

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

Land Use and Infrastructure



Gladstone Area  
Water Board



# Contents

<b>4. Land Use and Infrastructure</b>	<b>103</b>
<b>4.1 Introduction</b>	<b>103</b>
<b>4.2 Methodology</b>	<b>103</b>
<b>4.3 Assumptions and Limitations</b>	<b>104</b>
<b>4.4 Relevant Legislation and Policy</b>	<b>104</b>
<b>4.5 Baseline</b>	<b>104</b>
4.5.1 Fitzroy to Bajool	104
4.5.2 Bajool to Gladstone	115
<b>4.6 Assessment of Impacts</b>	<b>123</b>
4.6.1 Fitzroy to Bajool	123
4.6.2 Bajool to Gladstone	128
<b>4.7 Mitigation Measures</b>	<b>131</b>
4.7.1 Land Use	131
4.7.2 Land Tenure	131
4.7.3 Native Title	131
4.7.4 Economic Mineralisation and Extractive Resources	131
4.7.5 Residential and Recreational Areas	131
4.7.6 Infrastructure	131
4.7.7 Fences and Gates	132
<b>4.8 Residual Impacts</b>	<b>132</b>
<b>4.9 Cumulative and Interactive Impacts</b>	<b>132</b>
<b>4.10 Summary and Conclusions</b>	<b>132</b>

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.





## Figures

<b>Figure 4.1</b>	Existing land use pattern – Fitzroy to Bajool	106
<b>Figure 4.2</b>	Existing land tenure – Fitzroy to Bajool	108
<b>Figure 4.3</b>	Registered Native Title Claims – Fitzroy to Bajool	110
<b>Figure 4.4</b>	Mining, Petroleum and Mineral Exploration Permits – Fitzroy to Bajool	111
<b>Figure 4.5</b>	Residential and Recreational Areas – Fitzroy to Bajool	112
<b>Figure 4.6</b>	Existing Infrastructure – Fitzroy to Bajool	113
<b>Figure 4.7</b>	Existing land use pattern – Bajool to Gladstone	117
<b>Figure 4.8</b>	Existing land Tenure – Bajool to Gladstone	119
<b>Figure 4.9</b>	Registered Native Title Claims – Bajool to Gladstone	121
<b>Figure 4.10</b>	Mining, Petroleum and Mineral Exploration Permits – Bajool to Gladstone	122
<b>Figure 4.11</b>	Residential and Recreational Areas – Bajool to Gladstone	125
<b>Figure 4.12</b>	Existing infrastructure – Bajool to Gladstone	126

## Tables

<b>Table 4.1</b>	Impact Significance Criteria for Land Use and Infrastructure	103
<b>Table 4.2</b>	Land tenure – Fitzroy to Bajool	104
<b>Table 4.3</b>	Road Crossings (named roads) – Fitzroy to Bajool	115
<b>Table 4.4</b>	Railway Crossings – Fitzroy to Bajool	115
<b>Table 4.5</b>	Powerline Crossings – Fitzroy to Bajool	115
<b>Table 4.6</b>	Other Infrastructure Crossings – Fitzroy to Bajool	115
<b>Table 4.7</b>	Land Tenure – Bajool to Gladstone	116
<b>Table 4.8</b>	Road Crossings (named roads) – Bajool to Gladstone	123
<b>Table 4.9</b>	Railway Crossings – Bajool to Gladstone	123
<b>Table 4.10</b>	Powerline Crossings – Bajool to Gladstone	123
<b>Table 4.11</b>	Other Infrastructure Crossings – Bajool to Gladstone	123
<b>Table 4.12</b>	Assessment Summary Matrix	133





## 4. Land Use and Infrastructure

### 4.1 Introduction

This chapter documents the baseline or background description of the land use and infrastructure arrangements relevant to the Gladstone-Fitzroy Pipeline project (the project) and an assessment of the impacts of the project on these issues.

The study area for this chapter includes the land within the generally 30 m wide right-of-way (ROW) that is to be cleared for construction and includes the sites for project infrastructure. Where relevant, the areas directly adjacent to the ROW have been included.

The consistency of the project with relevant National, State, Regional and Local policy and legislation is described in Chapter 1, Introduction.

### 4.2 Methodology

The following tasks were undertaken as part of the land use and infrastructure assessment:

- Review of existing information. Aerial photography, topographic/cadastral maps, databases and various studies were reviewed to identify the land use and tenure pattern, Native Title claims, extractive and mineral development areas and infrastructure networks that will be traversed or have the potential to influence the project
- Description of the existing values in respect to land use, tenure, Native Title, economic mineralisation and extractive resources and infrastructure
- Identification of potential impacts and effects on land use and infrastructure
- Nomination of proposed mitigation measures
- Assessment of the residual impact of the project on land use and infrastructure using significance criteria.

