surrounding undisturbed areas (or other use as agreed with the landowner), including where relevant;
    - i. removing any stockpiles;
    - ii. re-establishing surface drainage lines;
    - iii. minimising the potential for slumping, subsidence or erosion;
    - iv. reinstating the **topsoil** if area is going to be revegetated;
    - v. respreading any cleared vegetation; and
    - vi. promoting establishment of vegetation of similar species composition and density of cover;
  - (c) ensuring that the quality of stormwater, water and seepage released from the disturbed areas is such that there is no release of prescribed water contaminants;
  - (d) ensuring that the water quality of any residual water bodies meets criteria for subsequent uses and does not cause environmental harm; and
  - (e) removing **infrastructure** from the **site**.

*Note: Where the areas disturbed as a result of extractive and screening activities are to be included in the future **Residue Management Area Dam**, the **holder** must only comply with part (c) and (d) of this condition.*

- L4 The only contaminants permitted to be stored in the **Residue Management Area Dam** are residues resulting from refining of bauxite, burning of fuel at and acid sulphate soils from the Rio Tinto Alcan Yarwun refinery in Yarwun.
- L5 Residue Management Area Dams  
The **hazard category** of the **Residue Management Area Dams** must be **determined** by a **suitably qualified and experienced person** at least once every two (2) years.
- L6 Regulated Dams - Location  
**Residue Management Area Dams** must be wholly located within the control points defined in Land— Table 1 (Location of Residue Management Area Dams).

**Land — Table 1 Location of Residue Management Area Dams**

Name of Regulated Dam	Coordinates	MGA/GDA94
Residue Management Area Dam 1	North-West	302837.943E 7360038.294N
	North- East	304613.533E 7360501.200N
	South-East	305951.024E 7357639.463N
	South-West	303373.838E 7357797.158N

- L7 The Residue Management Area Dams must comply with the basic details in Land — Table 2 (Basic Details of Residue Management Area Dams).

Land — Table 2 Basic Details of Residue Management Area Dams

Name of Regulated dam	Hazard Category	Maximum surface area of dam (ha)	Maximum volume of dam (m <sup>3</sup> )	Maximum depth of dam (m)*	Use of dam
Residue Management Area Dam 1	High	411 ha	87 Million m <sup>3</sup>	55m	The permanent containment of residues resulting from refining of bauxite, burning of fuel at or acid sulphate soils from the Rio Tinto Alcan Yarwun alumina refinery at Yarwun.

## Notes:

- i. Measured from the natural surface at the bottom of the dam wall to the surface of the crest of the dam.
- ii. Maximum surface area of dam (ha) is measured by determining the area that falls within the outer perimeter of the Residue Management Area Dam (being delineated by the outside edge of the exterior roadways and natural embankments (as the case may be) that form the outer bound of the area where residues are contained and associated operational activities are conducted).

- L8 All Residue Management Area Dams must meet the **hydraulic performance** criteria specified in Land — Table 3 (**Hydraulic Performance** of Residue Management Area Dams).

Land — Table 3 Hydraulic Performance of Residue Management Area Dams

Name of Regulated dam	Spillway Capacity or Diversion Capacity (Levees) AEP <sup>(3)</sup>	Design Storage Allowance (Dams other than levees) AEP <sup>(1)</sup>	Mandatory Reporting Level (Dams other than levees) AEP <sup>(3)</sup>
Residue Management Area Dam 1	PMF	AEP 1 in 50 for the 3 month wet season plus expected annual process inputs	AEP 1 in 50, 72 hour

## Notes:

- i. The **design storage allowance** on 1st November of each year for any high **hazard dam** containing hazardous waste **constructed** within the operational **land** must be equivalent to the run-off from a 1 in 50 **AEP** 3 month wet season plus process inputs for the 3 month wet season. Process inputs refers to the net volume of hazardous minerals, process waste and water, which are being permanently disposed of in the storage facility.
- ii. The critical design storm has a duration that produces the peak discharge for the catchments.

- iii. The **mandatory reporting level** refers to the level below the **spillway crest**, either the **AEP 1 in 50, 72 hour storm** or the **AEP 1 in 50 wave allowance**, whichever is lower.

L9 Regulated Dams - Certification and operation

The **Residue Management Area Dams** must be **constructed** in accordance with a **certified design plan** that has been submitted to the **administering authority**, and such that the resulting **dam** will deliver the performance stated in that submitted **design plan** and that **dam** is compliant in all respects with this **environmental authority**.

L10 **Construction** works on the within the **Residue Management Area Dam**, including any modification or lift, must not be commenced unless the **holder** has submitted to the **administering authority** a copy of a **design plan**, together with the **certification** by a RPEQ that the design of the **dam** will deliver the performance stated in that submitted **design plan** and that **dam** it is compliant in all respects with this **environmental authority**.

L11 The **environmental authority holder** must submit:

- (a) A copy of a set of 'as **constructed**' drawings to the **administering authority** together with the **certification** of a **suitably qualified and experienced person** that the **dam** 'as **constructed**' will deliver the performance stated in that submitted **design plan** and that **dam** is compliant in all respects with this **environmental authority**; and
- (b) the drawings and **certification** in (L11)(a) to the **administering authority** prior to commencing operation of that component of the **Residue Management Area Dam** that was subject to modification or lift referenced in the **design plan** in condition (L10).

L12 An **operational plan** must be kept current for the **Residue Management Area**.

L13 Where an **operational plan** covers **decommissioning** and **rehabilitation**, those operations are to be consistent with the **design plan** for the **Residue Management Area** and the **rehabilitation** requirements of this **environmental authority**.

L14 The **holder** must notify the **administering authority** as soon as possible, but within 24 hours, of the level in the **Residue Management Area Dam** reaching the **mandatory reporting level (MRL)**.

L15 Residue Management Area – Annual inspection and report

The **Residue Management Area** must be inspected annually by a **suitably qualified and experienced person**.

L16 At each annual inspection, the condition and adequacy of all components of the **Residue Management Area Dam** must be assessed:

- (a) against the most recent **hazard** assessment report and **design plan**;
- (b) against recommendations contained in previous annual inspections reports;
- (c) against recognised **dam** safety deficiency **indicators**;
- (d) for changes in circumstances potentially leading to a change in **hazard category**;
- (e) for conformance with the conditions of this **environmental authority**;
- (f) for conformance with the 'as **constructed**' drawings of the **certified design plan**;
- and
- (g) for the adequacy of the available storage in each dam, based on an actual observation or observations taken no more than three months prior to 1 November of each year, of accumulated sediment, state of the containment barrier and the level of liquids in the dam.

- L17 At each annual inspection, if a **mandatory reporting level** is required, it must be determined and marked on the **Management Area Dam**.
- L18 A final assessment of adequacy of available storage in the **Residue Management Area Dam** must be based on a **dam** level observed within the month of October each year and result in an estimate of the level in that **dam** as at 1 November each year.
- L19 For each annual inspection, a report on the condition and adequacy of each dam assessed, **certified** by the **suitably qualified and experienced person** and including any recommended actions to be taken to ensure the integrity of the **Residue Management Area**; must be provided to the **administering authority** by 1 December each year.
- L20 **Decommissioning**  
A **Decommissioning** Strategy for the **Residue Management Area** must be documented and submitted to the **administering authority** at least five (5) years prior to the commencement of decommissioning the **Residue Management Area**.
- L21 The **Residue Management Area** must be decommissioned in accordance with the **Decommissioning** Strategy.
- L22 On cessation of operation of a **Residue Management Area Dam**, that **dam** must be maintained so as to avoid environmental harm until that **dam** is decommissioned.
- L23 Prior to the cessation of the activities, the **Residue Management Area Dam** must be decommissioned such that it either:
- (a) becomes a **stable** landform, that no longer contains **flowable substances**; or
  - (b) is a **void** authorised by the **administering authority** to remain after **decommissioning**; and
  - (c) the dams contents is approved or authorised under relevant legislation for a **beneficial use**; and
  - (d) is compliant with the **rehabilitation** requirements of this **environmental authority**.
- L24 **Rehabilitation of the Residue Management Area Dam**  
The **holder** must in consultation with the **administering authority** develop, implement and submit to the **administering authority** a Final Land Use and **Rehabilitation** Plan for that part of the **Residue Management Area Dam** to be decommissioned at least five (5) years prior to such **decommissioning** commencing. The Plan must include, but is not limited to, the following:
- (a) disturbance type;
  - (b) disturbance area;
  - (c) land use after operations cease;
  - (d) proposed acceptance criteria including final surface level and contours, final drainage system, landform geotechnical stability criteria including surface settlement, sustainability of drainage works, susceptibility to erosion processes, leachate production, and surface water contamination;
  - (e) species of vegetation to be planted for the **rehabilitation** program including revegetation acceptance criteria if applicable, taking into consideration the surrounding **land use**;
  - (f) receiving and run-off water standards; and post operations closure, maintenance and monitoring requirements;
  - (g) **indicators** for success; and

(h) keeping appropriate records of **rehabilitation** measures implemented including taking of photographs demonstrative of **rehabilitation** achieved and the preparation of annual **rehabilitation** progress reports.

L25 Any amendments to the **Rehabilitation** Plan are to be submitted to the **administering authority**.

L26 All areas significantly disturbed by residue disposal must be rehabilitated in accordance with the acceptance criteria, referred to in the report provided in condition (L24) and as modified by the **administering authority**.

L27 If no modifications are advised by the **administering authority** to the **holder** within twelve months of the receipt of the report by the **administering authority**, then the acceptance criteria referred to in the report will apply.

L28 Once the final **land** use and **rehabilitation** plan is implemented, the **holder** must submit an annual **rehabilitation** progress report to the **administering authority**. The report should be provided with each year's annual return until the **environmental authority** is surrendered or the **administering authority** advises that this reporting is no longer required, (whichever is the earlier).

L29 Waste handling

All regulated waste removed from the **site** must be removed by a person that holds a current approval to transport such waste in accordance with the provisions of the Environmental Protection Act 1994 and sent to a facility that is permitted to accept such waste.

#### Condition

##### Social

C1 Complaint response

The **holder** must record the following details for all complaints received and provide this information to the **administering authority** with each month's compliance report:

- (a) time, date, name and contact details of the complainant (when authorised by the complainant);
- (b) reasons for the complaint;
- (c) response and any investigations undertaken;
- (d) conclusions formed;
- (e) grounds for forming the conclusions; and
- (f) any actions taken as a result of the complaint

C2 The **holder** or its representative must, when requested by the **administering authority**, reasonably cooperate with and participate in any community environmental liaison committee established in respect of either the **site** specifically, or the area where the **site** is located.

#### Condition

##### Water

W1 Pipelines, diffusers and pump stations

Except as otherwise authorised by this **environmental authority**, there must be no release of contaminants to waters.

W2 Permitted contaminant release and discharge point(s)

Contaminant(s) must only be released directly or indirectly to **waters** at the locations mentioned in Schedule 3, Water - Table 1 (Contaminants, sources and locations for releases to waters) and Schedule 2, Water - Figure 2 - (Release points and monitoring locations), in accordance with the contaminant release conditions and limits in Schedule 3, Water - Table 2 (Release limits and monitoring).

- W3 Release circumstances W1  
The discharge via release point W1 must be submerged such that the top of the diffuser is at least three and a half (3.5) metres below Lowest Astronomical Tide (LAT).
- W4 All contaminants discharged via release point W1 must be released through suitable diffusers to achieve a **minimum** initial dilution of 1:54 within 100 metres of the diffusers under all circumstances.
- W5 Where more than one diffuser is installed to serve release point W1, the individual component diffusers must not overlap each other.
- W6 Volumes released  
The hourly discharge volume of contaminants released to **waters** from discharge location W1 must be measured and records kept. This data must be provided in the specified format to the **administering authority** when requested.
- W7 There must be no discharge of contaminants from the **Residue Management Area Dam (RMD)** to **waters** except the seawater return line discharge released to **waters** from discharge location W1.
- W8 Measurements of volumes released from W1 must be **determined** by an appropriate method with an accuracy of +/-5%, (e.g. a calibrated flow meter).
- W9 Monitoring of releases from W1 for pH and turbidity must involve instrumentation that is continuous, on-line and be able to be recorded and alarmed.
- W10 The **maximum** allowable saltwater intake must not exceed 3850m<sup>3</sup>/per hour.
- W11 The **minimum** available storage to be provided for release points W2 and W3 (the first flush ponds) must be not less than the volume equivalent to twenty (20) millimetres of rainfall (per rainfall event) on the catchment served by each pond.
- W12 Release monitoring  
Monitoring of contaminants released to **waters** and water quality must be undertaken for the quality characteristics and parameters, at the monitoring point(s), and at the frequencies specified in Schedule 3, Water - Table 2 (Release limits and monitoring).
- W13 All determinations of water quality must be:
- (a) made in accordance with methods prescribed in the latest edition of the **administering authority's** Monitoring and Sampling Manual; and
  - (b) carried out on samples that are representative of the discharge; and
  - (c) samples collected must be analysed by a **NATA certified** laboratory or as approved by the **administering authority** using an approved methodology with sufficient sensitivity (Limit of Reporting) to adequately demonstrate whether or not the water characteristic complies with the relevant release limit prescribed in Schedule 3, Water - Table 2 (Release limits and monitoring).
- W14 The pH of discharge **waters** from W3 (eastern first flush) and W2 (northern first flush) must be continually monitored.
- W15 Toxic substances (acute and chronic)  
Notwithstanding any other condition of this **environmental authority**, there must be no discharge of any contaminants to any **waters** that exhibit toxicity (expressed as a LOEC) to any relevant test organisms in Direct Toxicity Assessments (DTAs) at a wastewater concentration that can be achieved within 10 metres of the diffuser.
- W16 Direct Toxicity Assessment (DTA)  
The **holder** must undertake DTAs to quantify the toxicity of the wastewater discharge and demonstrate compliance with condition (W15), and to confirm there has been no unacceptable level of toxicity to the test organisms. The DTA must be undertaken as required by and in accordance with the following:

- (a) all DTAs must be carried-out by a third party suitably qualified environmental aquatic ecotoxicologist(s) or other experts as required; and
- (b) a Routine Direct Toxicity Assessment (Routine DTA) must be undertaken every four (4) years; and
- (c) a Confirmation Direct Toxicity Assessment (Confirmation DTA) must be undertaken as soon as practicable after a Toxicological Risk Assessment (TRA) as defined in condition (W17) has determined that an increased toxicological effect is likely. The Confirmation DTA must occur within three (3) months of the change occurring and must utilise test water representative of the change(s). The Confirmation DTA must comply with the DTA requirements in condition W19 and must be undertaken utilising indicator organism(s) sensitive to the change(s) being investigated; and
- (d) an Event-based Direct Toxicity Assessment (Event-based DTA) must be undertaken wherever one or more specific trigger limits, indicated in Schedule 3, Water - Table 2 (Release limits and monitoring) for release point W1 are exceeded on four consecutive occasions as measured at the monitoring point W1. The Event-based DTA must be undertaken utilising indicator organisms sensitive to the change. After the third consecutive exceedance, preparations must be made so that should a fourth consecutive exceedance be confirmed, an Event-based DTA can be performed immediately; and
- (e) where successive DTA programs have identified specific test species as consistently the most sensitive for the purpose of detecting toxicity, then the suite of test species can be reduced to include only those test species. Any intention to change the numbers or types of toxicity tests used for DTA must be submitted to the **administering authority**.

W17 Toxicological Risk Assessment toxicity testing

A Toxicological Risk Assessment (TRA) must be undertaken to determine whether any proposed or accidental change to the process (including changes to inputs and/or treatment process) is **likely**<sup>1</sup> to result in an increased toxicological effect to aquatic organisms in the receiving environment and this assessment must be submitted to the **administering authority** within 30 days of the assessment being undertaken. Toxicological risk assessment must be undertaken in accordance with the following:

- (a) Focus on identifying wastewater quality or receiving environment conditions that may result in toxicity to biota within the mixing zone and must at least consider the wastewater and receiving water quality, temporal context and including supporting evidence for the outcome of the risk assessment; and
- (b) Evidence must include the results of a toxicity testing program that will examine the contribution of different water chemistries on toxicity; and
- (c) The scope and components of the toxicity testing program must be reviewed by a qualified ecotoxicologist before being submitted to the **administering authority**.

<sup>1</sup> likelihood of increased toxicological effect should be assessed using best professional judgment and supported by any available empirical or theoretical evidence. This may include changed chemical profile data at any stage of the effluent treatment process or

independent expert judgement, such as that provided by a third party or government advisory agency through a process of compliance audit.

W18 All DTAs required by this **environmental authority** must comply with the DTA requirements mentioned in condition (W19).

W19 DTA requirements

The DTA must include all specific methods and protocols to determine whether concentrations of toxicants are acutely toxic outside the approved acute toxicity zone or chronically toxic outside the approved chronic toxicity zone to any organisms assessed in the DTA, including:

- (a) specific test organisms to be utilised for DTA testing, in accordance with Section 8.3.6.8 of the ANZECC 2000 Guidelines, to provide an accurate indication of acute and chronic toxic effects in the receiving waters, taking into consideration locally occurring species and the nature of any change being investigated;
- (b) the selection and characterisation of environmental waters for dilution of the combined waste streams;
- (c) characterisation of the wastewater stream, including potential toxicants present. This must include the toxicants of concern mentioned in Schedule 3, Water– Table 3 (Toxicants of concern for Direct Toxicity Assessment);
- (d) the nature of the contaminant(s);
- (e) acute and chronic DTA testing conducted on end-of-pipe wastewater discharged;
- (f) the mixing zone dilution effects likely to be provided by the discharge structure;
- (g) test/biological end points;
- (h) DTA end-points (including NOEC and LOEC);
- (i) quality assurance/quality control;
- (j) applicable Toxicity Identification Evaluation (TIE) procedures to be followed should the **administering authority** require such an evaluation; and
- (k) reporting of DTA procedure results promptly to the **administering authority**, which must include but not be limited to:
  - i. NOEC for all bioassay results; and
  - ii. LOEC for all bioassay results; and
  - iii. all relevant sample collection information for the combined waste test sample and receiving **environment** dilution water; and
  - iv. timing of combined waste test sample collection in relation to process performance; and
  - v. details of any manipulation of the combined waste test sample or receiving **environment** dilution water; and
  - vi. test sample and receiving **environment** dilution water delivery details; and
  - vii. results of the chemical analysis of the combined waste test sample for known toxicants of concern, receiving **environment** dilution water, and the test water (combined wastes/receiving water) for each of the dilutions; and
  - viii. time between test sample collection and commencement of the DTA, and
  - ix. interpretation of results.

- W20 The **holder** must submit a report which includes all requirements of (W19) and the results of DTA testing to the **administering authority** no more than twenty (20) days following the completion of the report.
- W21 Diffusers validation  
The **holder** must provide to the **administering authority** a Diffuser Modelling Validation Plan and implement the plan within six (6) months of the completion of **commissioning**. The monitoring plan must be undertaken when waste water flows are at **maximum** rates. The monitoring plan must have the following objectives:
- (a) to validate all modelling and investigations related to the diffuser; and
  - (b) to confirm that expected dilutions predicted in design of the diffuser under specified flow conditions are met as a **minimum**.
- W22 The Diffuser Modelling Validation Plan required by condition (W21) must include but not be limited to) the following:
- (a) a description of the diffuser as installed;
  - (b) a description of applicable receiving environmental value and sediment and water quality objectives to be achieved;
  - (c) sampling of reference sites to determine the background concentration of relevant water quality parameters;
  - (d) sampling of the water column in the plume to determine and confirm the extent of the acute and chronic toxicity zone;
  - (e) investigate employing other approaches (e.g. dye-based diffuser validation techniques) where electrical conductivity-based methods are inconclusive;
  - (f) sufficient samples must be collected to determine the temporal and spatial extent of the toxicity zones within the plume;
  - (g) the methods for the collection and analysis of samples (including the Quality Assurance and Quality Control protocols adopted);
  - (h) the methods of analysing the data and responding to the results; and
  - (i) monitoring must be done by a **competent person(s)** in accordance with methods prescribed in the latest edition of the administering authorities Water Quality Sampling Manual, and carried out on representative samples.
- W23 The **holder** must consider any comments provided by the **administering authority** in relation to the Diffuser Modelling Validation Plan.
- W24 The **holder** must provide to the **administering authority** a Diffuser Validation Report not more than twenty (20) days after the receipt of results obtained from the Diffuser Modelling Validation Plan. The report must include:
- (a) the results of the monitoring required by the Diffuser Modelling Validation Plan;
  - (b) any deviations and reasons for such deviations from methods stated in the diffuser modelling validation plan;
  - (c) a determination on the validation of modelling and investigations undertaken;
  - (d) a statement confirming that **minimum** expected dilutions predicted in design of the diffuser under specified flow conditions are met;
  - (e) any resulting recommendations for changes that are necessary to minimise the likelihood of environmental harm and size of the initial mixing zone, if **minimum** dilutions are not achieved; and

- (f) any resulting recommendations for changes to the Receiving environment Monitoring Program.
- W25 A further diffuser validation program must be undertaken if the diffuser structures serving release point W1, once validated, undergo any significant modification of the diffuser structure, depth settings, increases in discharge volumes, or increases in toxicity of the wastewater occur or there is a significant change to local oceanographic conditions.
- W26 Receiving Environment Monitoring Program  
Within six (6) months of the commencement of this **environmental authority** a Receiving **Environment** Monitoring Program (REMP), focussing on near field and further field impacts, must be developed in consultation with the **administering authority** and then implemented. The program must be based on the outcomes of background environmental investigations, pertaining to the receiving **waters** (i.e. Port Curtis and connected waters) that address at least the following:
- (a) description of potentially affected receiving **waters** including key communities and background water and sediment quality characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality);
  - (b) description of applicable environmental values and sediment and water quality objectives to be achieved;
  - (c) any relevant reports prepared by other governmental or professional research organisations that relate to the receiving **environment** within which the REMP is proposed; and
  - (d) water and sediment quality targets within the receiving **environment** to be achieved, and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the REMP.
- W27 In relation to the Receiving **Environment** Monitoring Program required by condition (W26), a report, summarising the findings of the Receiving **Environment** Monitoring Program must be submitted to the **administering authority** annually.
- W28 Stormwater management  
There must be no release of stormwater that has been in contact with any contaminants at the **site** to any waters, other than in accordance with the conditions of this **environmental authority**.
- W29 Erosion and sediment control measures must be implemented and maintained to minimise on site erosion.
- W30 Stormwater, Erosion and Sediment Control Plans  
Within six (6) months of the date of this **environmental authority** a Stormwater, Erosion and Sediment Control Plan must be developed and implemented for all activities.
- W31 The Stormwater, Erosion and Sediment Control Plan mentioned in condition (W30) must include, but is not limited to the below:
- (a) the location of the discharge points;
  - (b) prevention of incident storm water and storm water run-off from contacting wastes or contaminants;
  - (c) diversion of uncontaminated stormwater away from areas where it may be contaminated by bulk products being loaded or unloaded, wastes, contaminants or other materials;
  - (d) collection, treatment and disposal of all contaminated storm water run-off;

- (e) contaminated stormwater runoff and incident rainfall is collected and treated, reused, or released in accordance with the conditions of this **environmental authority**;
- (f) roofing or minimising the size of areas where contaminants or wastes are stored or handled;
- (g) revegetating disturbed areas as soon as practicable after the completion of works;
- (h) using alternate materials and or processes (such as dry absorbents) to clean up spills that will minimise the generation of contaminated waters;
- (i) erosion and sediment control structures are placed and maintained to minimise erosion of disturbed areas and prevent the contamination of any waters;
- (j) an inspection and maintenance program for the erosion and sediment control features;
- (k) provision for adequate access to maintain all erosion and sediment control measures especially during the wet season months;
- (l) additional erosion and sediment control measures on slopes >10%;
- (m) surface water monitoring program designed to detect erosion and sediment runoff into **watercourses**; and
- (n) identification of remedial actions that would be required to ensure compliance with the conditions of this **environmental authority**.

W32 IECA erosion and sediment control plan

Any significant earthworks and **construction** project that will cause a disturbance to areas must have an implemented erosion and sediment control plan for that project that complies with the International Erosion Control Association (IECA) guidelines.

W33 An erosion and sediment control plan in condition (W32) must be **certified** by a **Certified Professional in Erosion and Sediment Control (CEPESC)** and submitted to the **administering authority** before commencement of the significant earthworks and **construction** project.

W34 Each sediment basin referenced in the erosion and sediment control plan required by condition (W32) must have the capacity to contain and treat all the stormwater runoff from the 85th percentile 5 **day** rainfall depth of 32.8mm.

W35 All discharges from W4, W10, W11, W12, W14 and W15 must be reported to the **administering authority** within 24 hours or the next business day.

W36 By 1 November each year, the **holder** must remove deposited sediment from the W7, W8, W6, W3 and W2 sedimentation ponds to achieve design storage allowance.

W37 The **holder** must visually inspect the ponds, embankments and **spillway** within twelve (12) hours of each overflow event. The inspection must be to determine the effectiveness of the erosion and sediment control measures and integrity of these structures. The inspection must be documented and necessary actions taken to ensure the integrity of the system is maintained. Where the inspection cannot be carried out due to safe access issues, the **administering authority** must be notified within twelve (12) hours of the overflow event and the inspection must be carried out as soon as safe to do so.

W38 Groundwater

The **holder** must not release contaminants to groundwater.

W39 Groundwater must be monitored at least at the locations defined in Schedule 3, Water – Table 4 (Alumina Refinery, Caustic Storage, and Residue Management Dam groundwater monitoring locations).

W40 The **holder** must ensure a groundwater monitoring program is performed which complies with the following requirements:

- (a) the program must be able to determine the impacts of the activities on the groundwater quality in the underlying aquifer(s);
- (b) the program must include, but not be limited to, a sufficient number of bores installed at locations and depths which yield representative groundwater samples from at least the uppermost aquifer so as to:
  - i. detect any seepage of contaminants to groundwater from the site; and
  - ii. establish the quality of groundwater affected by any seepage of contaminants.
- (c) samples of groundwater must be taken from each bore required by Schedule 3, Water, Table 4 (Alumina Refinery and residue management Area groundwater monitoring locations) at least twice per year; and
- (d) the samples obtained in accordance with paragraph (c) of this condition must be analysed for the parameters listed in Schedule 3, Water– Table 5 (Groundwater Monitoring).

W41 Records must be kept of the results of all determinations of the quality of groundwater for a period of at least fifteen (15) years and be made available to the **administering authority** upon request. Results must be presented in graphic form clearly showing variation of analyte concentration for each bore over time and median background concentrations. These records may be electronic.

W42 If the groundwater monitoring required by condition (W39) and (W40) indicates contamination by an analyte which exceeds the '**trigger levels**' the **holder** must notify the **administering authority** as per condition (G7) and (G8) and complete an investigation report into:

- (a) the extent of contamination and its mobility characteristics;
- (b) the cause of the exceedance;
- (c) whether source(s) has been removed;
- (d) known depth to water table;
- (e) permeability of the strata on the site;
- (f) the potential for environmental harm;
- (g) identification of potential receptors;
- (h) provide the monitoring results;
- (i) provide ambient groundwater quality;
- (j) interpretation of analyses of any samples taken; and
- (k) proposed actions to prevent or minimise environmental harm.

W43 Annual Groundwater Monitoring Report

An annual monitoring report must be prepared each year and submitted to the **administering authority** with each annual return. The report must include but not be limited to:

- (a) Any investigation report required by condition (W42);
- (b) details of the groundwater monitoring undertaken, including details of the sampling framework applied;
- (c) details of the groundwater analysis undertaken, and quality assurance and quality control measures applied;

- (d) a summary of the groundwater monitoring results obtained. Results must be presented in numerical and graphical form, showing relevant limits, and a comparison made with the previous twelve (12) months monitoring data; and
- (e) an interpretation, evaluation and explanation of the monitoring results and programs by a **specialist in the field** of water quality monitoring and assessment with determinations made as to any impacts on the **environment** and if so the level of environmental harm caused.
- W44 When not being sampled, monitoring bores must be sealed with a lockable cap.
- W45 Seawater intake  
The velocity of seawater being drawn in and around the mouth of the intake pipe structure located at Fisherman's Landing must never exceed 0.6m/s.
- W46 There must be no release of **waters** to the receiving **environment** which exhibits any visible hydrocarbon sheen.
- W47 **Groundwater Expression Management Plan**  
By **19 October 2019**, the **environmental authority holder** must prevent the expression of groundwater to the land identified in the area of Lot 8 on SP245963 and Part 68 on SP 272417 and illustrated in **Schedule 2 – Figure 3**.
- W48 By **20 October 2018**, the **environmental authority holder** must implement a Groundwater Expression Management Plan (GEMP) designed by an **appropriately qualified person** that prevents the expression of groundwater to the land identified in the area of Lot 8 on SP245963 and Part 68 on SP 272417 and illustrated in **Schedule 2 – Figure 3**.
- W49 The GEMP required by condition W48 must include the following requirements:
- A hydrogeological model that explains the process causing the expression of groundwater to land;
  - Details of actions to be undertaken as part of the GEMP to prevent the expression of groundwater to land;
  - A groundwater and surface water monitoring program capable of assessing the effectiveness of the GEMP at preventing the expression of groundwater to land and identifying any impacts to environmental values; and
  - Key outcomes and measurable indicators to determine if the requirements of condition W47 have been achieved.
- W50 The **environmental authority holder** must implement a mitigation strategy to capture the expression of groundwater to land identified in **Schedule 2 – Figure 3** and return to the Residual Management Area Dam.
- W51 By **1 November 2020**, achieve the following minimum **stabilisation area** for catchments W2, W3, W7 and W8:
- (a) For catchment W7, a minimum **stabilisation area** of 95%.
  - (b) For catchment W3, a minimum **stabilisation area** of 95%.
  - (c) For catchment W2, a minimum **stabilisation area** of 50%.
  - (d) For catchment W8, a minimum **stabilisation area** of 85%.
- Note 1: Refer to **Schedule 2 – Figure 4**.*
- W52 By **1 November 2020**, the following erosion and sediment control requirements must be achieved:

- (a) For catchment W7;
  - i. Implement a bitumen seal to the remaining 'Top Warehouse Road'.
  - ii. Re-contour and construct road drains to divert runoff from the road away from unsealed areas into drains.
  
- (b) For catchment W3;
  - i. Implement road drains and a bitumen seal to the 'stage 2 washer area'.
  - ii. Implement at-source erosion controls to two unsealed laydown areas.
  
- (c) For catchment W2;
  - i. Implement containment measures to the coal yard, including a bund around the coal stockpile, to prevent run-off and bypassing of the sediment pond.
  
- (d) For catchment W8;
  - i. Reshape and revegetate unstable embankments.
  - ii. Implement at-source erosion controls along stockpile road to reduce runoff into drains.
  - iii. Implement a silt blanket and gabion rock baskets in the W8 Catchment pond.

*Note 1: Refer to **Schedule 2 – Figure 6**.*

## Definitions

Key terms and/or phrases used in this document are defined in this section and **bolded** throughout this document. Applicants should note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

**"act"** means the *Environmental Protection Act 1994*.

**"activity"** means the environmentally relevant activities carried out by the holder.

**"administering authority"** means the Department of Environment and Heritage Protection or its successor.

**"AEP"** means the Annual Exceedance Probability, which is the probability that at least one event in excess of a particular magnitude will occur in any given year.

**"associated works"** in relation to a dam, means:

- a) operations of any kind and all things constructed, erected or installed for that dam; and
- b) any land used for those operations.

**"AWQ guidelines"** means the 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality', volumes 1, 2 and 3, published by ANZECC and ARMCANZ in October 2000 or more recent versions.

**"background noise level"** means the sound pressure level, measured in the absence of the noise under investigation, as the  $L_{A90,T}$  being the A-weighted sound pressure level exceeded for 90% of the measurement time period T of not less than 15 minutes, using Fast response.

**"bed and banks"** for a watercourse or wetland means land over which the water of the watercourse or wetland normally flows or that is normally covered by the water, whether permanently or intermittently; but does not include land adjoining or adjacent to the bed or banks that is from time to time covered by floodwater.

**"beneficial use"** refer to *Waste Reduction and Recycling Act 2011*.

**"best practice environmental management"** of an activity means the management of the activity to achieve an ongoing minimisation of the activity's environmental harm through cost-effective measures assessed against the measures currently used nationally and internationally for the activity. In deciding the best practice environmental management of an activity, regard must be had to the strategic planning by the person carrying out, or proposing to carry out, the activity, the administrative systems put into effect by the person, including staff training and monitoring and review of the systems, the public consultation carried out by the person, the product and process design and waste prevention, treatment and disposal.

**'boiler exemption'** means any of the following:

- a) the period of any chemical clean that is performed on the desulphurisation plant, that does not exceed 24 hours unless otherwise agreed to by the administering authority, by circulating acid within the scrubbing vessels of the plant.
- b) the period of any impaired operational performance of the desulphurisation plant that does not exceed 3 hours unless otherwise agreed to by the administering authority.
- c) the period of any maintenance performed, that does not exceed 24 hours unless

otherwise agreed to by the administering authority, which requires isolation of the desulphurisation plant or its components.

**“bund”** or **“bunded”** in relation to spill containment systems for fabricated or manufactured tanks or containers designed to a recognised standard means an embankment or wall of brick, stone, concrete or other impervious material which may form part or all of the perimeter of a compound and provides a barrier to retain liquid. Since the bund is the main part of a spill containment system, the whole system (or banded area) is sometimes colloquially referred to within industry as the bund. The bund is designed to contain spillages and leaks from liquids used, stored or processed above ground and to facilitate clean-up operations. As well as being used to prevent pollution of the receiving environment, bunds are also used for fire protection, product recovery and process isolation.

**“certification”**, **“certifying”** or **“certified”** by a suitably qualified and experienced person in relation to a design plan or an annual report regarding dams, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- a) exactly what is being certified and the precise nature of that certification;
- b) the relevant legislative, regulatory and technical criteria on which the certification has been based;
- c) the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- d) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

**“cogeneration exemption”** means any of the following:

- a) “start-up period” while the cogeneration facility is being brought up to ‘normal operation’ following a period of ‘inactivity’ – This period can be no longer than 2 hours;
- b) “shutdown period” while the cogeneration facility is being taken out of service from ‘normal operation’ to ‘inactivity’ - This period can be no longer than 2 hours;
- c) “Islanding period” while the gas turbine is operating and supplying electricity only to RTA Yarwun operations;
- d) “Extreme Weather Operation” where a cyclone warning of a category 2 or greater is issued by the Bureau of Meteorology (BOM) for the immediate area and the refinery is placed in ‘cyclone mode’, the gas turbine may be operated below 63.5% until 36 hours after the cyclone warning is raised or the category 2 or greater cyclone warning is cancelled;
- e) “AER Directed – Reduced Generator Output” where the National Energy Market operator or any of its agents directs RTA Yarwun to reduce the output of the generator to below 63.5% MCR, for the purpose of power system security, then RTA Yarwun may operate at the directed level until such time as the NEM operator or agent lifts any restriction;
- f) “Pipeline Directed – Reduced Generator Output”, where the operator of the gas pipeline(s) that supplies the RTA Yarwun site or any of its agents issues RTA Yarwun

with operational notices to reduce gas consumption to a level where the output of the generator is operated below 63.5% MCR then RTA Yarwun may operate at the directed level until such time as the pipeline(s) operator or agent lifts any restriction;

g) "Planned Major Shutdowns", where a major cogeneration plant shutdown is required by manufacturer's specifications to occur, a shutdown plan must be submitted to the administering authority outlining within the schedule where operation of the plant must be below 63.5% MCR to achieve successful re-commissioning. For the duration outlined in the shutdown period stack emissions; or

h) "Low Rate Operation of Cogeneration for Steam System Maintenance whilst Gas Turbine is Operational", operation of the gas turbine below 63.5% MCR for steam system maintenance is permitted for 120 hours each year, where the maximum duration of each individual maintenance period shall not exceed 10 hours.

**"commercial place"** means a work place used as an office or for business or commercial purposes, which is not part of the petroleum activities and does not include employees accommodation or public roads.

**"competent person(s)"** means a person(s) who has the appropriate skills, training and experience to conduct the monitoring.

**"construction"** or **"constructed"** in relation to a dam includes physical construction works for the building of a new dam, and modifying or lifting an existing dam, but does not include site preparatory works (in advance of construction) or investigations and testing necessary for purposes of preparing a design plan.

**"commissioning"** means the stage achieved once alumina production reaches 3 million tonnes per annum annualised for a period of one month.

**"dam"** means a land-based structure or a void that is designed to contain, divert or control flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. A dam does *not* mean a fabricated or manufactured tank or container, designed and constructed to an Australian Standard that deals with strength and structural integrity of that tank or container.

**"day"** means a business day.

**"design plan"** is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include all investigation and design reports, plans and specifications sufficient to hand to a contractor for construction, and planned decommissioning and rehabilitation outcomes; so as to address all hazard scenarios that would be identified by a properly conducted hazard assessment for the structure. Documentation must be such that a 'suitable qualified and experienced person' could conduct an independent review without seeking further information from the designer.

**"Design Storage Allowance"** or **"DSA"** means an available volume, estimated in accordance with the Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME 1995), that must be provided in a dam as at the first of November each year in order to prevent a discharge from that dam to a

probability (AEP) specified in that guideline. The DSA is estimated based on 100% runoff of wet season rainfall at the relevant AEP, taking account of process inputs during that wet season, with no allowance for evaporation.

**"determined"** by a suitably qualified and experienced person in relation to a hazard assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- a) exactly what has been assessed and the precise nature of that assessment;
- b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;
- c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

**"environmental authority"** means this environmental authority as defined under the *Environmental Protection Act 1994*.

**"dust collector"** means a device used for filtering particulate from the air which is otherwise free from fume or gaseous contaminants.

**"Dutch Intervention Guidelines target value"** means is the baseline concentration value below which compounds and/or elements are known or assumed not to affect the natural properties of the soil as outlined in the most current version of the *Circular on target values and intervention values for soil remediation*: Ministry of Housing, Spatial Planning and Environment Directorate-General For Environmental Protection, Department of Soil Protection.

**"dwelling"** means any of the following structures or vehicles that is principally used as a residence:

- a) a house, unit, motel, nursing home or other building or part of a building;
- b) a caravan, mobile home or other vehicle or structure on land; or
- c) a water craft in a marina.

**"environment"** includes:

- a) ecosystems and their constituent parts, including people and communities; and
- b) all natural and physical resources; and
- c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and
- d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).

**"environmentally relevant activities"** is any activity mentioned in Schedule 2 Chapter 4 in the *Environmental Protection Regulation 2008*

**"environmental nuisance"** means unreasonable interference or likely interference with an environmental value caused by—

- a) aerosols, fumes, light, noise, odour, particles or smoke; or

- b) an unhealthy, offensive or unsightly condition because of contamination; or
- c) another way prescribed by regulation.

**“flowable substance”** means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.

**“foreseeable future”** is the period used for assessing the total probability of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptable probability of failure before that time.

**“hazard”** in relation to a dam as defined, means the potential for environmental harm resulting from the collapse or failure of the dam to perform its primary purpose of containing, diverting or controlling flowable substances.

**“hazard category”** means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995).

**“holder”** The holder of an environmental authority for a prescribed ERA is the person who made an application for the authority; or if a transfer application for the authority has been approved under chapter 5, part 9—the person to whom the transferred environmental authority has been issued.

**“hydraulic performance”** means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the relevant hazard category in the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995).

**“impeded operational performance of pollution control equipment”** means when the pollution control equipment is not operating to design specification in relation to pollutant removal.

**“inactivity”** means for the purposes of reducing risk related to the emission of NO<sub>x</sub>, when there is no ignited gas supply to the burners.

**“indicators”** and water quality guidelines for an environmental value are decided using the following documents:

1. site specific documents for the water;
2. the ‘**QWQ guidelines**’;
3. the ‘**AWQ guidelines**’;
4. other relevant documents published by a ‘recognised entity’.

**“infrastructure”** means water storage dams, roads and tracks, buildings and other structures built for the purpose and duration of the conduct of the environmentally relevant activities, but does not include other facilities required for the long term management of the impact of those activities or the protection of potential resources. Such other facilities include dams other than water storage dams, waste dumps, voids, or stockpiles

and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.

**“lake”** means:

1. a lagoon, swamp or other natural collection of water, whether permanent or intermittent; and
2. the bed and banks and any other element confining or containing the water.

**“land”** means any parcel of land *and* area of ground together with any trees, crops or permanently attached buildings and including the airspace above land; and land that is, or is at any time, covered by waters; and waters. Land includes sealed and unsealed areas, road, dirt and soil.

**“ $L_{Amax\ adj, 15\ mins}$ ”** means the average maximum A-weighted sound pressure level; adjusted for noise character and measured over a time period of 15 minutes, using Fast response.

**“ $L_{Amax}$ ”** means the instantaneous maximum A-weighted sound pressure level; using Fast response.

**“levee”, “dyke” or “bund”** means a long embankment that is designed only to provide for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of water or flowable substances at any other times.

**“Lowest Astronomical Tide (LAT)”** The lowest tide level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions.

**“mg/L”** means milligrams per litre.

**“mandatory reporting level” or “MRL”** means a warning and reporting level determined in accordance with the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995). An MRL is the lowest level required in a regulated dam to allow either of the following to be retained:

1. the runoff from a 72 hour duration storm at the AEP specified in the Table 5; or
2. a wave allowance at that AEP as estimated using a recognised engineering method.

**“maximum”** means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

**“Maximum Continuous Rating (MCR)”** means the maximum output that can be sustained continuously under normal conditions over a day. The maximum actual output can be higher than the MCR.

**“minimum”** means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

**“NATA”** means the National Association of Testing Authorities, Australia.

**“natural gas”** includes CSG.

**“NEPM groundwater investigation level”** means the concentration of a contaminant above which further appropriate investigation and evaluation is required as set out in the

'Guideline on the Investigation Levels for Soil and Groundwater' prepared by the National Environment Protection (assessment of site contamination) Measure 1999 or more recent versions.

**"non-continuous spill"** means a single and isolated release of a contaminant to land that does not exceed 24 hours in duration and does not cause the potential for environmental harm.

**"normal operations"** means if the cogeneration facility is operating at a constant rate, whether or not it is operating at full capacity.

**"nuisance sensitive place"** means any of the following:

1. a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises;
2. library and educational institution (including a school, college and university);
3. childcare centre or kindergarten;
4. school or playground;
5. hospital, surgery or other medical institution;
6. protected area, or an area identified under a conservation plan under the *Nature Conservation Act 1992* as a critical habitat or an area of major interest;
7. marine park under the *Marine Parks Act 2004*;
8. park or garden that is open to the public (whether or not on payment of an amount) for use other than for sport or organised entertainment; or
9. a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.

**"occasion"** means any four sample results for metals and any four (4) 24-hour period where continuous samples indicate an exceedance.

**"operational plan"** means a document that amongst other things sets out procedures and criteria to be used for operating a dam during a particular time period. The operational plan as defined herein may form part of a plan of operations or plan otherwise required in legislation.

**"process contaminants"** means liquids and slurries used or produced in the processing of bauxite to alumina and does not include hydrocarbons.

**"QWQ guidelines"** means the document called '*Queensland water quality guidelines 2009*' or more recent versions.

**"range"** means that the measured value of the quality characteristic or contaminant must be less than the higher release limit stated and greater than the lower release limit stated.

**"recognised entity"** means:

1. a local government;

2. a public sector unit;
3. an agency of the Commonwealth or another State, however called, with similar functions to the functions of the chief executive;
4. a ministerial council established by the Council of Australian Governments;
5. the Commonwealth Scientific and Industrial Research Organisation;
6. a research centre completely or partly funded by the Commonwealth;
7. an Australian university;
8. a Queensland regional NRM body;
9. Healthy Waterways Limited ACN 137 943 554; and
10. any other international best proactive guideline including NEPM groundwater investigation level or Dutch Intervention Guidelines target value.

**“regulated dam”** means any dam in the significant or high hazard category as assessed using the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995).

**“rehabilitation”** means the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land

**“Residue Management Area Dam”** means a dam defined in Land – Table 1 (location of Residue Management Area Dams)

**“Residue Management Area”** means the land including fresh water dams surrounding the Residue Management Area Dam itself over Lot 1 on SP144430 and Lot 7 on SP228453.

**“representative of actual operating conditions”** means stack testing must be carried out when production rates are within 10% or greater than the average production rate of 3 months prior (excluding shutdowns) to when the testing is to be undertaken.

**“sensitive receptor”** means any of the following:

1. a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises;
2. library and educational institution (including a school, college and university);
3. childcare centre or kindergarten;
4. school or playground;
5. hospital, surgery or other medical institution;
6. protected area, or an area identified under a conservation plan under the *Nature Conservation Act 1992* as a critical habitat or an area of major interest;
7. marine park under the *Marine Parks Act 2004*;

8. park or garden that is open to the public (whether or not on payment of an amount) for use other than for sport or organised entertainment;
9. a place used as a workplace, an office or for business or commercial purposes; or
10. and includes a place within the curtilage of such a place reasonably used by persons at that place.

**“shutdown”** refers to any circumstance where the cogeneration plant is not operating for a period of time longer than 15 minutes.

**“site”** means the land to which the environmental authority attaches.

**“specialist in the field”** in reference to condition A8 of this environmental authority means a person or body possessing the relevant experience and qualifications to perform the required measurements and subsequent interpretation, evaluation and explanation of the monitoring results, trends and programs.

**“spillway”** means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

**“stable”** in relation to land, means land form dimensions are and will remain within tolerable limits now and in the foreseeable future. Issues to be properly considered in regard to whether or not the landform is stable include geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.

**“stabilisation area”** means a catchment area that has effective erosion and sediment source control measures implemented and maintained in accordance with the conditions of the environmental authority.

**“suitably qualified and experienced person”** in relation to dams means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 2002*, or at the relevant time holds a 'deemed registration' within the meaning of the *Mutual Recognition (Queensland) Act 1992*; and has knowledge, suitable experience and demonstrated expertise in relevant fields, as set out below:

1. knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and
2. a total of five years of demonstrated expertise in the geomechanics of dams with particular emphasis on stability, geology and geochemistry, and
3. a total of five years of demonstrated expertise in three of the following categories:
  1. investigation and design of dams;
  2. construction, operation and maintenance of dams;
  3. hydrology with particular reference to flooding, estimation of extreme

storms, water management or meteorology;

4. hydraulics with particular reference to sediment transport and deposition, erosion control, beach processes;
5. hydrogeology with particular reference to seepage, groundwater;
6. solute transport processes and monitoring thereof;
7. dam safety.

**“suitably qualified third party auditor”** means a person with a relevant qualification and at least five (5) years’ experience in the field of environmental auditing that is accepted by the administering authority.