The significance criteria used for this assessment are shown in Table 4.1 and have been made specific to land use and infrastructure.

Table 4.1 Impact Significance Criteria for Land Use and Infrastructure

Significance	Criteria
Major Adverse	Irreversible and significant adverse impacts to the viability and functioning of State and national interests in the region. Severance of many communities in the area from facilities, services or severance of the community itself. Permanent and total loss of income and livelihood to residents in the project area due to impacts to land uses. Permanent closure of one or more businesses. Serious damage to one or more items of infrastructure.
High Adverse	Considerable adverse change to the function of the State's interests in the region. Permanent displacement or relocation of a number of houses or businesses. Separation of a number of communities or residential properties from facilities and services. Relocation of a community facility of regional value to a less optimum location. Mitigation measures and detailed design for construction are unlikely to remove all of the significant effects upon the affected communities or interests. Permanent road closures.
Moderate Adverse	Long-term closure of some roads during construction and long-term impediments to local or regional access. Loss of productivity upon a large number of farms and agricultural holdings, however their operations remain viable. Short-term severance of communities from services, facilities or severance of the community itself. Some effects may remain following mitigation.
Minor Adverse	Temporary disruption of land uses with minimal loss of productivity. No severance of communities. Temporary and short-term disruption to traffic on some roads during construction. Almost all effects are removed through mitigation measures.
Negligible	Impacts to land use, access and infrastructure are not noticeable to landowners or other stakeholders and have no long-term effects. Momentary disruption to traffic on some roads during construction.
Beneficial	Land productivity is improved. Access is improved through road or other upgrades.

### 4.3 Assumptions and Limitations

The most recent available versions of datasets and aerial photography have been used for this assessment however it represents a 'point in time' assessment and does not account for future development that may occur in the project area prior to the commencement of construction.

### 4.4 Relevant Legislation and Policy

Details of relevant legislation and policy in relation to land use and infrastructure are detailed in Chapter 1, Introduction (Section 1.9).

### 4.5 Baseline

#### 4.5.1 Fitzroy to Bajool

##### 4.5.1.1 Land Use

Between the Fitzroy River and Bajool, the project corridor is largely within the Stanwell-Gladstone Infrastructure Corridor (SGIC) with the northern 14 to 15 km of the route being outside the SGIC in the Alton Downs easement.

The Fitzroy River intake and associated pump station will be located adjacent to the existing SunWater intake and pump station at Laurel Bank. The Alton Downs Water Treatment Plant (WTP) site is approximately 3 km from the intake. The total area of the WTP site is subject to detailed negotiation with the property owner, however the plant itself will occupy an area of approximately 11.5 ha. The site is partially cleared and is used for grazing purposes.

The section of the pipeline between the Fitzroy River and Bajool traverses pastoral and agricultural properties, with the majority of the pipeline route dominated by cattle grazing and some areas of intensive cattle pasture. The majority of properties traversed in this section of the project area are zoned as rural in the *Fitzroy Planning Scheme*, with the exception being the Alton Downs zone. Queensland Land Use data (Department of Natural Resources, Mines and Water 1999) shows that the vast majority (greater than 95 percent) of the project footprint traverses land that is classified as 'production from relatively natural environments'. This land use is further classified as 'grazing natural vegetation'.

There is a property traversed by the pipeline in the Alton Downs section of the pipeline route that is mapped in the Queensland Land Use data as being 'Production from dryland agriculture and plantations'. This land use is further classified as 'cropping' and the property is known from field investigations to be used for irrigated crops.

Other land uses in proximity to the route include infrastructure corridors, rural dwelling houses and some extractive industries. An existing explosives manufacturing facility is located to the west of Bajool and the Port Alma salt works is located to the east of Bajool.

The existing land use pattern is illustrated in Figure 4.1.

##### 4.5.1.2 Land Tenure


The project corridor traverses predominantly freehold lots. However, several leasehold areas, reserves and some State land are located adjacent to the corridor. Existing land tenure is illustrated in Figure 4.2.

Table 4.2 summarises the number of properties within the different types of tenure that the pipeline will traverse in the Fitzroy to Bajool section of the study area.

*Table 4.2 Land tenure – Fitzroy to Bajool*

Type of tenure	Number of properties
Freehold	81 Includes all land not specified under a different tenure in this table
Lands Lease	5
Road	16
Covenant Land	3 Freehold land with a covenant
Railway Corridor Land	2
Various Infrastructure Easements	4





There are no protected areas or reserves within the project footprint in this section of the project area, the nearest being Bouldercombe State Forest approximately 6 km west of the project in the vicinity of Gracemere.

Individual access and entry protocols will be agreed and documented for all landholders, with more stringent and specific requirements expected for state land.

#### **4.5.1.3 Native Title**

The project corridor in the Fitzroy to Bajool section of the project area is subject to one existing registered Native Title claim, namely the claim by the Darumbal People (NNTT File No.QC97/021), for the area between Raglan and the Fitzroy River. This claimant area is illustrated in Figure 4.3.

Native title rights and interests are extinguished on certain land such as freehold property or impaired, for example, on some pastoral leases. The extent of land subject to Native Title intersected by the intake, pumping station, WTP, pipeline and associated infrastructure is being investigated by GAWB and is subject to legal advice. Further information on the likely legislative processes to be undertaken by GAWB with respect to native title is described in Section 4.6.

The native title process for the land affected by the project is being undertaken in accordance with all legislative requirements of the *Native Title Act 1993 (Native Title Act)*, in full consultation with relevant Native Title claimants.

#### **4.5.1.4 Economic Mineralisation and Extractive Resources**

Mineral exploration permits overlay a significant area of land between the Fitzroy River and Bajool as shown in Figure 4.4. An exploration permit is issued for the purpose of exploration and allows the holder to take action to determine the existence, quality and quantity of minerals on, in or under land by methods which include prospecting, geophysical surveys, drilling, and sampling and testing of materials to determine mineral bearing capacity or properties of mineralisation. If exploration identifies the existence of specific minerals the subject of the permit, a permittee may eventually make an application for a mineral development licence or mining lease.

The intake is located in close proximity to, but outside of, the boundary of the separation area for the Pink Lily Key Resource Area (KRA) which is identified by *State Planning Policy 2/07 – Protection of Extractive Resources (SPP 2/07)*. This KRA consists of fine to coarse-grained sand and gravel in off-stream deposits in the Pink Lily and Lilymere Lagoons areas just west of Rockhampton. These resources are the major source of fine concrete aggregate and other construction sands for the Rockhampton region and may in the future need to supply other more distant markets such as Gladstone and Mackay. The separation area boundary is set at the full 200 m from the boundary of the off-stream resource. It also extends 200 m from existing or proposed processing plants.

#### **4.5.1.5 Residential and Recreational Areas**

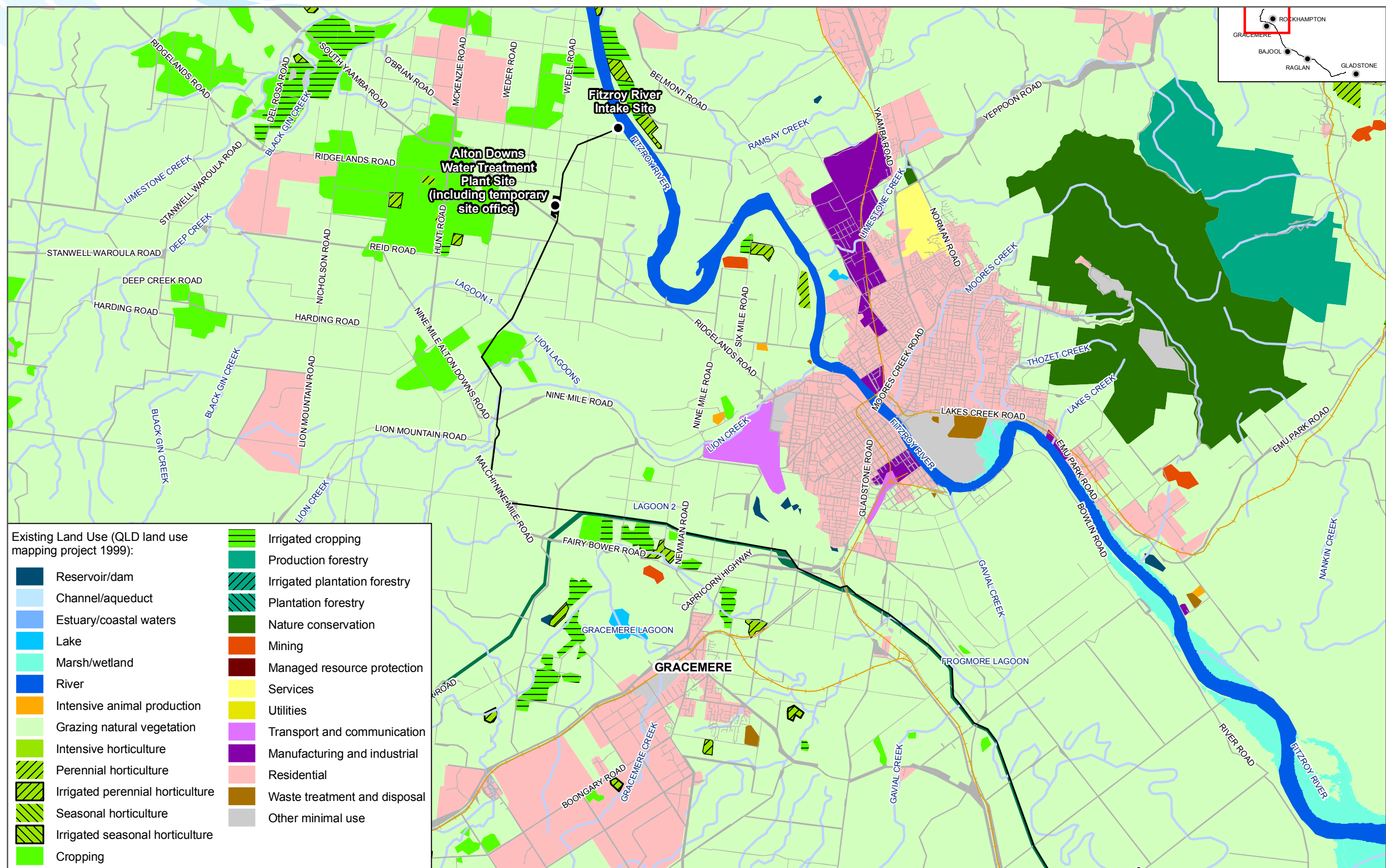
The project corridor has been planned to largely avoid residential areas. The key residential areas along the corridor between the Fitzroy River and Bajool are illustrated on Figure 4.5. They include rural residential development at Alton Downs and residential development within the towns of Gracemere and Bajool. Some smaller congregations of residential development occur at Port Curtis Junction and Marmor. The residential properties at Alton Downs are in closest proximity to the pipeline, with some houses being within 200 m of the proposed pipeline route. The areas zoned as 'rural residential' in the Fitzroy Planning Scheme are areas that occur in Gracemere and Bajool and are more than 1 km from the proposed pipeline alignment.