**“threatening processes”** means processes, features and actions that can have a detrimental effect upon the health and viability of an area of vegetation. For example, altered hydrology, land use practices, invasion by pest and weed species, land degradation, edge effects and fragmentation.

**“tolerable limits”** means a range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values. For example, a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing damage and limiting infiltration and percolation.

**“topsoil”** means the surface (top) layer of a soil profile, which is more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300mm in depth from the natural surface.

**“trigger levels”** means an indicator for an environmental value is a physical, chemical, biological or other property that can be measured or decided in a quantitative way.

**“upon”** means one sample must be taken on release of a discharge event commencing. Where a discharge event has a duration of 24 hours or greater, samples must be taken daily for one week and once a week thereafter.

**“void”** means any constructed, open excavation in the ground.

**“visible dust event”** means an event that results in a visible dust moving beyond the lot and plan where the relevant ERA is carried out.

**“waters”** - includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.

**“watercourse”** means a river, creek or stream in which water flows permanently or intermittently:

1. in a natural channel, whether artificially improved or not;
2. in an artificial channel that has changed the course of the watercourse; but, in any case, only:
  1. unless a regulation under paragraph (d), (e) or (f) declares otherwise-at every

place upstream of the point (point A) to which the high spring tide ordinarily flows and reflows, whether due to a natural cause or to an artificial barrier;

2. if a regulation has declared an upstream limit for the watercourse-the part of the river, creek or stream between the upstream limit and point A;
3. if a regulation has declared a downstream limit for the watercourse-the part of the river, creek or stream upstream of the limit; or
4. if a regulation has declared an upstream and a downstream limit for the watercourse-the part of the river, creek or stream between the upstream and the downstream limits.

**“watercourse”** includes the bed and banks and any other element of a river, creek or stream confining or containing water.

**“water quality guidelines”** are quantitative measures or statements for indicators, including contaminant concentration or sustainable load measures of water that protect a stated environmental value.

**“wetland”** means an area shown as a wetland on a ‘Map of referable wetlands’, a document approved by the chief executive (environment). A map of referable wetlands can be viewed at [www.ehp.qld.gov.au](http://www.ehp.qld.gov.au).

Schedules

Schedule 1—Approved ERA locations

Location		Environmentally Relevant Activities											
Lot	Plan	ERA 8 - 3	ERA 8 - 4	ERA 8 - 5	ERA 14 - 1	ERA 15	ERA 16 - 2(d)	ERA - 16 (c)	ERA 31 - 2(b)	ERA 50 - 1(a)	ERA 50 - 2	ERA 56	ERA 60 - 1(d)
503	SP144788			✓						✓	✓		
502	SP224189	✓	✓	✓						✓	✓		
1	SP144433								✓	✓	✓		
23	SP103896								✓	✓	✓		
22	SP103896								✓	✓	✓		
21	SP103896								✓	✓	✓		
14	SP147866								✓	✓	✓		
9	SP147866								✓	✓	✓		
Gladstone - Mt Larcom Rd									✓	✓	✓		
8	SP218634	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	SP235022						✓	✓		✓	✓		
7	SP147726									✓	✓		
7	SP145439								✓				
54	SP137048								✓				
1	RP911260								✓				
Lindherr Rd									✓				
27	SP115227								✓				
Calliope River Rd									✓				
79	CP911258								✓				
23	SP115225								✓				
Halls Road									✓				
13	RP620157								✓				
91	SP122250								✓				
Quarry Rd									✓				
21	SP115224								✓				
20	SP115224								✓				
7	SP177782								✓				
Unnamed Road									✓				
1	SP144430	✓	✓	✓		✓	✓	✓	✓			✓	✓
7	SP228453	✓	✓	✓		✓	✓	✓	✓			✓	✓



Schedule 2—Monitoring, maps and plans

Figure 1 - Refinery Catchment Areas – First Flush Catchment

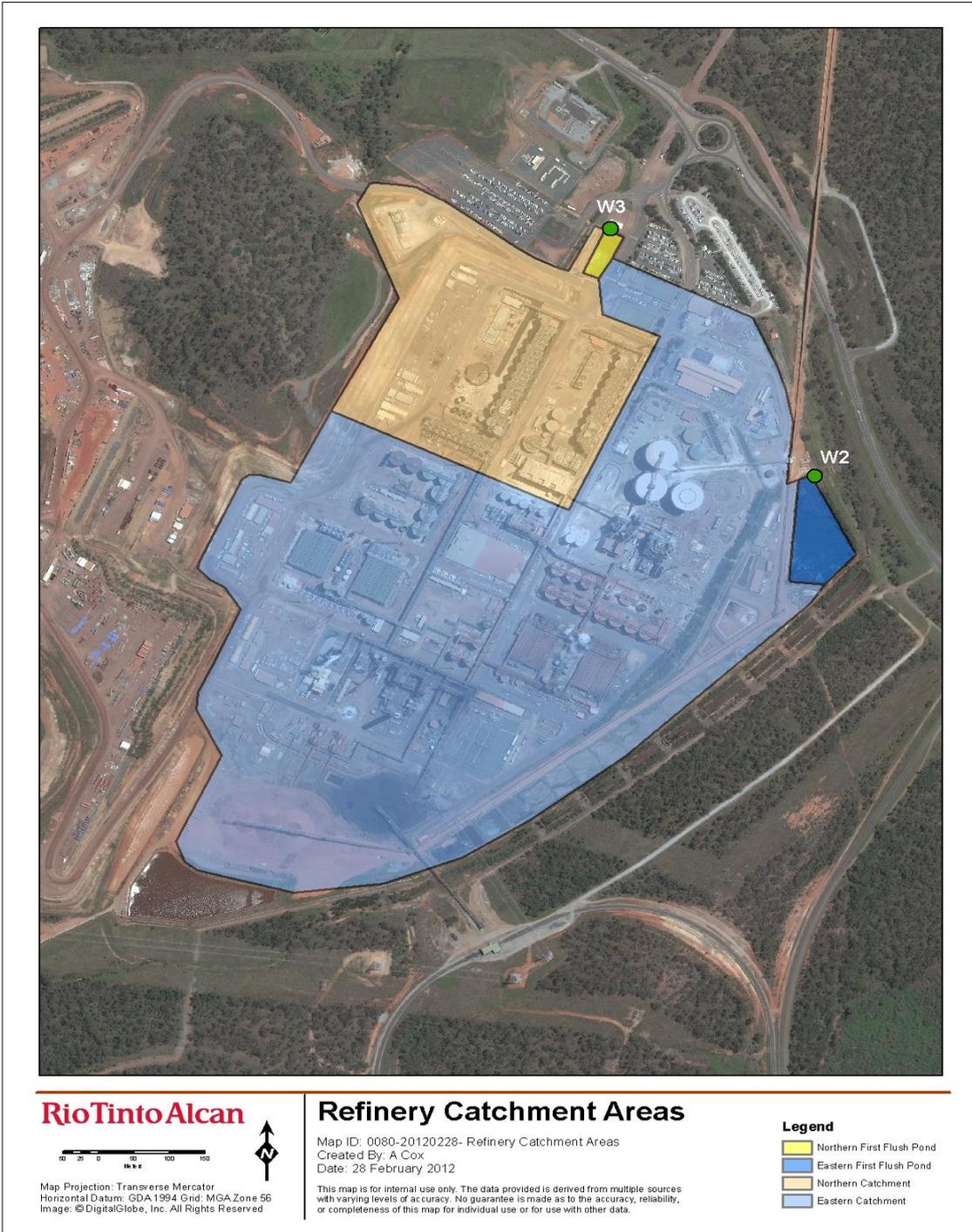
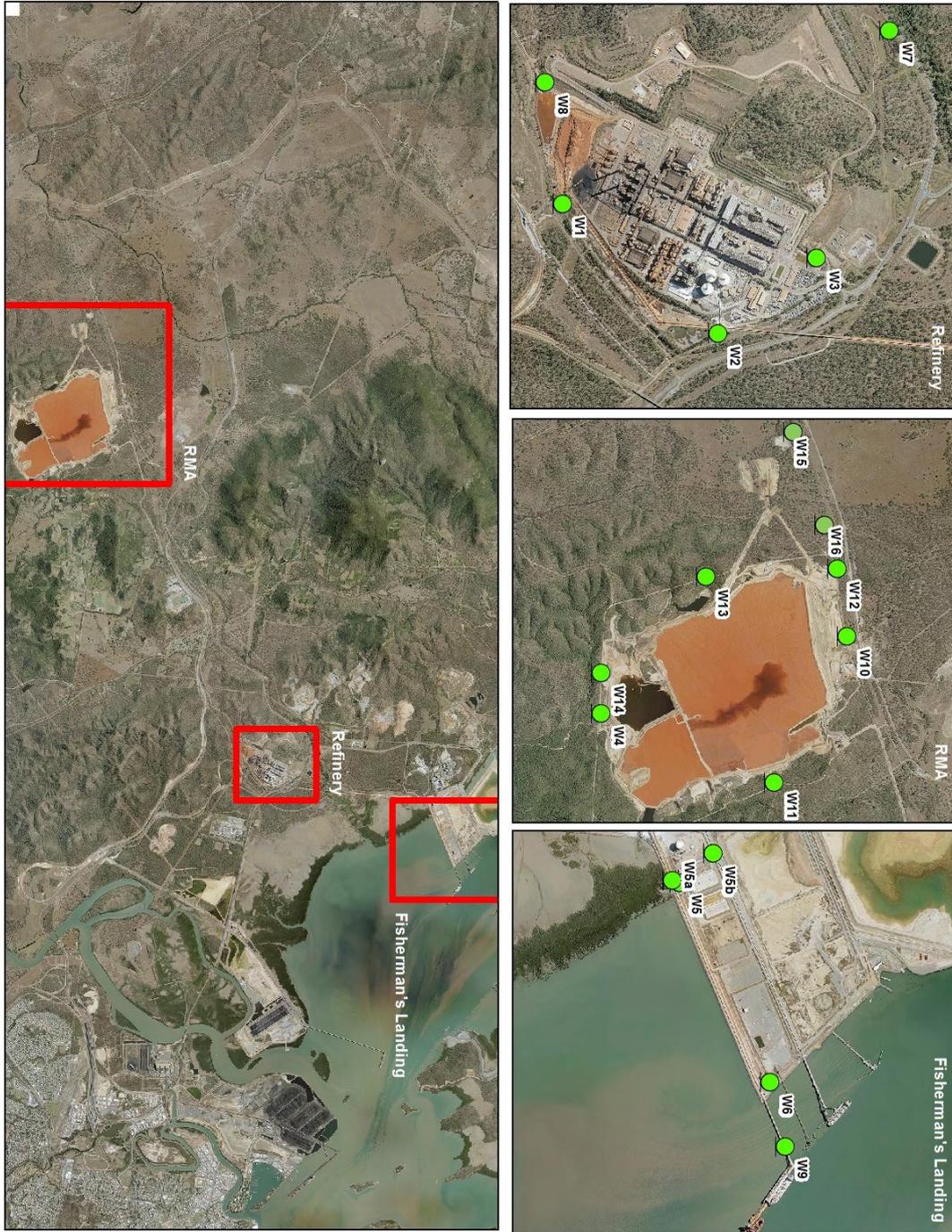


Figure 2 – Release points and monitoring locations



Surface Water Release Point Locations

Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1984 Grid: MGA Zone 56  
Image: © AAM Pty Ltd. All Rights Reserved

This map is for internal use only. The data provided is derived from multiple sources with varying levels of accuracy. No guarantee is made as to the accuracy, reliability, or completeness of this map for individual use or for use with other data.

Map ID: 0006-20071207 - Surface Water Release locations  
Created By: A Cox  
Date Issued: 20 February 2018

RioTinto

Figure 3 – Groundwater expression area

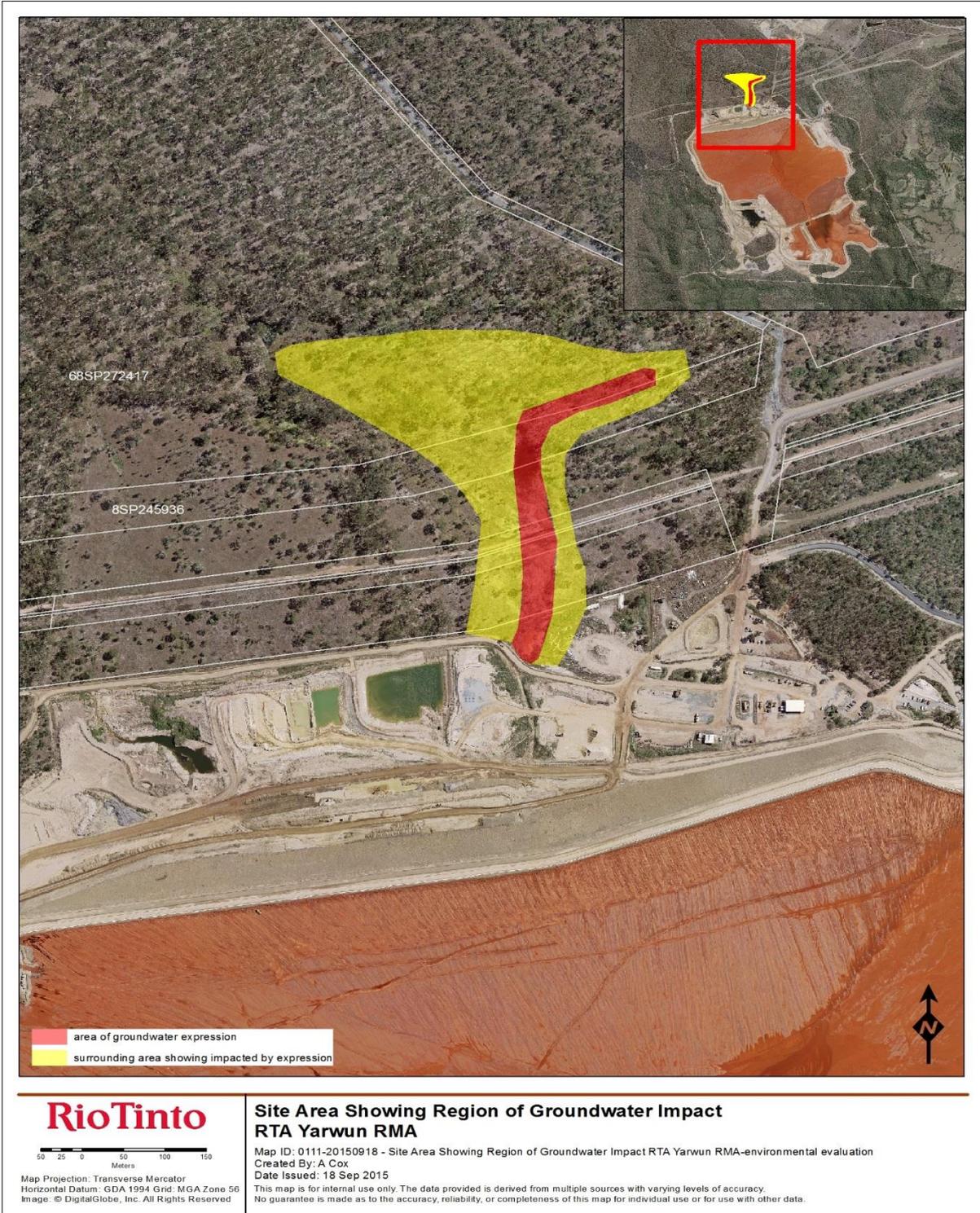


Figure 4 – Refinery catchment areas.

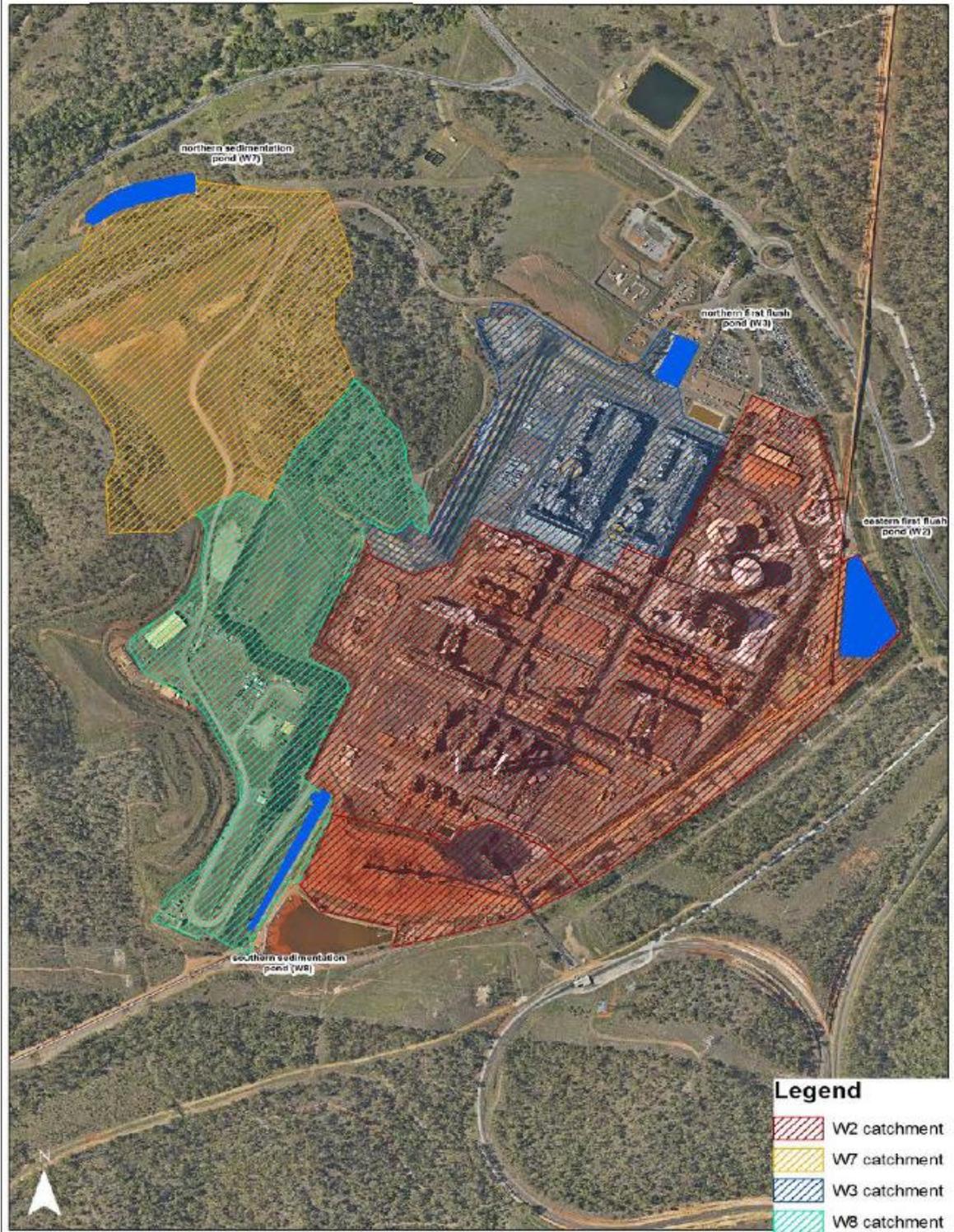
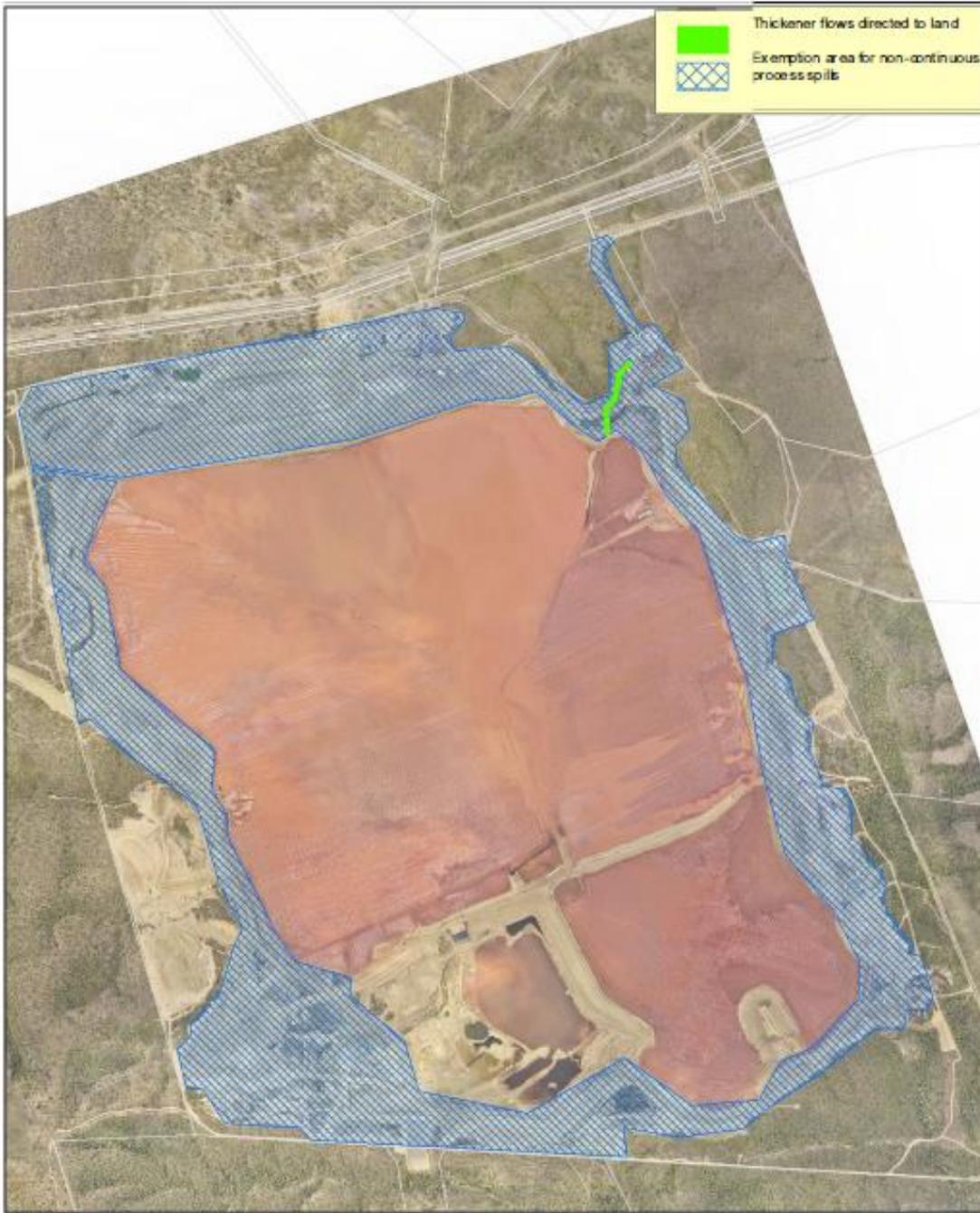


Figure 5 – Condition L2 exemption areas RMA



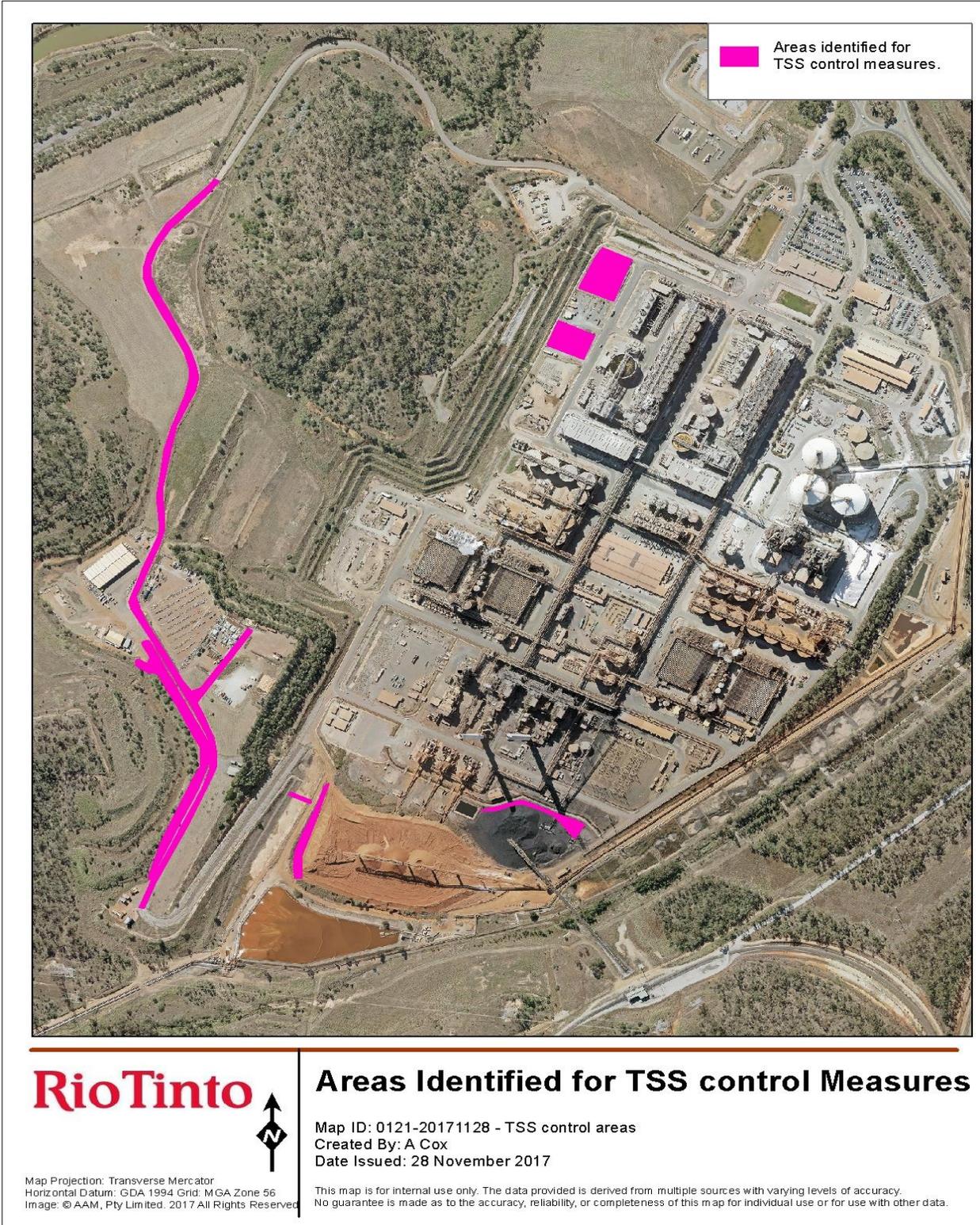
**RioTinto**  
S. 14, 2014

Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1984  
Vertical Datum: AHD, 1984  
Image: Aerial, 2019  
Copyright: Rio Tinto 2020. All rights reserved.

**RMA Lot 1 SP144430 Exemption Areas**

Map ID: 01202017H22 - RMA lot 1 SP144430 exemption areas  
Created By: A.Cis  
Date: 30 January 2020  
This map is for internal use only. The data provided is deemed to be accurate and reliable, but no guarantee is made as to the accuracy, reliability or completeness of this map for individual use or for use with other data.

Figure 6 – Condition W52 erosion and sediment control requirements



## Schedule 3—Monitoring and release limits

Air - Table 1 Source description

Release point number	Source description	Minimum release height (metres - Australian Height Datum)	Minimum Efflux Velocity (metres/second)*	Minimum release temperature (degrees Celsius)*
B1	Boiler 1	120	17	114 *
B2	Boiler 2	120	17	114 *
B3	Boiler 3	120	17	50 *
C1	Calciner 1	60	17	130*
C2	Calciner 2	60	17	130*
C3	Calciner 3	60	17	130*
C4	Calciner 4	60	17	130*
Cogen	Gas Turbine Stack	50	20	149*

Notes:

\***Minimum** efflux velocities and temperature must be achieved when operating above 80% **Maximum Continuous Rating (MCR)**

Air - Table 2 Contaminants release limits to air

Release point	Contaminant release	Maximum concentration release limit	Maximum mass release limit	Averaging Period
B1	Particulates	50mg/Nm3 (dry)	2.7g/s	24 hour rolling average
	Oxides of Nitrogen	500mg/Nm3 (dry)	27g/s	1 hour rolling average
	Sulphur Dioxide	1450mg/Nm3 (dry)	71g/s	1 hour rolling average
	Mercury	0.2mg/Nm3 (dry)	0.009g/s	-
	Total volatile organic compounds (TVOC) as n-propane equivalent	40mg/Nm3 (dry)	1.8g/s	-
B2	Particulates	50mg/Nm3 (dry)	2.7g/s	24 hour rolling average
	Oxides of Nitrogen	500mg/Nm3 (dry)	27g/s	1 hour rolling average
	Sulphur Dioxide	1450mg/Nm3 (dry)	71g/s	1 hour rolling average
	Mercury	0.2mg/Nm3 (dry)	0.009g/s	-

Release point	Contaminant release	Maximum concentration release limit	Maximum mass release limit	Averaging Period
	Total volatile organic compounds (TVOC) as n-propane equivalent	40mg/Nm <sup>3</sup> (dry)	1.8g/s	-
B3	Particulates	50mg/Nm <sup>3</sup> (dry)	2.7g/s	1 hour block average
	Oxides of Nitrogen	500mg/Nm <sup>3</sup> (dry)	27g/s	1 hour rolling average
	Sulphur Dioxide	205mg/Nm <sup>3</sup> (dry) (desulphurisation)**	10g/s**	1 hour rolling average
C1	Particulates	100mg/Nm <sup>3</sup> (dry)	N/A	24 hour rolling average
	Oxides of Nitrogen	200mg/Nm <sup>3</sup> (dry)	N/A	1 hour block average
	Total volatile organic compounds (TVOC) as n-propane equivalent	40mg/Nm <sup>3</sup> (dry)	N/A	-
C2	Particulates	100mg/Nm <sup>3</sup> (dry)	N/A	24 hour rolling average
	Oxides of Nitrogen	200mg/Nm <sup>3</sup> (dry)	N/A	1 hour block average
	Total volatile organic compounds (TVOC) as n-propane equivalent	40mg/Nm <sup>3</sup> (dry)	N/A	-
C3	Particulates	100mg/Nm <sup>3</sup> (dry)		24 hour rolling average
	Oxides of Nitrogen	200mg/Nm <sup>3</sup> (dry)	N/A	1 hour block average
	Total volatile organic compounds (TVOC) as n-propane equivalent	40mg/Nm <sup>3</sup> (dry)	N/A	-
C4	Particulates	100mg/Nm <sup>3</sup> (dry)		24 hour rolling average
	Oxides of Nitrogen	200mg/Nm <sup>3</sup> (dry)	N/A	1 hour block average
	Total volatile organic compounds (TVOC) as n-propane equivalent	40mg/Nm <sup>3</sup> (dry)	N/A	-
Cogen	Oxides of Nitrogen	70mg/Nm <sup>3</sup> (dry) at 15% O <sub>2</sub> *	27g/s*	1 hour block average

Notes:

\*The **maximum** concentration release limit and **maximum** mass release limit for the Cogen release point do not apply during a 'cogeneration exemption'.

**\*\*The maximum concentration release limit and maximum mass release limit for Sulphur Dioxide at the B3 release point do not apply during a 'boiler exemption'.**

**Air - Table 3 Required release point determinations**

Release point number	Determination Required	Frequency*
B1	Particulates	Continuous
	Oxides of Nitrogen	Continuous
	Sulphur Dioxide	Continuous
	Mercury	Quarterly
	Total volatile organic compounds as n-propane equivalent	Quarterly
B2	Particulates	Continuous
	Oxides of Nitrogen	Continuous
	Sulphur Dioxide	Continuous
	Mercury	Quarterly
	Total volatile organic compounds as n-propane equivalent	Quarterly
B3	Particulates	Annually
	Oxides of Nitrogen	Continuous
	Sulphur Dioxide	Continuous
C1	Particulates	Continuous
	Oxides of Nitrogen	Quarterly
	Total volatile organic compounds as n-propane equivalent	Annually (one calciner each quarter)
C2	Particulates	Continuous
	Oxides of Nitrogen	Quarterly
	Total volatile organic compounds as n-propane equivalent	Annually (one calciner each quarter)
C3	Particulates	Continuous
	Oxides of Nitrogen	Quarterly
	Total volatile organic compounds as n-propane equivalent	Annually (one calciner each quarter)
C4	Particulates	Continuous
	Oxides of Nitrogen	Quarterly
	Total volatile organic compounds as n-propane equivalent	Annually (one calciner each quarter)
Cogen	Oxides of Nitrogen	Quarterly

\* Note: Sampling equipment must be operated at 85% of total operating capacity to allow for the performance of maintenance activities, and sampling frequency shall be subject to equipment outages for such purposes.

**Water – Table 1 Contaminants, sources and locations for releases to waters**

GPS locations for release point	Release Point Descriptor	Contaminants and source	Permitted Waters and locations for the release
311606.000E 7362966.00N	W1	Settled neutralised process effluent, boiler blowdown and stormwater runoff from the alumina plant Effluent Pond to be discharged via diffuser at W9. (W1 is upstream from W9)	Port Curtis via diffuser W9 at Fisherman's Landing wharf
321333.6923E 7363022.587N	W2	Discharge of stormwater runoff from Eastern 1 <sup>st</sup> Flush Pond	Unnamed tributary of Boat Creek at the site boundary
312032.770E 7363636.204N	W3	Discharge of stormwater runoff from Northern 1 <sup>st</sup> Flush Pond	Unnamed tributary of Boat Creek at the site boundary
304605.000E 7357736.00N	W4	Discharge of diverted stormwater from the exterior of the RMA	Gravel Creek
312921.913E 7367213.56N	W5	Discharge of potentially alkaline contaminated stormwater from the Caustic Storage Facility located at Fisherman's Landing	Port Curtis via southern <b>bund</b> drain at Fisherman's Landing
312911.2E 7367174.1N	W5a <sup>1</sup>	Water resulting from the neutralisation of residual caustic soda from the caustic bladders to be discharged via diffuser at release point W9, only once every five years unless otherwise agreed to by the administering authority <sup>1</sup> .	Port Curtis via diffuser W9 at Fisherman's Landing Wharf
312838.354E 7367431.783N	W5b	Discharge of potentially alkaline contaminated stormwater from the Caustic Storage Facility located at Fisherman's Landing	Port Curtis via northern bund drain at Fisherman's Landing
314032.7868E 7367213.568N	W6	Stormwater and wash down water from wharf sediment <b>dam</b> containing alumina and bauxite wash down water from the wharf	Port Curtis via southern <b>bund</b> drain at Fisherman's Landing

## Environmental authority EPPR00926513

GPS locations for release point	Release Point Descriptor	Contaminants and source	Permitted Waters and locations for the release
311130.811E 7367712.280N	W7	Discharge of stormwater runoff from Northern Lay-down Area Sedimentation Pond	Unnamed tributary of Boat Creek to the south of Port Curtis Way
311335.670E 7364313.383N	W8	Discharge of stormwater runoff from Southern Lay-down Area Sedimentation Pond	Diversion gully west of RTA 670 pond, to an unnamed tributary of Boat Creek south of Port Curtis Way adjacent the RTA Yarwun Refinery <b>site</b> northern boundary
314389.785153E 7362954.722N	W9	Contaminants and sources mentioned for W1 and W5a	Port Curtis via diffuser at Fisherman's Landing Wharf
303685.3E 7360184.6N	W10	Discharge of diverted stormwater from the exterior of the RMA	Unnamed ephemeral gully from northern boundary
305162.1E 7359458.5N	W11	Discharge of diverted stormwater from the exterior of the RMA	Unnamed ephemeral gully from eastern boundary
303014.5E 7360083.8N	W12	Discharge of diverted stormwater from the exterior of the RMA	Unnamed ephemeral gully from northern boundary
303087.5E 7358786.2N	W13	Discharge of diverted stormwater from the exterior of the RMA	Unnamed ephemeral gully from northern boundary of RMA 2
304047.6E 7357756.4N	W14	Discharge of diverted stormwater from the exterior of the RMA	Gravel Creek
301731.39E 7359633.59N	W15	Discharge of diverted stormwater from RMA2 borrow operations	Unnamed ephemeral gully from northern boundary of RMA2
302757.17E 7360010.37N	W16	Discharge of diverted stormwater from RMA2 borrow operations	Unnamed ephemeral gully from northern boundary of RMA2

## Notes:

1. The release of neutralised residual caustic soda from the caustic bladder at the release point W5a is only permitted when agreed to by the administering authority.

Water – Table 2 Release limits and monitoring

Monitoring point	Release point	Quality characteristics	Release limit				Minimum Monitoring frequency *
			Minimum	Median	80 <sup>th</sup> percentile	Maximum	
Discharge pipe from alumina plant effluent pond	W1	pH	6.5			9.5	Continuous
		Total Suspended solids					Monthly
		Turbidity				150 NTUs	Continuous
		Aluminium (Filtered)				14mg/L	Monthly
		Aluminium (Filtered)		5mg/L			Monthly based on a 12 months rolling average
		Vanadium (µg/L – filtered)					Monthly
		Gallium (µg/L – filtered)					
		Molybdenum (µg/L – filtered)					
		Alkalinity (mg/L),					
		Total dissolved solids (mg/L),					
		Dissolved Oxygen (mg/L)					
Eastern 1 <sup>st</sup> Flush Pond at spillway	W2	pH	6.5			9	Daily upon discharge
		Total suspended solids			163 mg/L <sup>4</sup>		
		Aluminium (Filtered)				3mg/L	each release event
		Vanadium (µg/L – filtered)					
		Gallium (µg/L – filtered)					
		Molybdenum (µg/L – filtered)					
		Alkalinity (mg/L),					
		Total dissolved solids (mg/L),					
Dissolved Oxygen (mg/L)							

Monitoring point	Release point	Quality characteristics	Release limit				Minimum Monitoring frequency *
			Minimum	Median	80 <sup>th</sup> percentile	Maximum	
Northern 1 <sup>st</sup> Flush Pond at spillway	W3	pH	6.5			9	Daily upon discharge
		Total suspended solids			163 mg/L <sup>4</sup>		
		Vanadium (µg/L – filtered)					Each release event
		Aluminium (Filtered)				3mg/L	
		Gallium (µg/L – filtered)					
		Molybdenum (µg/L – filtered)					
		Alkalinity (mg/L),					
		Total dissolved solids (mg/L), Dissolved Oxygen (mg/L)					
RMA diversion drain south east (RMA 1)	For W4					Daily upon discharge	
		Total Suspended solids (TSS)					50mg/L <sup>2</sup>
		Turbidity					70NTU <sup>1 2</sup>
Caustic storage facility at spillway	W5	pH	6.5			9	Daily upon discharge
Discharge from caustic bladders	W5a	pH	6.5			9.5	Continuous
		Total Suspended solids					Once during discharge
		Turbidity				150 NTU	Continuous
		Aluminium (Filtered)		5mg/L		14mg/L	Once during discharge
		Vanadium (µg/L – filtered)					
		Gallium (µg/L – filtered)					
		Molybdenum (µg/L – filtered)					
		Alkalinity (mg/L),					

Monitoring point	Release point	Quality characteristics	Release limit				Minimum Monitoring frequency *
			Minimum	Median	80 <sup>th</sup> percentile	Maximum	
		Total dissolved solids (mg/L), Dissolved Oxygen (mg/L)					
Caustic storage facility – top of bladders	W5b	pH	6.5			9	Daily upon discharge
Sediment Pond at discharge to drain	W6	pH	6.5			9	Daily upon discharge
		Total suspended solids (TSS)				Greater of 50mg/L or within 10% of TSS at background <sup>3</sup>	
Northern Lay-down Area Sediment Pond – discharge to drain	W7	pH	6.5			8.5	Daily upon discharge
		Total Suspended Solids (TSS)				85 mg/L <sup>4</sup>	
Southern Lay-down Area Sediment Pond – discharge to drain	W8	pH	6.5			8.5	Daily upon discharge
		Total Suspended Solids (TSS)				163 mg/L <sup>4</sup>	
Diffuser at Fisherman's landing wharf	W9						
	W10	Turbidity				75 NTU <sup>1 2</sup>	Daily upon discharge

Monitoring point	Release point	Quality characteristics	Release limit				Minimum Monitoring frequency *	
			Minimum	Median	80 <sup>th</sup> percentile	Maximum		
RMA diversion drain north (RMA 1)		Total Suspended Solids (TSS)				50mg/L <sup>2</sup>	Daily upon discharge	
RMA diversion drain east (RMA 1)	W11	Turbidity				75 NTU <sup>1 2</sup>	Daily upon discharge	
		Total Suspended Solids (TSS)				50mg/L <sup>2</sup>	Daily upon discharge	
RMA diversion drain north west (RMA 1)	W12	Turbidity				75 NTU <sup>1 2</sup>	Daily upon discharge	
		Total Suspended Solids (TSS)				50mg/L <sup>2</sup>	Daily upon discharge	
RMA diversion drain west (RMA 2)	W13	Turbidity					Daily upon discharge	
		Total Suspended Solids (TSS)					Daily upon discharge	
External Spillway Southern boundary of RMA, 200m downstream from RMA internal spillway (RMA 1)	W14	Electrical conductivity				950µs/cm	Daily upon discharge	
		pH	6.5			8.5		
		Turbidity				75 NTU <sup>12</sup>		
		Total Suspended Solids (TSS)				50 mg/L <sup>2</sup>		
			Vanadium (µg/L - filtered)					Each release event
			Aluminium (filtered)					
			Gallium (µg/L - filtered)					
			Molybdenum (µg/L - filtered)					
			Alkalinity (mg/L)					

Monitoring point	Release point	Quality characteristics	Release limit				Minimum Monitoring frequency *
			Minimum	Median	80 <sup>th</sup> percentile	Maximum	
		Total dissolved solids (mg/L)					
		Dissolved Oxygen (mg/L)					
RMA2 Northern boundary	W15	Turbidity				75 NTU <sup>1 2</sup>	Daily upon discharge
		Total Suspended Solids (TSS)				50mg/L <sup>2</sup>	
RMA2 Northern boundary	W16	Turbidity				75 NTU <sup>1 2</sup>	Daily upon discharge
		Total Suspended Solids (TSS)				50mg/L <sup>2</sup>	

## Notes:

- 75 NTU to be used as an interim turbidity **maximum** limit for the release of sedimentation pond water in situations where there is an operational need to discharge from the sedimentation pond prior to a laboratory confirmed TSS result being available. The interim turbidity limit will remain in place until a correlated value is **determined** based on a **minimum** of 24 paired (measure from same sample bottle) data points for turbidity and TSS with a correlation coefficient  $R^2 \geq 0.7$ . The correlation must be developed from data representing TSS ranging from the Limit of Reporting (or  $\leq 10\text{mg/L}$  TSS) to  $\geq 50\text{mg/L}$ . Once a correlation has been developed in accordance with these requirements, the Turbidity Limit should be amended accordingly.
- This limit is only required to be achieved during the controlled discharge (for example, de-watering activities from excavations and sediment basins) and upon any release that is within the 85th percentile 5 day rainfall depth of 32.8mm.
- Background means water quality measured at an upstream location in receiving **waters** unaffected by the activities.
- One of five consecutive samples measured at each release point, is permitted to exceed the release limit.

Note: Sampling equipment must be operated at 85% of total operating capacity to allow for the performance of maintenance activities, and sampling frequency shall be subject to equipment outages for such purposes.

## Water – Table 3 Toxicants of concern for Direct Toxicity Assessment

Toxicant of Concern		
Metals and Metalloids		
Aluminium	Copper	Vanadium
Antimony	Lead	Zinc
Arsenic (total)	Mercury (total)	Molybdenum
Cadmium	Nickel	Gallium
Chromium (total)	Silver	-
Cobalt	Uranium	-

Water - Table 4 Alumina Refinery and Residue Management Dam groundwater monitoring locations

Monitoring Point	AMG Coords (WGS84)	AMG Coords (WGS84)	Surface RL (m)
RGW1	312184.803E	7364021.178N	10.4
RGW5	312163.091E	7363335.353N	15.3
580BH31	303361.360E	7360428.450N	54.6
580BH30	305147.447E	7359435.455N	77.5
580BH07	303132.260E	7358783.861N	83.5
ALD 1	303078.861E	7359615.456N	55.81
CSGW1	312832.501E	7367195.235N	3.6
CSGW2	312752.817E	7367389.799N	3.81
CSGW3	312912.620E	7367457.120N	3.91
CSGW4	312992.520E	7367276.935N	3.83
580BH22C	302882.530E	7359783.779N	66.9
580MB3001	305670.929E	7358217.138N	91.48
580 ED1	304448.830E	7357753.381N	74.1

Notes: Where the codes mean:

RGW – Refinery Groundwater Bore

580BH, 580MB and ALD – Area 580 (Residue Management Area) Groundwater Bore

CSGW – Caustic Storage Groundwater Bore

Water - Table 5 Groundwater monitoring

Quality Characteristic Determination	Monitoring Points	Frequency
For Groundwater Samples		
Water level pH Aluminium, Vanadium, Gallium, Molybdenum ( $\mu\text{g/L}$ - all filtered) Fluoride Alkalinity ( <b>mg/L</b> ) Total dissolved solids ( <b>mg/L</b> ) Dissolved Oxygen ( <b>mg/L</b> ) Electrical conductivity ( $\mu\text{S/cm}$ ) Major ions <b>mg/L</b> – (calcium, magnesium, sodium, potassium, chloride, carbonate/bicarbonate and sulphate)	All bores listed in Schedule C – Table 4	Twice per calendar year, not less than 4 months apart

END OF PERMIT

# Notice

## *Environmental Protection Act 1994*

### Environmental Evaluation

#### **Notice to conduct or commission an environmental evaluation**

*This notice to conduct or commission an environmental evaluation is issued by the administering authority pursuant to section 326B of the Environmental Protection Act 1994.*

RTA Yarwun Pty Ltd  
975 Hanson Road  
YARWUN QLD 4680

Your reference: EPPR00926513

Our reference: 221024, 101/0006008

15 April 2015

**Take notice:** that under the *Environmental Protection Act 1994* (the Act) a notice to conduct or commission an environmental investigation is issued to RTA Yarwun Pty Ltd (you) by the administering authority. The administering authority is the Chief Executive of the Department of Environment and Heritage Protection (the department).

The notice to conduct or commission an environmental investigation is issued in respect of the activities of RTA Yarwun Pty Ltd at 975 Hanson Road, Yarwun, QLD, 4680, on land described as Lot 1 SP144430 (the premises).

#### **A. Grounds**

The notice to conduct or commission an environmental investigation is issued on the following grounds:

- an activity or proposed activity is causing, or is likely to cause environmental harm.