There are no areas classified as 'open space' in the Fitzroy Planning Scheme that are within the project area between Fitzroy and Bajool.

Known recreational uses in the Fitzroy River include water skiing at the Rockhampton Water Skiing and Powerboat Club at Alton Downs. The boat ramp for the Ski Club is located downstream of the proposed Fitzroy River intake point and downstream of the existing SunWater intake.

#### **4.5.1.6 Infrastructure**

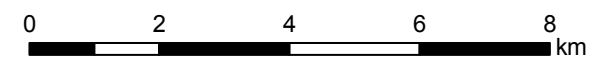
The location of various types of infrastructure (e.g. roads, railways, powerlines and pipelines) in proximity to the project corridor is illustrated in Figure 4.6. The project corridor crosses a number of existing infrastructure corridors as set out in Table 4.3 to Table 4.6. All highways are bitumen sealed. A series of minor and local roads (and some farm access tracks) are traversed by the project corridor and will likely also be used by vehicles associated with construction activities as detailed in Chapter 13, Transport and Access Arrangements.



Gladstone - Fitzroy Pipeline Project

**Figure 4.1 - Existing Land Use Pattern - Fitzroy to Bajool**

Sheet 1 of 2



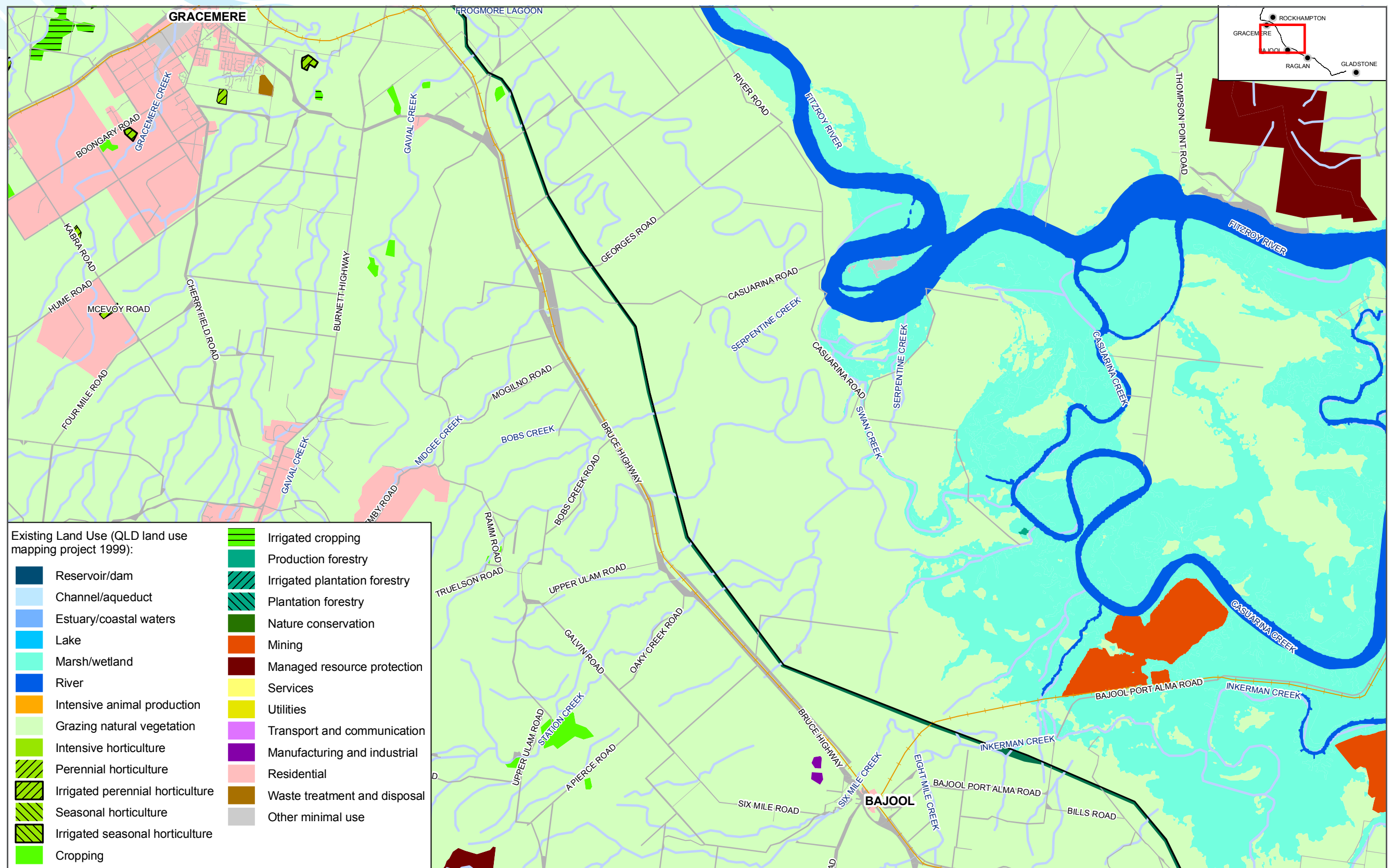
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**ARUP**