The facts and circumstances forming the basis for these grounds are:

1. RTA Yarwun Pty Ltd (RTAY) operates the Yarwun Alumina Refinery over 24 tenements located approximately 10 kilometres west of the city of Gladstone.
2. RTAY report that on 29 January 2014 they provided verbal notification to the department of a ground water expression issue.
3. At a meeting on 26 August 2014, RTAY informed the department of two groundwater expressions first observed in 2013, to the north (the Northern Groundwater Expression) and northeast (the Firewater Dams Expression) of the RMA.
4. Department officers inspected the Northern Groundwater Expression (NGE) on Friday 5 September 2014 and observed an area with water ponding on the surface of the land surrounded by a significant area of dead or damaged vegetation. Department officers undertook water quality sampling of the ponded water at the NGE and results found high salinity (53.8 mS/cm).
5. Department officers also inspected the Firewater Dams Expression (FWDE) on Friday 5 September 2014 and observed damp soil up-slope of the small GW1 dam and fire water, the expression was

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## Notice to conduct or commission an environmental evaluation

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ponding in the dams from the surrounding soil. Department officers undertook water quality sampling of the ponded water and the results found high salinity (31.1 mS/cm) and very low pH (2.83).

6. RTA Yarwun have expressed an opinion that, based on evidence collected to date, the expressions are naturally occurring groundwater and that there has been no release of contaminants from the RMA to groundwater.
7. Schedule 9 of the *Environmental Protection Regulations 2008* provides criteria for the definition of a water contaminant, the two of which that are relevant include;
  - a liquid containing suspended or dissolved solids; and
  - a substance that has a pH outside the range 6.5 to 8.5.
8. The water quality results obtained by departmental officers on 5 September 2014 demonstrate that the ponded groundwater expressions contain contaminants as;
  - the *Australian and New Zealand guidelines for fresh and marine water quality* define total dissolved solids (salinity) as the measure of all inorganic salts dissolved in water (see section 4.3.3.5); and
  - the NGE was characterised by very high salinity; and
  - the FWDE was characterised by a low pH of 2.83, outside the pH range 6.5 to 8.5.
9. RTAY provided the department with a report titled *Investigation of dead vegetation north of the RTA Yarwun RMA* dated October 2014 (Report number 590404001561-1). The report found that multiple lines of evidence clearly show the death of the vegetation is a result of salt scalding from the groundwater expression in the area north of the RMA.
10. RTAY provided the department with a report titled *Groundwater Expression at the Rio Tinto Alcan RMA* dated 27 November 2014 (Report number 15188-1). The report found the following;
  - Groundwater expression in the vicinity of the north wall of the RMA was first observed in 2008 with effects on site including road damage and dead vegetation.
  - In 2013 it was observed that an area of dead vegetation and standing water appeared to the north of the RMA boundary, outside of the RTAY tenure.
  - The observed groundwater expression has likely been caused by elevated pressure in the foundation materials below the RMA.
11. Environmental harm as defined by section 14 of the *Environmental Protection Act 1994*, is any adverse effect, or potential adverse effect (whether temporary or permanent and whatever magnitude, duration or frequency) on an environmental value.
12. An environmental value, defined in section 9 of the *Environmental Protection Act 1994*, is a quality or physical characteristic of the environment that is conducive to ecological health.
13. The Queensland Government data set *Biodiversity status of pre-clearing and remnant regional ecosystems series* identifies vegetation at or immediately downstream of the NGE as including regional ecosystem (RE) 11.3.4 - *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains with VMA class Of Concern.
14. The Of Concern RE 11.3.4 is considered a physical characteristic of the environment that is conducive to ecological health and so is an environmental value under section 9 of the *Environmental Protection Act 1994*.
15. Desktop analysis by the department using available mapping tools indicates that the some of the dead or damaged vegetation is likely RE 11.3 4.

## Notice to conduct or commission an environmental evaluation

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16. The death and damage to the RE 11.3.4 and other surrounding vegetation, is considered environmental harm under section 14 of the *Environmental Protection Act 1994*.
17. A report submitted to the department by RTAY in late 2014, which was prepared by Red Earth Engineering, for the purpose of proposing temporary mitigation options, identified a number of small watercourses which run through the groundwater expression area, with the overall drainage flowing to the north-west in to Larcom Creek.
18. Larcom Creek is included in the *Curtis Island, Calliope River and Boyne River Basins Environmental Values and Water Quality Objectives*, under the *Environmental Protection (Water) Policy 2009*, which lists environmental values by waterway and states the following environmental values are applicable to Larcom Creek;
  - Aquatic ecosystems;
  - Irrigation Farm supply/use;
  - Stock water;
  - Aquaculture;
  - Human consumer;
  - Primary recreation;
  - Secondary recreation;
  - Visual recreation;
  - Drinking water;
  - Industrial use; and
  - Cultural and spiritual values.
19. In the absence of intervention by RTAY, during a rainfall event it is likely that the contaminated ponded water at the NGE and FWDE will migrate to Larcom Creek via the two ephemeral drainage channels which run through the groundwater expression areas. Such a discharge is likely to cause environmental harm to environmental values listed in the *Curtis Island, Calliope River and Boyne River Basins Environmental Values and Water Quality Objective*.
20. In late 2014 RTAY submitted to the department, a conceptual design for the construction a temporary levee to capture contaminated water accumulated during 24hr 60mm rainfall events as the initial mitigation option to minimise environmental harm while a more permanent solution was investigated.
21. On 26 February 2015, an alternative and preferred mitigation proposal was provided to the department for an extensive channel collection system designed to collect and pump back contaminated stormwater run-off from the groundwater expression areas during low intensity rain events.
22. In order to minimise environmental harm, RTAY confirmed on 24 March 2015 that the first short-term mitigation actions had been undertaken, which involved;
  - the construction of a system comprised of a trench, sump, pipelines and pump, being implemented to collect and transport ponded groundwater at the NGE to the RMA; and
  - the pumping of ponded groundwater from the FWDE to the RMA.

### B. Requirements

The report on the environmental investigation must address the following relevant matters:

## Notice to conduct or commission an environmental evaluation

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1. Identify all possible groundwater expressions associated with the Residue Management Area in addition to the already identified Northern Groundwater Expression and Firewater Dams Expression.
2. Identify the source, cause and extent of groundwater expressions associated with the Residue Management Area.
3. Characterise the chemical composition of the groundwater expression water and, with reference to Australia and New Zealand Environment Conservation Council and the Queensland Water Quality Guidelines, identify aspects of the water chemistry that have the potential to cause environmental harm in the receiving environment.
4. Determine the geographical extent of actual and potential contamination in the receiving environment. The investigation must include, but should not necessarily be limited to the following:
  - a. identification of the relevant environmental values;
  - b. conceptual models that delineate the geographical extent of the actual and potential contamination;
  - c. assessments of the impacts on:
    - i. water quality for surface and groundwaters including shallow water aquifers on and off the RTAY tenements;
    - ii. sediment quality;
    - iii. soils;
    - iv. flora and fauna;
  - d. a comparison and review of previous relevant studies undertaken;
  - e. a comparison to valid reference sites.
5. Assessments must be carried out in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) and AusRivas methodology and / or alternative methods where these are justified on the grounds that the alternative methods will provide a relevant and reliable assessment;
6. Based on the investigations undertaken under requirements 1 to 5, determine and report on all available remediation and rehabilitation options, including costs, and detail remedial works required to prevent contaminated water being discharge to the receiving environment and to rehabilitate impacted environmental values. Remediation and rehabilitation options must ensure ongoing protection of the environmental values of the receiving environment.
7. From the options provided in requirement 6 nominate a preferred solution and provide a timetable for implementation of the necessary remedial and rehabilitative works.

The environmental investigation must be carried out, and the environmental report prepared, by a suitably qualified person.

A suitably qualified person is defined as a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter, and can give authoritative assessment, advice and analysis using relative relevant protocols, standards, methods or literature.

The environmental report must be submitted to the department on or before:

- 4:00pm 14 October 2015.

## Notice to conduct or commission an environmental evaluation

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As the recipient of this notice, you are also required to provide a statutory declaration in the form attached, to accompany the environmental report submitted to the department. The suitably qualified person who prepares the environmental report must also provide a statutory declaration in the form attached to accompany the environmental report submitted to the department.

You can view an electronic version of the statutory declaration for a recipient using the following search term (EM494).<sup>1</sup>

An electronic version of the statutory declaration for a suitably qualified person form is available using the search term (EM471).

### **Take notice:**

1. the requirements of the notice to conduct or commission an environmental investigation take effect immediately upon service of this notice;
2. this notice remains in force until further notice from the department; and
3. you are responsible for meeting the costs of conducting or commissioning the environmental evaluation, preparing the environmental report and providing any further information as requested by the department.

### **C. Reviews and appeals**

The provisions regarding reviews of decisions and appeals are found in sections 519 to 539 of the Act.

A person who is dissatisfied with certain decisions of the department, may be able to apply to have the department review that original decision.

Generally, a request to have a decision reviewed must be made:

- within 10 business days of the decision being notified to the person;
- be supported by enough information to enable the department to decide the application for review; and
- be made using the application for review of an original decision form (EM709).

Where an application has been made for a decision to be reviewed, the applicant may also apply to the relevant court for a stay of the decision to secure the effectiveness of the review.

Once the original decision has been reviewed, a person who is dissatisfied with the review decision may be able to appeal against that decision to the relevant court within 22 business days after receiving notice of the review decision.

A person whose interests are or would be adversely affected by a decision of the department may also be able to request a statement of reasons for a decision or a statutory order review under the *Judicial Review Act 1991*.

For further information about reviews and appeals see the:

1. Information sheet - internal review and appeal to the Planning and Environment Court (EM1866).
2. Information sheet - internal review and appeal to the Land Court (EM1157).

You may have other legal rights or obligations and should seek your own legal advice.

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<sup>1</sup> This is the publication number. The publication number can be used as a search term to find the latest version of a publication at <[www.ehp.qld.gov.au](http://www.ehp.qld.gov.au)>.

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**Notice to conduct or commission an environmental evaluation**

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**D. Penalty**

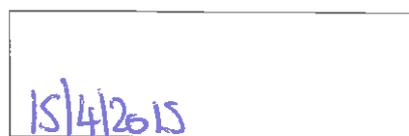
Failure to comply with a notice to conduct or commission an environmental evaluation is an offence.

1. The maximum penalty for an individual is 300 penalty units, totalling \$34,155.
2. The maximum penalty for a corporation is 1500 penalty units, totalling \$170,775.

Should you have any queries in relation to this notice, please contact David Love of the department on telephone number (07) 4971 6508.



Signature



Date

Hamish Butler  
A/Compliance Manager  
Delegate of the Chief Executive  
Department of Environment and Heritage Protection  
*Environmental Protection Act 1994*

**Enquiries:**  
PO Box 7230  
CAIRNS QLD 4870  
Ph: (07) 4222 5334  
Email: ESCairns@ehp.qld.gov.au

# Statutory Declaration

*Environmental Protection Act 1994*

**Environmental Evaluation**

## **Suitably qualified person**

*A Statutory Declaration is a written statement of facts that is sworn or declared under the Oaths Act 1867. This Statutory Declaration must be completed by the person who conducted the environmental evaluation and accompany the environmental report submitted to the Department of Environment and Heritage Protection (the department).*

### **Oaths Act 1867**

**QUEENSLAND  
TO WIT**

I

\_\_\_\_\_

Insert the name of the person making this declaration

of

\_\_\_\_\_

Insert the street address of the person making this declaration

in the State of Queensland do solemnly and sincerely declare that:

- I am the suitably qualified person and author of an environmental report entitled

\_\_\_\_\_

Insert title of the environmental report

In accordance with the environmental evaluation issued by the department under the Act to:

\_\_\_\_\_

Insert name of recipient of the notice

\_\_\_\_\_

Insert date of the notice

A copy of my report is attached to this statutory declaration and marked "A".

I possess the following qualifications and experience relevant to this environmental evaluation:

\_\_\_\_\_

I have not knowingly included any false, misleading or incomplete information in the report; and

I have not knowingly failed to reveal any relevant information or document to the department.

I certify that:

- The report addresses the relevant matters for the evaluation and is factually correct; and
- The opinions expressed in it are honestly and reasonably held.

I make this solemn declaration conscientiously believing the same to be true, and by virtue of the *Oaths Act 1867*.

Taken and declared before me, at

\_\_\_\_\_

Insert location

this \_\_\_\_\_ day of \_\_\_\_\_ in the year \_\_\_\_\_

Insert day (e.g. 18th)                      Insert month                      Insert year

\_\_\_\_\_  
Signed  
(Person making this declaration)

\_\_\_\_\_  
Signed  
<INSERT Justice of the Peace / Commissioner  
for Declarations / Lawyer>

\_\_\_\_\_  
Printed name and registration number (if  
applicable)

# Statutory Declaration

*Environmental Protection Act 1994*

**Environmental Evaluation**

## Recipient

*A Statutory Declaration is a written statement of facts that is sworn or declared under the Oaths Act 1867. In accordance with section 326E of the Environmental Protection Act 1994 (the Act), this Statutory Declaration must be completed by the recipient of an environmental evaluation notice and must accompany the environmental report submitted to the Department of Environment and Heritage Protection (the department).*

### **Oaths Act 1867**

**QUEENSLAND**

**TO WIT**

I \_\_\_\_\_

Insert the name of the person making this declaration

of \_\_\_\_\_

Insert the street address of the person making this declaration

in the State of Queensland do solemnly and sincerely declare that in accordance with section 326E of the *Environmental Protection Act 1994* (the Act), I have:

- not knowingly given any false or misleading information; and
- given all relevant information

to the person who carried out the environmental evaluation, over the period:

to

\_\_\_\_\_

Insert start date

\_\_\_\_\_

Insert end date

for the purpose of submitting a report in accordance with the environmental evaluation notice issued by the department under the Act to:

\_\_\_\_\_

Insert name of recipient of the notice

\_\_\_\_\_

Insert date of the notice

A copy of the report is attached to this statutory declaration and marked "A".

I make this solemn declaration conscientiously believing the same to be true, and by virtue of the *Oaths Act 1867*.

Taken and declared before me, at

\_\_\_\_\_

Insert location

this

day of

in the  
year

\_\_\_\_\_

Insert day (e.g. 18th)

\_\_\_\_\_

Insert month

\_\_\_\_\_

Insert year

\_\_\_\_\_  
Signed

(Person making this declaration)

\_\_\_\_\_  
Signed

<INSERT Justice of the Peace / Commissioner  
for Declarations / Lawyer>

\_\_\_\_\_  
Printed name and registration number (if  
applicable)

# Information sheet

*Environmental Protection Act 1994*

## Internal review and appeal to Land Court

*This information sheet forms part of an information notice under the Environmental Protection Act 1994. It gives a summary of the process for review and appeal under the Environmental Protection Act and subordinate legislation. Refer to ss. 519 to 530 and Part 1 of Schedule 2 of the Environmental Protection Act for complete information about the process for internal review and appeal to the Land Court.*

### Introduction

The *Environmental Protection Act 1994* (EP Act) provides for a right of internal review of certain decisions made under the EP Act. Decisions that can be reviewed are listed in Schedule 2 of the EP Act. The EP Act also provides that a dissatisfied person for a review decision listed in Part 1 of Schedule 2 of the EP Act may appeal against the original decision or the review decision to the Land Court.

### Summary of the process for internal review and appeal to the Land Court

#### Chapter 11, Part 3 of the EP Act

#### Division 1—Interpretation

##### Section 519 Original decisions

- 1) A decision mentioned in schedule 2 is an 'original decision'.
- 2) A decision under an environmental protection policy or regulation that the policy or regulation declares to be a decision to which this part applies is also an original decision.

##### Section 520 Dissatisfied person

This section nominates the dissatisfied person for an original or review decision.

#### Division 2—Internal review of decisions

##### Section 521 Procedure for review

- 1) A dissatisfied person may apply for a review of an original decision.
- 2) The application must—
  - a) be made in the approved form to the administering authority within—
    - i) 10 business days<sup>1</sup> after the day on which the person receives notice of the original decision or the administering authority is taken to have made the decision (the 'review date'); or
    - ii) the longer period the authority in special circumstances allows; and
  - b) be supported by enough information to enable the authority to decide the application.
- 3) On or before making the application, the applicant must send the following documents to the other persons who were given notice of the original decision—
  - a) notice of the application (the 'review notice');

- b) a copy of the application and supporting documents.
- 4) The review notice must inform the recipient that submission on the application may be made to the administering authority within 5 business days after the application is made to the authority.
- 5) If the administering authority is satisfied the applicant has complied with subsections (2) and (3), the authority must, within 10 business days after receiving the application—
  - a) review the original decision;
  - b) consider any submissions properly made by a recipient of the review notice; and
  - c) make a decision (the 'review decision') to—
    - i) confirm or revoke the original decision; or
    - ii) vary the original decision in a way the administering authority considers appropriate.
- 6) The application does not stay (i.e. suspend or stop) the original decision.
- 7) The application must not be dealt with by—
  - a) the person who made the original decision; or
  - b) a person in a less senior office than the person who made the original decision.
- 8) Within 10 business days after making the review decision, the administering authority must give written notice of the decision to the applicant and persons who were given notice of the original decision.
- 9) The notice must—
  - a) include the reasons for the review decision; and
  - b) inform the person of their right of appeal against the decision.
- 10) If the administering authority does not comply with subsection (5) or (8), the authority is taken to have made a decision confirming the original decision.
- 11) Subsection (7) applies despite the *Acts Interpretation Act 1954*, s. 27A.
- 12) This section does not apply to an original decision made by—
  - a) for a matter, the administration and enforcement of which has been devolved to a local government—the local government itself or the chief executive officer of the local government personally; or
  - b) for another matter—the chief executive personally.
- 13) Also, this section does not apply to an original decision to issue a clean-up notice.

**Section 522 Stay of operation of particular original decisions**

- 1) If an application is made for review of an original decision mentioned in schedule 2, part 1 or 2, the applicant may immediately apply for a stay of the decision to—
  - a) for an original decision mentioned in schedule 2, part 1—the Land Court; or
  - b) for an original decision mentioned in schedule 2, part 2—the Court.
- 2) The Land Court or the Court may stay the decision to secure the effectiveness of the review and any later appeal to the Land Court or the Court.

- 3) A stay may be given on conditions the Land Court or the Court considers appropriate and has effect for the period stated by the Land Court or the Court.
- 4) The period of a stay must not extend past the time when the administering authority reviews the decision and any later period the Land Court or the Court allows the applicant to enable the applicant to appeal against the review decision.

### **Division 3—Appeals**

#### **Subdivision 1—Appeals to Land Court**

##### **Section 523 Review decisions subject to Land Court appeal**

This subdivision applies to original decisions mentioned in Schedule 2, Part 1 of the EP Act.

##### **Section 524 Right of appeal**

A dissatisfied person who is dissatisfied with the decision may appeal against the decision to the Land Court.

##### **Section 525 Appeal period**

- 1) The appeal must be started within 22 business days after the appellant receives notice of the decision.
- 2) However, the Land Court may at any time extend the time for starting the appeal.

##### **Section 526 Land Court mediation**

- 1) Any party to the appeal may, at any time before the appeal is decided, ask the Land Court to conduct or provide mediation for the appeal.
- 2) The mediation must be conducted by the Land Court or a mediator chosen by the Land Court<sup>2</sup>.

##### **Section 527 Nature of appeal**

The appeal is by way of rehearing, unaffected by the review decision.

##### **Section 528 Land Court's powers for appeal**

In deciding the appeal, the Land Court has the same powers as the administering authority.

##### **Section 529 Decision for appeals against refusals under s. 207**

- 1) This section applies if the decision appealed against is a decision under s. 207 to refuse to allow an application for environmental authority (mining lease) to proceed.
- 2) In deciding the appeal the Land Court must confirm the decision or allow the appeal.
- 3) If the appeal is allowed—
  - a) the relevant period for the administering authority to make the decision is taken to have been extended to when the decision on the appeal is made; and
  - b) the authority is taken, at the end of the period, not to have made the decision.

##### **Section 530 Decision for other appeals**

- 1) This section applies if the decision appealed against is not a decision mentioned in s. 529(1).
- 2) In deciding the appeal, the Land Court may—
  - a) confirm the decision;
  - b) set aside the decision and substitute another decision; or

- c) set aside the decision and return the matter to the administering authority who made the decision, with directions the Land Court considers appropriate.
- 3) In setting aside or substituting the decision, the Land Court has the same powers as the authority.
- 4) However, this part does not apply to a power exercised under subsection (3).
- 5) If the Land Court substitutes another decision, the substituted decision is taken for this Act, other than this subdivision, to be the authority's decision.

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<sup>1</sup> Under the *Environmental Protection Act 1994* business days—'generally, does not include a day between 26 December and 1 January in the following year'.

<sup>2</sup> For information on how to start the appeal, see the *Land and Court Rules 2000*. For information on the conduct of the mediation, see the *Land Court Act 2000*. Information is also available on the Land Court website at <[www.landcourt.qld.gov.au](http://www.landcourt.qld.gov.au)>.

# Information sheet

*Environmental Protection Act 1994*

## Internal review and appeal to Planning and Environment Court

*This information sheet forms part of an information notice under the Environmental Protection Act 1994. It gives a summary of the process for review and appeal to the Planning and Environment Court under the Environmental Protection Act and subordinate legislation. Refer to ss. 519 - 539 and schedule 2 of the Environmental Protection Act for complete information about the process for internal review and appeal to the Planning and Environment Court.*

### Introduction

The *Environmental Protection Act 1994* (EP Act) provides for a right of internal review and appeal against certain decisions made under the EP Act. Decisions that can be reviewed or appealed are listed in schedule 2 of the EP Act and within certain sections of the regulations and subordinate legislation<sup>1</sup> made under the EP Act. The EP Act also provides that a dissatisfied person for a review decision, other than those listed in part 1 of schedule 2 of the EP Act<sup>2</sup>, may appeal the decision to the Planning and Environment Court (the Court).

### Summary of the process for internal review and appeal to the Court

#### Chapter 11, Part 3 of the EP Act

#### Division 1 — Interpretation

##### Section 519 Original decisions

- 1) A decision mentioned in schedule 2 is an 'original decision'.
- 2) A decision under an environmental protection policy or regulation that the policy or regulation declares to be a decision to which this part applies is also an 'original decision'.

##### Section 520 Dissatisfied person

This section nominates the dissatisfied person for an original or review decision.

#### Division 2 — Internal review of decisions

##### Section 521 Procedure for review

- 1) A dissatisfied person may apply for a review of an original decision.
- 2) The application must—
  - a) be made in the approved form to the administering authority within—
    - i) 10 business days<sup>3</sup> after the day on which the person receives notice of the original decision or the administering authority is taken to have made the decision (the 'review date'); or
    - ii) the longer period the authority in special circumstances allows ; and
  - b) be supported by enough information to enable the authority to decide the application.
- 3) On or before making the application, the applicant must send the following documents to the other persons who were given notice of the original decision—

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Internal review and appeal to Planning and Environment Court

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- a) notice of the application (the 'review notice');
  - b) a copy of the application and supporting documents.
- 4) The review notice must inform the recipient that submission on the application may be made to the administering authority within five business days after the application is made to the authority.
- 5) If the administering authority is satisfied the applicant has complied with subsection (2) and (3), the authority must, within 10 business days after receiving the application—
- a) review the original decision;
  - b) consider any submissions properly made by a recipient of the review notice; and
  - c) make a decision (the 'review decision') to—
    - i) confirm or revoke the original decision; or
    - ii) vary the original decision in a way the administering authority considers appropriate.
- 6) The application **does not** stay the original decision.
- 7) The application must not be dealt with by—
- a) the person who made the original decision; or
  - b) a person in a less senior office than the person who made the original decision.
- 8) Within 10 business days after making the review decision, the administering authority must give written notice of the decision to the applicant and persons who were given notice of the original decision.
- 9) The notice must—
- a) include the reasons for the review decision; and
  - b) inform the person of their right of appeal against the decision.
- 10) If the administering authority does not comply with subsections (5) or (8), the authority is taken to have made a decision confirming the original decision.
- 11) Subsection (7) applies despite the *Acts Interpretation Act 1954*, section 27A.
- 12) This section does not apply to an original decision made by—
- a) for a matter, the administration and enforcement of which has been devolved to a local government, the local government itself or the chief executive officer of the local government personally; or
  - b) for another matter — the chief executive personally.
- 13) Also, this section does not apply to an original decision to issue a clean-up notice.

**Section 522 Stay of operation of original decisions**

- 1) If an application is made for review of an original decision, the applicant may immediately apply for a stay of the decision to—
  - a) for an original decision mentioned in schedule 2, part 1—the Land Court; or
  - b) for an original decision mentioned in schedule 2, part 2—the Court.
- 2) The Land Court or the Court may stay the decision to secure the effectiveness of the review and any later appeal to the Land Court or the Court.

## Internal review and appeal to Planning and Environment Court

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- 3) A stay may be given on conditions the Land Court or the Court considers appropriate and has effect for the period stated by the Land Court or the Court.
- 4) The period of a stay must not extend past the time when the administering authority reviews the decision and any later period the Land Court or the Court allows the applicant to enable the applicant to appeal against the review decision.

### Division 4 — Appeals to Court

#### Section 531 Who may appeal

- 1) A dissatisfied person who is dissatisfied with a review decision, other than a review decision to which subdivision 1<sup>4</sup> applies, may appeal against the decision to the Court.
- 2) The chief executive may appeal against another administering authority's decision (whether an original or review decision) to the Court.
- 3) A dissatisfied person who is dissatisfied with an original decision to which s. 521 does not apply may appeal against the decision to the Court.

#### Section 532 How to start appeal

- 1) An appeal is started by—
  - a) filing written notice of appeal with the registrar of the Court; and
  - b) complying with rules of court applicable to the appeal.
- 2) The notice of appeal must be filed—
  - a) if the appellant is the chief executive—within 33 business days after the decision is made or taken to have been made; or
  - b) if the appellant is not the chief executive—within 22 business days after the day the appellant receives notice of the decision or the decision is taken to have been made.
- 3) The Court may at any time extend the period for filing the notice of appeal.
- 4) The notice of appeal must state fully the grounds of the appeal and the facts relied on.

#### Section 533 Appellant to give notice of appeal to other parties

- 1) Within 8 business days after filing the notice of appeal, the appellant must serve notice of the appeal on—
  - a) if the appellant is the chief executive—all persons who were given notice of the original decision; or
  - b) if the appellant is not the chief executive—the other persons who were given notice of the original decision.
- 2) The notice must inform the persons that, within 10 business days after service of the notice of appeal, they may elect to become a respondent to the appeal by filing in the Court a notice of election under rules of court.

#### Section 534 Persons may elect to become respondents to appeal

A person who properly files in the Court a notice of election becomes a respondent to the appeal.

#### Section 535 Stay of operation of decisions

- 1) The Court may grant a stay of a decision appealed against to secure the effectiveness of the appeal.

## Internal review and appeal to Planning and Environment Court

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- 2) A stay may be granted on conditions the Court considers appropriate and has effect for the period stated by the Court.
- 3) The period of a stay must not extend past the time when the Court decides the appeal.
- 4) An appeal against a decision does not affect the operation or carrying out of the decision unless the decision is stayed.

### Section 535A Stay of decision to issue a clean-up notice

- 5) This section applies to an application under section 535 for a stay of a decision to issue a clean-up notice.
- 6) In deciding the application, the Court must have regard to—
  - a) the quantity and quality of contamination of the environment that is likely to be caused if the stay is granted; and
  - b) the proximity of the place at or from which the contamination incident is happening or happened to a place with environmental values that may be adversely affected by the contamination.

### Section 536 Hearing procedures

- 1) The procedure for an appeal is to be in accordance with the rules of court applicable to the appeal or, if the rules make no provision or insufficient provision, in accordance with directions of the judge.
- 2) An appeal is by way of rehearing, unaffected by the administering authority's decision.

### Section 537 Assessors

If the judge hearing an appeal is satisfied the appeal involves a question of special knowledge and skill, the judge may appoint one or more assessors to help the judge in deciding the appeal.

### Section 538 Appeals may be heard with planning appeals

- 1) This section applies if—
  - a) a person appeals against an administering authority's decision (whether an original or review decision) to refuse to grant a registration certificate or to accredit an environmental risk management plan (ERMP); and
  - b) a person appeals against the assessment manager's decision under the *Sustainable Planning Act 2009* about a planning or development matter for the premises to which the certificate or the ERMP or the application for the certificate relates.
- 2) On the application of a party to either of the appeals, the Court may order—
  - a) the appeals to be heard together or one immediately after the other; or
  - b) one appeal to be stayed until the other has been decided.
- 3) The application may be made—
  - a) by an appellant when starting an appeal or at any time before the appeals are decided; or
  - b) by another party at any time before the appeals are decided.
- 4) This section applies even though the parties, or all of the parties, to the appeals are not the same.

### Section 539 Powers of Court on appeal

- 1) In deciding an appeal, the Court may—

- a) confirm the decision appealed against; or
  - b) vary the decision appealed against; or
  - c) set aside the decision appealed against and make a decision in substitution for the decision set aside.
- 2) If on appeal the Court acts under subsection (1)(b) or (c), the decision is taken, for this Act (other than this part), to be that of the administering authority.

### Further information

The latest version of this publication can be found at <[www.ehp.qld.gov.au](http://www.ehp.qld.gov.au)>. Note: where available, the publication number (e.g. EM1866 for this document) can be used as a search term.

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<sup>1</sup> The original decisions under the subordinate legislation are subject to change. As at 11 May 2010 they are listed in:

- Regulation 110 of the Environmental Protection Regulation 2008; and
- Regulation 68C of the Environmental Protection (Waste Management) Regulation 2000.

<sup>2</sup> An appeal may be made to the Land Court for original decisions in part 1 of schedule 2.

<sup>3</sup> Under the *Environmental Protection Act 1994* "business days does not include a business day between 26 December and 1 January in the following year".

<sup>4</sup> Subdivision 1 is about appeals to the Land Court and information about this is contained in ss. 519 - 539.

# Notice

## *Environmental Protection Act 1994*

### **Environmental Protection Order**

*This environmental protection order is issued by the administering authority pursuant to section 358 of the Environmental Protection Act 1994.*

RTA Yarwun Pty Ltd  
123 Albert Street  
BRISBANE QLD 4000

Your reference: EPPR00926513

Our reference: 101/0006008|n4743187|CA34297

19 August 2016

Dear Mr McGibbon

**Take notice:** that under the *Environmental Protection Act 1994* (the Act) this environmental protection order (EPO) is issued to RTAY Yarwun Pty Ltd (you) by the administering authority. The administering authority is the Chief Executive of the Department of Environment and Heritage Protection (the department).

The EPO is issued in respect to the activities of RTAY Yarwun Pty Ltd at 975 Hanson Road, Yarwun, QLD, 4680 on land described as Lot 1 SP144430 (the premises).

#### **A. Grounds**

This EPO is issued on the following grounds:

- The administering authority is satisfied, because of an environmental evaluation conducted by the person, unlawful environmental harm is being, or is likely to be, caused.

The facts and circumstances forming the basis for these grounds are:

- RTA Yarwun Pty Ltd (RTAY) is permitted to undertake ERA 60 Waste Disposal, in order to dispose of residue from the process of alumina refining at the premises. The residue is disposed of in a tailings dam in the area known as the Residue Management Area (RMA).
- RTAY observed two areas of groundwater expression in 2013:
  - An area to the north of the RMA boundary, outside of the RTAY tenure, called the Northern Groundwater Expression (NGE).
  - An area to the northeast of the RMA boundary, on the RTAY tenure and within a car park and fire water dams, called the Fire Water Dam Expression (FWDE).

- At a meeting on 26 August 2014 RTAY informed the department of the two groundwater expressions first observed in 2013 to the north and northeast of the RMA; the NGE and the FWDE.
- Departmental officers inspected the NGE on Friday 5 September 2014 and observed an area with water ponding on the surface of the land surrounded by approximately 7ha (as estimated by RTAY) of dead vegetation. Departmental officers undertook water quality sampling of the ponded water at the NGE and results found high salinity (53.8 mS/cm).
- RTA Yarwun Pty Ltd provided (the department) with a report titled Investigation of dead vegetation north of the RTA Yarwun RMA dated October 2014 (Report number 590404001561-1). The report found that multiple lines of evidence clearly show the death of the vegetation is a result of salt scalding from the naturally saline groundwater expression in the area north of the RMA. The report found that decant water from the RMA was not present in the groundwater expressed in the impacted area.
- The department issued an Environmental Evaluation (EE) Notice to RTA Yarwun Pty Ltd on 15 April 2015. The EE broadly required the source, cause and extent of groundwater expressions associated with the residue management area to be investigated.
- RTA Yarwun Pty Ltd submitted an EE Report to the department on 14 October 2015.
- The EE Report identified the likely cause of the groundwater expressions as groundwater pressure in the foundation materials beneath the RMA and progressive mounding of underlying naturally saline groundwater within the foundation materials beneath the RMA. The increased downward pressure of the tailings is thought to be compressing the natural ground underlying the RMA. A comparison of the chemical signatures of water from toe drains, various piezometers, the Firewater dam and RMA decant water was undertaken in addition to geophysical surveying. All seepage, piezometer and dam water samples were found to be groundwater and not seepage from the RMA.
- The Report also indicates the location of the RMA dam in the valley floor is potentially limiting the movement of groundwater from the topographic high in the east, resulting in increased pressures in the vicinity of the dam.
- The EE Report identified both groundcover and tree vegetation within and close to the site is being impacted by expressed saline groundwater. As a result of the expressed groundwater salt scalding has occurred in this area. Sump EC concentrations fluctuated between 20,000 and 50,000  $\mu\text{S}/\text{cm}$  over the period December 2014-August 2015.
- The Queensland Government data set Biodiversity status of pre-clearing and remnant regional ecosystems series identifies vegetation at or immediately downstream of the groundwater expression as remnant vegetation containing Of Concern regional ecosystems (RE) 11.3.
- Environmental harm as defined by section 14 of the Environmental Protection Act 1994 is any adverse effect, or potential adverse effect (whether temporary or permanent and whatever magnitude, duration or frequency) on an environmental value.
- An environmental value, defined in section 9 of the Environmental Protection Act 1994 is a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety.
- The Of Concern regional ecosystem is considered to be a physical characteristic of the environment that is conducive to ecological health and therefore is an environmental value under section 9 of the Environmental Protection Act 1994.
- Based on the EE Report provided by RTA Yarwun Pty Ltd and observations made by departmental officers, the department is of the opinion that the operation of the RMA has caused and is likely to

continue to cause unlawful environmental harm. The department acknowledges the efforts RTAY have made to mitigate the environmental impact(s) of the groundwater expression via the implementation of the short term management strategy (STMS).

## B. Requirements

In accordance with this EPO, you are required to do the following:

1. RTAY must develop and implement a Long Term Management Strategy (LTMS):
  - a. By 22 December 2016, you must develop and provide the department with a copy of the pre-feasibility study for an appropriate LTMS to relieve the observed groundwater pressures and to prevent saline groundwater expression.
  - b. By 30 May 2018, you must develop and provide the department with a copy of the feasibility study for an appropriate LTMS.
  - c. You must implement the LTMS as soon as practically possible after the completion of the feasibility study to ensure sufficient data is available to determine the success of the LTMS.

Any planned expansion of the Residue Management Area must be taken into consideration when planning for the LTMS to ensure management options are sufficient to prevent expression of groundwater.

2. By 1 November 2016, you must prepare and implement a groundwater-monitoring program to obtain long-term data of event and base flows over several wet seasons to assess the effectiveness of the LTMS.

The groundwater-monitoring program must be developed by an appropriately qualified person in the fields of hydrogeology and groundwater sampling design.

3. Annually from commencement of the EPO, a groundwater monitoring report must be submitted to the administering authority ensuring that one full wet season (November – April) of data is captured in each report.

The report must include but is not limited to:

- Details of the monitoring undertaken, including details of the sampling framework applied;
  - Details of the groundwater analysis undertaken and quality assurance and quality control measures applied;
  - A summary of the monitoring results obtained; and
  - An interpretation, evaluation and explanation of the results by an appropriately qualified person in the field of water quality monitoring and assessment with determinations made as to the nature and extent of any environmental impact on the receiving environment and the success of the LTMS.
4. You must develop and submit to the administering authority a rehabilitation feasibility study for the impacted area (Lot 68 SP272417, Lot 8 SP245936, Lot 7 SP177782). The feasibility study is to be submitted at same time of requirement 1 (b) 30 May 2016. The feasibility study must be completed by a suitably qualified person.

RTAY must submit a copy of the rehabilitation feasibility study to the administering authority and implement if deemed suitable by the department.

RTAY must consider:

- The likely success of re-establishing a viable plant community; and
  - The alternative of securing a biodiversity offset.
  - Planned operational land use of the impacted area.
5. You must notify the administering authority as soon as practically possible of becoming aware of any monitoring result that indicates the presence of decant water from the RMA in groundwater and/or surface water.
6. By 1 November 2016, you must prepare and implement a surface water-monitoring program to assess the effectiveness of the implemented LTMS at preventing the contamination of receiving waters from saline groundwater expressions.

The surface water-monitoring program must be developed by an appropriately qualified person and must include but is not limited to:

- Monitoring of surface water quality must include but not limited to the following parameters:
    - Insitu monitoring pH, temperature, dissolved oxygen, electrical conductivity.
    - Laboratory analysed (NATA accredited) samples for major ions and metals (dissolved and total).
  - Sampling must include the following locations:
    - Site(s) immediately downstream of the saline groundwater expression area;
    - Upstream reference site(s);
  - Downstream monitoring site(s) that are representative of;
    - All downstream watercourses; and
    - All downstream water types, such as swamps, freshwater streams and estuaries.
  - Sampling must be undertaken monthly and within 48 hours of a heavy rainfall event (heavy rainfall event is defined as >35mm in 24 hours).
  - Review of the surface water monitoring results to ensure early detection of decant signatures in surface water.
7. From commencement of the EPO, a surface water monitoring report must be submitted to the administering authority by 31<sup>st</sup> July each calendar year the EPO is in effect ensuring that one full wet season (November - April) of data is captured in each report.

The report must include but is not limited to:

- Details of the monitoring undertaken, including details of the sampling framework applied;
- Details of the analysis undertaken and quality assurance and quality control measures applied;
- The following statistics for each parameter at each sampling location:
  - 20th percentile;
  - Median or 50th percentile;
  - 80th percentile;
  - Mean, minimum and maximum.
- A summary of the monitoring results obtained; and

- An interpretation, evaluation and explanation of the results by an appropriately qualified person in the field of water quality monitoring and assessment with determinations made as to the nature and extent of any environmental impact on the receiving environment from the saline ground water expression.
8. The EPO will remain in force for a period of three years. From 30 September 2016 to 30 September 2019.

### **C. Obligations**

If you propose to dispose of the place or business to which the EPO relates, you **must** advise the buyer of the existence of this EPO.

If you cease to carry out the activity to which this EPO relates, you **must** give written notice of ceasing to carry out the activity to the department within 10 days of ceasing the activity.

#### **Take notice:**

1. the requirements of this order take effect immediately upon service of the order;
2. failure to comply with this order is an offence under the Act;
3. this order remains in force until further notice from the administering authority.

### **D. Penalty**

Failure to comply with an EPO is an offence.

1. The maximum penalty for an individual for wilfully contravening an EPO is 6250 penalty units, totalling \$761,875 or five years imprisonment.
2. The maximum penalty for a corporation for wilfully contravening an EPO is 31,250 penalty units, totalling \$3,809,375.
3. The maximum penalty for an individual for contravening an EPO is 4500 penalty units, totalling \$548,550
4. The maximum penalty for a corporation for contravening an EPO is 22,500 penalty units, totalling \$2,742,750

Failure to provide written notice to the buyer is an offence.

1. The maximum penalty for an individual is 50 penalty units, totalling \$6095.
2. The maximum penalty for a corporation is 250 penalty units, totalling \$30,475.

Failure to provide written notice within 10 business days of ceasing the activity to the department is an offence.

3. The maximum penalty for an individual is 50 penalty units, totalling \$6095.
4. The maximum penalty for a corporation is 250 penalty units, totalling \$30,475.

Section 3 of the Penalties and Sentences Regulation 2015 prescribes the monetary value of a penalty unit.

### **E. Reviews and appeals**

The provisions regarding review of decisions and appeals may be found in sections 519 to 539 of the Act.

A person who is dissatisfied with certain decisions of the department, may be able to apply to have the department review that original decision.

Generally, a request to have a decision reviewed must be made:

1. within 10 business days of the decision being notified to the person;
2. be supported by enough information to enable the department to decide the application for review; and
3. be made using the application for review of an original decision form (EM709).<sup>1</sup>

Where an application has been made for a decision to be reviewed, the applicant may also apply to the relevant court for a stay of the decision to secure the effectiveness of the review.

Once the original decision has been reviewed, a person who is dissatisfied with the review decision may be able to appeal against that decision to the relevant court within 22 business days after receiving notice of the review decision.

A person whose interests are or would be adversely affected by a decision of the department may also be able to request a statement of reasons for a decision or a statutory order review under the *Judicial Review Act 1991*.

For further information about reviews and appeals see the information sheet - internal review and appeal to the Planning and Environment Court (EM1866). You may have other legal rights or obligations and should seek your own legal advice.

Should you have any queries in relation to the notice, please contact David Love on telephone number 49716508



Signature



Date

Rebecca Booker  
Compliance Manager, Minerals  
Delegate of the Chief Executive  
Department of Environment and Heritage Protection  
*Environmental Protection Act 1994*

**Enquiries:**  
PO Box 5065 GLADSTONE QLD 4650  
Ph: (07) 49716512  
Email: cwes\_glastone@ehp.qld.gov.au

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<sup>1</sup> This is the publication number. The publication number can be used as a search term to find the latest version of a publication at <[www.ehp.qld.gov.au](http://www.ehp.qld.gov.au)>.

# **Environmental Management Register Search Results**



Department of Environment and Science (DES)  
ABN 46 640 294 485  
400 George St Brisbane, Queensland 4000  
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA  
www.des.qld.gov.au

**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50737495      EMR Site Id: 42557      17 November 2021  
Client Reference:  
Cheque Number:

This response relates to a search request received for the site:  
Lot: 91      Plan: SP122250

**EMR RESULT**

The above site IS included on the Environmental Management Register.

The site you have searched has been subdivided from the following site, which IS included on the EMR or the CLR.

Lot: 1      Plan: RP601330  
Address: BUTLER STREET  
YARWUN QLD 4680

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.  
RAILWAY YARDS - operating a railway yard including goods-handling yards, workshops and maintenance areas.

**CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

**ADDITIONAL ADVICE**

All search responses include particulars of land listed in the EMR/CLR when the search was generated.  
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

**Administering Authority**



Department of Environment and Science (DES)  
ABN 46 640 294 485  
400 George St Brisbane, Queensland 4000  
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA  
www.des.qld.gov.au

**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50737494      EMR Site Id: 53125      17 November 2021  
Client Reference:  
Cheque Number:

This response relates to a search request received for the site:  
Lot: 101      Plan: DS185

**EMR RESULT**

The above site IS included on the Environmental Management Register.  
Lot: 101      Plan: DS185  
Address: TOONDA/PT ALMA ROAD  
ULAM (R) 4702

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.  
**WASTE STORAGE, TREATMENT OR DISPOSAL** - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50, 000 persons having sludge drying beds or on-site disposal facilities.

**CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

**ADDITIONAL ADVICE**

All search responses include particulars of land listed in the EMR/CLR when the search was generated.  
The EMR/CLR does NOT include:-

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2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50737493      EMR Site Id: 20783      17 November 2021  
Client Reference:  
Cheque Number:

This response relates to a search request received for the site:  
Lot: 1      Plan: RP911260

**EMR RESULT**

The above site IS included on the Environmental Management Register.

The site you have searched has been subdivided from the following site, which IS included on the EMR or the CLR.

Lot: 1      Plan: RP618672  
Address: BOAT CREEK ROAD  
YARWUN QLD 4694

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.  
LANDFILL - disposing of waste (excluding inert construction and demolition waste).

**CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

**ADDITIONAL ADVICE**

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2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

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**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50737492      EMR Site Id: 37992      17 November 2021  
Client Reference:  
Cheque Number:

This response relates to a search request received for the site:  
Lot: 7      Plan: SP145439

**EMR RESULT**

The above site IS included on the Environmental Management Register.

The site you have searched has been subdivided from the following site, which IS included on the EMR or the CLR.

Lot: 3      Plan: CP860100  
Address: MT. MILLER ROAD  
NOT ADVISED 4680

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.  
GUN, PISTOL OR RIFLE RANGE - operating a gun, pistol or rifle range.

**CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

**ADDITIONAL ADVICE**

All search responses include particulars of land listed in the EMR/CLR when the search was generated.

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1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

**Administering Authority**



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**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50737491      EMR Site Id: 54061      17 November 2021  
Cheque Number:  
Client Reference:

This response relates to a search request received for the site:  
Lot: 140      Plan: SP122252

**EMR RESULT**

The above site IS included on the Environmental Management Register.

Lot: 140      Plan: SP122252  
Address: MOUNT LARCOM  
MOUNT LARCOM 4680

The site has been subject to contamination from a hazardous contaminant as follows:  
HAZARDOUS CONTAMINANT - This site has been subject to a hazardous contaminant. Refer to the summary given below.  
Possible high arsenic levels along rail corridor.

**CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

**ADDITIONAL ADVICE**

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1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

**Administering Authority**



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**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50738834      EMR Site Id: 70683      23 November 2021  
Client Reference:  
Cheque Number:

This response relates to a search request received for the site:  
Lot: 1      Plan: SP144430

**EMR RESULT**

The above site IS included on the Environmental Management Register.

Lot: 1      Plan: SP144430  
Address: 293 MYLREA ROAD  
ALDOGA QLD 4694

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.

**WASTE STORAGE, TREATMENT OR DISPOSAL** - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50, 000 persons having sludge drying beds or on-site disposal facilities.

**ABRASIVE BLASTING** - carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.

**CHEMICAL MANUFACTURE OR FORMULATION** - manufacturing, blending, mixing or formulating chemicals if -

- (a) the chemicals are designated dangerous goods under the dangerous goods code; and
- (b) the facility used to manufacture, blend, mix or formulate the chemicals has a design production capacity of more than 1 t per week.

**CHEMICAL STORAGE** - (other than petroleum products or oil under item 29) - storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.

**COAL FIRED POWER STATION** - operating a coal fired power station.

**ELECTRICAL TRANSFORMERS** - manufacturing, repairing or disposing of electrical transformers.

**METAL TREATMENT OR COATING** - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth).

**MINERAL PROCESSING** - chemically or physically extracting or processing metalliferous ores.

While sites are listed on the EMR using the lot and plan description, a mining lease may affect only a limited area of the lot. In many instances with rural properties, only a small area may be potentially affected by the mining activities and the ongoing landuse is unaffected. More detailed information relating to the location of the mining activities may be held by the Department of Environment and Science or the Department of Natural Resources, Mines and Energy.

**PETROLEUM PRODUCT OR OIL STORAGE** - storing petroleum products or oil -

(a) in underground tanks with more than 200L capacity; or

(b) in above ground tanks with -

(i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code - more than 2, 500L capacity; or

(ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code - more than 5, 000L capacity; or

(iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia - more than 25, 000L capacity.

**SMELTING OR REFINING** - fusing or melting metalliferous metal or refining the metal.

### **CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

### **ADDITIONAL ADVICE**

All search responses include particulars of land listed in the EMR/CLR when the search was generated.

The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

**Administering Authority**



Department of Environment and Science (DES)  
ABN 46 640 294 485  
400 George St Brisbane, Queensland 4000  
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**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50738836      EMR Site Id: 88957      23 November 2021  
Client Reference:  
Cheque Number:

This response relates to a search request received for the site:  
Lot: 8      Plan: SP218634

**EMR RESULT**

The above site IS included on the Environmental Management Register.

Lot: 8      Plan: SP218634  
Address: 975 HANSON ROAD  
THE NARROWS 4695

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.  
**LIVESTOCK DIP OR SPRAY RACE** - operating a livestock dip or spray race facility.

For the majority of rural properties only a small area may be affected by the chemicals used in livestock dips and spray races. The Department of Environment and Science may hold further information relating to the location of the dip site within this property.

**SMELTING OR REFINING** - fusing or melting metalliferous metal or refining the metal.

**ABRASIVE BLASTING** - carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.

**CHEMICAL MANUFACTURE OR FORMULATION** - manufacturing, blending, mixing or formulating chemicals if -

- (a) the chemicals are designated dangerous goods under the dangerous goods code; and
- (b) the facility used to manufacture, blend, mix or formulate the chemicals has a design production capacity of more than 1 t per week.

**CHEMICAL STORAGE** - (other than petroleum products or oil under item 29) - storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.

**COAL FIRED POWER STATION** - operating a coal fired power station.

**ELECTRICAL TRANSFORMERS** - manufacturing, repairing or disposing of electrical transformers.

**METAL TREATMENT OR COATING** - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth).

**MINERAL PROCESSING** - chemically or physically extracting or processing metalliferous ores.

While sites are listed on the EMR using the lot and plan description, a mining lease may affect only a limited area of the lot. In many instances with rural properties, only a small area may be potentially affected by the mining activities and the ongoing landuse is unaffected. More detailed information relating to the location of the mining activities may be held by the Department of Environment and

Science or the Department of Natural Resources, Mines and Energy.

**PETROLEUM PRODUCT OR OIL STORAGE** - storing petroleum products or oil -

(a) in underground tanks with more than 200L capacity; or

(b) in above ground tanks with -

(i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code - more than 2, 500L capacity; or

(ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code - more than 5, 000L capacity; or

(iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia - more than 25, 000L capacity.

**WASTE STORAGE, TREATMENT OR DISPOSAL** - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50, 000 persons having sludge drying beds or on-site disposal facilities.

### **CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

### **ADDITIONAL ADVICE**

All search responses include particulars of land listed in the EMR/CLR when the search was generated.

The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

**Administering Authority**



Department of Environment and Science (DES)  
ABN 46 640 294 485  
400 George St Brisbane, Queensland 4000  
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA  
www.des.qld.gov.au

**SEARCH RESPONSE**  
**ENVIRONMENTAL MANAGEMENT REGISTER (EMR)**  
**CONTAMINATED LAND REGISTER (CLR)**

Shannon Brown  
L-13 The Rocket 203 Robina Town Centre Drive  
Robina QLD 4226

Transaction ID: 50738835      EMR Site Id: 23 November 2021  
Cheque Number:  
Client Reference:

This response relates to a search request received for the site:  
Lot: 12      Plan: SP190336  
94 QUARRY RD  
YARWUN

**EMR RESULT**

The above site is NOT included on the Environmental Management Register.

**CLR RESULT**

The above site is NOT included on the Contaminated Land Register.

**ADDITIONAL ADVICE**

All search responses include particulars of land listed in the EMR/CLR when the search was generated.  
The EMR/CLR does NOT include:-

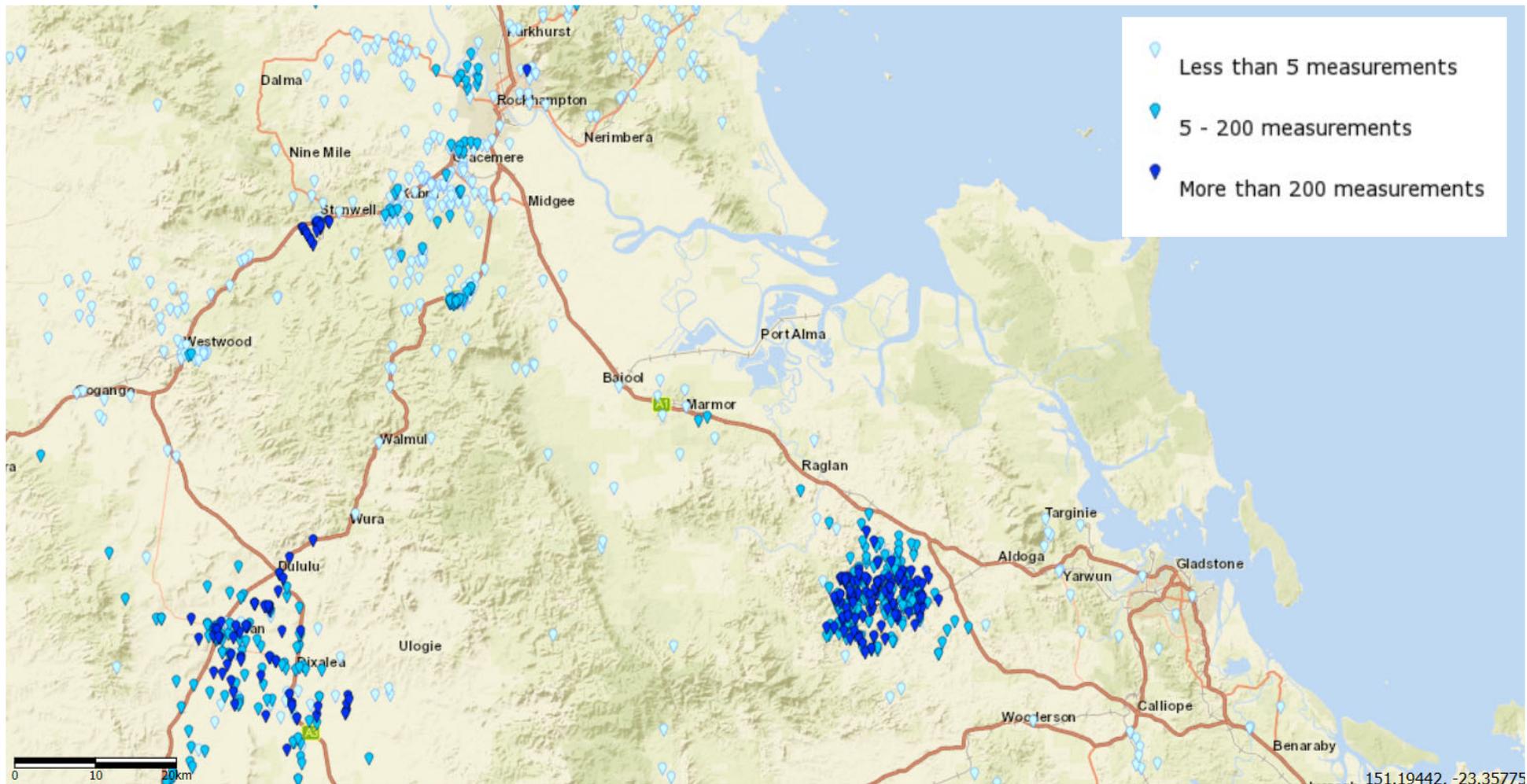
1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

**Administering Authority**

# Groundwater Bore Records

# BOM Groundwater Bores



# 1RP911260 (hydrology and groundwater bore)

23°50'6"S 151°7'9"E

23°50'6"S 151°8'2"E



23°50'55"S 151°7'9"E

23°50'55"S 151°8'2"E

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# 1RP911260 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline



### Lake

Lake

### Reservoir

Reservoir

### Canal line

Canal

### Canal area

Canal area

### Watercourse line

- Major - perennial
- Major - non perennial
- Minor - perennial
- Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge



### Watercourse stream order

### Registered water bores [RDMW and private]

- Artesian bore
- Artesian bore (abandoned but useable)
- Artesian bore (abandoned and destroyed)
- Artesian bore, ceased to flow
- Artesian bore, ceased to flow (abandoned but useable)
- Artesian bore, ceased to flow (abandoned and destroyed)
- Sub-artesian facility
- Sub-artesian facility (abandoned but useable)
- Sub-artesian facility (abandoned and destroyed)
- Surface water facility
- Surface water facility (abandoned but useable)
- Surface water facility (abandoned and destroyed)

### Land parcel

Parcel

### Land parcel - gt 1 ha

Parcel

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# 1RP911260 (hydrology and groundwater bore)

 Legend

---

Land parcel - gt 10 ha

 Parcel

Land parcel - gt 1000 ha

 Parcel

Land parcel label

Land parcel label - gt 1 ha

Land parcel label - gt 10 ha

Land parcel label - gt 1000 ha

Road Crossing

 Bridge

Tunnel

Road

 Highway

 Main

 Local

 Private

Railway



Cities and Towns





# 7SP145439 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline

— Coastline

### Lake

Lake

### Reservoir

Reservoir

### Canal line

— Canal

### Canal area

Canal area

### Watercourse line

— Major - perennial

-- Major - non perennial

— Minor - perennial

-- Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge

—

### Watercourse stream order

### Registered water bores [RDMW and private]

● Artesian bore

⊕ Artesian bore (abandoned but useable)

⊕ Artesian bore (abandoned and destroyed)

● Artesian bore, ceased to flow

⊕ Artesian bore, ceased to flow (abandoned but useable)

⊕ Artesian bore, ceased to flow (abandoned and destroyed)

● Sub-artesian facility

⊕ Sub-artesian facility (abandoned but useable)

⊕ Sub-artesian facility (abandoned and destroyed)

● Surface water facility

⊕ Surface water facility (abandoned but useable)

⊕ Surface water facility (abandoned and destroyed)

### Land parcel

□ Parcel

### Land parcel - gt 1 ha

□ Parcel

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# 7SP145439 (hydrology and groundwater bore)

 Legend

---

Land parcel - gt 10 ha

 Parcel

Land parcel - gt 1000 ha

 Parcel

Land parcel label

Land parcel label - gt 1 ha

Land parcel label - gt 10 ha

Land parcel label - gt 1000 ha

Railway



Road crossing

 Bridge

Tunnel

Cities and Towns



Road

 Highway

 Main

 Local

 Private



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**Coastline**

 Coastline

**Lake**

Lake

**Reservoir**

Reservoir

**Canal line**

 Canal

**Canal area**

Canal area

**Watercourse line**

 Major - perennial

 Major - non perennial

 Minor - perennial

 Minor - non perennial

**Watercourse area**

Watercourse area

**Water area edge**



**Watercourse stream order**

**Registered water bores  
[RDMW and private]**

 Artesian bore

 Artesian bore (abandoned but useable)

 Artesian bore (abandoned and destroyed)

 Artesian bore, ceased to flow

 Artesian bore, ceased to flow (abandoned but useable)

 Artesian bore, ceased to flow (abandoned and destroyed)

 Sub-artesian facility

 Sub-artesian facility (abandoned but useable)

 Sub-artesian facility (abandoned and destroyed)

 Surface water facility

 Surface water facility (abandoned but useable)

 Surface water facility (abandoned and destroyed)

**Land parcel**

 Parcel

**Land parcel - gt 1 ha**

 Parcel

**Maxar**

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Land parcel - gt 10 ha

 Parcel

Land parcel - gt 1000 ha

 Parcel

Land parcel label

Land parcel label - gt 1 ha

Land parcel label - gt 10 ha

Land parcel label - gt 1000 ha

Road crossing

 Bridge

Tunnel

Railway



Cities and Towns



Road

 Highway

 Main

 Local

 Private

# 101DS185 (hydrology and groundwater bore)

23°38'60"S 150°42'34"E

23°38'60"S 150°44'29"E



23°40'46"S 150°42'34"E

23°40'46"S 150°44'29"E

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# 101DS185 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline



### Lake

Lake

### Reservoir

Reservoir

### Canal line

Canal

### Canal area

Canal area

### Watercourse line

Major - perennial

Major - non perennial

Minor - perennial

Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge



### Watercourse stream order

### Registered water bores [RDMW and private]

Artesian bore

Artesian bore (abandoned but useable)

Artesian bore (abandoned and destroyed)

Artesian bore, ceased to flow

Artesian bore, ceased to flow (abandoned but useable)

Artesian bore, ceased to flow (abandoned and destroyed)

Sub-artesian facility

Sub-artesian facility (abandoned but useable)

Sub-artesian facility (abandoned and destroyed)

Surface water facility

Surface water facility (abandoned but useable)

Surface water facility (abandoned and destroyed)

### Land parcel

Parcel

### Land parcel - gt 1 ha

Parcel

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# 101DS185 (hydrology and groundwater bore)

 Legend

---

Land parcel - gt 10 ha

 Parcel

Land parcel - gt 1000 ha

 Parcel

Land parcel label

Land parcel label - gt 1 ha

Land parcel label - gt 10 ha

Land parcel label - gt 1000 ha

Road Crossing

 Bridge

Tunnel

Road

 Highway

 Main

 Local

 Private

Railway



Cities and Towns





# 140SP122252 (hydrology and groundwater bore)

## Legend

## Attribution

### Registered water bores [RDMW and private]

-  Artesian bore
-  Artesian bore (abandoned but useable)
-  Artesian bore (abandoned and destroyed)
-  Artesian bore, ceased to flow
-  Artesian bore, ceased to flow (abandoned but useable)
-  Artesian bore, ceased to flow (abandoned and destroyed)
-  Sub-artesian facility
-  Sub-artesian facility (abandoned but useable)
-  Sub-artesian facility (abandoned and destroyed)
-  Surface water facility
-  Surface water facility (abandoned but useable)
-  Surface water facility (abandoned and destroyed)

### Coastline



### Lake

Lake

### Reservoir

Reservoir

### Canal line

Canal

### Canal area

Canal area

### Watercourse line

-  Major - perennial
-  Major - non perennial
-  Minor - perennial
-  Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge



### Watercourse stream order

### Land parcel

 Parcel

### Land parcel - gt 1 ha

 Parcel

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# 140SP122252 (hydrology and groundwater bore)

 Legend

---

Land parcel - gt 10 ha

 Parcel

Land parcel - gt 1000 ha

 Parcel

Land parcel label

Land parcel label - gt 1 ha

Land parcel label - gt 10 ha

Land parcel label - gt 1000 ha

Cities and Towns



Road crossing

 Bridge

Tunnel

Railway



Road

 Highway

 Main

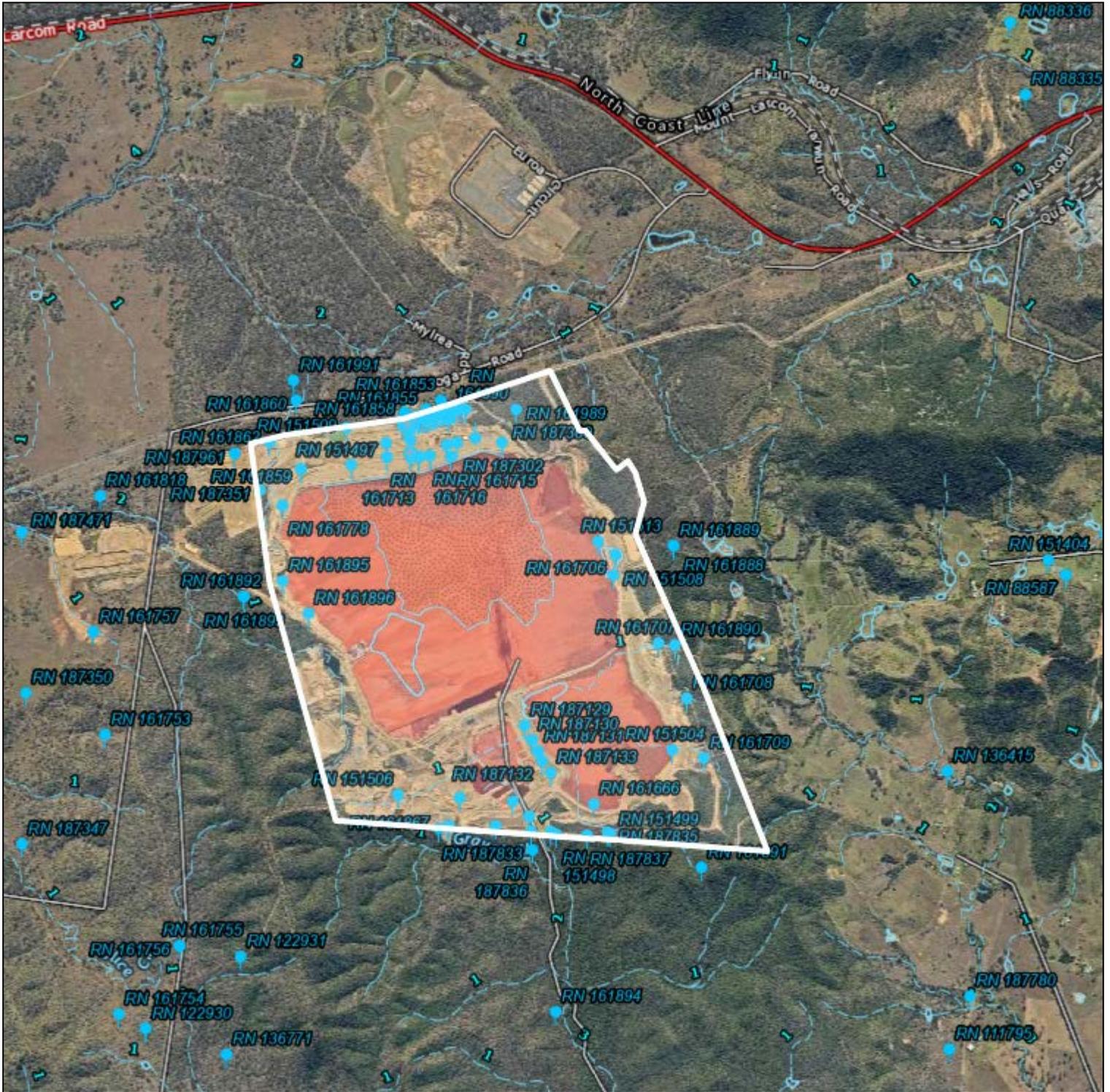
 Local

 Private

# Lot 2/RP608546 (hydrology and groundwater bore)

23°50'7"S 151°2'58"E

23°50'7"S 151°6'49"E



23°53'38"S 151°2'58"E

23°53'38"S 151°6'49"E

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# Lot 2/RP608546 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline

— Coastline

### Lake

Lake

### Reservoir

Reservoir

### Canal line

— Canal

### Canal area

Canal area

### Watercourse line

— Major - perennial

-- Major - non perennial

— Minor - perennial

-- Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge

—

### Watercourse stream order

### Registered water bores [RDMW and private]

● Artesian bore

⊕ Artesian bore (abandoned but useable)

⊕ Artesian bore (abandoned and destroyed)

● Artesian bore, ceased to flow

⊕ Artesian bore, ceased to flow (abandoned but useable)

⊕ Artesian bore, ceased to flow (abandoned and destroyed)

● Sub-artesian facility

⊕ Sub-artesian facility (abandoned but useable)

⊕ Sub-artesian facility (abandoned and destroyed)

● Surface water facility

⊕ Surface water facility (abandoned but useable)

⊕ Surface water facility (abandoned and destroyed)

### Road Crossing

— Bridge

Tunnel

### Railway

—

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# Lot 2/RP608546 (hydrology and groundwater bore)

## Legend

---

### Road

 Highway

 Main

 Local

 Private

### Cities and Towns



# Lot 2/RP608546 (hydrology and groundwater bore)

23°40'19"S 150°43'18"E

23°40'19"S 150°44'16"E



23°41'12"S 150°43'18"E

23°41'12"S 150°44'16"E

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# Lot 2/RP608546 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline

— Coastline

### Registered water bores [RDMW and private]

-  Artesian bore
-  Artesian bore (abandoned but useable)
-  Artesian bore (abandoned and destroyed)
-  Artesian bore, ceased to flow
-  Artesian bore, ceased to flow (abandoned but useable)
-  Artesian bore, ceased to flow (abandoned and destroyed)
-  Sub-artesian facility
-  Sub-artesian facility (abandoned but useable)
-  Sub-artesian facility (abandoned and destroyed)
-  Surface water facility
-  Surface water facility (abandoned but useable)
-  Surface water facility (abandoned and destroyed)

### Lake

Lake

### Reservoir

Reservoir

### Canal line

--- Canal

### Canal area

Canal area

### Watercourse line

- Major - perennial
- Major - non perennial
- Minor - perennial
- Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge

—

### Watercourse stream order

### Road Crossing

- Bridge
- Tunnel

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# Lot 2/RP608546 (hydrology and groundwater bore)

## Legend

---

### Road

 Highway

 Main

 Local

 Private

### Railway



### Cities and Towns





# Lot 8/SP218634 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline

— Coastline

### Lake

Lake

### Reservoir

Reservoir

### Canal line

— Canal

### Canal area

Canal area

### Watercourse line

— Major - perennial

-- Major - non perennial

— Minor - perennial

-- Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge

—

### Watercourse stream order

### Registered water bores [RDMW and private]

● Artesian bore

⊕ Artesian bore (abandoned but useable)

⊕ Artesian bore (abandoned and destroyed)

● Artesian bore, ceased to flow

⊕ Artesian bore, ceased to flow (abandoned but useable)

⊕ Artesian bore, ceased to flow (abandoned and destroyed)

● Sub-artesian facility

⊕ Sub-artesian facility (abandoned but useable)

⊕ Sub-artesian facility (abandoned and destroyed)

● Surface water facility

⊕ Surface water facility (abandoned but useable)

⊕ Surface water facility (abandoned and destroyed)

### Land parcel

□ Parcel

### Land parcel - gt 1 ha

□ Parcel

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# Lot 8/SP218634 (hydrology and groundwater bore)

## Legend

---

Land parcel - gt 10 ha

 Parcel

Land parcel - gt 1000 ha

 Parcel

Land parcel label

Land parcel label - gt 1 ha

Land parcel label - gt 10 ha

Land parcel label - gt 1000 ha

Road Crossing

 Bridge

Tunnel

Road

 Highway

 Main

 Local

 Private

Railway



Cities and Towns





# Lot 12/SP190336 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline

— Coastline

### Registered water bores [RDMW and private]

- Artesian bore
- ⊕ Artesian bore (abandoned but useable)
- ⊖ Artesian bore (abandoned and destroyed)
- Artesian bore, ceased to flow
- ⊕ Artesian bore, ceased to flow (abandoned but useable)
- ⊖ Artesian bore, ceased to flow (abandoned and destroyed)
- Sub-artesian facility
- ⊕ Sub-artesian facility (abandoned but useable)
- ⊖ Sub-artesian facility (abandoned and destroyed)
- Surface water facility
- ⊕ Surface water facility (abandoned but useable)
- ⊖ Surface water facility (abandoned and destroyed)

### Lake

Lake

### Reservoir

Reservoir

### Canal line

--- Canal

### Canal area

Canal area

### Watercourse line

- Major - perennial
- Major - non perennial
- Minor - perennial
- Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge

—

### Watercourse stream order

### Land parcel

□ Parcel

### Land parcel - gt 1 ha

□ Parcel

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# Lot 12/SP190336 (hydrology and groundwater bore)

## Legend

---

Land parcel - gt 10 ha

 Parcel

Land parcel - gt 1000 ha

 Parcel

Land parcel label

Land parcel label - gt 1 ha

Land parcel label - gt 10 ha

Land parcel label - gt 1000 ha

Road crossing

 Bridge

 Tunnel

Road

 Highway

 Main

 Local

 Private

Railway



Cities and Towns



# Lot 250/R2621 (hydrology and groundwater bore)

23°23'10"S 150°26'22"E

23°23'10"S 150°27'19"E



23°24'3"S 150°26'22"E

23°24'3"S 150°27'19"E

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# Lot 250/R2621 (hydrology and groundwater bore)

## Legend

## Attribution

### Coastline

— Coastline

### Lake

Lake

### Reservoir

Reservoir

### Canal line

— Canal

### Canal area

Canal area

### Watercourse line

— Major - perennial

-- Major - non perennial

— Minor - perennial

-- Minor - non perennial

### Watercourse area

Watercourse area

### Water area edge

—

### Watercourse stream order

### Registered water bores [RDMW and private]

● Artesian bore

⊕ Artesian bore (abandoned but useable)

⊕ Artesian bore (abandoned and destroyed)

● Artesian bore, ceased to flow

⊕ Artesian bore, ceased to flow (abandoned but useable)

⊕ Artesian bore, ceased to flow (abandoned and destroyed)

● Sub-artesian facility

⊕ Sub-artesian facility (abandoned but useable)

⊕ Sub-artesian facility (abandoned and destroyed)

● Surface water facility

⊕ Surface water facility (abandoned but useable)

⊕ Surface water facility (abandoned and destroyed)

### Road Crossing

— Bridge

Tunnel

### Railway

—

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# Lot 250/R2621 (hydrology and groundwater bore)

## Legend

---

### Road

 Highway

 Main

 Local

 Private

### Cities and Towns



Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 16:17

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
88338	Sub-Artesian Facility	Existing		Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description	P108		Latitude	23-49-51	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-09-31	Sub-area	
Original Name	OFFICE LICENCE ONLY		GIS Latitude	-23.830876784	Lot	1
			GIS Longitude	151.158551632	Plan	RP612126
			Easting	312438		
Driller Name			Northing	7363279	Map Scale	104 - 1: 100 000
Drill Company			Zone	56	Map Series	M - Metric Series
Const Method	CABLE TOOL		Accuracy	SKET	Map No	9150
Bore Line			GPS Accuracy		Map Name	GLADSTONE
D/O File No	515/030/0282	Polygon	Checked	Yes	Prog Section	
R/O File No	30-0282	Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date		Data Owner				
Roles	Water Supply					

**Casing** 2 records for RN 88338

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	01/10/1969	1	0.00	23.80	Steel Casing	4.760	WT - Wall Thickness	152
A	01/10/1969	2	21.90	23.80	Perforated or Slotted Casing		AP - Aperture Size	152

**Strata Logs** 5 records for RN 88338

Rec	Top (m)	Bottom (m)	Strata Description
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Report Date: 09/11/2021 16:17

## Groundwater Information

GWDB8250

## Bore Report

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	12.80	SOIL & GRITTY CLAY
2	12.80	23.77	MED TO HARD GRANITE(????) SOFT BANDS
902			SWL 23/10/69 - 11.2 M
903			BAILER TEST - 1.0 L/S
910			WRC COND 10/69 - 1880 MICROS/CM

## Stratigraphies

2 records for RN 88338

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00		DOONSIDE FORMATION
DNR	2	0.00		DOONSIDE FORMATION

## Aquifers

2 records for RN 88338

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	17.40		GNTE - Acid Intrusive, Granite	23/10/1969	-11.20	N			Y	WZ	DOONSIDE FORMATION
2	22.00	23.80	GNTE - Acid Intrusive, Granite			N	COND 1880	1.00	Y	WZ	DOONSIDE FORMATION

## Pump Tests Part 1

1 records for RN 88338

Pipe	Date	Rec	RN of Pumped Bore	Top (m)	Bottom (m)	Dist (m)	Meth	Test Types	Pump Type	Suction Set (m)	Q Prior to Test (l/s)	Dur of Q PR (mins)	Pres on Arriv (m)	Q on Arriv (l/s)
A	23/10/1969	1	88338	21.90	23.80		PUM	CQ						

## Pump Tests Part 2

1 records for RN 88338

Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 16:17

From Year:

Pipe	Date	Rec	Test Dur (mins)	SWL(m)	Recov Time (mins)	Resid DD (m)	Max DD or P RED (m)	Q at Max DD (l/s)	Time to Max DD (mins)	Max Q (l/s)	Calc Stat HD (m)	Design Yield (l/s)	Design BP (m)	Suct. Set (m)	Tmsy (m2/Day)	Stor
A	23/10/1969	1	360	-12.62			2.70	0.95	360			1.52	20.70		17	

**Bore Conditions** 0 records for RN 88338

**Elevations** 0 records for RN 88338

**Water Analysis Part 1** 2 records for RN 88338

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
A	23/10/1969	1	GCL	44034	22.00	PU	GB	1880	7.6		1256.55	1042.56	486	350	1.0	4.5	
A	09/09/1970	1	GCL	46660	22.00	PU	GB	1710	7.1		1221.20	982.30	439	385	0.9	4.6	

**Water Analysis Part 2** 2 records for RN 88338

Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	23/10/1969	1	227.0		84.0	67.0		421.0		3.0	430.0	0.55		24.0				
A	09/09/1970	1	222.0		82.0	57.0		470.0			355.0	0.20		35.0				

**Water Levels** 1 records for RN 88338

Pipe	Date	Time	Measure (m)	Meas Point	Remark	Meas Type	Coll Auth	Coll	Method	Project	Quality
A	23/10/1969		-11.20	N Natural Surface		ACT Actual	NR	NR	Not Recorded		130 Data is of unknown quality

**Wire Line Logs** 0 records for RN 88338

**Field Measurements** 0 records for RN 88338

Report Date: 09/11/2021 16:17

Queensland Government  
Groundwater Information  
Bore Report

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From Year:

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**Special Water Analysis**

0 records for RN 88338

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:22

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
88339	Sub-Artesian Facility	Existing	01/05/1986	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description	P41 ROAD RES. ADJ. TO LOT1 RP889920		Latitude	23-50-57	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-07-37	Sub-area	
Original Name	OFFICE LICENCE ONLY		GIS Latitude	-23.8491481	Lot	
			GIS Longitude	151.12683914	Plan	
			Easting	309234		
Driller Name			Northing	7361213	Map Scale	104 - 1: 100 000
Drill Company			Zone	56	Map Series	M - Metric Series
Const Method	ROTARY RIG		Accuracy	SKET	Map No	9150
Bore Line			GPS Accuracy		Map Name	GLADSTONE
D/O File No	515/030/1470	Polygon	Checked	Yes	Prog Section	
R/O File No	30-1470	Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date		Data Owner				
Roles	Water Supply					

**Casing** 2 records for RN 88339

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	01/05/1986	1	0.00	12.20	Polyvinyl Chloride		WT - Wall Thickness	150
A	01/05/1986	2			Perforated or Slotted Casing		AP - Aperture Size	150

**Strata Logs** 4 records for RN 88339

Rec	Top (m)	Bottom (m)	Strata Description
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Report Date: 11/11/2021 10:22

## Groundwater Information

GWDB8250

## Bore Report

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	12.20	NO DETAILS
902			SWL 7/86 - 3.0 M
903			AIR TEST - 2.5 L/S
910			WRC COND - 5530 MICROS/CM

## Stratigraphies

0 records for RN 88339

## Aquifers

1 records for RN 88339

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	12.20		MDST - Mudstone	01/07/1986	-3.00	N	5530 US/CM	2.50	Y	FR	BERSERKER GROUP

## Pump Tests Part 1

0 records for RN 88339

## Pump Tests Part 2

0 records for RN 88339

## Bore Conditions

0 records for RN 88339

## Elevations

0 records for RN 88339

## Water Analysis Part 1

0 records for RN 88339

## Water Analysis Part 2

0 records for RN 88339

## Water Levels

1 records for RN 88339

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas Type	Coll Auth	Coll	Method	Project	Quality
A	01/07/1986		-3.00	N	Natural Surface		ACT Actual	NR	NR	Not Recorded		130 Data is of unknown quality

From Year:

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**Wire Line Logs**

0 records for RN 88339

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**Field Measurements**

0 records for RN 88339

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**Special Water Analysis**

0 records for RN 88339

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 16:14

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
88341	Sub-Artesian Facility	Existing	12/10/1976	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description	R246		Latitude	23-50-28	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-07-20	Sub-area	
Original Name	OFFICE LICENCE ONLY		GIS Latitude	-23.841227429	Lot	124
			GIS Longitude	151.12211853	Plan	CTN1362
			Easting	308742		
Driller Name	BEASLEY J		Northing	7362084	Map Scale	104 - 1: 100 000
Drill Company	HILLGROVE DRILLING		Zone	56	Map Series	M - Metric Series
Const Method	ROTARY		Accuracy	SKET	Map No	9150
Bore Line			GPS Accuracy		Map Name	GLADSTONE
D/O File No	515/030/2230	Polygon	Checked	Yes	Prog Section	
R/O File No	30-2230	Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date		Data Owner				
Roles	Water Supply					

**Casing** 3 records for RN 88341

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	12/10/1976	1	0.00	18.10	Polyvinyl Chloride		WT - Wall Thickness	152
A	12/10/1976	2	15.10	17.10	Perforated or Slotted Casing		AP - Aperture Size	152
A	12/10/1976	3	17.10	20.00	Open Hole			165

**Strata Logs** 7 records for RN 88341

Report Date: 09/11/2021 16:14

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	4.60	BROWN CLAY
2	4.60	16.50	DARK BROWN WEATHERED VOLCANICS
3	16.50	17.00	FRACTURED GREEN VOLCANICS WATER
4	17.00	20.00	HARD GREEN VOLCANICS
902			SWL 12/10/76 - 5.42 M
903			AIR TEST - 4.4 L/S
910			WRC COND - 5100 MICROS/CM

### Stratigraphies

1 records for RN 88341

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00		BERSERKER GROUP

### Aquifers

1 records for RN 88341

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	13.00	17.00	VOLC - Volcanic	12/10/1976	-5.42	N	COND 5100	4.40	Y	FR	BERSERKER GROUP

### Pump Tests Part 1

1 records for RN 88341

Pipe	Date	Rec	RN of Pumped Bore	Top (m)	Bottom (m)	Dist (m)	Meth	Test Types	Pump Type	Suction Set (m)	Q Prior to Test (l/s)	Dur of Q PR (mins)	Pres on Arriv (m)	Q on Arriv (l/s)
A	20/10/1976	1	88341	15.00	17.00		PUM	SD						

### Pump Tests Part 2

1 records for RN 88341

Pipe	Date	Rec	Test	SWL(m)	Recov	Resid	Max DD	Q at	Time to	Max Q	Calc	Design	Design	Suct.	Tmsy	Stor
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Report Date: 09/11/2021 16:14

## Groundwater Information

GWDB8250

## Bore Report

From Year:

		Dur (mins)	Time (mins)	DD (m)	or P RED (m)	Max DD (l/s)	Max DD (mins)	(l/s)	Stat HD (m)	Yield (l/s)	BP (m)	Set (m)	(m2/Day)
A	20/10/1976	1	300	-5.30		3.01	3.85	300		8.50	15.00		111

## Bore Conditions

0 records for RN 88341

## Elevations

0 records for RN 88341

## Water Analysis Part 1

1 records for RN 88341

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
A	20/10/1976	1	GCL	70771	20.00	PU	GB	4900	7.3	70	2690.50	2627.33	2077	215	5.6	1.6	

## Water Analysis Part 2

1 records for RN 88341

Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	20/10/1976	1	170.0	0.5	436.0	240.0		262.0			1490.0	0.30	9.7	82.0				

## Water Levels

1 records for RN 88341

Pipe	Date	Time	Measure (m)	Meas Point	Remark	Meas Type	Coll Auth	Coll	Method	Project	Quality
A	12/10/1976		-5.42	N	Natural Surface	ACT	Actual	NR	NR	Not Recorded	130 Data is of unknown quality

## Wire Line Logs

0 records for RN 88341

## Field Measurements

0 records for RN 88341

## Special Water Analysis

0 records for RN 88341

From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 15:35

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
111438	Sub-Artesian Facility	Existing	15/10/1999	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-50-42	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-07-34	Sub-area	
Original Name	BOYLE		GIS Latitude	-23.844961776	Lot	3
			GIS Longitude	151.12616046	Plan	RP604826
			Easting	309159		
Driller Name	FRIEMUTH H		Northing	7361676	Map Scale	503 - 1: 50 000
Drill Company	DEPCO		Zone	56	Map Series	M - Metric Series
Const Method	ROTARY		Accuracy	SKET	Map No	9150-3
Bore Line			GPS Accuracy		Map Name	
D/O File No	520/001/7	Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date		Data Owner	DNR			
Roles	Water Supply					

**Casing** 3 records for RN 111438

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	15/10/1999	1	0.00	12.19	Polyvinyl Chloride	5.900	WT - Wall Thickness	140
A	15/10/1999	2	9.14	12.19	Perforated or Slotted Casing			
A	15/10/1999	3	0.00	12.19	Gravel Pack			165

**Strata Logs** 1 records for RN 111438

Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 15:35

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	12.19	A

**Stratigraphies**

0 records for RN 111438

**Aquifers**

1 records for RN 111438

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	10.97	12.19	GNTE - Acid Intrusive, Granite	15/10/1999	-2.44	N	4000 US/CM	1.77	Y	WZ	BERSERKER GROUP

**Pump Tests Part 1**

0 records for RN 111438

**Pump Tests Part 2**

0 records for RN 111438

**Bore Conditions**

0 records for RN 111438

**Elevations**

0 records for RN 111438

**Water Analysis Part 1**

0 records for RN 111438

**Water Analysis Part 2**

0 records for RN 111438

**Water Levels**

1 records for RN 111438

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas Type	Coll Auth	Coll	Method	Project	Quality
A	15/10/1999		-2.40	R	Reference Point		NR Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

**Wire Line Logs**

0 records for RN 111438

**Field Measurements**

1 records for RN 111438

Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 15:35

From Year:

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Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp Method	Samp Source
A	15/10/1999	12.20	4000							PU Pump - Other or Flowing Bore	GB Groundwater - from Bore

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**Special Water Analysis**

0 records for RN 111438

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 16:57

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
111458	Sub-Artesian Facility	Abandoned but Still Usable	05/05/1954	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-48-41	Basin	1300
Parish	2798 - LANGMORN		Longitude	150-58-46	Sub-area	
Original Name			GIS Latitude	-23.811392592	Lot	1
			GIS Longitude	150.979537644	Plan	MPH2774
			Easting	294169		
Driller Name	B C SAINSBURY		Northing	7365190	Map Scale	253 - 1: 25 000
Drill Company	IWSC		Zone	56	Map Series	M - Metric Series
Const Method	CABLE TOOL		Accuracy		Map No	9050-21
Bore Line			GPS Accuracy		Map Name	
D/O File No	520/001(97)	Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date		Data Owner				
Roles	Water Supply					

**Casing** 2 records for RN 111458

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	05/05/1954	1	0.00	7.30	Standard Screwed Swelled Black	4.760	WT - Wall Thickness	152
A	05/05/1954	2	7.30	11.73	Open Hole			

**Strata Logs** 4 records for RN 111458

Rec	Top (m)	Bottom (m)	Strata Description
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Report Date: 09/11/2021 16:57

## Groundwater Information

GWDB8250

## Bore Report

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	3.00	CLAY & STONES
2	3.00	6.40	ROTTEN SHALE ROCK
3	6.40	9.30	BLUE DIORITE
4	9.30	11.73	SHALE

## Stratigraphies

0 records for RN 111458

## Aquifers

2 records for RN 111458

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	5.50		SHLE - Shale						N	FR	CRANA BEDS
2	10.40		SHLE - Shale	05/05/1954	-3.00	N	TS 2437MG/L	0.50	Y	FR	CRANA BEDS

## Pump Tests Part 1

0 records for RN 111458

## Pump Tests Part 2

0 records for RN 111458

## Bore Conditions

0 records for RN 111458

## Elevations

0 records for RN 111458

## Water Analysis Part 1

1 records for RN 111458

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
A	05/05/1954	1	GCL	13995	11.70	BA	GB		7.8		2861.30	2328.86	497	859	0.3	14.6	7.24

## Water Analysis Part 2

1 records for RN 111458

Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 16:57

From Year:

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Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	05/05/1954	1	748.2		47.6	91.8		1047.5			776.0	0.80		149.4				

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**Water Levels** 0 records for RN 111458

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**Wire Line Logs** 0 records for RN 111458

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**Field Measurements** 0 records for RN 111458

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**Special Water Analysis** 0 records for RN 111458

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 17:21

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
122757	Sub-Artesian Facility	Abandoned and Destroyed	11/03/2005	Rockhampton	6370 - ROCKHAMPTON REGIONAL COUNCIL

Details			Location			
Description			Latitude	23-40-04	Basin	1300
Parish	4161 - SAN JOSE		Longitude	150-43-21	Sub-area	
Original Name			GIS Latitude	-23.6677165	Lot	86
			GIS Longitude	150.7223884	Plan	DS185
			Easting	267709		
Driller Name	ORR, JAMES THOMAS		Northing	7380707	Map Scale	
Drill Company	ABCO DRILLING		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy	GPS	Map No	
Bore Line			GPS Accuracy	20	Map Name	
D/O File No	520/001/30	Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	07/04/2005	Data Owner				
Roles	Water Supply					

**Casing** 2 records for RN 122757

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	11/03/2005	1	0.00	9.00	Grout			
A	11/03/2005	2	9.00	27.50	Cuttings or other fill between casing and hole wall			

**Strata Logs** 9 records for RN 122757

Rec	Top (m)	Bottom (m)	Strata Description
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Report Date: 09/11/2021 17:21

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.30	TOP SOIL, BROWN
2	0.30	0.60	CLAY, BROWN
3	0.60	5.00	WEATHERED ROCK, GREY
4	5.00	6.00	WEATHERED BASALT, GREY-WHITE
5	6.00	8.50	BASALT, BLUE-GREY, HARD
6	8.50	12.20	BASALT, QUARTZ, RED-BROWN, SOFT
7	12.20	16.70	BASALT, BLUE, HARD
8	16.70	19.00	LIMESTONE, BLUE-WHITE, MED-HARD
9	19.00	27.50	BSLT, LIGHT BLUE, HARD

**Stratigraphies** 0 records for RN 122757

**Aquifers** 0 records for RN 122757

**Pump Tests Part 1** 0 records for RN 122757

**Pump Tests Part 2** 0 records for RN 122757

**Bore Conditions** 0 records for RN 122757

**Elevations** 0 records for RN 122757

**Water Analysis Part 1** 0 records for RN 122757

**Water Analysis Part 2** 0 records for RN 122757

**Water Levels** 0 records for RN 122757

**Wire Line Logs** 0 records for RN 122757

From Year:

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**Field Measurements**

0 records for RN 122757

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**Special Water Analysis**

0 records for RN 122757

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 15:25

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
122758	Sub-Artesian Facility	Abandoned and Destroyed	11/03/2005	Rockhampton	6370 - ROCKHAMPTON REGIONAL COUNCIL

Details			Location			
Description			Latitude	23-40-02	Basin	1300
Parish	4161 - SAN JOSE		Longitude	150-43-24	Sub-area	
Original Name			GIS Latitude	-23.6672794	Lot	86
			GIS Longitude	150.7233565	Plan	DS185
			Easting	267807		
Driller Name	ORR, JAMES THOMAS		Northing	7380757	Map Scale	
Drill Company	ABCO DRILLING		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy	GPS	Map No	
Bore Line			GPS Accuracy	20	Map Name	
D/O File No	520/001/30	Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	07/04/2005	Data Owner				
Roles	Water Supply					

**Casing** 2 records for RN 122758

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	11/03/2005	1	0.00	10.60	Grout			
A	11/03/2005	2	10.60	42.60	Cuttings or other fill between casing and hole wall			

**Strata Logs** 10 records for RN 122758

Rec	Top (m)	Bottom (m)	Strata Description
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Report Date: 09/11/2021 15:25

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.30	TOPSOIL, BROWN
2	0.30	2.40	CLAY, YELLOW-GREY
3	2.40	3.30	CLAY, BROWN
4	3.30	4.20	CLAYEY GRAVEL, BROWN
5	4.20	9.10	WEATHERED BASALT, BLUE-GREY, SOFT
6	9.10	13.70	WEATHERED BASALT, BLUE-GREY, MED-HARD
7	13.70	14.30	BASALT, BLUE, HARD
8	14.30	17.00	BASALT, BLUE-GREY, MEDIUM-HARD
9	17.00	29.00	BASALT, BLUE, MED-HARD
10	29.00	42.60	BASALT, BLUE, MED-HARD

**Stratigraphies** 0 records for RN 122758

**Aquifers** 0 records for RN 122758

**Pump Tests Part 1** 0 records for RN 122758

**Pump Tests Part 2** 0 records for RN 122758

**Bore Conditions** 0 records for RN 122758

**Elevations** 0 records for RN 122758

**Water Analysis Part 1** 0 records for RN 122758

**Water Analysis Part 2** 0 records for RN 122758

**Water Levels** 0 records for RN 122758

**Wire Line Logs** 0 records for RN 122758

From Year:

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**Field Measurements**

0 records for RN 122758

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**Special Water Analysis**

0 records for RN 122758

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:23

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
136514	Sub-Artesian Facility	Existing	16/10/2007	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-50-56	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-07-33	Sub-area	
Original Name			GIS Latitude	-23.8488231	Lot	41
			GIS Longitude	151.125822	Plan	CTN67
			Easting	309130		
Driller Name	K BOURNE		Northing	7361248	Map Scale	103 - 1: 10 000
Drill Company	DEPCO DRILLING		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy	GPS	Map No	9150
Bore Line			GPS Accuracy	20	Map Name	GLADSTONE
D/O File No	520/001/7	Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	25/10/2007	Data Owner				
Roles	Water Supply					

**Casing** 4 records for RN 136514

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	16/10/2007	1	0.00	21.30	Polyvinyl Chloride	5.900	WT - Wall Thickness	140
A	16/10/2007	2	15.20	21.30	Perforated or Slotted Casing	4.000	AP - Aperture Size	
A	16/10/2007	3	6.00	21.30	Gravel Pack	5.000	GR - Gravel Size	
A	16/10/2007	4	0.00	6.00	Grout			140

**Strata Logs** 4 records for RN 136514

Report Date: 11/11/2021 10:23

## Groundwater Information

GWDB8250

## Bore Report

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.30	SOIL
2	0.30	9.10	WEATHERING
3	9.10	17.00	DECOMPOSED *
4	17.00	21.30	DIRITE

## Stratigraphies

0 records for RN 136514

## Aquifers

1 records for RN 136514

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	16.70	17.00	XXXX - Unknown	16/10/2007	-21.00	N	2000	1.26	Y	FR	BERSERKER GROUP