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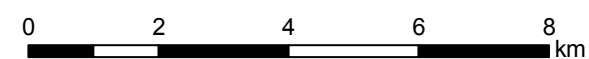




Gladstone - Fitzroy Pipeline Project

**Figure 4.1 - Existing Land Use Pattern - Fitzroy to Bajool**

Sheet 2 of 2



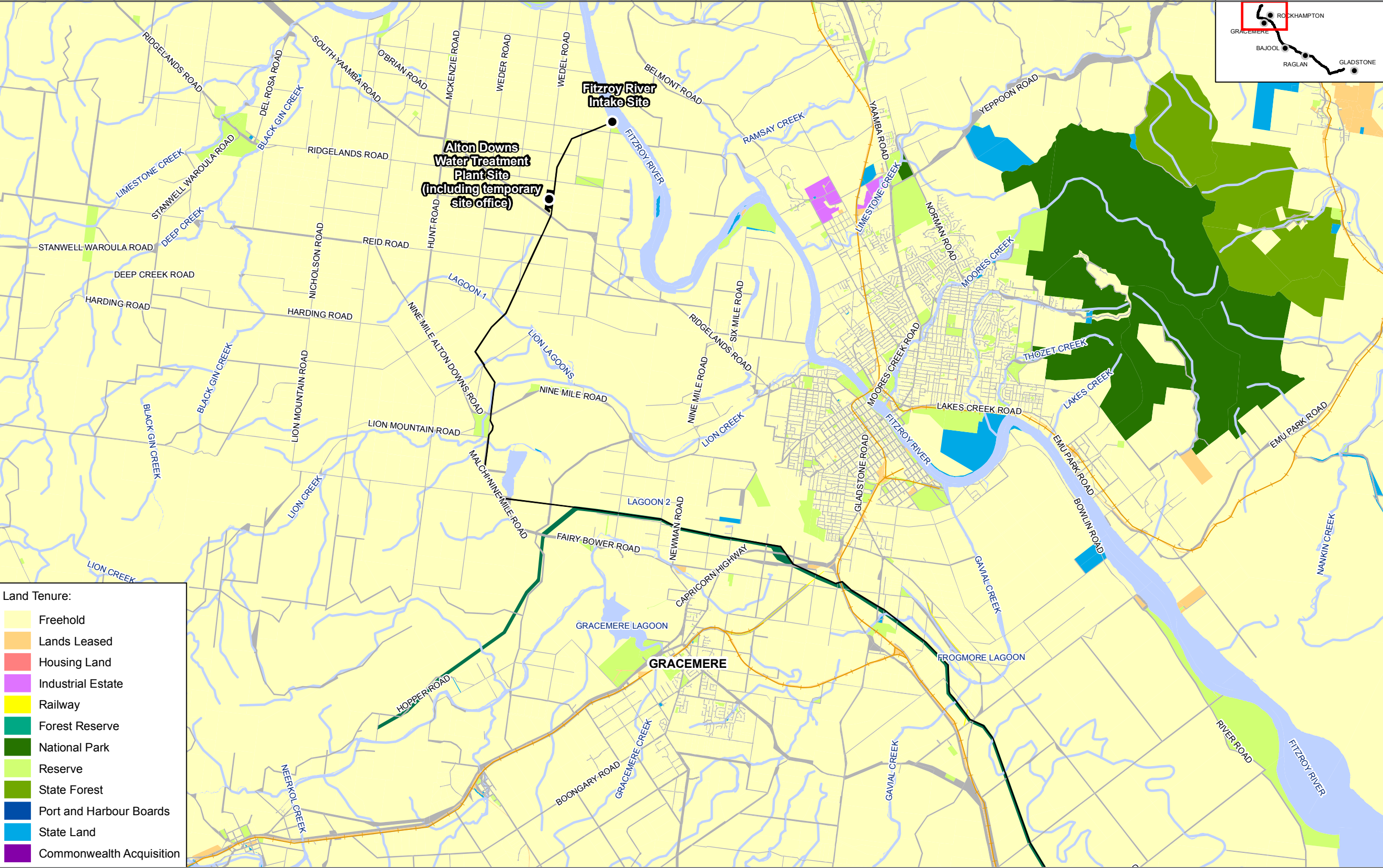
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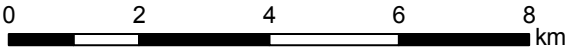
- Land Tenure:
- Freehold
  - Lands Leased
  - Housing Land
  - Industrial Estate
  - Railway
  - Forest Reserve
  - National Park
  - Reserve
  - State Forest
  - Port and Harbour Boards
  - State Land
  - Commonwealth Acquisition