## Pump Tests Part 1

0 records for RN 136514

## Pump Tests Part 2

0 records for RN 136514

## Bore Conditions

0 records for RN 136514

## Elevations

0 records for RN 136514

## Water Analysis Part 1

0 records for RN 136514

## Water Analysis Part 2

0 records for RN 136514

## Water Levels

0 records for RN 136514

## Wire Line Logs

0 records for RN 136514

## Field Measurements

0 records for RN 136514

## Special Water Analysis

0 records for RN 136514

From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 17:20

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
136700	Sub-Artesian Facility	Existing	30/06/2006	Rockhampton	6370 - ROCKHAMPTON REGIONAL COUNCIL

Details			Location			
Description			Latitude	23-40-02	Basin	1300
Parish	4161 - SAN JOSE		Longitude	150-43-21	Sub-area	
Original Name			GIS Latitude	-23.6672222	Lot	86
			GIS Longitude	150.7225	Plan	DS185
			Easting	267720		
Driller Name	ORR, JAMES THOMAS		Northing	7380762	Map Scale	
Drill Company	ABCO		Zone	56	Map Series	M - Metric Series
Const Method	ROTARY AIR		Accuracy		Map No	9050
Bore Line			GPS Accuracy		Map Name	BAJOOL
D/O File No	520/00130	Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date		Data Owner				
Roles	Water Supply					

**Casing** 3 records for RN 136700

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	29/06/2006	1	0.00	28.65	Polyvinyl Chloride			140
A	29/06/2006	2	19.51	28.65	Perforated or Slotted Casing			
A	29/06/2006	3	0.00	5.79	Grout			

**Strata Logs** 7 records for RN 136700

Report Date: 09/11/2021 17:20

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.30	TOPSOIL , GRAVEL BROWN
2	0.30	1.52	CLAY RED BROWN
3	1.52	2.74	CLAY YELLOW GREY
4	2.74	3.66	CLAY RED -GREY
5	3.66	24.08	SILTSTONE YELLOW-BROWN, DAMP, MED-SOFT
6	24.08	28.65	SILTSTONE, YELLOW-BLUE, SLIGHT FRACTURS 79FT TO 85FT
7			.025L/S BY 85FT, 85FT TO 94FT YELLOW-BLUE MED

**Stratigraphies** 0 records for RN 136700

**Aquifers** 1 records for RN 136700

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	24.08	28.65	MDST - Mudstone	29/06/2006	-10.06	N	1800PPM	0.03	N	FR	MOUNT HOLLY FORMATION

**Pump Tests Part 1** 0 records for RN 136700

**Pump Tests Part 2** 0 records for RN 136700

**Bore Conditions** 0 records for RN 136700

**Elevations** 0 records for RN 136700

**Water Analysis Part 1** 0 records for RN 136700

**Water Analysis Part 2** 0 records for RN 136700

**Water Levels** 0 records for RN 136700

**Wire Line Logs** 0 records for RN 136700

Report Date: 09/11/2021 17:20

Queensland Government  
Groundwater Information  
Bore Report

Page: 3 of 4  
GWDB8250

From Year:

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**Field Measurements**

0 records for RN 136700

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**Special Water Analysis**

0 records for RN 136700

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 16:56

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
151465	Sub-Artesian Facility	Existing	08/07/2011	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-48-49	Basin	1300
Parish	2798 - LANGMORN		Longitude	150-58-47	Sub-area	
Original Name			GIS Latitude	-23.81357358	Lot	3
			GIS Longitude	150.9796912	Plan	DSN801264
			Easting	294188		
Driller Name	FORD, KENNETH FRANCIS		Northing	7364948	Map Scale	104 - 1: 100 000
Drill Company	FORD DRILLING		Zone	56	Map Series	M - Metric Series
Const Method	ROTARY AIR		Accuracy		Map No	9050
Bore Line			GPS Accuracy		Map Name	BAJOOOL
D/O File No	520/001/97	Polygon	Checked	Yes	Prog Section	2
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	10/07/2011	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 5 records for RN 151465

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	08/07/2011	1	0.00	18.00	Polyvinyl Chloride	11.000	WT - Wall Thickness	140
A	08/07/2011	2	12.00	18.00	Screen	2.000	AP - Aperture Size	
A	08/07/2011	3	10.00	18.00	Gravel Pack	5.000	GR - Gravel Size	170
A	08/07/2011	4	5.00	10.00	Cuttings or other fill between casing and hole wall			170
A	08/07/2011	5	0.00	5.00	Grout			170

Report Date: 09/11/2021 16:56

From Year:

**Strata Logs**

5 records for RN 151465

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	BROWN TOPSOIL
2	1.00	6.00	BROWN CLAY
3	6.00	12.00	BROKEN VOLCANICS
4	12.00	15.00	VOLCANICS
5	15.00	18.00	VOLCANICS

**Stratigraphies**

0 records for RN 151465

**Aquifers**

1 records for RN 151465

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	12.00	18.00	VOLC - Volcanic	08/07/2011	-2.00	N	1850 MS/CM	0.30	Y	FR	ROCKHAMPTON GROUP

**Pump Tests Part 1**

0 records for RN 151465

**Pump Tests Part 2**

0 records for RN 151465

**Bore Conditions**

0 records for RN 151465

**Elevations**

0 records for RN 151465

**Water Analysis Part 1**

0 records for RN 151465

**Water Analysis Part 2**

0 records for RN 151465

**Water Levels**

0 records for RN 151465

**Wire Line Logs**

0 records for RN 151465

From Year:

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**Field Measurements**

0 records for RN 151465

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**Special Water Analysis**

0 records for RN 151465

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 11:21

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
151478	Sub-Artesian Facility	Existing	05/08/2011	Rockhampton	6370 - ROCKHAMPTON REGIONAL COUNCIL

Details			Location			
Description			Latitude	23-23-32	Basin	1300
Parish	4035 - ROCKHAMPTON		Longitude	150-27-06	Sub-area	
Original Name			GIS Latitude	-23.39226159	Lot	432
			GIS Longitude	150.4516596	Plan	LIV401245
			Easting	239544		
Driller Name	SAINSBURY, RICHARD BRUCE		Northing	7410755	Map Scale	104 - 1: 100 000
Drill Company	R&G DRILLING PTY LTD		Zone	56	Map Series	M - Metric Series
Const Method	CABLE TOOL		Accuracy		Map No	8951
Bore Line			GPS Accuracy		Map Name	RIDGELANDS
D/O File No	520/001/29	Polygon	Checked	Yes	Prog Section	2
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	15/08/2011	Data Owner				
Roles	Water Supply					

**Casing** 6 records for RN 151478

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	15/08/2011	1	0.00	19.86	Stainless Steel	9.200	WT - Wall Thickness	273
A	15/08/2011	2	22.85	23.85	Screen	0.060	AP - Aperture Size	220
A	15/08/2011	3	21.85	22.85	Screen	0.040	AP - Aperture Size	220
A	15/08/2011	4	19.85	21.85	Screen	0.030	AP - Aperture Size	220
X	15/08/2011	5	0.00	5.00	Grout			350

Report Date: 11/11/2021 11:21

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	15/08/2011	6	0.00	19.86	Gravel Pack			270

### Strata Logs

7 records for RN 151478

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.60	BACKFILL
2	0.60	1.80	BROWN CLAY
3	1.80	6.00	BROWN CLAYEY SAND
4	6.00	17.80	FINE TO COARSE SAND
5	17.80	18.00	CLAY BAND GREY
6	18.00	23.60	FINE TO COARSE SAND & GRAVEL
7	23.60	29.40	CLAY-BOUND GRAVEL, NO WATER

### Stratigraphies

0 records for RN 151478

### Aquifers

1 records for RN 151478

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	6.70	23.60	SAND - Sand	15/08/2011	-6.70	N	3800 MS/CM	31.50	Y	UC	FITZROY RIVER ALLUVIUM

### Pump Tests Part 1

0 records for RN 151478

### Pump Tests Part 2

0 records for RN 151478

### Bore Conditions

0 records for RN 151478

### Elevations

0 records for RN 151478

From Year:

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<b>Water Analysis Part 1</b>	<b>0 records for RN 151478</b>
<b>Water Analysis Part 2</b>	<b>0 records for RN 151478</b>
<b>Water Levels</b>	<b>0 records for RN 151478</b>
<b>Wire Line Logs</b>	<b>0 records for RN 151478</b>
<b>Field Measurements</b>	<b>0 records for RN 151478</b>
<b>Special Water Analysis</b>	<b>0 records for RN 151478</b>

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:54

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
151508	Sub-Artesian Facility	Existing	18/07/2011	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-51-58	Basin	1320
Parish	3374 - MT LARCOM		Longitude	151-05-06	Sub-area	
Original Name			GIS Latitude	-23.86609029	Lot	1
			GIS Longitude	151.0851094	Plan	SP144430
			Easting	305009		
Driller Name	MCLEAN, WAYNE ROBERT		Northing	7359280	Map Scale	104 - 1: 100 000
Drill Company	BURNETT DRILLING CO.		Zone	56	Map Series	M - Metric Series
Const Method	ROTARY MUD		Accuracy		Map No	9150
Bore Line			GPS Accuracy		Map Name	GLADSTONE
D/O File No	520/001/40	Polygon	Checked	Yes	Prog Section	34232
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	05/09/2011	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 7 records for RN 151508

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	18/07/2011	1	0.00	12.50	Polyvinyl Chloride	5.000	WT - Wall Thickness	30
A	18/07/2011	2	12.50	18.50	Screen	0.400	AP - Aperture Size	30
A	18/07/2011	3	3.00	15.00	Centraliser			
X	18/07/2011	4	11.00	18.50	Gravel Pack	2.000	GR - Gravel Size	98
X	18/07/2011	5	18.50	18.70	Bentonite Seal			98

Report Date: 11/11/2021 10:54

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	18/07/2011	6	10.00	11.00	Bentonite Seal			98
X	18/07/2011	7	0.00	10.00	Grout			100

### Strata Logs

4 records for RN 151508

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	GRAVEL/CLAY - LIGHT BROWN
2	1.00	10.00	FRACTURED SILTSTONE - GREY/BROWN
3	10.00	16.00	SILACEOUSFRACTURED SILTSTONE
4	16.00	20.30	ARENITE, FINE TO COURSE GRAINED - GREY

### Stratigraphies

0 records for RN 151508

### Aquifers

1 records for RN 151508

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	12.50	18.50	SSTO - Siltstone	18/07/2011	-9.99	N			Y	PS	ROCKHAMPTON GROUP

### Pump Tests Part 1

0 records for RN 151508

### Pump Tests Part 2

0 records for RN 151508

### Bore Conditions

0 records for RN 151508

### Elevations

0 records for RN 151508

### Water Analysis Part 1

0 records for RN 151508

### Water Analysis Part 2

0 records for RN 151508

From Year:

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<b>Water Levels</b>	<b>0 records for RN 151508</b>
<b>Wire Line Logs</b>	<b>0 records for RN 151508</b>
<b>Field Measurements</b>	<b>0 records for RN 151508</b>
<b>Special Water Analysis</b>	<b>0 records for RN 151508</b>

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:54

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
151508	Sub-Artesian Facility	Existing	18/07/2011	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-51-58	Basin	1320
Parish	3374 - MT LARCOM		Longitude	151-05-06	Sub-area	
Original Name			GIS Latitude	-23.86609029	Lot	1
			GIS Longitude	151.0851094	Plan	SP144430
			Easting	305009		
Driller Name	MCLEAN, WAYNE ROBERT		Northing	7359280	Map Scale	104 - 1: 100 000
Drill Company	BURNETT DRILLING CO.		Zone	56	Map Series	M - Metric Series
Const Method	ROTARY MUD		Accuracy		Map No	9150
Bore Line			GPS Accuracy		Map Name	GLADSTONE
D/O File No	520/001/40	Polygon	Checked	Yes	Prog Section	34232
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	05/09/2011	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 7 records for RN 151508

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	18/07/2011	1	0.00	12.50	Polyvinyl Chloride	5.000	WT - Wall Thickness	30
A	18/07/2011	2	12.50	18.50	Screen	0.400	AP - Aperture Size	30
A	18/07/2011	3	3.00	15.00	Centraliser			
X	18/07/2011	4	11.00	18.50	Gravel Pack	2.000	GR - Gravel Size	98
X	18/07/2011	5	18.50	18.70	Bentonite Seal			98

Report Date: 11/11/2021 10:54

## Groundwater Information

GWDB8250

## Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	18/07/2011	6	10.00	11.00	Bentonite Seal			98
X	18/07/2011	7	0.00	10.00	Grout			100

## Strata Logs

4 records for RN 151508

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	GRAVEL/CLAY - LIGHT BROWN
2	1.00	10.00	FRACTURED SILTSTONE - GREY/BROWN
3	10.00	16.00	SILACEOUSFRACTURED SILTSTONE
4	16.00	20.30	ARENITE, FINE TO COURSE GRAINED - GREY

## Stratigraphies

0 records for RN 151508

## Aquifers

1 records for RN 151508

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	12.50	18.50	SSTO - Siltstone	18/07/2011	-9.99	N			Y	PS	ROCKHAMPTON GROUP

## Pump Tests Part 1

0 records for RN 151508

## Pump Tests Part 2

0 records for RN 151508

## Bore Conditions

0 records for RN 151508

## Elevations

0 records for RN 151508

## Water Analysis Part 1

0 records for RN 151508

## Water Analysis Part 2

0 records for RN 151508

From Year:

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<b>Water Levels</b>	<b>0 records for RN 151508</b>
<b>Wire Line Logs</b>	<b>0 records for RN 151508</b>
<b>Field Measurements</b>	<b>0 records for RN 151508</b>
<b>Special Water Analysis</b>	<b>0 records for RN 151508</b>

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 17:16

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161276	Sub-Artesian Facility	Existing	24/06/2015	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-49-47	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-09-21	Sub-area	
Original Name	BH02		GIS Latitude	-23.8296017922	Lot	8
			GIS Longitude	151.1557678744	Plan	SP218634
			Easting	312153		
Driller Name	MONTELEONE, PETER		Northing	7363417	Map Scale	
Drill Company	GEODRILL AUSTRALIA		Zone	56	Map Series	
Const Method	ROTARY MUD		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	07/07/2015	Data Owner				
Roles	Mine Monitoring					

**Casing** 5 records for RN 161276

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	24/06/2015	1	0.00	17.00	Polyvinyl Chloride	5.000	WT - Wall Thickness	60
A	24/06/2015	2	17.00	20.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	60
X	24/06/2015	3	0.00	6.50	Grout			200
X	24/06/2015	4	6.50	7.00	Bentonite Seal			96
X	24/06/2015	5	7.00	20.00	Gravel Pack			96

Report Date: 09/11/2021 17:16

From Year:

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**Strata Logs** 5 records for RN 161276

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Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	4.50	GRAVELLY CLAY (FILL)
2	4.50	8.00	SILTY CLAY (NATURAL)
3	8.00	9.50	GRAVELLY CLAY
4	9.50	10.50	GRAVELLY CLAY/WEATHERED ROCK
5	10.50	20.00	MW ROCK (BEDROCK)

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**Stratigraphies** 0 records for RN 161276

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**Aquifers** 0 records for RN 161276

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**Pump Tests Part 1** 0 records for RN 161276

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**Pump Tests Part 2** 0 records for RN 161276

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**Bore Conditions** 0 records for RN 161276

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**Elevations** 0 records for RN 161276

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**Water Analysis Part 1** 0 records for RN 161276

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**Water Analysis Part 2** 0 records for RN 161276

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**Water Levels** 0 records for RN 161276

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**Wire Line Logs** 0 records for RN 161276

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**Field Measurements** 0 records for RN 161276

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**Special Water Analysis** 0 records for RN 161276

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From Year:

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Report Date: 11/11/2021 10:14

## Groundwater Information

GWDB8250

## Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161276	Sub-Artesian Facility	Existing	24/06/2015	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-49-47	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-09-21	Sub-area	
Original Name	BH02		GIS Latitude	-23.8296017922	Lot	8
			GIS Longitude	151.1557678744	Plan	SP218634
			Easting	312153		
Driller Name	MONTELEONE, PETER		Northing	7363417	Map Scale	
Drill Company	GEODRILL AUSTRALIA		Zone	56	Map Series	
Const Method	ROTARY MUD		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	07/07/2015	Data Owner				
Roles	Mine Monitoring					

### Casing 5 records for RN 161276

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	24/06/2015	1	0.00	17.00	Polyvinyl Chloride	5.000	WT - Wall Thickness	60
A	24/06/2015	2	17.00	20.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	60
X	24/06/2015	3	0.00	6.50	Grout			200
X	24/06/2015	4	6.50	7.00	Bentonite Seal			96
X	24/06/2015	5	7.00	20.00	Gravel Pack			96

Report Date: 11/11/2021 10:14

From Year:

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**Strata Logs** 5 records for RN 161276

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Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	4.50	GRAVELLY CLAY (FILL)
2	4.50	8.00	SILTY CLAY (NATURAL)
3	8.00	9.50	GRAVELLY CLAY
4	9.50	10.50	GRAVELLY CLAY/WEATHERED ROCK
5	10.50	20.00	MW ROCK (BEDROCK)

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**Stratigraphies** 0 records for RN 161276

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**Aquifers** 0 records for RN 161276

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**Pump Tests Part 1** 0 records for RN 161276

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**Pump Tests Part 2** 0 records for RN 161276

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**Bore Conditions** 0 records for RN 161276

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**Elevations** 0 records for RN 161276

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**Water Analysis Part 1** 0 records for RN 161276

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**Water Analysis Part 2** 0 records for RN 161276

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**Water Levels** 0 records for RN 161276

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**Wire Line Logs** 0 records for RN 161276

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**Field Measurements** 0 records for RN 161276

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**Special Water Analysis** 0 records for RN 161276

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 17:14

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161277	Sub-Artesian Facility	Existing	23/06/2015	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description	BH01		Latitude	23-49-42	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-09-24	Sub-area	
Original Name	BH01		GIS Latitude	-23.82824791	Lot	8
			GIS Longitude	151.15657214	Plan	SP218634
			Easting	312233		
Driller Name	MONTELEONE, PETER		Northing	7363568	Map Scale	
Drill Company	GEODRILL AUSTRALIA		Zone	56	Map Series	
Const Method	ROTARY MUD		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	07/07/2015	Data Owner				
Roles	Mine Monitoring					

**Casing** 5 records for RN 161277

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	23/06/2015	1	0.00	15.00	Polyvinyl Chloride	4.950	WT - Wall Thickness	60
A	23/06/2015	2	15.00	18.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	60
A	23/06/2015	3	6.00	18.00	Gravel Pack			96
X	23/06/2015	4	5.50	6.00	Bentonite Seal			96
X	23/06/2015	5	0.00	5.50	Grout			96

Report Date: 09/11/2021 17:14

From Year:

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**Strata Logs** 3 records for RN 161277

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Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	4.50	CLAY, GRVELLY, FILL
2	4.50	7.00	CLAY, GRAVELLY, NATURAL
3	7.00	18.00	CLAY, SILTY, SANDY

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**Stratigraphies** 0 records for RN 161277

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**Aquifers** 0 records for RN 161277

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**Pump Tests Part 1** 0 records for RN 161277

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**Pump Tests Part 2** 0 records for RN 161277

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**Bore Conditions** 0 records for RN 161277

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**Elevations** 0 records for RN 161277

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**Water Analysis Part 1** 0 records for RN 161277

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**Water Analysis Part 2** 0 records for RN 161277

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**Water Levels** 0 records for RN 161277

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**Wire Line Logs** 0 records for RN 161277

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**Field Measurements** 0 records for RN 161277

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**Special Water Analysis** 0 records for RN 161277

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From Year:

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Report Date: 11/11/2021 10:14

## Groundwater Information

GWDB8250

## Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161277	Sub-Artesian Facility	Existing	23/06/2015	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description	BH01		Latitude	23-49-42	Basin	1320
Parish	897 - CALLIOPE		Longitude	151-09-24	Sub-area	
Original Name	BH01		GIS Latitude	-23.82824791	Lot	8
			GIS Longitude	151.15657214	Plan	SP218634
			Easting	312233		
Driller Name	MONTELEONE, PETER		Northing	7363568	Map Scale	
Drill Company	GEODRILL AUSTRALIA		Zone	56	Map Series	
Const Method	ROTARY MUD		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	07/07/2015	Data Owner				
Roles	Mine Monitoring					

### Casing 5 records for RN 161277

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	23/06/2015	1	0.00	15.00	Polyvinyl Chloride	4.950	WT - Wall Thickness	60
A	23/06/2015	2	15.00	18.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	60
A	23/06/2015	3	6.00	18.00	Gravel Pack			96
X	23/06/2015	4	5.50	6.00	Bentonite Seal			96
X	23/06/2015	5	0.00	5.50	Grout			96

Report Date: 11/11/2021 10:14

From Year:

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**Strata Logs** 3 records for RN 161277

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Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	4.50	CLAY, GRVELLY, FILL
2	4.50	7.00	CLAY, GRAVELLY, NATURAL
3	7.00	18.00	CLAY, SILTY, SANDY

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**Stratigraphies** 0 records for RN 161277

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**Aquifers** 0 records for RN 161277

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**Pump Tests Part 1** 0 records for RN 161277

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**Pump Tests Part 2** 0 records for RN 161277

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**Bore Conditions** 0 records for RN 161277

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**Elevations** 0 records for RN 161277

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**Water Analysis Part 1** 0 records for RN 161277

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**Water Analysis Part 2** 0 records for RN 161277

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**Water Levels** 0 records for RN 161277

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**Wire Line Logs** 0 records for RN 161277

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**Field Measurements** 0 records for RN 161277

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**Special Water Analysis** 0 records for RN 161277

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 09/11/2021 16:42

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161467	Sub-Artesian Facility	Existing	24/02/2016	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-48-54	Basin	1300
Parish	6000 - NO LONGER USED		Longitude	150-59-03	Sub-area	
Original Name			GIS Latitude	-23.81504796	Lot	8
			GIS Longitude	150.98422833	Plan	RP620660
			Easting	294653		
Driller Name	SUTTON, JASON		Northing	7364791	Map Scale	
Drill Company	BGD		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	30/05/2016	Data Owner				
Roles	Water Supply					

**Casing** 6 records for RN 161467

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	24/02/2016	1	0.00	49.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	140
A	24/02/2016	2	38.00	47.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	140
X	24/02/2016	3	0.00	6.00	Grout			200
X	24/02/2016	4	6.00	8.00	Bentonite Seal			200
X	24/02/2016	5	8.00	49.00	Gravel Pack			200

Report Date: 09/11/2021 16:42

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	24/02/2016	6	6.00	42.00	Centraliser			

### Strata Logs

7 records for RN 161467

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	5.00	FILL
2	5.00	12.00	WEATHERED ROCK
3	12.00	40.00	MUDSTONE
4	40.00	41.00	SMALL FRACTURES
5	41.00	45.00	MUDSTONE
6	45.00	46.00	SMALL FRACTURES
7	46.00	49.00	MUDSTONE

### Stratigraphies

0 records for RN 161467

### Aquifers

2 records for RN 161467

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	40.00	41.00	MDST - Mudstone	24/02/2016	-13.00	N	POTABLE	0.10	Y	FR	ROCKHAMPTON GROUP
2	46.00	49.00	MDST - Mudstone	24/02/2016	-13.00	N	POTABLE	0.11	Y	PS	ROCKHAMPTON GROUP

### Pump Tests Part 1

1 records for RN 161467

Pipe	Date	Rec	RN of Pumped Bore	Top (m)	Bottom (m)	Dist (m)	Meth	Test Types	Pump Type	Suction Set (m)	Q Prior to Test (l/s)	Dur of Q PR (mins)	Pres on Arriv (m)	Q on Arriv (l/s)
A	24/02/2016	1	161467				PUM			46.00				

### Pump Tests Part 2

1 records for RN 161467

From Year:

Pipe	Date	Rec	Test Dur (mins)	SWL(m)	Recov Time (mins)	Resid DD (m)	Max DD or P RED (m)	Q at Max DD (l/s)	Time to Max DD (mins)	Max Q (l/s)	Calc Stat HD (m)	Design Yield (l/s)	Design BP (m)	Suct. Set (m)	Tmsy (m2/Day)	Stor
A	24/02/2016	1	120	-13.00			33.00	0.11						46.00		

**Bore Conditions** 0 records for RN 161467

**Elevations** 0 records for RN 161467

**Water Analysis Part 1** 0 records for RN 161467

**Water Analysis Part 2** 0 records for RN 161467

**Water Levels** 0 records for RN 161467

**Wire Line Logs** 0 records for RN 161467

**Field Measurements** 1 records for RN 161467

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp Method	Samp Source
A	24/02/2016		1560	6.9						PU Pump - Other or Flowing Bore	GB Groundwater - from Bore

**Special Water Analysis** 0 records for RN 161467

**Bore Report**From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:52

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161716	Sub-Artesian Facility	Existing	01/12/2017	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-51-35	Basin	1320
Parish	6000 - NO LONGER USED		Longitude	151-04-28	Sub-area	
Original Name	DPMW6		GIS Latitude	-23.85964821	Lot	1
			GIS Longitude	151.07439683	Plan	SP144430
			Easting	303908		
Driller Name	SAINSBURY, RICHARD BRUCE		Northing	7359979	Map Scale	
Drill Company	J & S DRILLING		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	08/12/2017	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 10 records for RN 161716

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	01/12/2017	1	0.00	48.00	Polyvinyl Chloride	3.350	WT - Wall Thickness	60
A	01/12/2017	2	36.00	48.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	60
X	01/12/2017	3	0.00	10.00	Polyvinyl Chloride	8.800	WT - Wall Thickness	160
X	01/12/2017	4	0.00	10.00	Grout			250
X	01/12/2017	5	0.00	32.00	Grout			143

Report Date: 11/11/2021 10:52

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	01/12/2017	6	32.00	34.00	Bentonite Seal			143
X	01/12/2017	7	34.00	48.00	Gravel Pack	3.000	GR - Gravel Size	143
X	01/12/2017	8	48.00	49.00	Bentonite Seal			143
X	01/12/2017	9	49.00	53.00	Cuttings or other fill between casing and hole wall			143
X	01/12/2017	10	3.00	47.00	Centraliser			

### Strata Logs

4 records for RN 161716

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.50	WEATHERED SILTSTONE
2	1.50	8.50	SILTSTONE: FIRM
3	8.50	10.00	SILTSTONE: HARD
4	10.00	56.00	BLUE SILTSTONE

### Stratigraphies

0 records for RN 161716

### Aquifers

1 records for RN 161716

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	36.00	48.00	SSTO - Siltstone			N	7.25 MS		Y	PS	ROCKHAMPTON GROUP

### Pump Tests Part 1

1 records for RN 161716

Pipe	Date	Rec	RN of Pumped Bore	Top (m)	Bottom (m)	Dist (m)	Meth	Test Types	Pump Type	Suction Set (m)	Q Prior to Test (l/s)	Dur of Q PR (mins)	Pres on Arriv (m)	Q on Arriv (l/s)
A	01/12/2017	1	161716				PUM			48.00				

### Pump Tests Part 2

1 records for RN 161716

Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:52

From Year:

Pipe	Date	Rec	Test Dur (mins)	SWL(m)	Recov Time (mins)	Resid DD (m)	Max DD or P RED (m)	Q at Max DD (l/s)	Time to Max DD (mins)	Max Q (l/s)	Calc Stat HD (m)	Design Yield (l/s)	Design BP (m)	Suct. Set (m)	Tmsy (m2/Day)	Stor
A	01/12/2017	1		-3.72										48.00		

**Bore Conditions** 0 records for RN 161716

**Elevations** 0 records for RN 161716

**Water Analysis Part 1** 0 records for RN 161716

**Water Analysis Part 2** 0 records for RN 161716

**Water Levels** 0 records for RN 161716

**Wire Line Logs** 0 records for RN 161716

**Field Measurements** 0 records for RN 161716

**Special Water Analysis** 0 records for RN 161716

From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:15

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161927	Sub-Artesian Facility	Existing	08/08/2018	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-49-32	Basin	1320
Parish	6000 - NO LONGER USED		Longitude	151-09-26	Sub-area	
Original Name			GIS Latitude	-23.82569001	Lot	8
			GIS Longitude	151.15710886	Plan	SP218634
			Easting	312284		
Driller Name	SIDELNIK, DANIEL		Northing	7363852	Map Scale	
Drill Company	J & S DRILLING		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	31/08/2018	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 5 records for RN 161927

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	08/08/2018	1	0.00	20.70	Polyvinyl Chloride	5.000	WT - Wall Thickness	64
A	08/08/2018	2	20.70	26.70	Perforated or Slotted Casing	0.500	AP - Aperture Size	64
X	08/08/2018	3	0.00	13.15	Grout			150
X	08/08/2018	4	13.15	14.10	Bentonite Seal			150
X	08/08/2018	5	14.10	26.70	Gravel Pack	3.000	GR - Gravel Size	150

Report Date: 11/11/2021 10:15

From Year:

**Strata Logs** 2 records for RN 161927

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	8.00	GRAVEL/SANDS CLAYS
2	8.00	21.00	CLAYS WITH SILT/SAND

**Stratigraphies** 0 records for RN 161927

**Aquifers** 1 records for RN 161927

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	14.50	21.10	CLAY - Clay			N			Y	SC	QUATERNARY - UNDEFINED

**Pump Tests Part 1** 0 records for RN 161927

**Pump Tests Part 2** 0 records for RN 161927

**Bore Conditions** 0 records for RN 161927

**Elevations** 0 records for RN 161927

**Water Analysis Part 1** 0 records for RN 161927

**Water Analysis Part 2** 0 records for RN 161927

**Water Levels** 0 records for RN 161927

**Wire Line Logs** 0 records for RN 161927

**Field Measurements** 0 records for RN 161927

**Special Water Analysis** 0 records for RN 161927

From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:15

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
161930	Sub-Artesian Facility	Existing	11/08/2018	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-49-30	Basin	1320
Parish	6000 - NO LONGER USED		Longitude	151-09-16	Sub-area	
Original Name			GIS Latitude	-23.82499904	Lot	8
			GIS Longitude	151.15444892	Plan	SP218634
			Easting	312012		
Driller Name	SIDELNIK, DANIEL		Northing	7363925	Map Scale	
Drill Company	J & S DRILLING		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	31/08/2018	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 5 records for RN 161930

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	11/08/2018	1	0.00	15.00	Polyvinyl Chloride	5.000	WT - Wall Thickness	64
A	11/08/2018	2	15.00	18.00	Perforated or Slotted Casing	0.500	AP - Aperture Size	64
X	11/08/2018	3	0.00	12.60	Grout			150
X	11/08/2018	4	12.60	13.80	Bentonite Seal			150
X	11/08/2018	5	13.80	18.00	Gravel Pack			150

Report Date: 11/11/2021 10:15

## Bore Report

From Year:

## Strata Logs

2 records for RN 161930

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	8.00	GRAVELS/SANDS/CLAY
2	8.00	12.00	CLAYS/SILT/SANDS

## Stratigraphies

0 records for RN 161930

## Aquifers

1 records for RN 161930

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	15.00		CLAY - Clay SAND - Sand			N			Y	SC	QUATERNARY - UNDEFINED

## Pump Tests Part 1

0 records for RN 161930

## Pump Tests Part 2

0 records for RN 161930

## Bore Conditions

0 records for RN 161930

## Elevations

0 records for RN 161930

## Water Analysis Part 1

0 records for RN 161930

## Water Analysis Part 2

0 records for RN 161930

## Water Levels

0 records for RN 161930

## Wire Line Logs

0 records for RN 161930

## Field Measurements

0 records for RN 161930

## Special Water Analysis

0 records for RN 161930

From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:53

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
187131	Sub-Artesian Facility	Existing	03/02/2019	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-52-32	Basin	1320
Parish	6000 - NO LONGER USED		Longitude	151-04-51	Sub-area	
Original Name	BH03		GIS Latitude	-23.87560016	Lot	1
			GIS Longitude	151.08071967	Plan	SP144430
			Easting	304576		
Driller Name	ANDERSON, TIMOTHY		Northing	7358221	Map Scale	
Drill Company	J & S DRILLING		Zone	56	Map Series	
Const Method	ROTARY MUD		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	15/03/2019	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 5 records for RN 187131

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	03/02/2019	1	0.00	13.50	Polyvinyl Chloride	5.000	WT - Wall Thickness	60
A	03/02/2019	2	10.50	13.50	Perforated or Slotted Casing	0.400	AP - Aperture Size	60
X	03/02/2019	3	0.00	8.50	Grout			115
X	03/02/2019	4	8.50	9.50	Bentonite Seal			115
X	03/02/2019	5	9.50	14.00	Gravel Pack			115

Report Date: 11/11/2021 10:53

## Groundwater Information

GWDB8250

## Bore Report

From Year:

## Strata Logs

2 records for RN 187131

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	13.00	ENGINEERED FILL (BOULDERS, PEBBLES, GRAVELS WITH CLAY)
2	13.00	14.00	LIGHT YELLOW/BROWN MED CLAY

## Stratigraphies

0 records for RN 187131

## Aquifers

1 records for RN 187131

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	10.50	13.50	CGRY - Clayey Gravel	03/02/2019	-10.68	N	BRACKISH		Y	SC	

## Pump Tests Part 1

1 records for RN 187131

Pipe	Date	Rec	RN of Pumped Bore	Top (m)	Bottom (m)	Dist (m)	Meth	Test Types	Pump Type	Suction Set (m)	Q Prior to Test (l/s)	Dur of Q PR (mins)	Pres on Arriv (m)	Q on Arriv (l/s)
A	03/02/2019	1	187131				PUM		AIR					

## Pump Tests Part 2

1 records for RN 187131

Pipe	Date	Rec	Test Dur (mins)	SWL(m)	Recov Time (mins)	Resid DD (m)	Max DD or P RED (m)	Q at Max DD (l/s)	Time to Max DD (mins)	Max Q (l/s)	Calc Stat HD (m)	Design Yield (l/s)	Design BP (m)	Suct. Set (m)	Tmsy (m2/Day)	Stor
A	03/02/2019	1	180	-10.68												

## Bore Conditions

0 records for RN 187131

## Elevations

0 records for RN 187131

## Water Analysis Part 1

0 records for RN 187131

From Year:

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<b>Water Analysis Part 2</b>	<b>0 records for RN 187131</b>
<b>Water Levels</b>	<b>0 records for RN 187131</b>
<b>Wire Line Logs</b>	<b>0 records for RN 187131</b>
<b>Field Measurements</b>	<b>0 records for RN 187131</b>
<b>Special Water Analysis</b>	<b>0 records for RN 187131</b>

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From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 11:02

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
196042	Sub-Artesian Facility	Existing	13/05/2021	Rockhampton	6370 - ROCKHAMPTON REGIONAL COUNCIL

Details			Location			
Description			Latitude	23-41-07	Basin	1300
Parish	6000 - NO LONGER USED		Longitude	150-43-50	Sub-area	
Original Name			GIS Latitude	-23.685197664	Lot	
			GIS Longitude	150.7306038114	Plan	
			Easting	268578		
Driller Name	WATKINSON, ANTHONY		Northing	7378784	Map Scale	
Drill Company	JAB DRILLING		Zone	56	Map Series	
Const Method	ROTARY AIR		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	26/05/2021	Data Owner				
Roles	Water Supply					

**Casing** 6 records for RN 196042

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	13/05/2021	1	0.00	25.00	Polyvinyl Chloride			140
A	13/05/2021	2	13.00	25.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	140
X	13/05/2021	3	0.00	2.00	Steel Casing	6.400	WT - Wall Thickness	200
X	13/05/2021	4	0.00	8.00	Grout			190
X	13/05/2021	5	8.00	10.00	Bentonite Seal			190

Report Date: 11/11/2021 11:02

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	13/05/2021	6	10.00	25.00	Gravel Pack			190

**Strata Logs** 3 records for RN 196042

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	2.00	FILL/OVERBURDEN/ROCKS
2	2.00	18.00	WEATHERED SILTSTONE: HARD
3	18.00	25.00	BLUE ROCK

**Stratigraphies** 0 records for RN 196042

**Aquifers** 1 records for RN 196042

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	18.00		SSTO - Siltstone	13/05/2021	-10.00	N	BRACKISH	0.25	Y	WZ	MOUNT ALMA FORMATION

**Pump Tests Part 1** 0 records for RN 196042

**Pump Tests Part 2** 0 records for RN 196042

**Bore Conditions** 0 records for RN 196042

**Elevations** 0 records for RN 196042

**Water Analysis Part 1** 0 records for RN 196042

**Water Analysis Part 2** 0 records for RN 196042

**Water Levels** 0 records for RN 196042

Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 11:02

From Year:

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**Wire Line Logs**

0 records for RN 196042

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**Field Measurements**

1 records for RN 196042

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	13/05/2021		3300							XX	Unknown	GB	Groundwater - from Bore

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**Special Water Analysis**

0 records for RN 196042

From Year:

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Queensland Government  
Groundwater Information  
Bore Report

Report Date: 11/11/2021 10:13

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
196059	Sub-Artesian Facility	Existing	23/06/2021	Rockhampton	3360 - GLADSTONE REGIONAL

Details			Location			
Description			Latitude	23-49-41	Basin	1320
Parish	6000 - NO LONGER USED		Longitude	151-08-54	Sub-area	
Original Name	B07		GIS Latitude	-23.8280685472	Lot	8
			GIS Longitude	151.1483887072	Plan	SP218634
			Easting	311399		
Driller Name	PARDOEN, DANIEL		Northing	7363577	Map Scale	
Drill Company	NUMAC DRILLING		Zone	56	Map Series	
Const Method	AUGER		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No		Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	28/06/2021	Data Owner				
Roles	Sub-Artesian Monitoring					

**Casing** 4 records for RN 196059

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	23/06/2021	1	0.00	4.00	Polyvinyl Chloride	5.000	WT - Wall Thickness	60
A	23/06/2021	2	4.00	12.00	Perforated or Slotted Casing	0.500	AP - Aperture Size	60
X	23/06/2021	3	0.00	3.50	Grout			150
X	23/06/2021	4	3.50	12.00	Cuttings or other fill between casing and hole wall			150

**Strata Logs** 4 records for RN 196059

Report Date: 11/11/2021 10:13

From Year:

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Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	5.00	FILL - SANDY CLAY
2	5.00	7.00	FILL - GRAVELS
3	7.00	10.00	FILL - SANDY CLAYS
4	10.00	12.00	WEATHERED SANDSTONE

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**Stratigraphies** 0 records for RN 196059

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**Aquifers** 0 records for RN 196059

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**Pump Tests Part 1** 0 records for RN 196059

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**Pump Tests Part 2** 0 records for RN 196059

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**Bore Conditions** 0 records for RN 196059

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**Elevations** 0 records for RN 196059

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**Water Analysis Part 1** 0 records for RN 196059

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**Water Analysis Part 2** 0 records for RN 196059

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**Water Levels** 0 records for RN 196059

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**Wire Line Logs** 0 records for RN 196059

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**Field Measurements** 0 records for RN 196059

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**Special Water Analysis** 0 records for RN 196059

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From Year:

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# Historical Aerial Photographs

# Aerial review

Lot 101 on DS185

1956



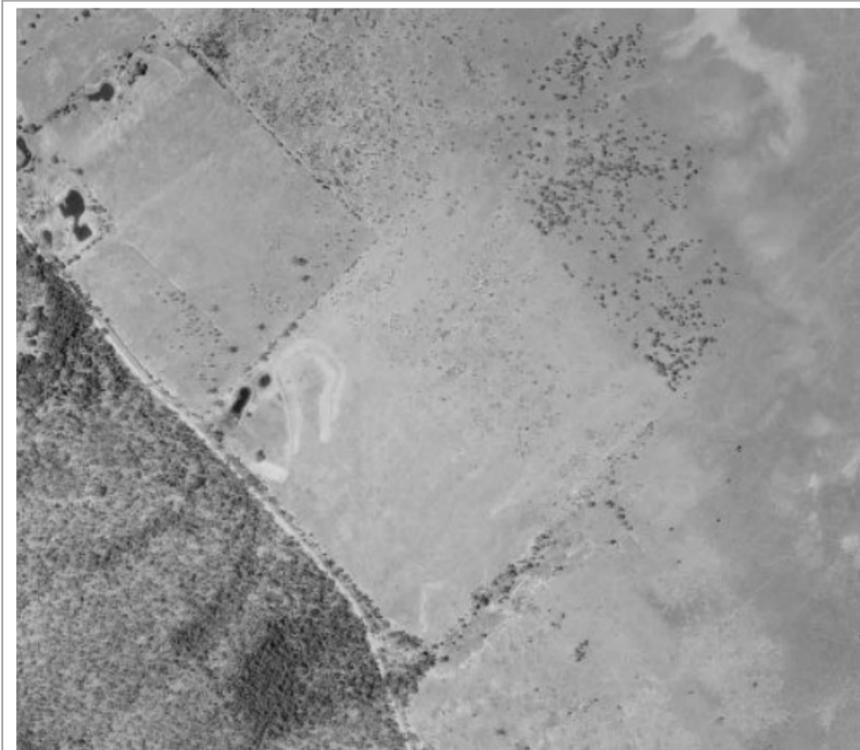
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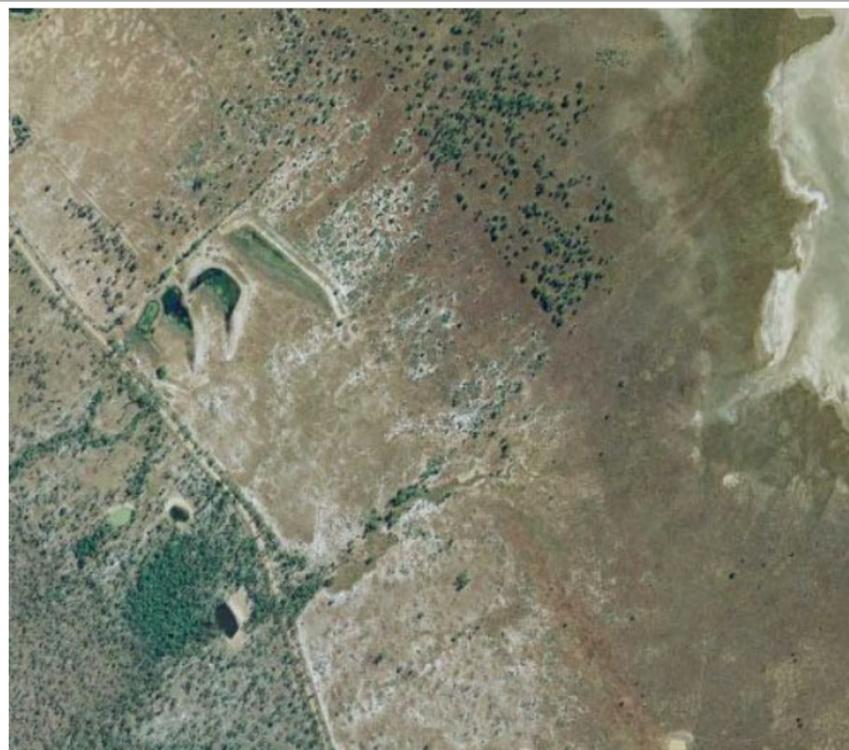
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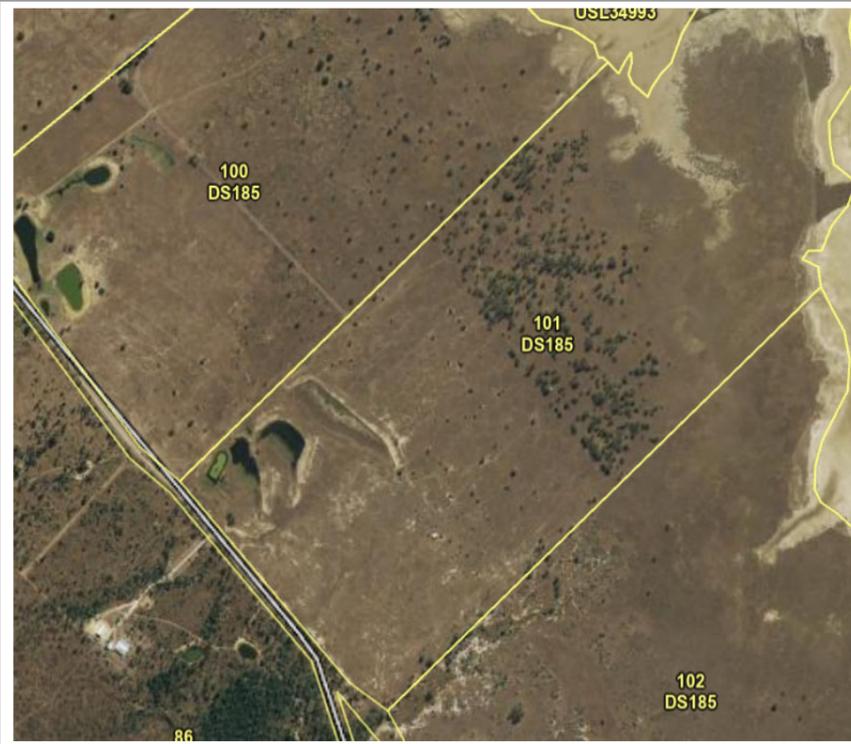
2004