Gladstone - Fitzroy Pipeline Project

**Figure 4.2 - Existing Land Tenure - Fitzroy to Bajool**

Sheet 1 of 2

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



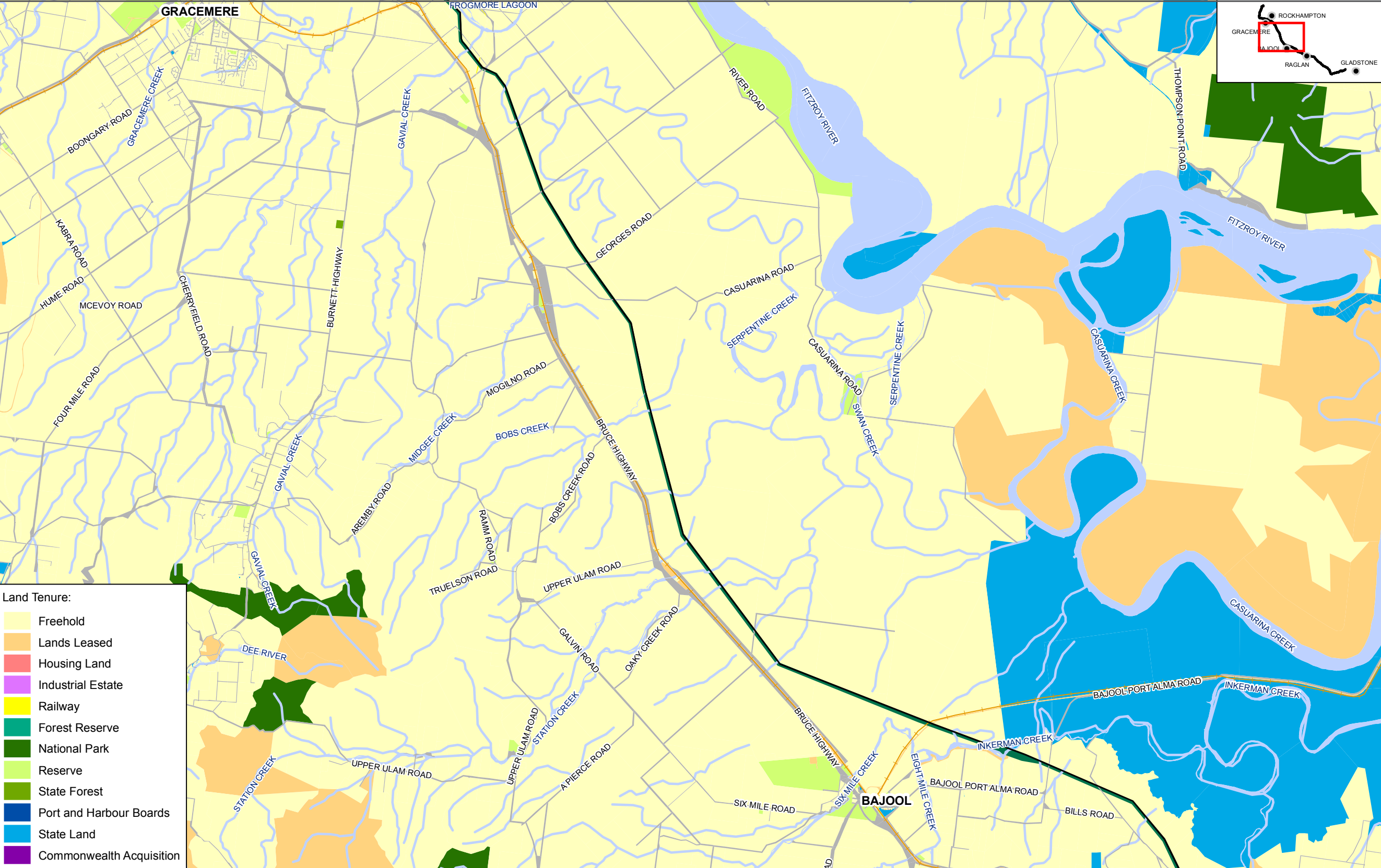
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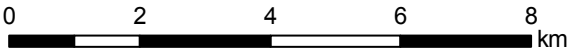