# Aerial review

## Lot 101 on DS185

2010



2014



2020



# Aerial review

Lot 1 on RP911260

1956



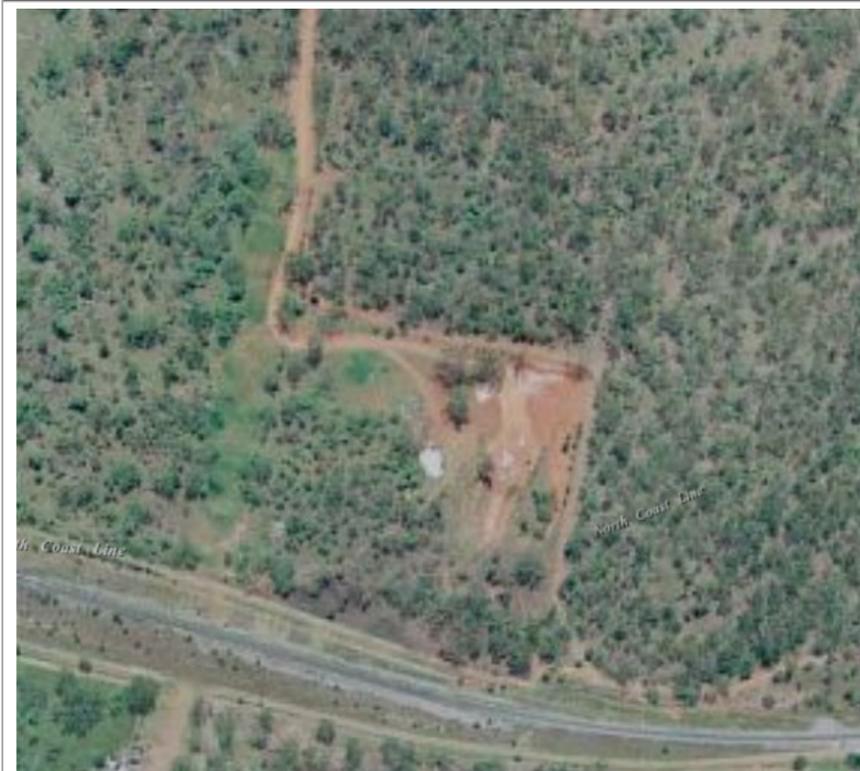
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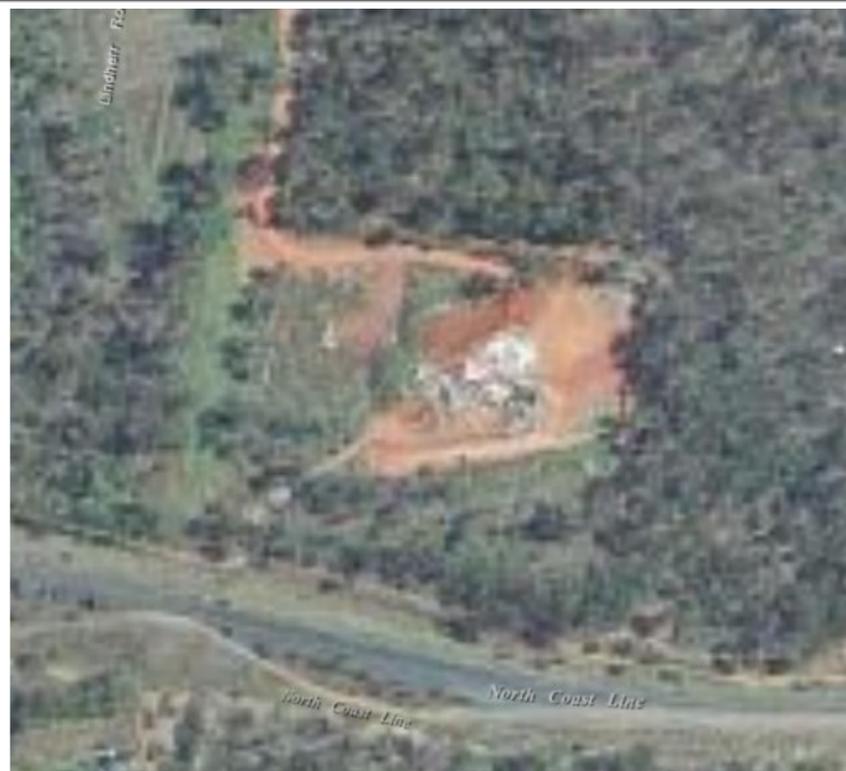
1983



1992



1996



2010



# Aerial review

## Lot 1 on RP911260

2014



2020



# Aerial review

Lot 91 on SP122250

1959



1965



# Aerial review

Lot 91 on SP122250

1980



1989



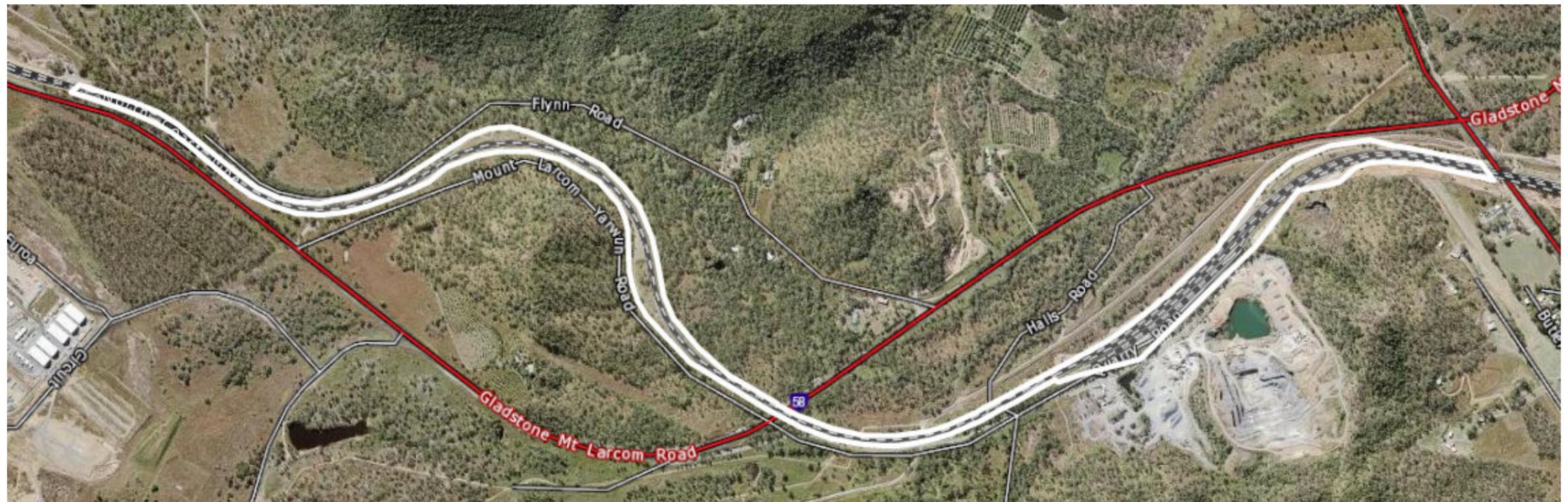
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Lot 91 on SP122250

1996



2015



# Aerial review

Lot 91 on SP122250

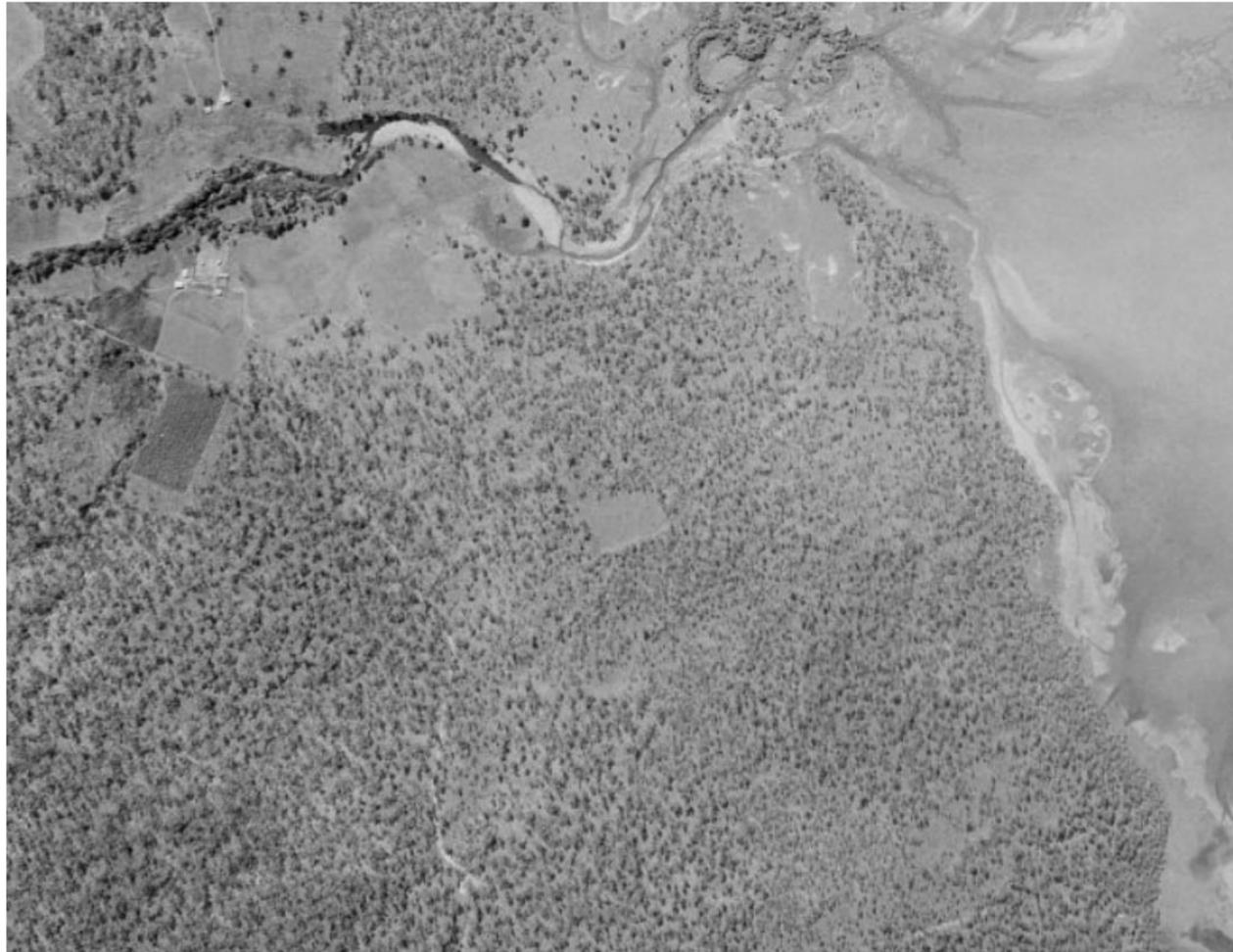
2021



# Aerial review

Lot 7 on SP145439 and Lot 8 on SP218634

1959



1973



# Aerial review

Lot 7 on SP145439 and Lot 8 on SP218634

1981



1992



# Aerial review

Lot 7 on SP145439 and Lot 8 on SP218634

2003



2009



# Aerial review

Lot 7 on SP145439 and Lot 8 on SP218634

2015



2020



# Aerial review

Lot 140 on SP22252

1959



# Aerial review

Lot 140 on SP22252

1965



# Aerial review

Lot 140 on SP22252

1981



# Aerial review

Lot 140 on SP22252

1994



# Aerial review

Lot 140 on SP22252

2007



# Aerial review

Lot 140 on SP22252

2017



# Aerial review

Lot 12 on SP190336

1959



1969



1979



1996



2012



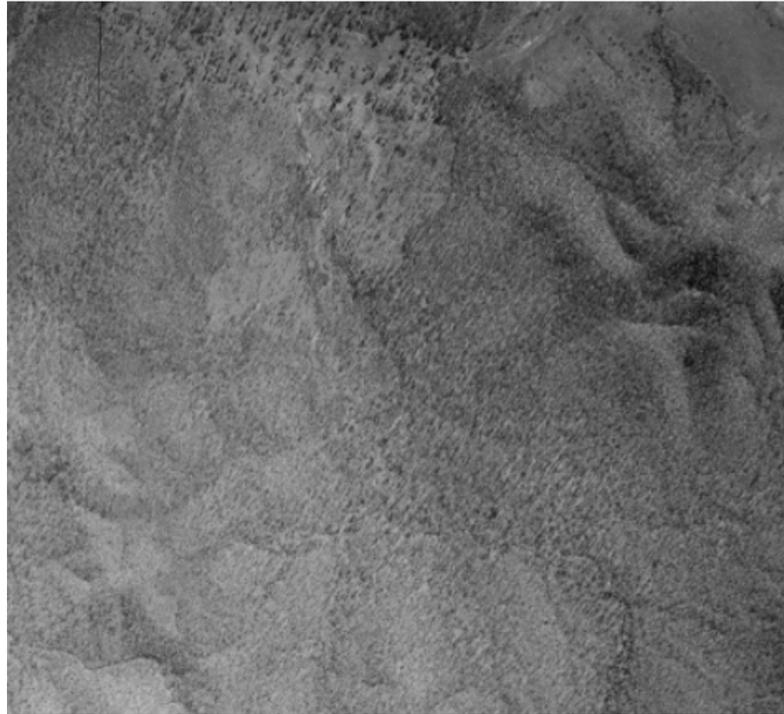
2020



# Aerial review

Lot 1 on SP144430

1959



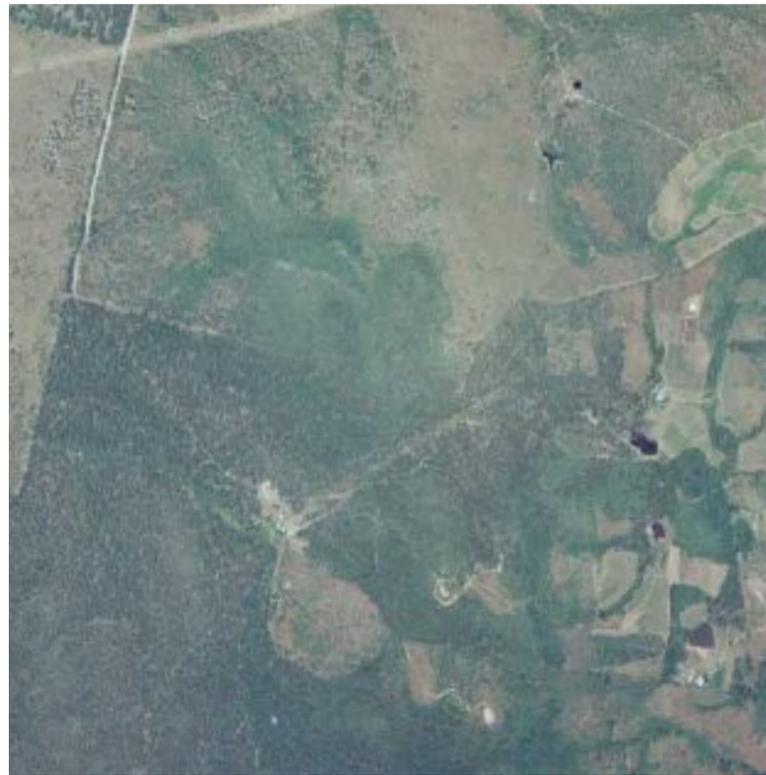
1965



1981



1992



2007



2014





# Aerial review

Lot 1 on SP144430

2020



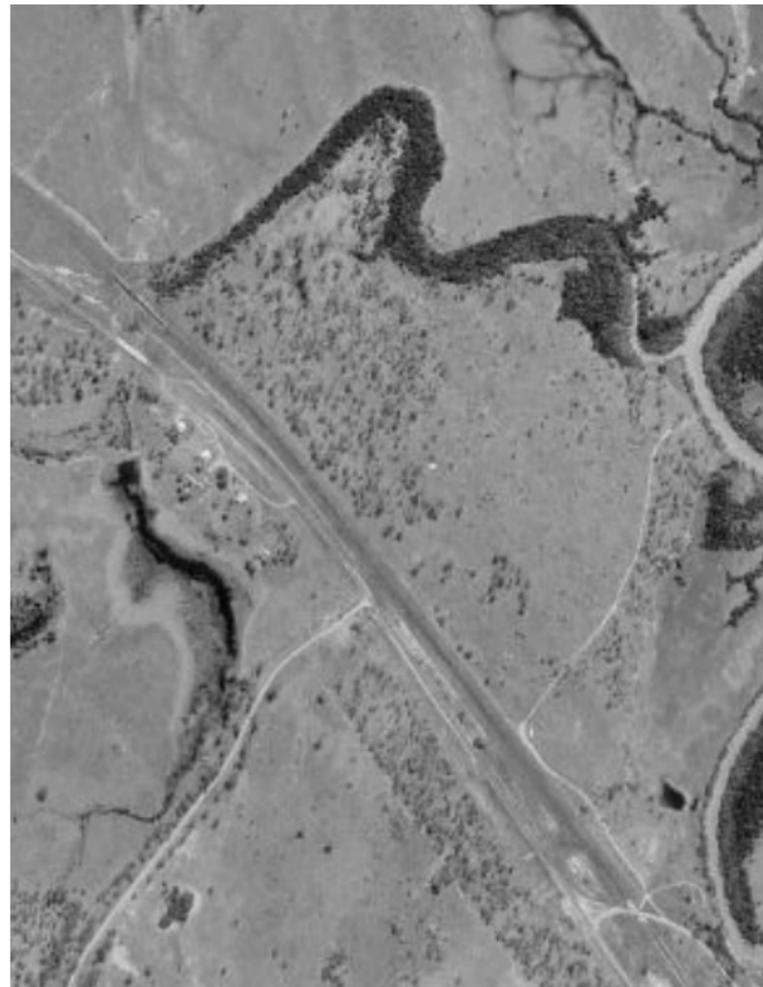
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Lot 167 & 168 on CP859402

1956



1973



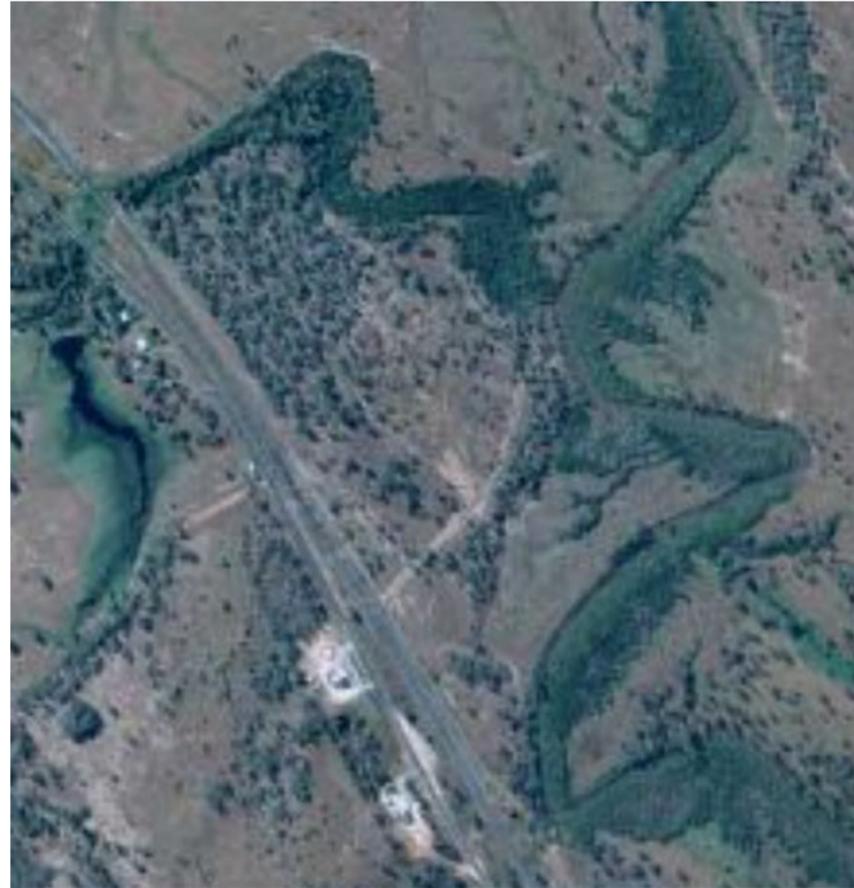
1985



# Aerial review

Lot 167 & 168 on CP859402

1994



2004



2010





# Aerial review

Lot 167 & 168 on CP859402

2020



# **Appendix B**

**Site specific environmental setting**

**Table A.1 QLD Globe desktop searches of environmental setting**

Site	Geology	Hydrology	Groundwater bore records
1. Lot 101 on DS185	<p>The dominant geology is Qa/1-YARROL/SCAG (alluvium).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Clay, silt, sand and gravel: intermediate terraces of flood plain alluvium.</li> </ul> <p>The north-east area of the site's dominant rock is Qhe/m-YARROL/SCAG (miscellaneous unconsolidated sediments).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Mud, sandy mud, muddy sand and minor gravel: estuarine channels and banks, supratidal flats and coastal grasslands.</li> </ul>	There are three dams located on the south-west area of the site.	<p>3 x registered groundwater boreholes within 320 m of the site.</p> <ul style="list-style-type: none"> <li>– RN136700</li> <li>– RN122757 (abandoned and destroyed)</li> <li>– RN122758 (abandoned and destroyed).</li> </ul>
2. Lot 1 on RP911260	<p>The dominant rock is Stanthorpe Granite/a (arenite-mudrock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Chert, jasper, mudstone, siltstone, lithic sandstone, limestone and altered basalt.</li> </ul>	There are two unnamed waterways that intersect the north-east and north-west corners of the site.	<p>The closest groundwater bore is approximately 470 m south-west of the site.</p> <ul style="list-style-type: none"> <li>– RN111438</li> </ul>
3. Lot 91 on SP122250	<p>The site has four geology types and are listed in order from west to east of the site.</p> <p>The far western site's dominant rock is Chalmers Formation (mixed sedimentary rocks and felsites).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Siltstone, lithic sandstone, rhyolitic to andesitic volcanoclastic breccia, rhyolitic and dacitic tuff, minor andesitic tuff.</li> </ul> <p>The next surface geology is TQr-QLD (colluvium as the dominant rock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Clay, silt, sand, gravel and soil; colluvial and residual deposits (generally on older land surfaces).</li> </ul> <p>The next surface geology is Qa-QLD (alluvium as the dominant rock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Clay, silt, sand and gravel; flood-plain alluvium.</li> </ul> <p>The east area of the site has the Lakes Creek Formation (arenite-mudrock as the dominant rock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Siltstone and lithic sandstone.</li> </ul>	The site is intersected by 5 unnamed streams and Sandy Creek. There are 7 unnamed reservoirs that are adjacent to the site.	<p>There is a groundwater bore 40 m south of the east area of the site.</p> <ul style="list-style-type: none"> <li>– RN88341.</li> </ul>
4. Lot 7 on SP145439	<p>There are two geology types in this site.</p> <p>The major surface geology is Qa-QLD (alluvium as the dominant rock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Clay, silt, sand and gravel; flood-plain alluvium.</li> </ul> <p>The minor geology (which is in the west-east area of the site) has the Doonside Formation (arenite-mudrock as the dominant rock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Chert, jasper, mudstone, siltstone, lithic sandstone, limestone and altered basalt.</li> </ul>	There is a waterway with several legs that runs parallel through the western portion of the site.	<p>3 x registered groundwater boreholes 200m within the site.</p> <ul style="list-style-type: none"> <li>– RN161277</li> <li>– RN161276</li> <li>– RN88338.</li> </ul>
5. Lot 140 on SP122252	<p>There are five geology types in this site. Half of the site on the western side has the same geology, while the eastern half has a variety of four geology types.</p>	There are four unnamed waterways that intersect the site. There is also an unnamed waterway that	<p>3 x registered groundwater boreholes 400m within the site.</p>

Site	Geology	Hydrology	Groundwater bore records
	<p>The western side of the site has the Rockhampton Group (dominant rock that is sedimentary).</p> <ul style="list-style-type: none"> <li>- Lithological summary: Dark grey mudstone, siltstone, felsic volcanoclastic sandstone, polymictic conglomerate, ooid-bearing sandstone and conglomerate with mudstone rip-up clasts; oolitic and pisolitic limestone and minor skeletal limestone; rare rhyolitic ignimbrite.</li> </ul> <p>The eastern side of the site has the following geology:</p> <ul style="list-style-type: none"> <li>- TQa-QLD. Alluvium is the dominant rock. <ul style="list-style-type: none"> <li>- Lithological summary: Locally red-brown mottled, poorly consolidated sand, silt, clay, minor gravel; high-level alluvial deposits (generally related to present stream valleys but commonly dissected)</li> </ul> </li> <li>- TQr/YARROL/SCAG. Colluvium is the dominant rock. <ul style="list-style-type: none"> <li>- Lithological summary: Red soil; colluvial and residual deposits derived from mafic rocks</li> </ul> </li> <li>- PRg/b-YARROL/SCAG. Gabbroid is the dominant rock. <ul style="list-style-type: none"> <li>- Lithological summary: Grey, fine to coarse-grained, equigranular to porphyritic gabbro, hornblende diorite and quartz diorite to biotite-hornblende quartz monzodiorite</li> </ul> </li> <li>- TQr-QLD. Colluvium is the dominant rock. <ul style="list-style-type: none"> <li>- Lithological summary: Clay, silt, sand, gravel and soil; colluvial and residual deposits (generally on older land surfaces).</li> </ul> </li> </ul>	<p>runs parallel to the west area of the site.</p>	<ul style="list-style-type: none"> <li>- RN151465</li> <li>- RN111458 (abandoned but still useable)</li> <li>- RN161467.</li> </ul>
<p><b>6.</b> Lot 8 on SP218634</p>	<p>This site has two geology types. The main geology spreads across the north, west and east portion of the site.</p> <p>The dominant geology is Doonside Formation (arenite-mudrock).</p> <ul style="list-style-type: none"> <li>- Lithological summary: Chert, jasper, mudstone, siltstone, lithic sandstone, limestone and altered basalt.</li> </ul> <p>The secondary geology in the southern portion of the site is Qa-QLD (alluvium).</p> <ul style="list-style-type: none"> <li>- Lithological summary: Clay, silt, sand and gravel; flood-plain alluvium.</li> </ul>	<p>There is a lake in the north area and a reservoir and canal lines in the east of the site (in the Yarwun Alumina Refinery).</p> <p>There are several legs from Boat Creek in the north and west area of the site and several legs from an unnamed watercourse stream in the south-west area of the site.</p>	<p>5 x registered groundwater boreholes within the site.</p> <ul style="list-style-type: none"> <li>- RN196059</li> <li>- RN161276</li> <li>- RN161277</li> <li>- RN161927</li> <li>- RN161930</li> </ul>
<p><b>7.</b> Lot 12 on SP190336</p>	<p>This site has two geology types. The main type is within the middle (north to south) area of the site.</p> <p>The dominant geology is Lakes Creek Formation (arenite-mudrock).</p> <ul style="list-style-type: none"> <li>- Lithological summary: Siltstone and lithic sandstone.</li> </ul> <p>The secondary geology is present in the far west and east areas of the site. The dominant geology is Qa-QLD (alluvium).</p> <ul style="list-style-type: none"> <li>- Lithological summary: Clay, silt, sand and gravel; flood-plain alluvium.</li> </ul>	<p>There are two reservoirs (one in the north-west area and one in the south area). There are several legs from Sandy Creek in the north-west area of the site as well as several waterway streams throughout the site.</p>	<p>2 x registered groundwater boreholes within 30m of the site.</p> <ul style="list-style-type: none"> <li>- RN88339</li> <li>- RN136514.</li> </ul>

Site	Geology	Hydrology	Groundwater bore records
<p><b>8.</b> Lot 1 on SP144430</p>	<p>This site has two geology types. The main geology is present within the entire east, west and south area.</p> <p>The dominant geology is Rockhampton Group (sedimentary rock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Dark, grey mudstone, siltstone, felsic volcanoclastic sandstone, polymictic conglomerate, ooid-bearing sandstone and conglomerate with mudstone rip-up clasts; oolitic and pisolitic limestone and minor skeletal limestone; rare rhyolitic ignimbrite.</li> </ul> <p>The secondary geology is present in a small area of the northern portion. The dominant geology is TQa-QLD (alluvium).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Locally red-brown mottled, poorly consolidated sand, silt, clay, minor gravel; high-level alluvial deposits (generally related to present stream valleys but commonly dissected).</li> </ul>	<p>There are three reservoirs within the site (stored red mud slurry). There are three water course streams in the southern area, with one stream coming from Gravel Creek.</p>	<p>There are over 50 registered groundwater boreholes within the site. For simplification, 1 borehole in each section of the site was taken.</p> <ul style="list-style-type: none"> <li>– North (RN161716)</li> <li>– South (RN187131)</li> <li>– East (151508)</li> <li>– West (RN151508)</li> </ul>
<p><b>9.</b> Lot 2 on RP608546</p>	<p>This site has three geology types. The main geology is present in the north and west portion of the site. The dominant geology is Mount Alma Formation (arenite-mudrock).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Thinly interbedded fine-grained sandstone and siltstone and thick beds of conglomerate with andesitic to dacitic clasts and siltstone rip-up-clasts.</li> </ul> <p>The secondary geology is present in the south portion of the site. The dominant geology is Qa-QLD (alluvium).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Clay, silt, sand and gravel; flood-plain alluvium.</li> </ul> <p>The minor geology is present along the eastern side of the site. The dominant geology is Qa/1-YARROL/SCAG (alluvium).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Clay, silt, sand and gravel: intermediate terraces of flood plain alluvium.</li> </ul>	<p>There are three reservoirs along the eastern side of the site. There is an unnamed watercourse stream that runs approximately 70m north of the site. There is another unnamed watercourse stream that runs diagonal to the south-west corner.</p>	<p>1 x registered groundwater bore approximately 110m south of the site.</p> <ul style="list-style-type: none"> <li>– RN196042.</li> </ul>
<p><b>10.</b> Lot 250 on R2621</p>	<p>The site has one geology type. The dominant geology is Qa/1-YARROL/SCAG (alluvium).</p> <ul style="list-style-type: none"> <li>– Lithological summary: Clay, silt, sand and gravel: intermediate terraces of flood plain alluvium.</li> </ul>	<p>There are no watercourses within the site. There is a reservoir approximately 160m north of the site. There are three lakes within 600m south of the site.</p>	<p>1 x registered groundwater bore approximately 130m east of the site.</p> <ul style="list-style-type: none"> <li>– RN151478.</li> </ul>

# **Appendix E**

## **Ecology Assessment Report**



# Fitzroy to Gladstone Pipeline

**Baseline terrestrial and aquatic ecology  
technical report**

Gladstone Area Water Board

4 November 2022

**GHD ABN 39 008 488 373**

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<b>Printed date</b>	5/11/2022 3:04:00 PM
<b>Last saved date</b>	5 November 2022 3:04 PM
<b>File name</b>	https://projectsportal.ghd.com/sites/pp14_03/gawbgfpsecondaryappr/ProjectDocs/Ecology/12559247_GFP_Baseline Terrestrial and Aquatic Ecology Assessment.docx
<b>Author</b>	Victoria Crepin, Shannon Blatchford, James Wyatt
<b>Project manager</b>	Amanda Smedley
<b>Client name</b>	Gladstone Area Water Board
<b>Project name</b>	GAWB GFP Secondary Approvals
<b>Document title</b>	Fitzroy to Gladstone Pipeline   Baseline terrestrial and aquatic ecology technical report
<b>Revision version</b>	Rev A
<b>Project number</b>	12559247

**Document status**

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	S. Blatchford P. Moonie J. Wyatt V. Crepin T. Moeser	J. Simmonds N. Clark	JSimmonds* NClark*	S Wilson	SWilson*	4/11/2022

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# Abbreviations and acronyms

Abbreviation / acronym	Definition
ADR	Accepted Development Requirements
ALA	Atlas of Living Australia
ASS	Acid Sulfate Soils
CEMP	Construction Environmental Management Plan
DAF	Department of Agriculture and Fisheries
DAWE	Department of Agriculture Water and the Environment (presently Department of Climate Change, Energy, the Environment and Water)
DBH	Diameter Breast Height
DEHP	Department of Environment and Heritage Protection
DES	Department of Environment and Science
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DoE	Commonwealth Department of the Environment
DoR	The Department of Resources
EPA	Environmental Protection Agency (Queensland) (presently Department of Environment and Science)
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESCP	Erosion and Sediment Control Plan
FGP	Fitzroy to Gladstone Pipeline
GAWB	Gladstone Area Water board
GBR	Great Barrier Reef
GSDA	Gladstone State Development Area
HAT	Highest Astronomical Tide
HDD	Horizontal Directional Drilling
HES	High Ecological Significance
LGA	Local Government Areas
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NCA	<i>Nature Conservation Act 1992</i>
OEMP	Operations Environmental Management Plan
PMAV	Property Maps of Assessable Vegetation
PMST	EPBC Act Protected Matters Search Tool
ROW	Pipeline Right of Way
RE	Regional Ecosystem
SDWO	<i>State Development and Public Works Act 1971</i>
SMP	Species Management Plan
SRI	Significant Residual Impact
SGIC SDA	Stanwell to Gladstone Infrastructure Corridor State Development Area

Abbreviation / acronym	Definition
TEC	Threatened Ecological Community
VMA	Vegetation Management Act
WoNS	Weeds of National Significance
WQMP	Water Quality Management Plan
WWBW	Queensland waterways for waterway barrier works

# 1. Introduction

## 1.1 Project overview

Gladstone Area Water Board (GAWB) is a Queensland Government statutory Water Authority with the purpose of ensuring the long- and short-term water needs of current and future customers are met in ways that are environmentally, socially and commercially sustainable.

On 1 October 2000, GAWB commenced operations as a Category 1 commercialised Water Authority under the *Water Act 2000* (Qld). From the 1st of July 2008, GAWB became a registered service provider under the *Water Supply (Safety and Reliability) Act 2008* (Qld). GAWB is responsible to the Minister for Regional Development and Manufacturing.

The Department of Regional Development, Manufacturing and Water has appointed GAWB as the Delivery Management Proponent for the pre-construction activities associated with the proposed Fitzroy to Gladstone Pipeline (FGP) (previously referred to as the Gladstone to Fitzroy Pipeline/GFP) project (the project).

The project is an option to address the single source water supply risk from Awoonga Dam, enabling long-term water security for urban and industrial customers in the Gladstone region. The project also has the potential to provide water for the emerging hydrogen industry.

The project traverses the Rockhampton Regional Council and Gladstone Regional Council Local Government Areas (LGAs) (Figure 1-1). The 116 kilometre (km) long pipeline will commence on the lower Fitzroy River at Laurel Bank (Northern Section), with the majority of its length within the Stanwell-Gladstone Infrastructure Corridor State Development Area (SGIC SDA). The pipeline then connects with GAWB's existing water infrastructure near Yarwun within the Gladstone State Development Area (GSDA).

The pre-construction activities being delivered by GAWB include:

- Appointing key advisors
- Addressing land tenure, permits and approvals
- Determining long lead time items (if required)
- Determining and commencing the preferred construction procurement strategy.

In addition, GAWB is undertaking several technical investigations and baseline surveys for the project to understand the existing environment and the potential impacts. Environmental management plans and procedures to manage potential impacts from the project are also being progressed.

## 1.2 Project background

In 2007, the Coordinator-General declared the project a 'significant project', requiring an Environmental Impact Statement (EIS) under Section 26(1) of the *State Development and Public Works Act 1971* (SDPWO Act). Further, in 2007 the then Commonwealth Department of Environment and Water Resources issued a notification of referral decision and designated the project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as a 'controlled action' to be assessed under the bilateral agreement as per the SDPWO Act. The controlled action decision identified that the project required assessment and approval under the EPBC Act for potential significant impact on listed threatened species and communities which are Matters of National Environmental Significance (MNES).

An EIS was prepared for the project in 2008 (Arup 2008) with the Supplementary EIS finalised in 2009.

Following the EIS process, the project obtained the following primary environmental approvals:

- The Commonwealth government approved the EIS (EPBC Act reference: EPBC 2007/3501), on 4 November 2011, with conditions varied on 29 October 2021 and 20 June 2022:
  - The approval is for the proposed construction and operation of a 116 km pipeline and associated infrastructure to transport up to 30 gigalitres of water per annum from an intake point at Laurel Bank on the Fitzroy River to Gladstone, near Aldoga, Queensland

- The controlling provisions were listed threatened species and communities (Sections 18 and 18A).
- Coordinator-General EIS evaluation report under Section 26(1) of the SDPWO Act:
- The Coordinator-General issued an evaluation of the project's EIS on 2 February 2010 which established the framework for the State approvals required for the project (noting the report lapsed in February 2018).

The Commonwealth listed threatened species and communities that were identified as controlling provisions and considered in the EPBC Act decision at 4 November 2011 (i.e. MNES controlling provisions) are listed in Table 1-1 below. The MNES identified in Table 1-1 are considered the MNES for the purpose of this Ecology Assessment Report.

Table 1-1 MNES values previously assessed controlling provisions as part of the EPBC Approval

Species / ecological community	Common name	EPBC Act status*
TECs		
Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant)		E
Semi-evergreen vine thickets of the brigalow belt		E
Flora		
<i>Atalaya collina</i>		E
<i>Cycas megacarpa</i>		E
<i>Cycas ophiolitica</i>		E
<i>Quassia bidwillii</i> ( <i>Samadera bidwillii</i> **)		V
Fauna		
<i>Delma torquata</i>	Collared delma	V
<i>Denisonia maculata</i>	Ornamental snake	V
<i>Egernia rugosa</i>	Yakka skink	V
<i>Epthianura crocea macgregori</i>	Yellow chat (Dawson subspecies)	CE
<i>Erythroriorchis radiatus</i>	Red goshawk	V
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V
<i>Nyctophilus corbeni</i> (formally listed as <i>N. timoriensis</i> )	Greater long-eared bat	V
<i>Paradelma orientalis</i>	Brigalow scaly-foot	NL
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	V
<i>Rheodytes leukops</i>	Fitzroy River turtle	V
<i>Rostratula australis</i> (formally listed as <i>R. benghalensis</i> )	Australian painted snipe	E
Key to table:		
– CE – critically endangered; E – endangered; V – vulnerable; LC – least concern;		
– * – Status under the EPBC Act as at June 2022		
– ** - <i>Quassia bidwillii</i> is now known as <i>Samadera bidwillii</i>		

## 1.3 Purpose of this report

GAWB commissioned GHD to conduct terrestrial and aquatic ecological assessments at locations that will or may be affected by the project (Figure 1-1). This assessment involved identifying the existing terrestrial and aquatic ecological values within the study area, including vegetation communities, identifying terrestrial and aquatic flora and fauna species that are present and describing the type, condition and context of ecosystems and habitat.

This report documents the findings of the ecological assessment from desktop assessment and field investigations. Based on the description of ecological values, an assessment of impacts was conducted, options to

avoid and mitigate impacts were identified, and a rigorous analysis was conducted to identify if any matters of state environmental significance (MSES) will experience a significant residual impact (SRI) from the project, in accordance with the Queensland *Significant Residual Impact Guideline* (Department Environment and Heritage Protection (DEHP) 2014).

As identified in Section 1.2, the project is subject to a current EPBC approval with the controlling provisions being those threatened species and communities listed at the time of the approval. The EPBC approval identified significant impacts to the yellow chat that required offsets; no other MNES were identified as requiring offsets. Those threatened species and communities that have been listed or had classification amendments since issuing of the EPBC approval are not required to be managed under the EPBC approval. Therefore, detailed assessment of MNES and associated significant residual impacts as a result of the project is not required for species listed after the approval was granted.

To assist GAWB in meeting the requirements of the EPBC approval and their general environmental duty, this current ecological assessment has included:

- A review of MNES that were listed at the time of the EPBC approval with an aim to identify any significant changes to ground conditions since preparation of the EIS assessment of controlling provisions.
- Identification of MNES (species and species' habitat) that have been listed under the EPBC Act since issuing of the EPBC approval to assist GAWB in meeting their general environmental duty to minimise environmental impacts of the project where possible (noting these are outside of the controlling provisions of the EPBC approval).

This report will:

- Support the implementation of the EPBC approval
- Support State environmental and planning approvals required for the project
- Provide guidance for environmental management of ecological values throughout the project
- Assist GAWB, in meeting their general environmental duty of care as related to ecological values (such as those outlined in proponent Environmental Policies or Environmental Management Systems).

## 1.4 Definitions

For the purposes of this report, definitions as described in Table 1-2 apply:

Table 1-2 Report Definitions

Subject	Definition
<b>The project</b>	Pre-construction activities for the proposed Fitzroy to Gladstone Pipeline (FGP)
<b>Pre-construction</b>	Activities, including but not limited to planning, design, and surveys, that occur within study area prior to the commencement of construction activities
<b>Pipeline alignment</b>	The area proposed to be directly impacted by the project which includes the alignment an approximate 30 m right of way (ROW)
<b>Project footprint</b>	The area proposed to be directly impacted by the project which includes the pipeline alignment, the telecommunication and power supply easements, access tracks and laydown areas
<b>Study area</b>	The area subject to ecological field surveys and includes the pipeline alignment and supporting infrastructure locations
<b>Desktop search extent</b>	10 km buffer around the pipeline alignment used for desktop searches of environmental values
<b>Conservation significant</b>	Any species or ecological community that is listed as critically endangered, endangered, vulnerable or near threatened under the EPBC Act or the <i>Nature Conservation Act 1992</i> (NC Act)
<b>Northern Section</b>	Refers to approximately 15 km of pipeline, the intake facility of the southern bank of the Lower Fitzroy River and the pump station, and the Alton Downs Water Treatment Plant

Subject	Definition
<b>SGIC SDA Section</b>	Refers to works within the Stanwell to Gladstone Infrastructure Corridor State Development Area (SGIC SDA) comprising approximately 80 km of pipeline and the Raglan Pump Station and Reservoir
<b>GSDA Section</b>	Refers to works within the Gladstone State Development Area (GSDA) comprising approximately 21 km of pipeline and the Aldoga Reservoirs

## 1.5 Limitations

This Ecology Technical Report was prepared by GHD in performing services under the Service Provider Agreement dated 4 June 2015 between GHD and GAWB (the Contract). The report does not amend the Contract or take away from the rights or obligations of GAWB and GHD under the Contract or in respect of the standard and quality of the services performed under the Contract. If there is any inconsistency between the Contract and this report, the Contract prevails to the extent of the inconsistency.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in this report and are subject to the scope limitations set out in this report.

GHD has prepared this report on the basis of information provided by GAWB and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and undertaken at or in connection with, specific survey sites. Survey conditions at other parts of the site may be different from the site conditions found at the specific survey sites.

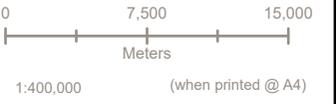
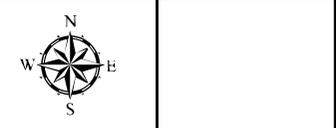
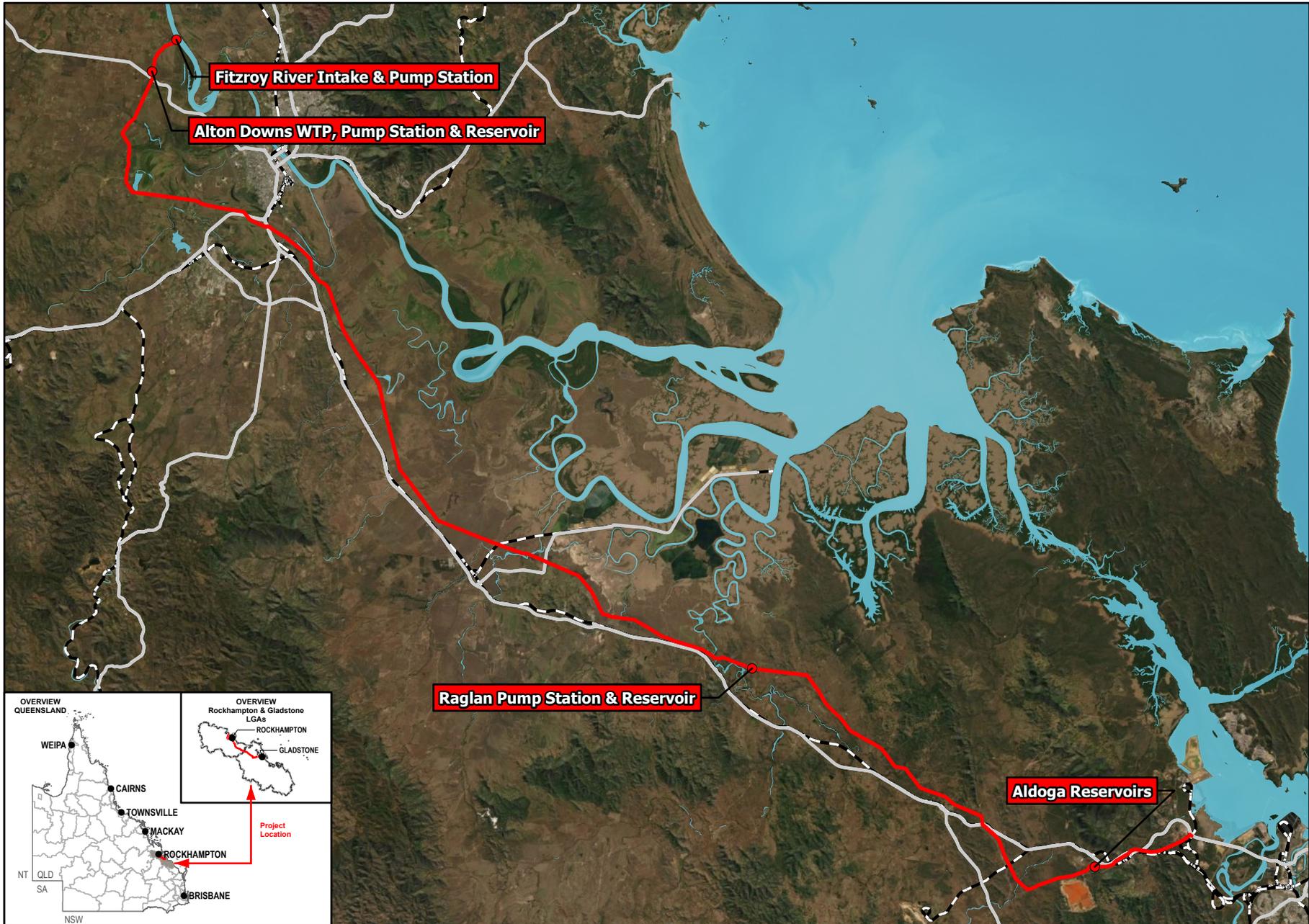
Investigations undertaken in respect of this report are constrained by the particular survey conditions, such as land access, geographic constraints and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of flora and fauna populations) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

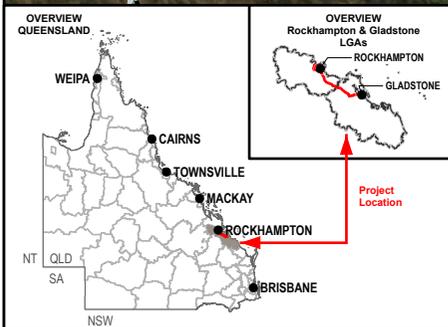
## 1.6 Assumptions

This report should be read with respect to the following:

- Access was not available to all areas within the study area during the field survey. The ecological values of areas that were unable to be assessed has been based on desktop assessment results and ground-truthing of environmental conditions within the broader study area
- The assessment presents field survey results from two seasonal field surveys undertaken in summer (February 2022) and autumn (May 2022). The presence and detectability of terrestrial and aquatic flora and fauna species during the field assessments is strongly influenced by seasonality and therefore survey results have been interpreted with consideration of this potential variability. The description of environmental values and impact assessment presented in this report are informed by the results of the two seasonal surveys.



- Legend**
- Facility Locations
  - Pipeline Alignment
  - Main Roads
  - - - Railways
  - Waterbody



**Data Sources:**  
 1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021  
 2. Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**SMEC Disclaimer:**  
 Maps are for graphical purposes only. The information on this map is from a computer database accessed using a Geographic Information System (GIS). They do not represent a legal survey and the information provided includes inherent errors. SMEC cannot guarantee the accuracy of the information contained on this map. Each user of this map is responsible for determining its suitability for his or her intended use or purpose.

## 2. Methodology

### 2.1 List of relevant legislation

The key legislation of relevance to the project are:

- *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
- *State Development and Public Works Organisation Act 1971*
- *Vegetation Management Act 1999*
- *Biosecurity Act 2014*
- *Nature Conservation Act 1992*
- *Fisheries Act 1994*.
- *Environmental Offsets Act 2014*.

The significant impact assessments were undertaken in accordance with the following guidelines:

- Commonwealth *Significant Impact Guidelines 1.1* (DoE 2013)
- Queensland *Significant Residual Impact Guideline* (DEHP 2014b).

Consideration has been given to these in developing this report.

### 2.2 Approach

The ecological assessment for the project included a combination of desktop review of environmental databases, relevant mapping layers and a field assessment of the terrestrial flora and fauna, and aquatic ecological values within the study area. Together, these assessments allowed for a baseline description of the ecological values of the study area to be compiled, against which an assessment of the project's impacts to Commonwealth MNES and Queensland MSES could be made.

### 2.3 Desktop assessment

A number of ecological assessments have been undertaken for the project, and now form part of the desktop analysis for the current assessment, as outlined in Table 2-1.

Table 2-1 Previous ecological assessments undertaken for the project

Year	Author	Report title
2008	Arup	Gladstone-Fitzroy Pipeline Project Environmental Impact Statement – CH 6 Terrestrial Flora
2008	Arup	Gladstone-Fitzroy Pipeline Project Environmental Impact Statement – CH 7 Terrestrial Fauna
2021	SMEC	Gladstone to Fitzroy Pipeline Stage 2 – Detailed Assessment – Environmental Technical Report

The desktop assessment was undertaken to identify and collate existing information on the ecological values of the environment within the study area. Desktop searches were undertaken for the study area to provide location-specific information on EPBC Act and NC Act listed threatened species, threatened ecological communities (TECs) and ecosystems/habitats with the potential to occur. For all desktop searches, the search extent encompassed a 10 km buffer around each of the three pipeline alignment sections as outlined in section 1.1 (Northern Section, SGIC SDA and GSDA). This was undertaken to provide context about the potential presence of mobile species or cryptic species that are known to occur in similar habitat within the region. To gain a full understanding of the potential ecological values present, desktop results present current listed MNES species and communities. However, those that were listed following the EPBC approval are not addressed further, apart from those species that are co-listed with State legislation.

The desktop assessment used the information sources listed in Table 2-2.

**Table 2-2** Information sources used for the desktop assessment

Information sources	Comments
Department of Climate Change, Energy, the Environment and Water (DCCEEW) EPBC Act Protected Matters Search Tool (PMST)	The DCCEEW PMST was used to identify conservation significant flora and fauna species and TECs listed under the EPBC Act (MNES) that have the potential to occur in the vicinity of the study area (Appendix A).
Department of Environment and Science (DES) WildNet database	The DES WildNet database was searched to retrieve historical records of flora and fauna species previously recorded in the vicinity of the study area (Appendix A).
DES Species Profile Search database	The DES Species Profile Search was undertaken to obtain spatial data records for conservation significant flora and fauna species including those responsible for generating high-risk trigger areas and essential habitat intersecting the study area. The search was also undertaken to gain an understanding of the location and collection date of any conservation significant flora and fauna records in proximity to the study area.
Atlas of Living Australia database	The Atlas of Living Australia database was searched to retrieve historical records of flora and fauna species previously observed in the vicinity of the study area.
DES Biomaps	The DES Biomaps mapping tool was used to review specific locations, collection date and details of records of species of conservation significance in the study area.
The Department of Resources (DoR) Regulated Vegetation Mapping	The DoR Vegetation Management Regional Ecosystem and Remnant Map spatial layer (version 12.1) was viewed to determine the extent and type of Regional Ecosystems (REs) mapped in the study area.
DoR Essential Habitat Mapping	The DoR Essential Habitat Map spatial layer (version 6.13) was viewed to determine if vegetation within the study area has been identified as essential habitat for any conservation significant species listed under provisions of the NC Act.
DES Protected plants flora survey trigger mapping	The DES protected plants flora trigger map spatial layer (version 8.0) was viewed to identify whether the vegetation within the study area was in proximity to a record of a conservation significant flora species.

## 2.4 Ecological field assessment

### 2.4.1 Overview

Terrestrial surveys were undertaken by principal flora ecologist Peter Moonie (Red Ash Consulting) and senior fauna ecologist Shannon Blatchford (GHD). Peter has a Bachelor of Science in Ecology with over 20 years' experience in the fields of ecology and natural resource management. Shannon has a Bachelor of Science in Ecology and Conservation Biology with 12 years' experience in environmental management and ecological assessments. Aquatic surveys were undertaken by senior aquatic ecologist Lauren Pratt, and aquatic ecologists James Wyatt, and Tim Moeser. Lauren has a Bachelor of Marine Studies in Marine Biology and Ecology with Honours and has 13 years' experience in freshwater aquatic ecosystem monitoring. James has a Bachelor of Environmental Management and Ecology with honours and has 12 years' experience in freshwater ecosystem monitoring. Tim has a Bachelor of Science in Aquatic Resource Management and has 6 years' experience in aquatic ecology. Terrestrial and aquatic field team curriculum vitae (CVs) are provided in Appendix C.

Two ecological field surveys were undertaken in February (wet season) and May (post wet season) in 2022 at representative locations throughout the study area to gather information about the environmental values associated with the existing environment, confirm the presence of species of conservation significance, and record any key ecological features that should be avoided or considered for the proposed Project. Field survey dates are listed in Table 2-3.

Aquatic surveys were conducted during summer (wet season) and autumn (post wet season) conditions to provide the best opportunity to capture and/or observe the highest diversity of aquatic flora and fauna species, including fish, crocodiles, and turtles, noting that some watercourses in the region are ephemeral.

Table 2-3 Timing of the terrestrial and aquatic field survey events

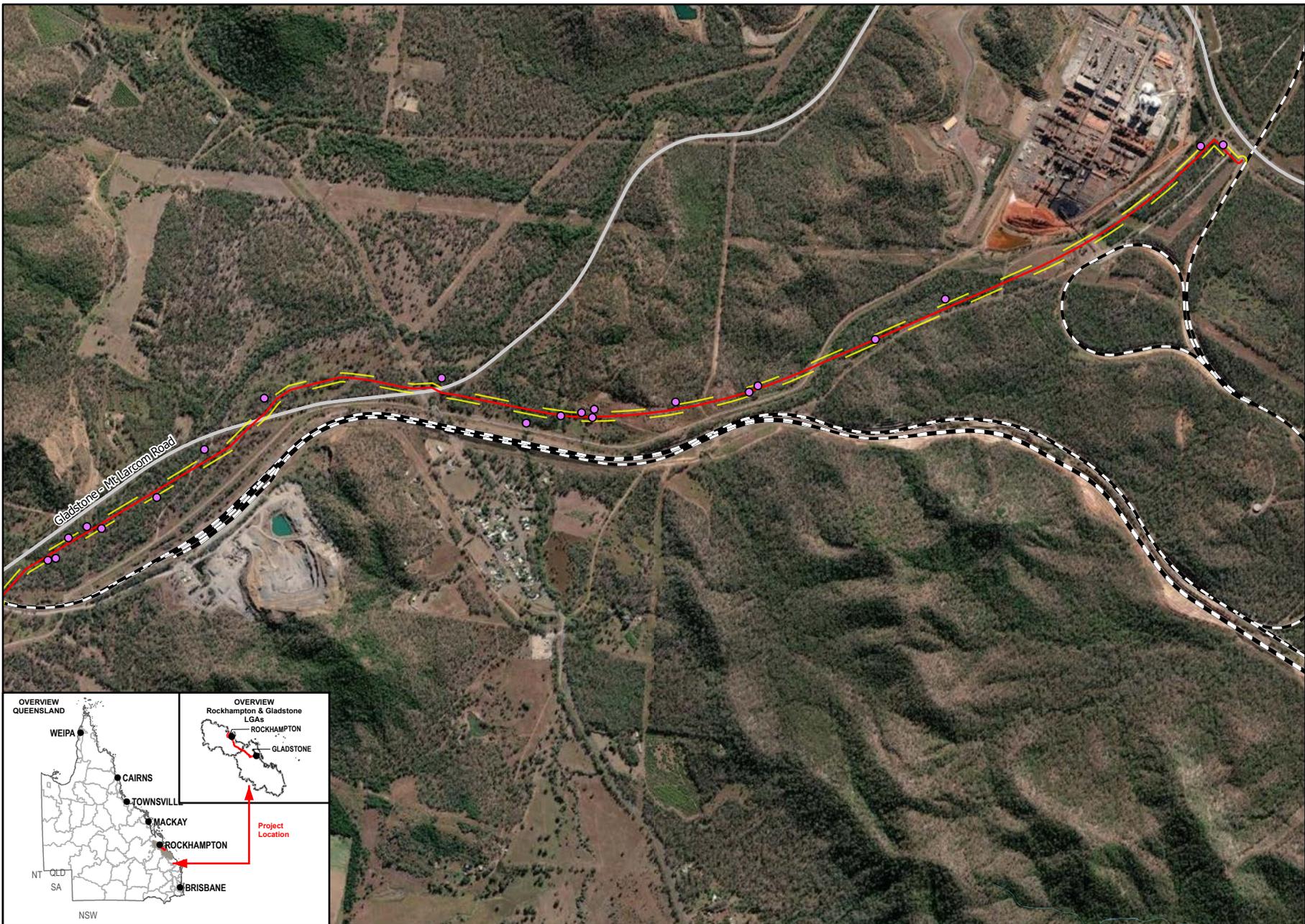
Terrestrial field survey events			Aquatic field survey events		
Season	Date	Days	Season	Date	Days
Summer	21 – 25 February 2022	5	Summer	21 – 23 February 2022	3
Autumn	2 – 9 May 2022	8	Autumn	3 – 10 May 2022	8

## 2.4.2 Vegetation communities and flora survey methods

A total of 207 vegetation and flora field survey sites were assessed during the two ecological field surveys, as presented in Figure 2-1. Surveys were undertaken in accordance with relevant Commonwealth/State guidelines. A description of survey methods employed for relevant environmental matters is provided in Table 2-4.

Table 2-4 Vegetation communities and flora survey methods used within the study area

Assessment	Survey method
Threatened Ecological Communities	The structural and compositional characteristics of vegetation communities across the study area were compared with DCCEEW’s approved conservation advice of TECs to assess whether any vegetation communities present met the requirements necessary to constitute a TEC, noting that assessments were restricted to those communities that were accessible and mapped as comprising REs equivalent to TECs identified in the EPBC Act PMST.
Regional Ecosystems	Verification of REs accessed during the ecological field surveys were undertaken using a combination of Quaternary level assessments and informal observations (as described in Neldner <i>et al.</i> 2020). Data and observations were collected on the structural and floristic composition of vegetation communities as well as soils, geology and landform to determine the RE type. Where a mapped RE did not accurately reflect on-site observations, it was assigned an RE from the REDD (Queensland herbarium 2019) that most closely matched the Land Zone and vegetation attributes observed. Discrepancies in RE boundaries were also noted. Height and cover measurements at survey sites were also assessed against relevant RE benchmark data where initial observations suggested that mapped regrowth vegetation may have achieved remnant status.  RE verification was restricted to the project corridor only and not all polygons were verified. Where RE verifications were not completed, DoR mapping was accepted by default.
Threatened flora species	Threatened flora searches within high-risk flora trigger areas were undertaken in accordance with the <i>Flora Survey Guidelines – Protected Plants</i> (2020) (referred to herein as the flora survey guidelines). A combination of timed meander and systematic transect search methods (as described in the flora survey guidelines) were employed. The timed meander method was principally used in highly modified areas (e.g. paddocks) where plant diversity was low and access, particularly through tall dense exotic grasses, was problematic. The seasonality of the flora survey was considered suitable for the detection of all threatened flora species considered to have a moderate or high potential to occur in the clearing impact area. The survey was co-ordinated and led by a suitably qualified person who has appropriate qualifications, training and experience in undertaking such surveys.  Opportunistic searches for conservation significant flora species were also undertaken in potentially suitable habitat beyond the high-risk flora trigger areas. Species targeted included those identified during desktop searches that were considered potentially present based on habitat requirements and known distributions.
Marine plants	Marine plant surveys were undertaken within and adjacent to tidal lands in the study area, whereby tidal lands were considered to include portions of the study area at or below highest astronomical tide (HAT). The marine plants definition specified in the <i>Fisheries Act 1994</i> and qualifications made in the Department of Agriculture and Fisheries (DAF) Fish Habitat Management Operational Policy FHMOP001 (2007) were used for the purposes of the survey. Data collected included marine plant species present, extents and whether impacts would be of a temporary or permanent basis. An impact was considered to be of a permanent nature where the marine plant could not reasonably be replaced (naturally or via assisted regeneration) within a 5-year period as per the Queensland Significant Residual Impact Guideline (DEHP 2014b).  Scaled plans showing the location and extent of marine plants were prepared with reference to Marine plant Appendix 3 of the State Development Assessment Provisions Guideline State code 11: Removal, destruction, or damage of marine plants (DAF 2022).
Weeds	Opportunistic observations of introduced flora species listed under the <i>Biosecurity Act 2014</i> were also undertaken.





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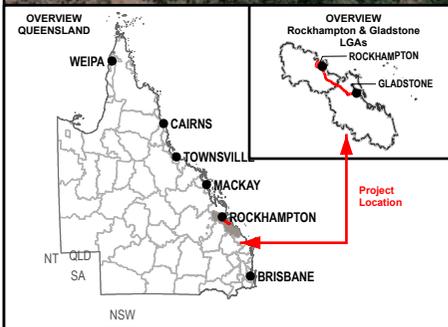
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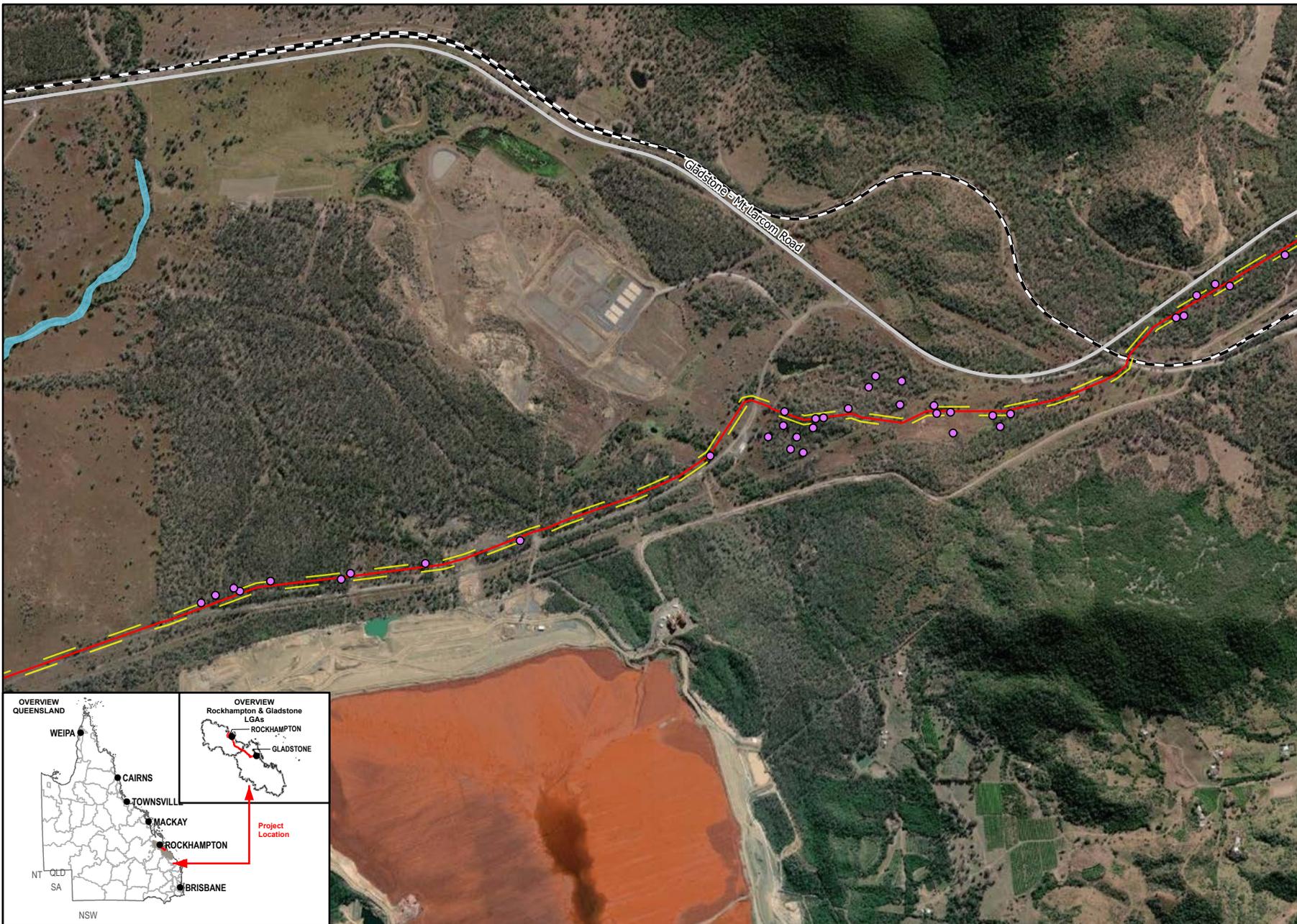
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- Quaternary Assessment Site
  - Study Area
  - Fitzroy to Gladstone Pipeline Alignment
  - Main Roads
  - Railways
  - Waterbody



**Data Sources:**

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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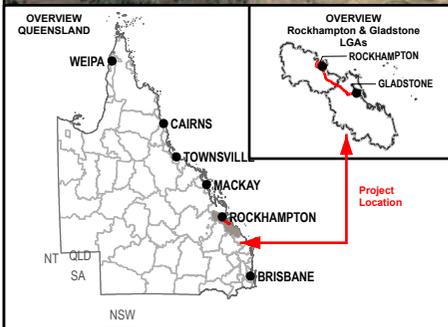
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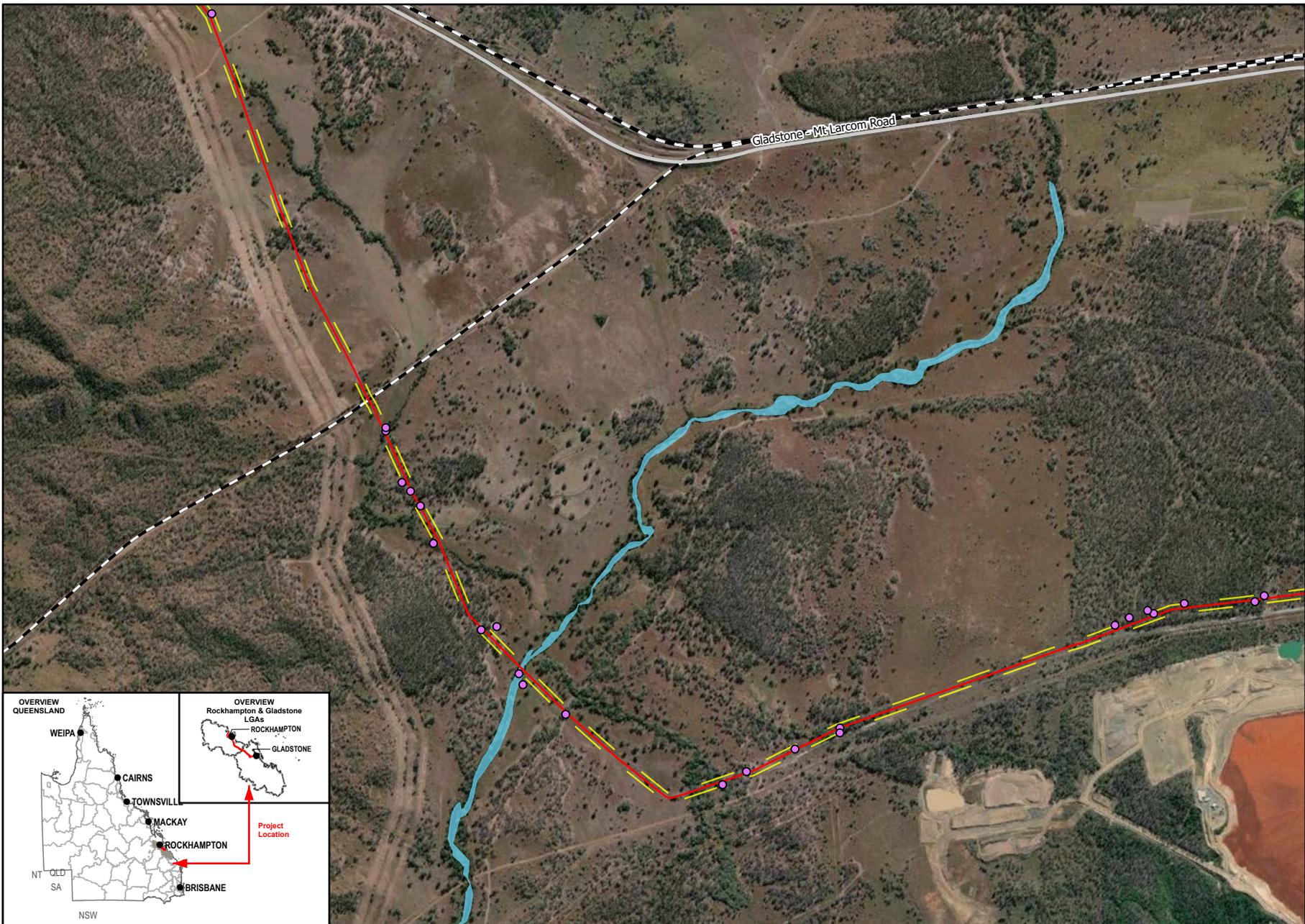
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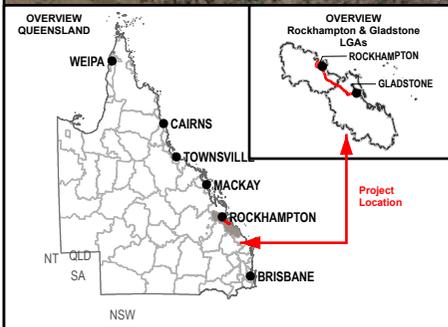
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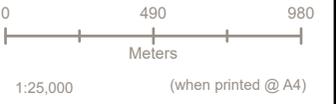
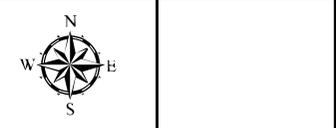
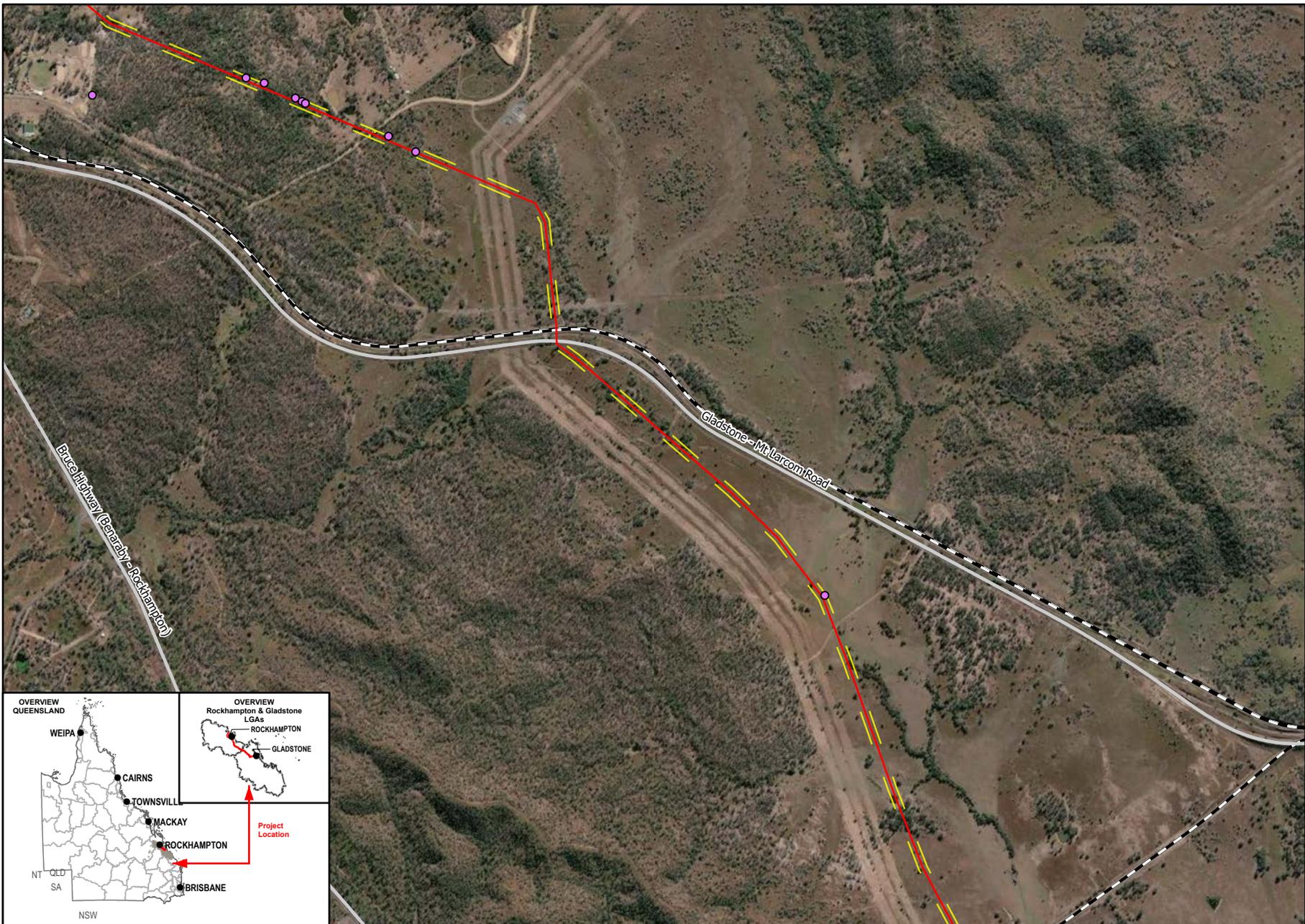
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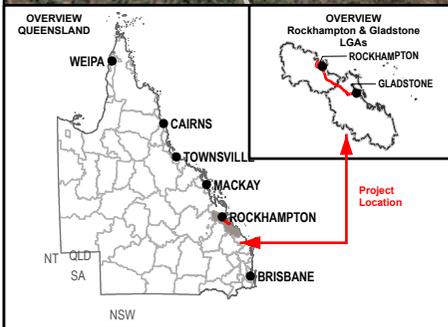
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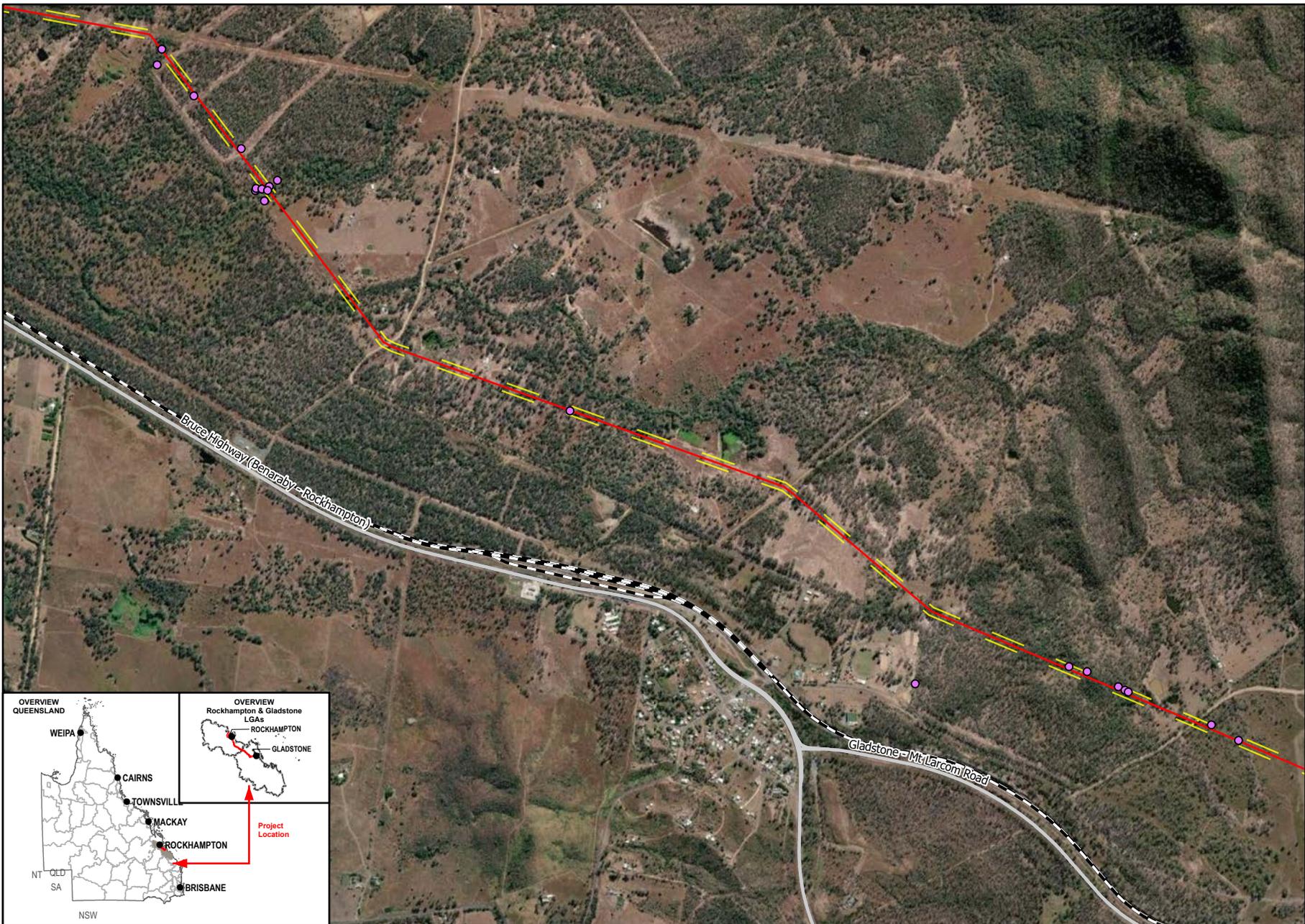
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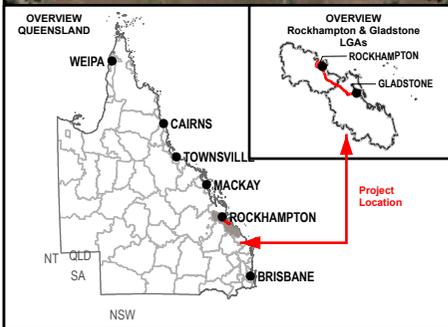


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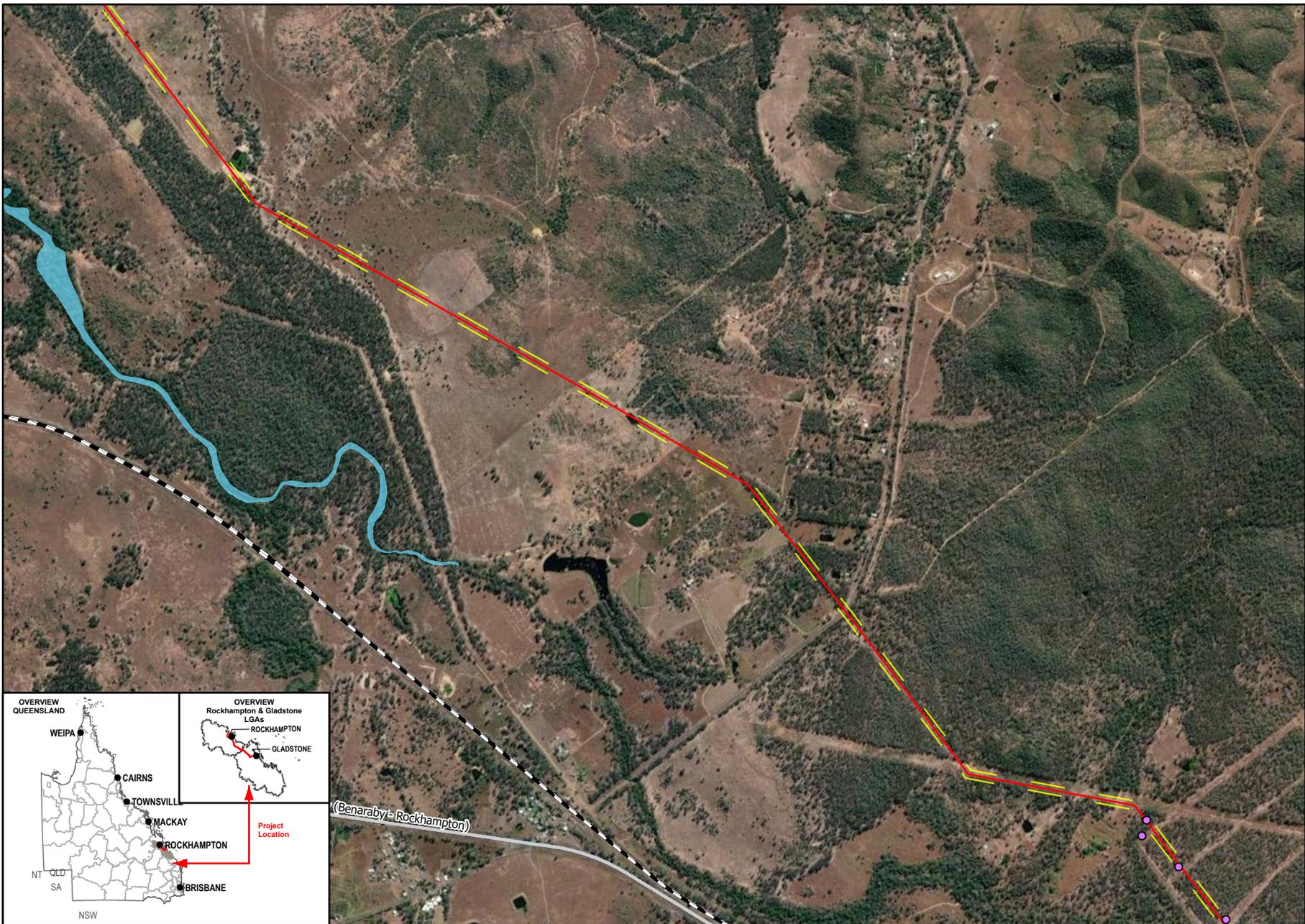
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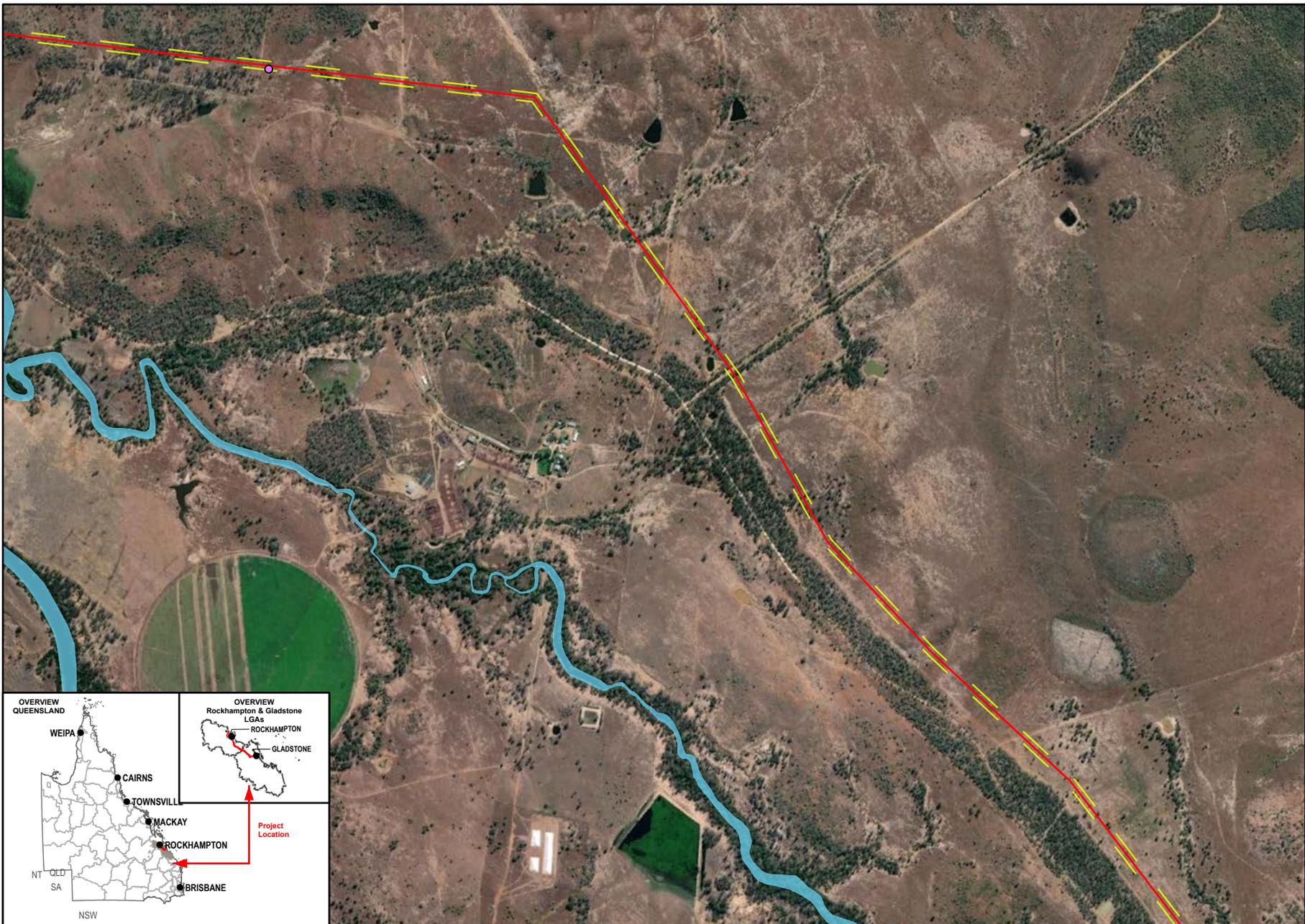
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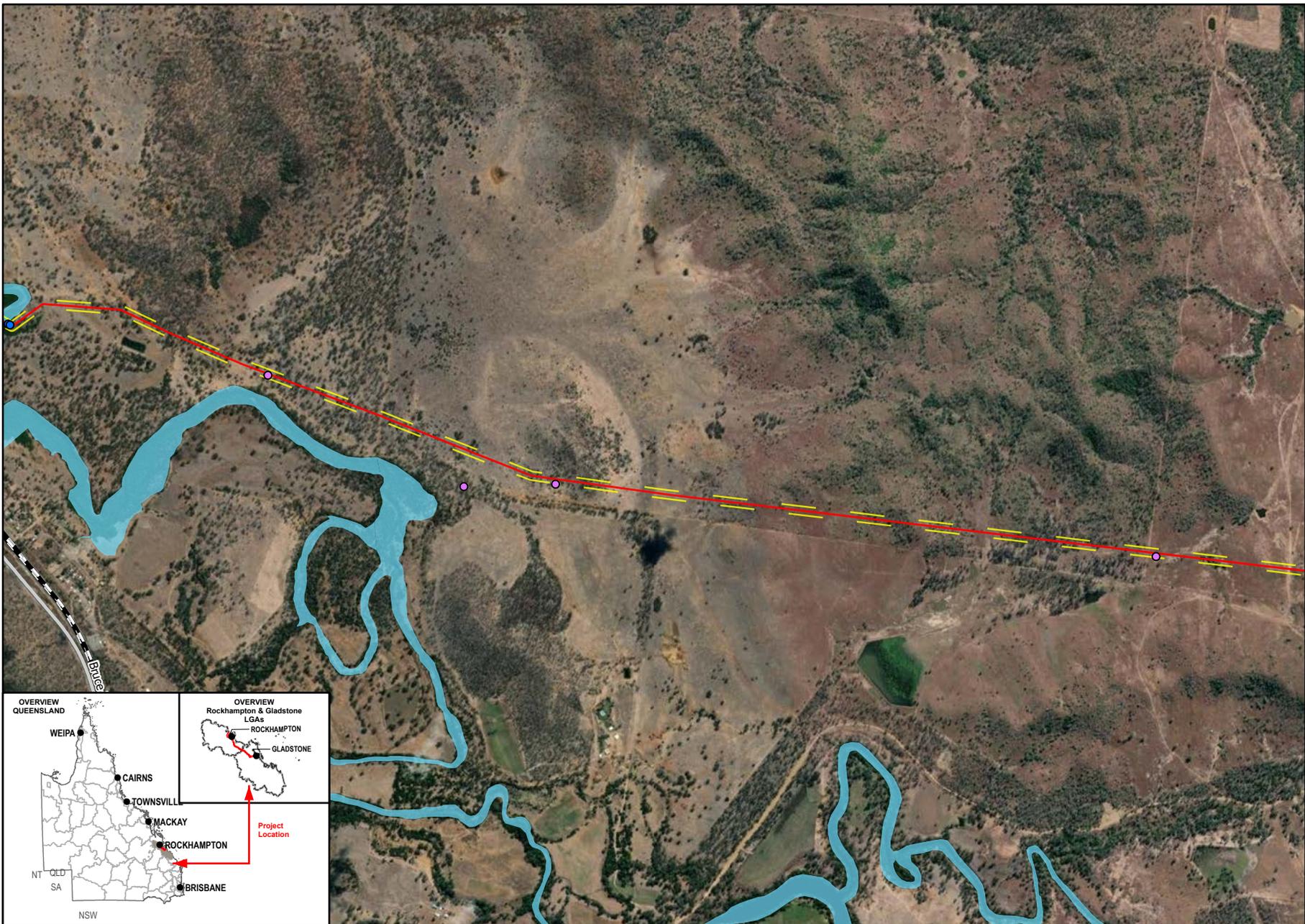
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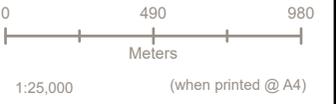
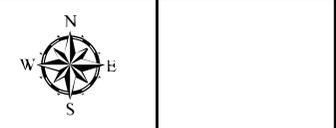
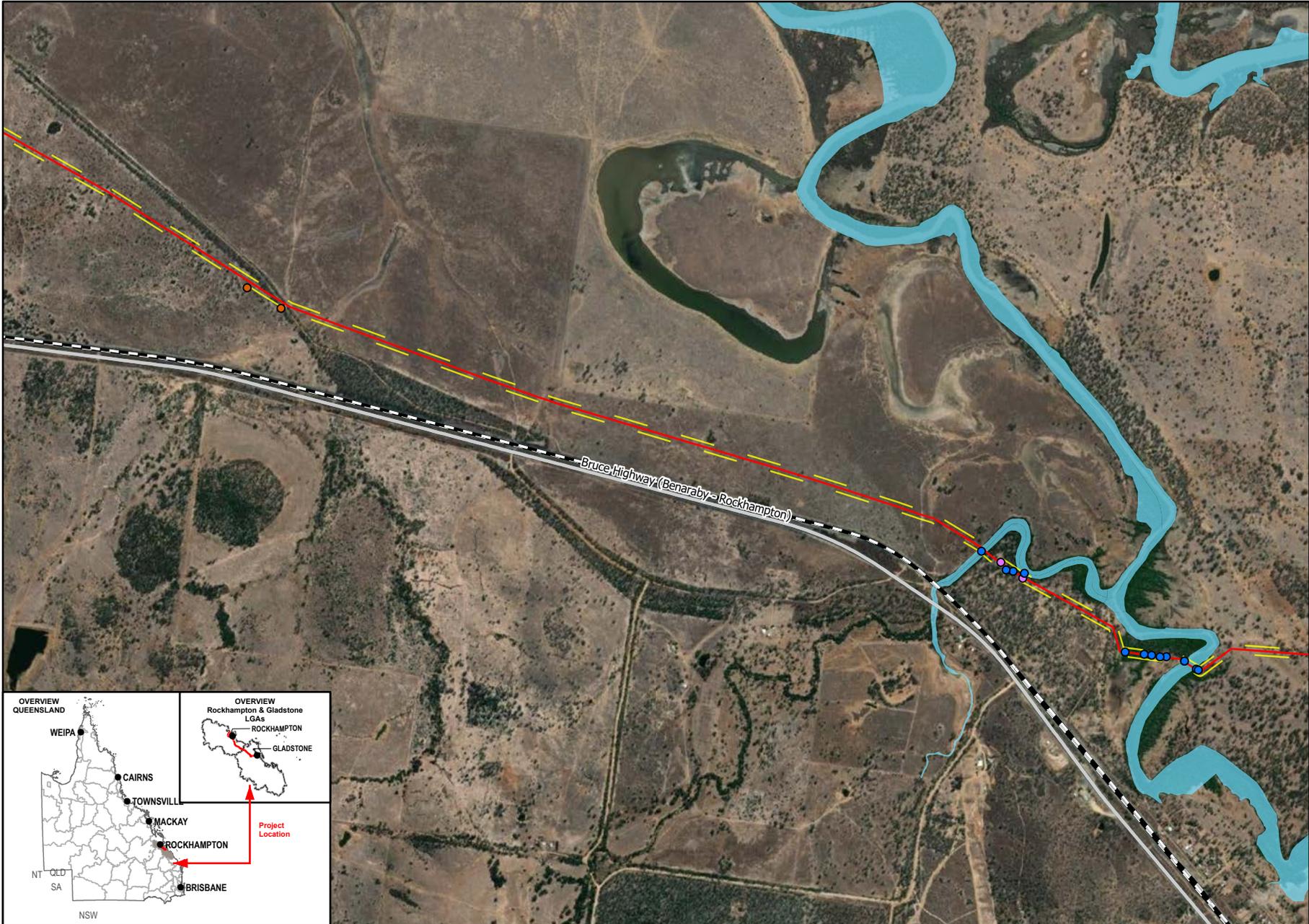
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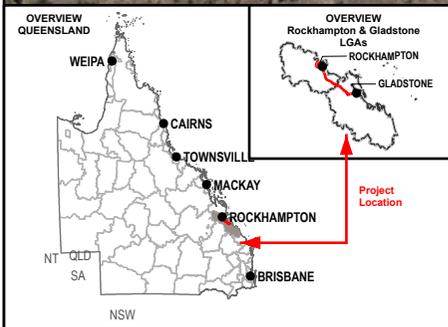
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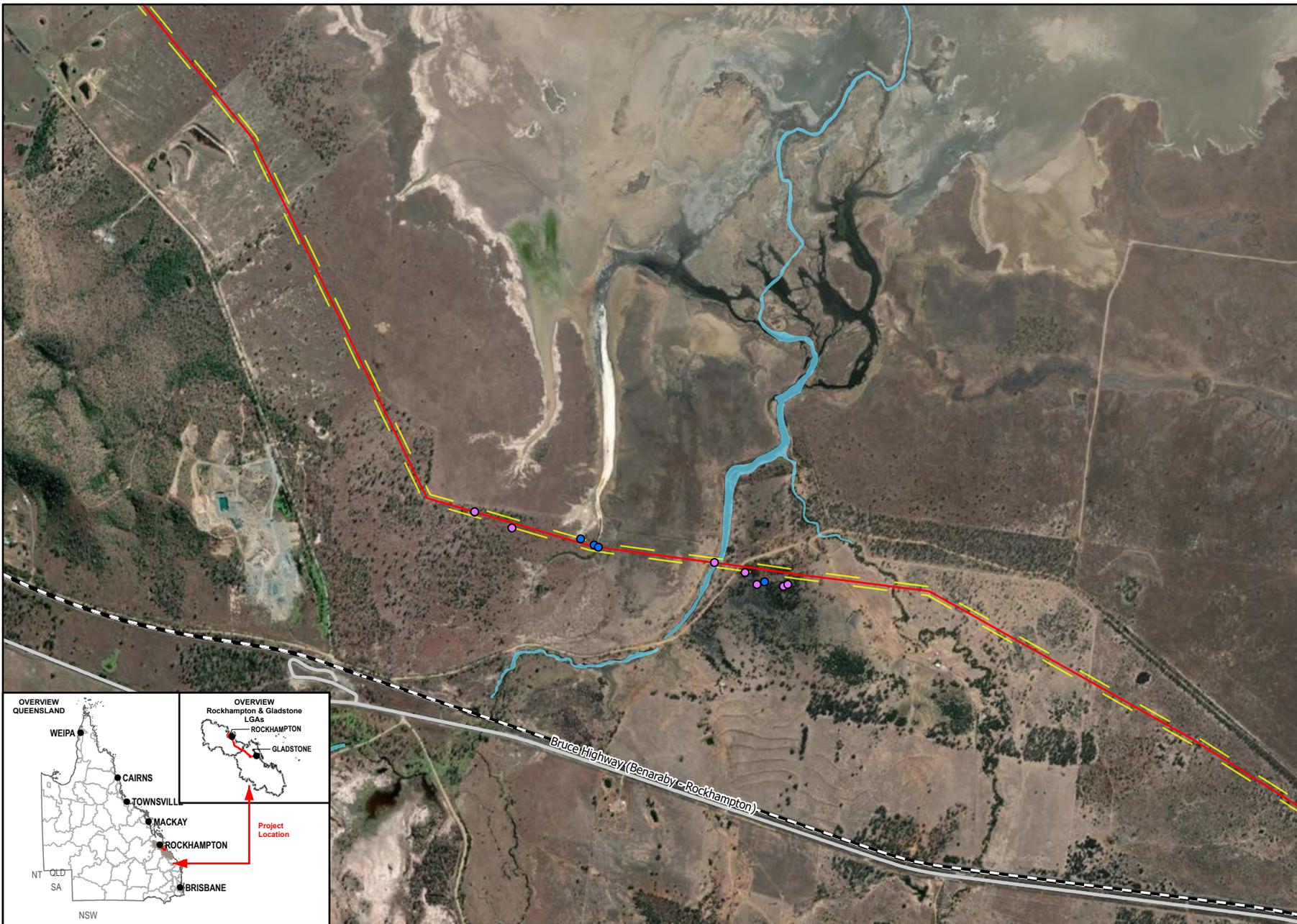
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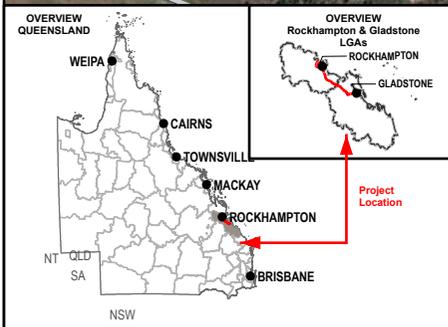
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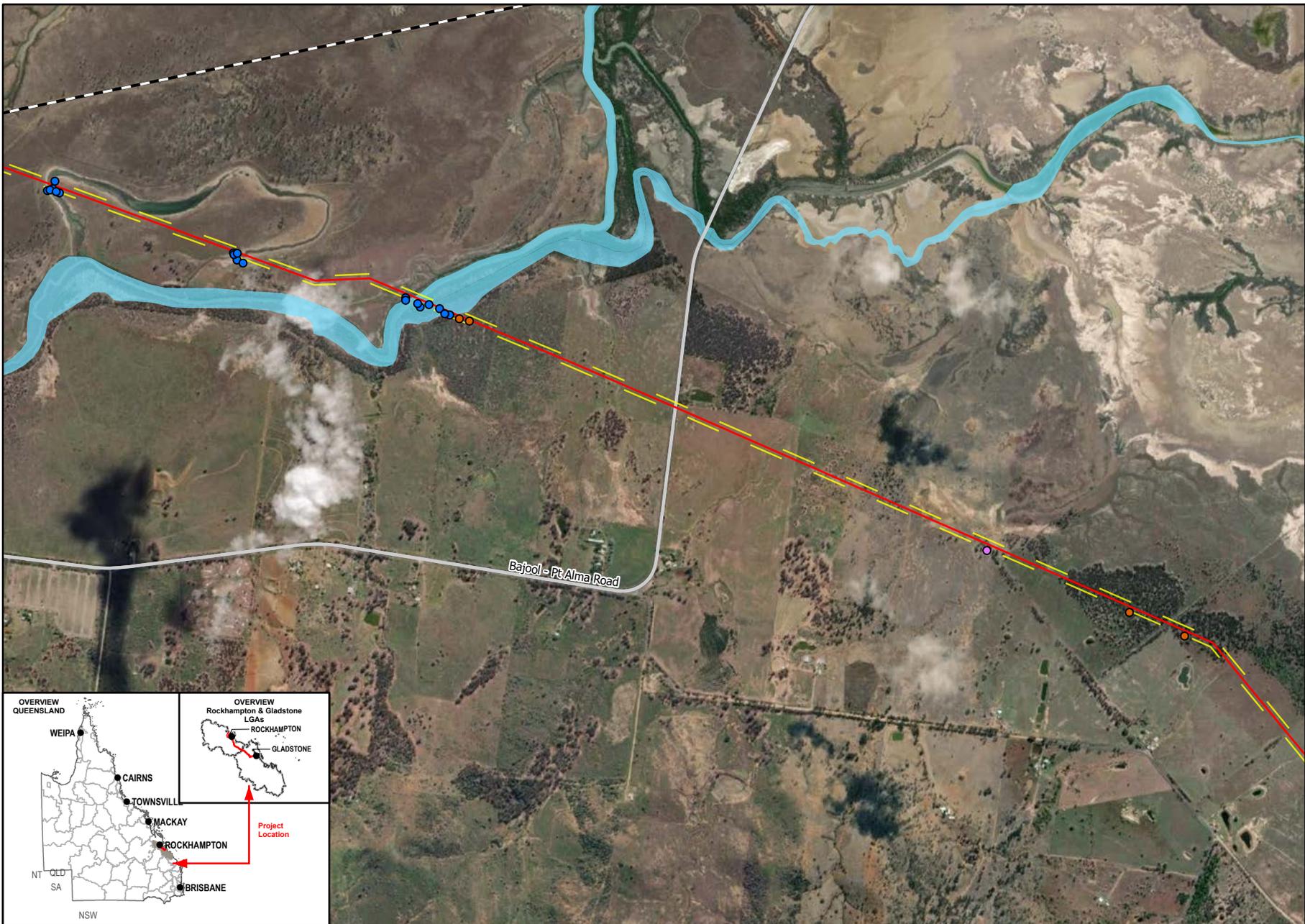
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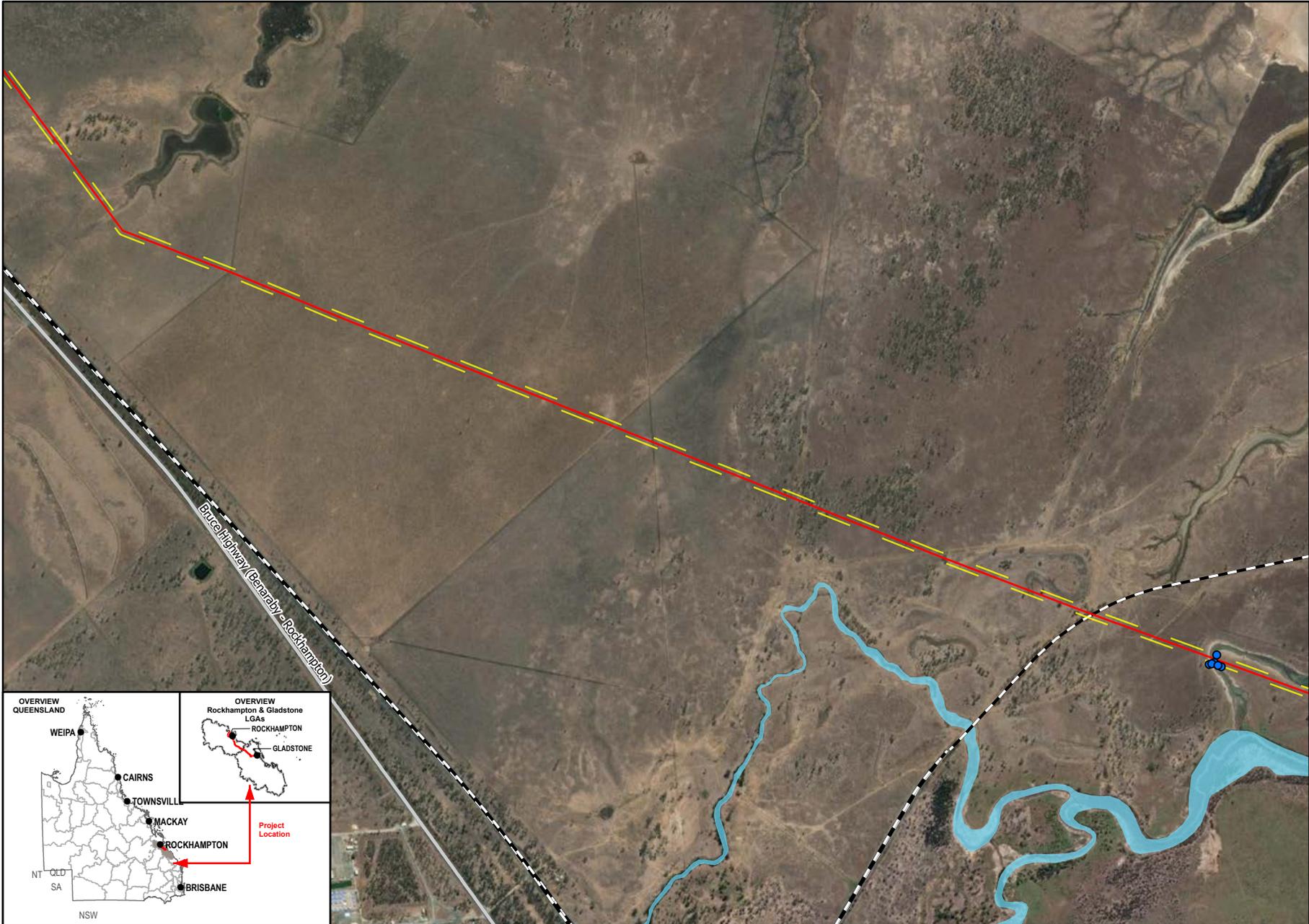
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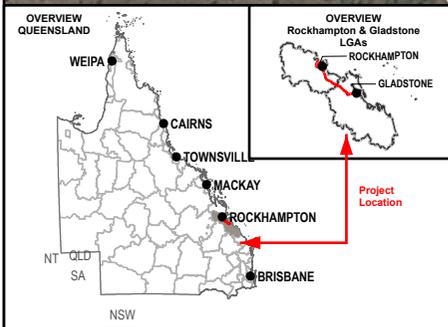
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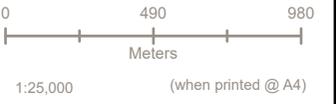
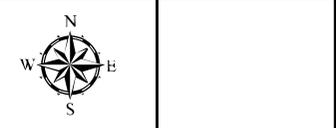
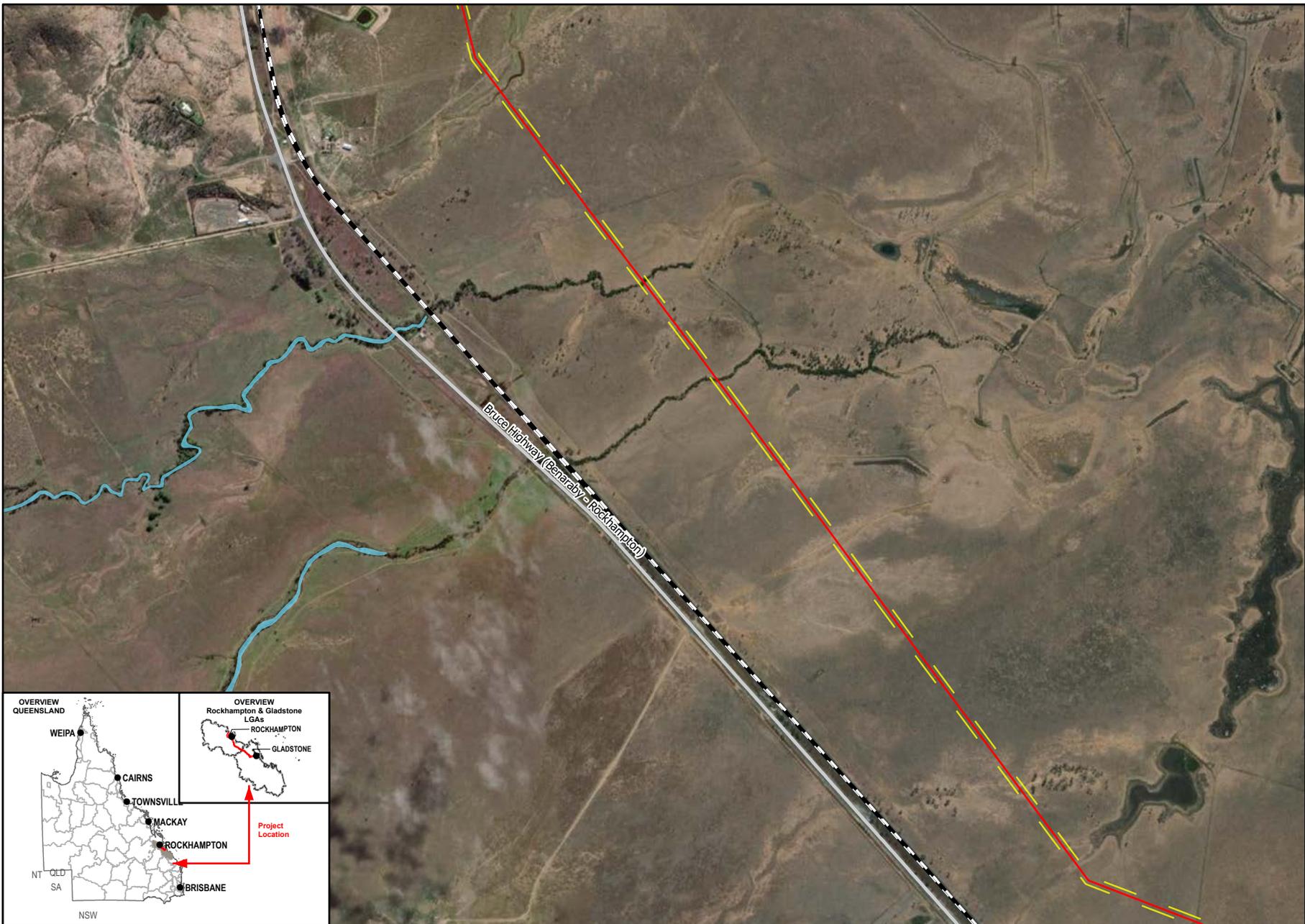


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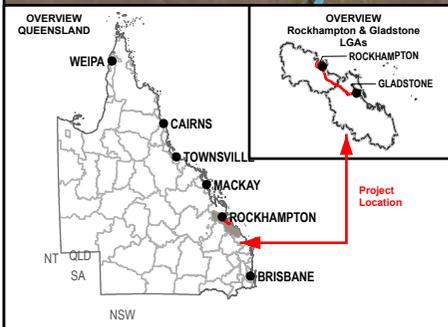
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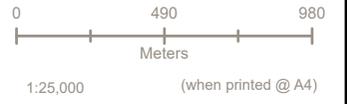
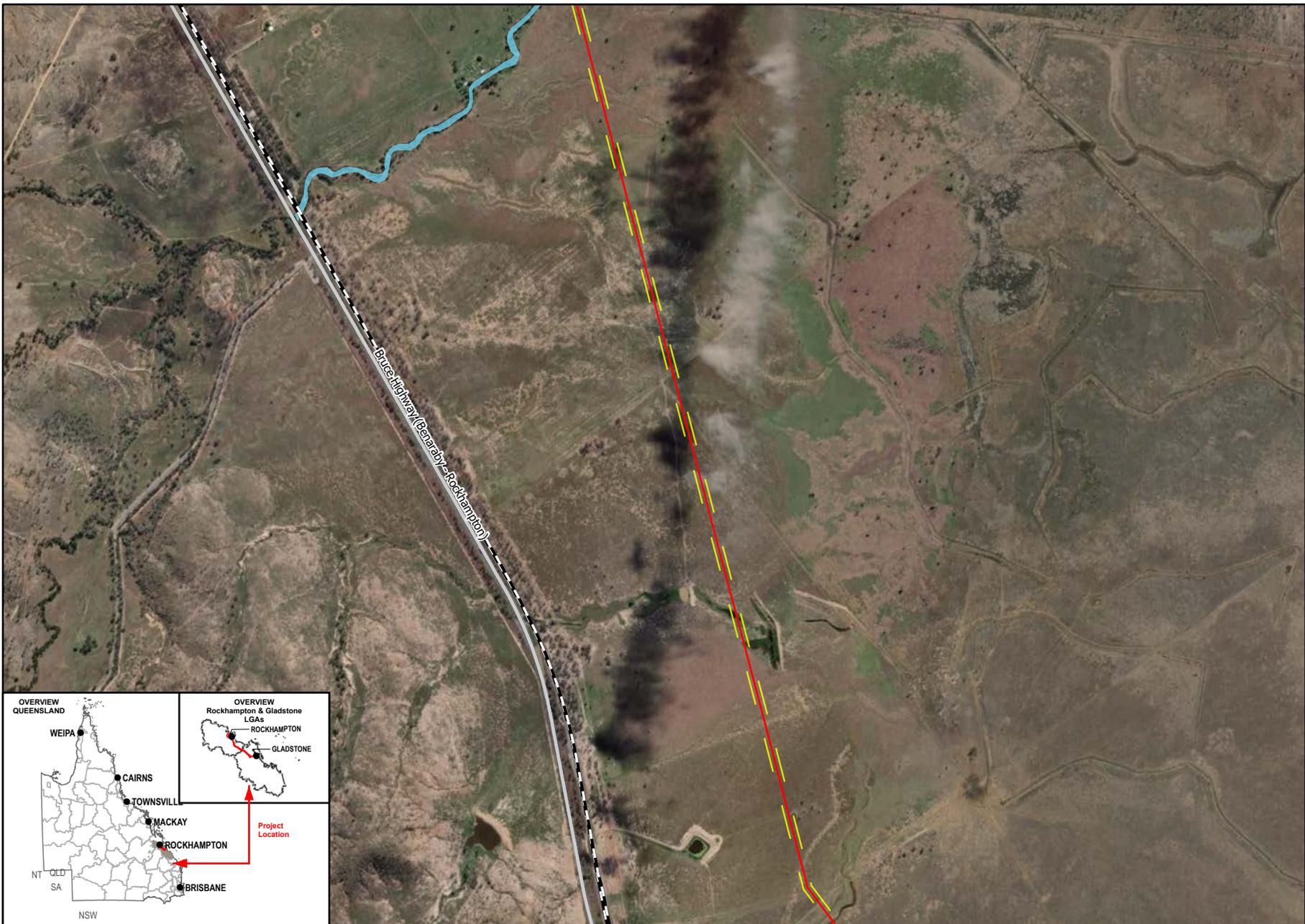


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- — — Study Area
  - — — Fitzroy to Gladstone Pipeline Alignment
  - — — Main Roads
  - — — Railways
  - — — Waterbody

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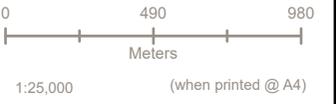
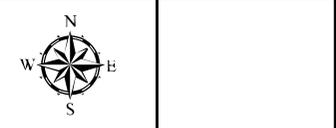
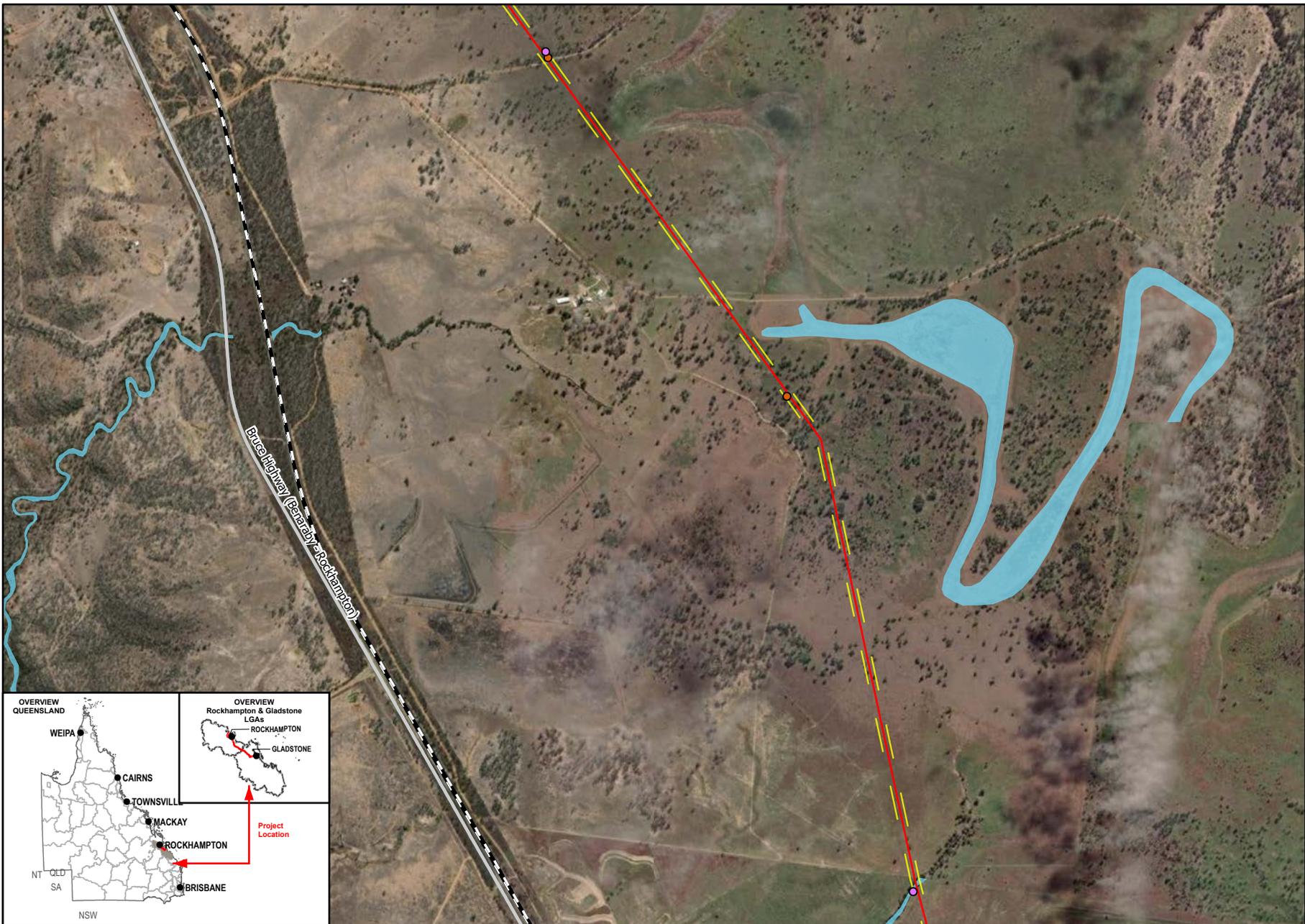
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- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

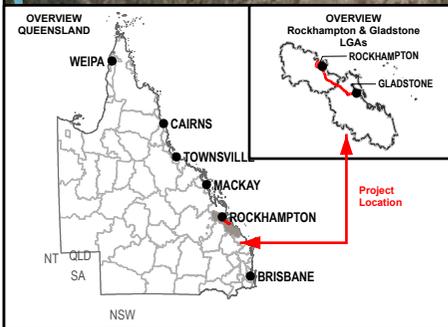


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- Legend**
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  - Railways
  - Waterbody

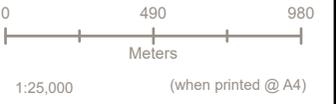
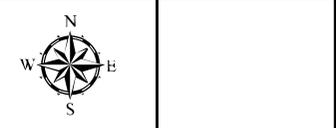
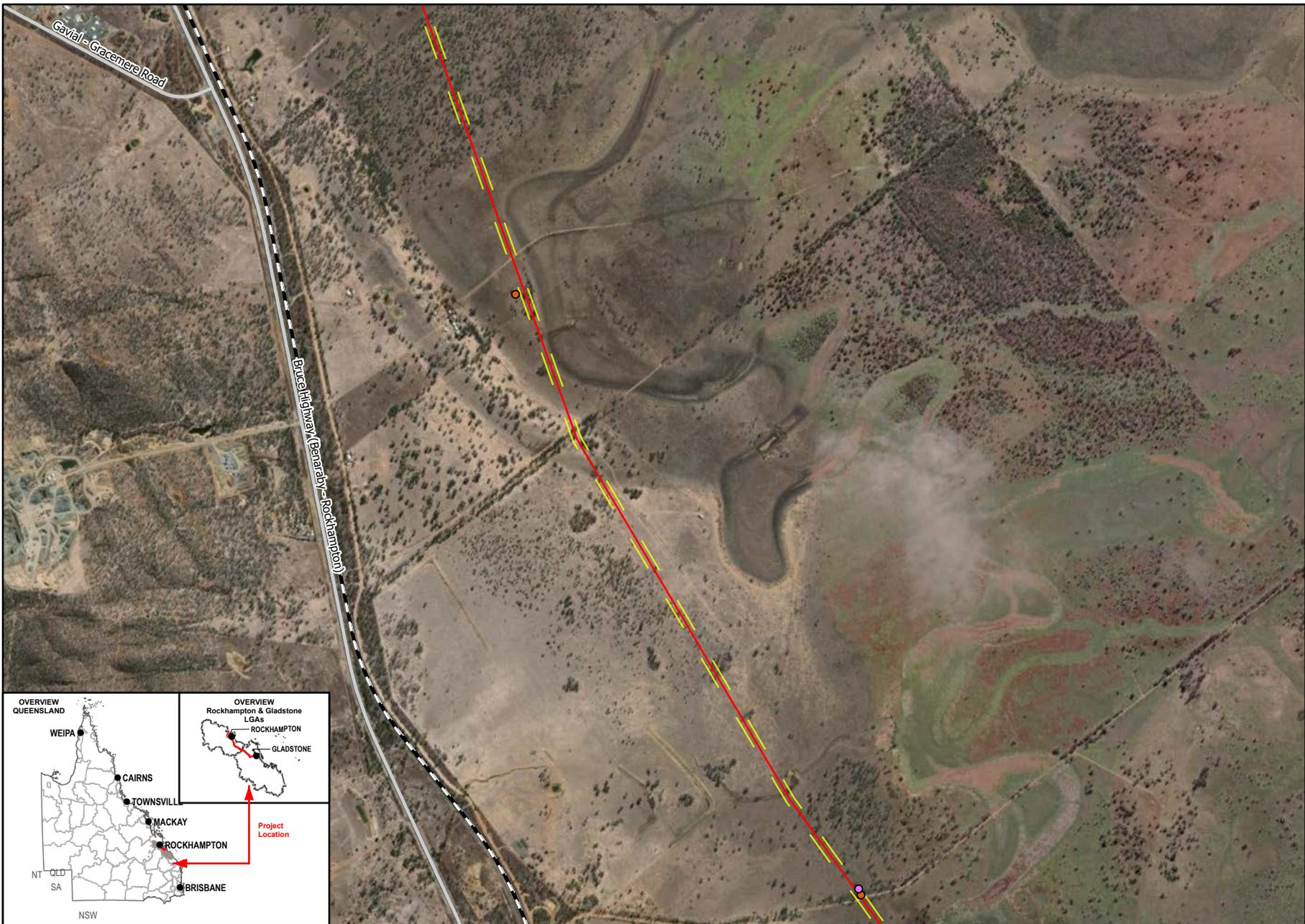


**Data Sources:**

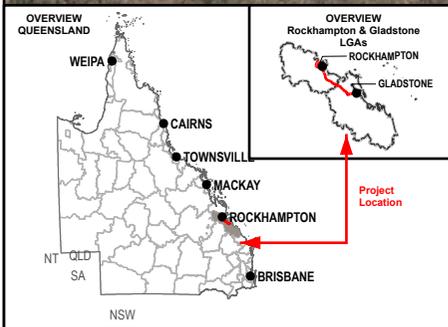
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2. Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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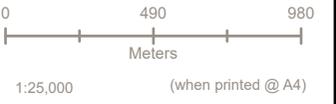
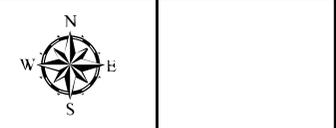
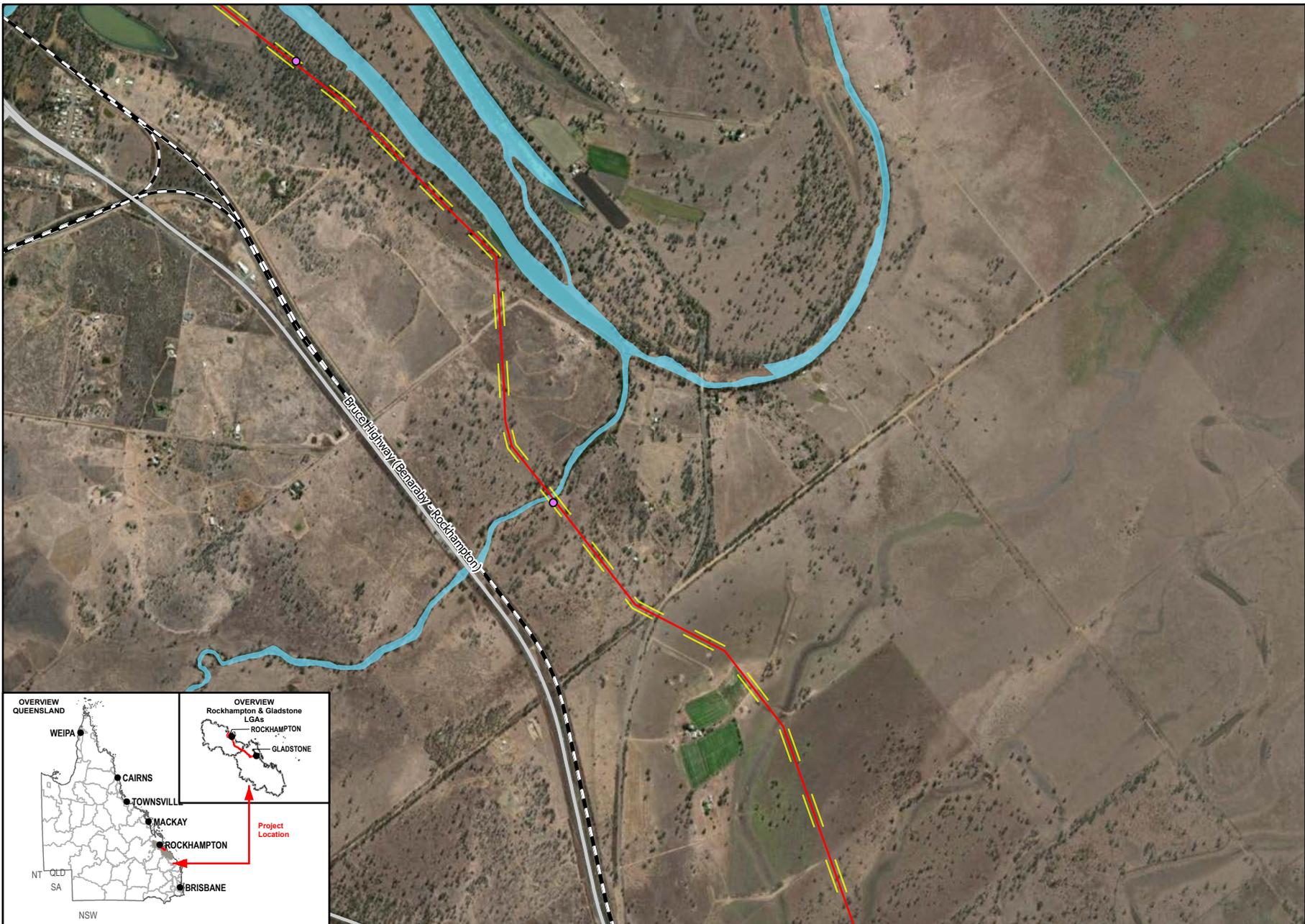
- Legend**
- Flora Survey Type**
- TEC Assessment Site
  - Quaternary Assessment Site
  - Study Area
  - Fitzroy to Gladstone Pipeline Alignment
  - Main Roads
  - Railways



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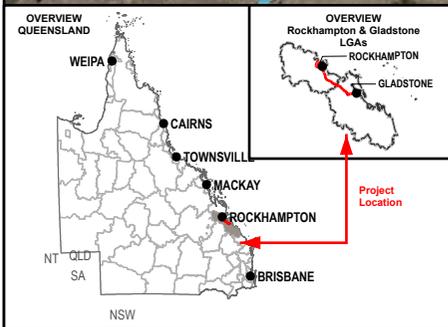


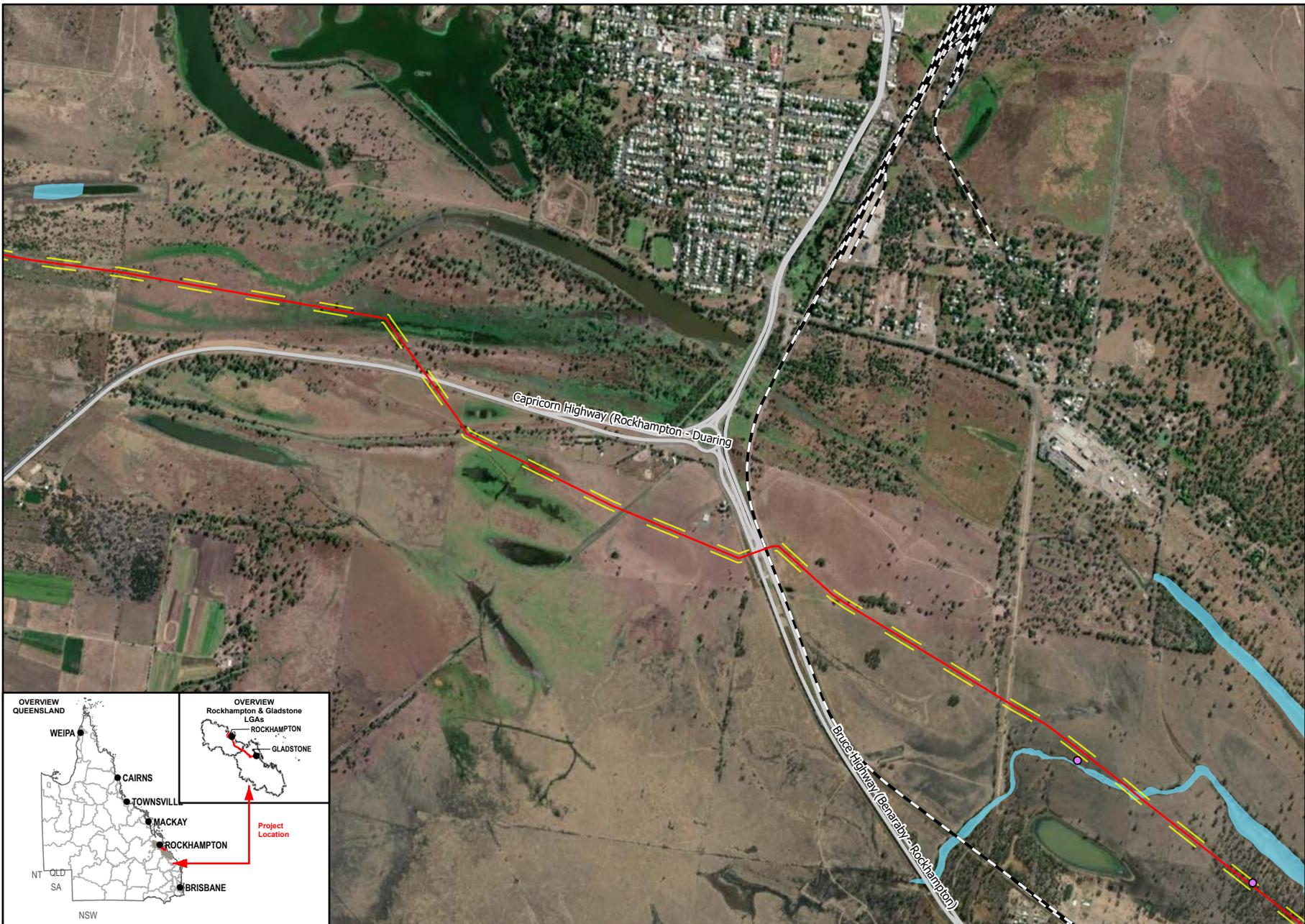
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0 490 980  
Meters

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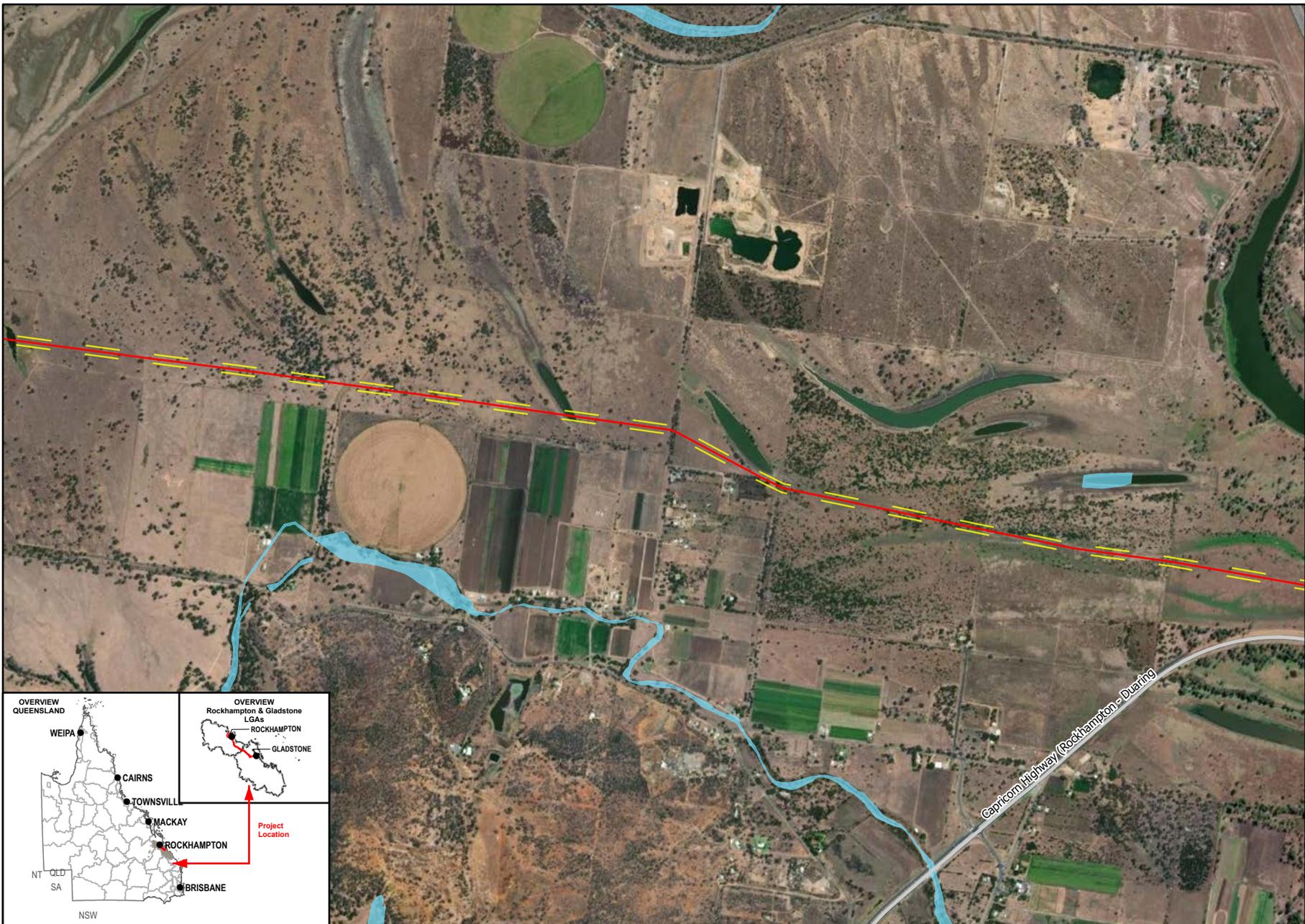
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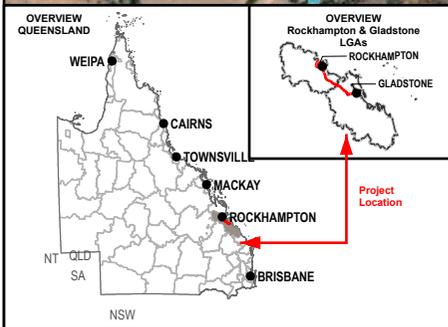
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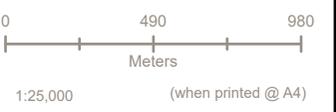
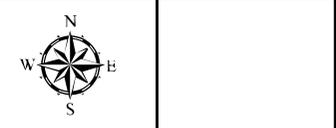
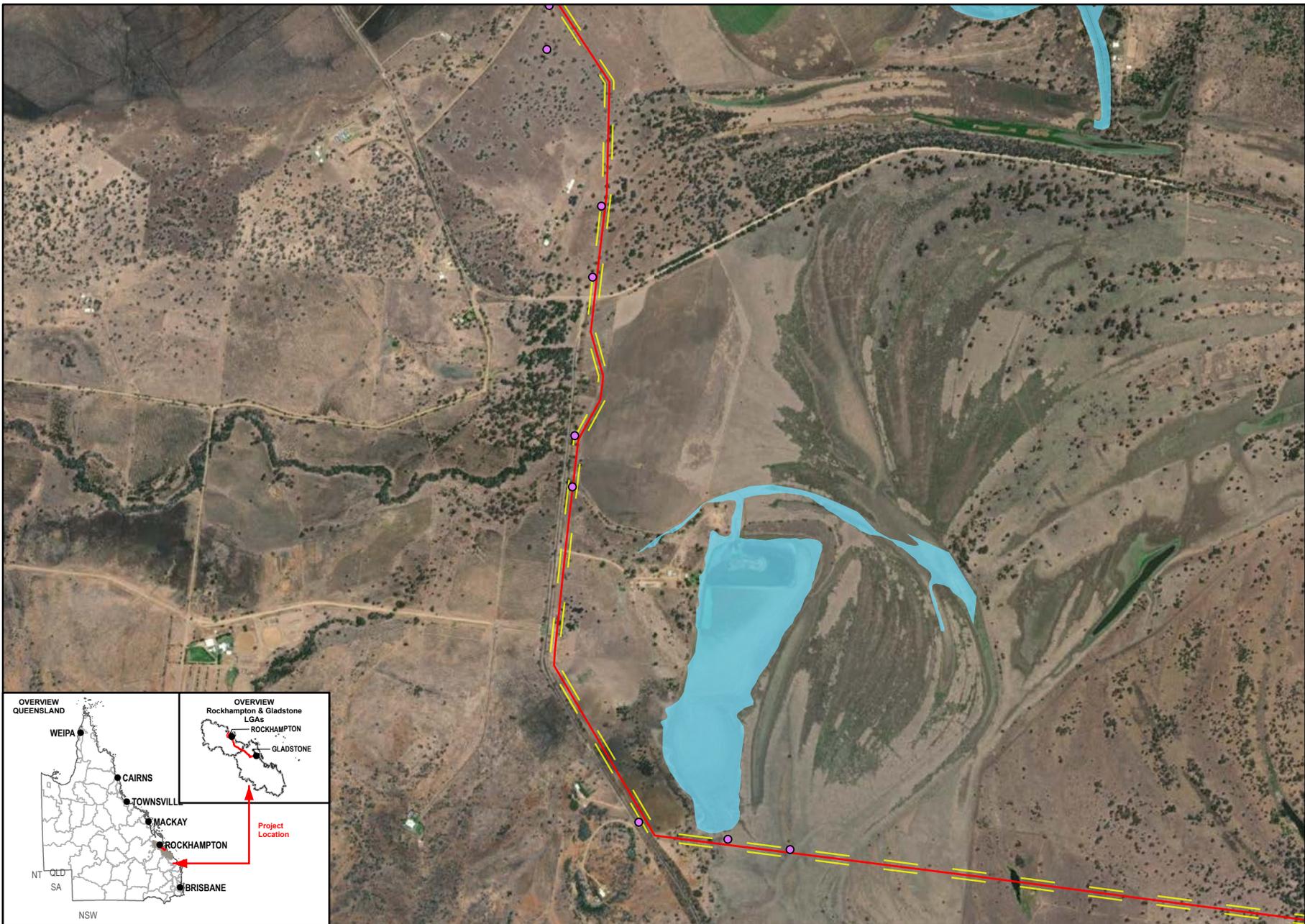
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