- Land Tenure:
- Freehold
  - Lands Leased
  - Housing Land
  - Industrial Estate
  - Railway
  - Forest Reserve
  - National Park
  - Reserve
  - State Forest
  - Port and Harbour Boards
  - State Land
  - Commonwealth Acquisition

Gladstone - Fitzroy Pipeline Project  
**Figure 4.2 - Existing Land Tenure - Fitzroy to Bajool**  
Sheet 2 of 2

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



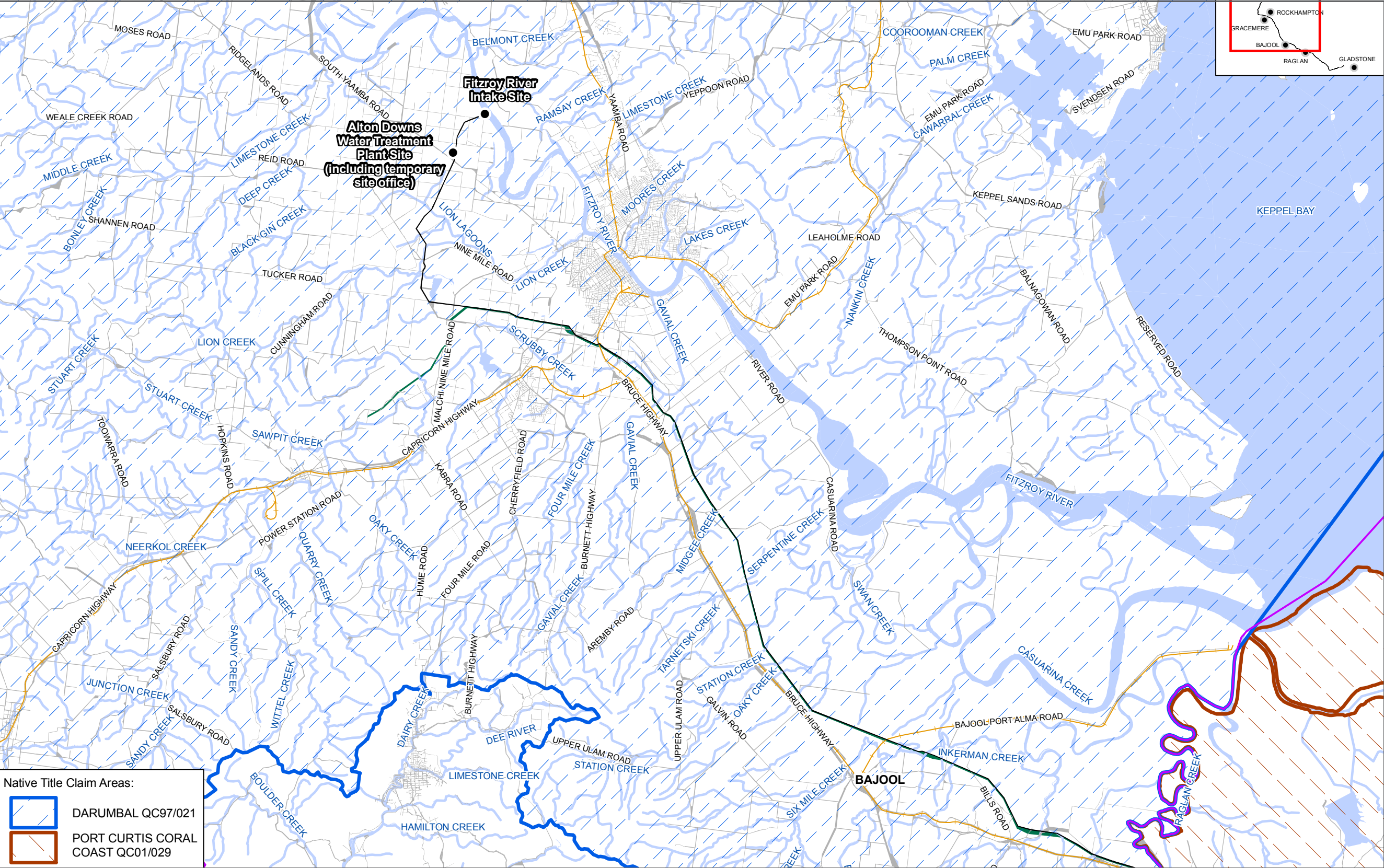
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Native Title Claim Areas:

- DARUMBAL QC97/021
- PORT CURTIS CORAL COAST QC01/029

Gladstone - Fitzroy Pipeline Project

**Figure 4.3 - Registered Native Title Claims - Fitzroy to Bajool**

Sheet 1 of 1

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

0 5 10 15 km

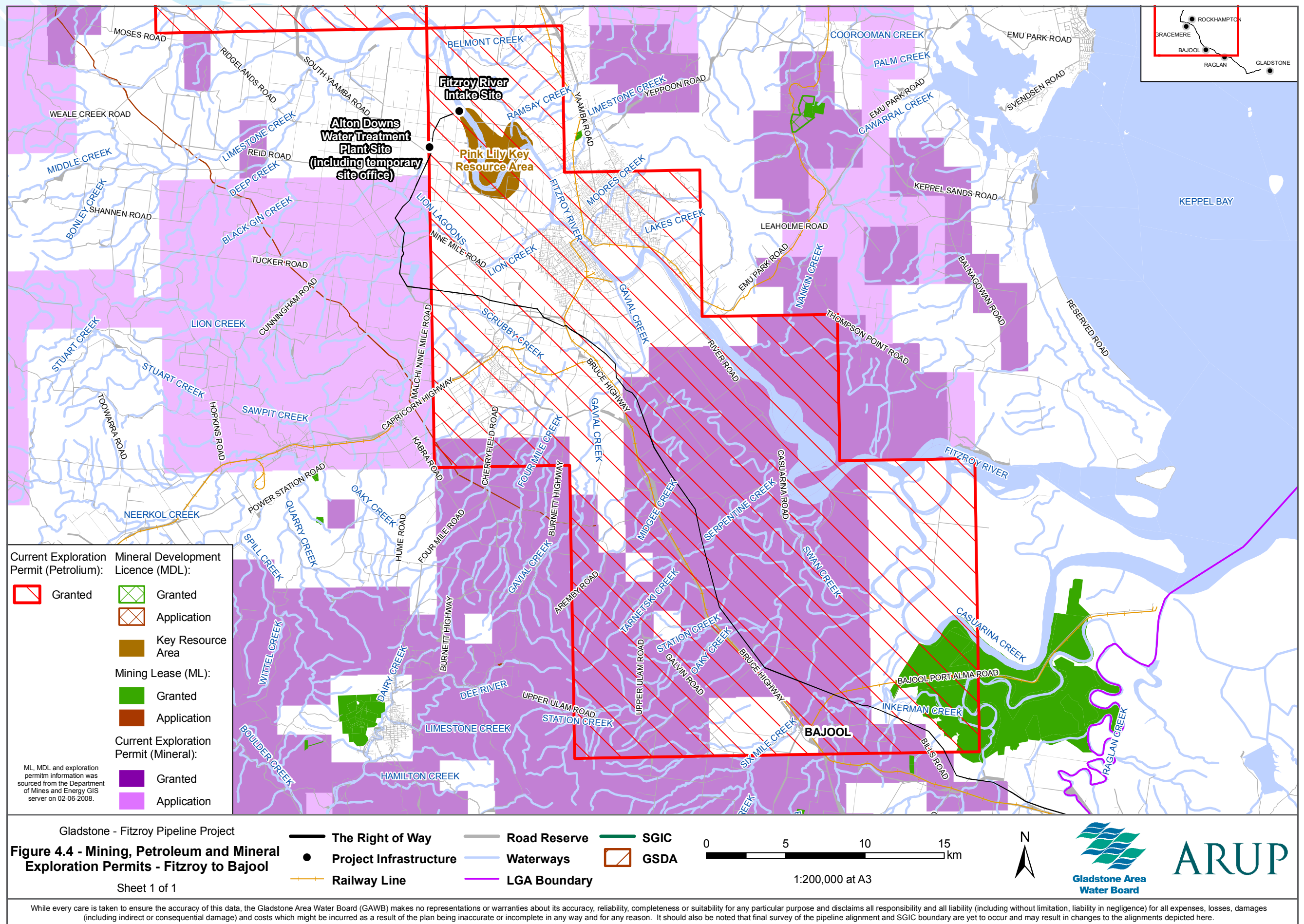
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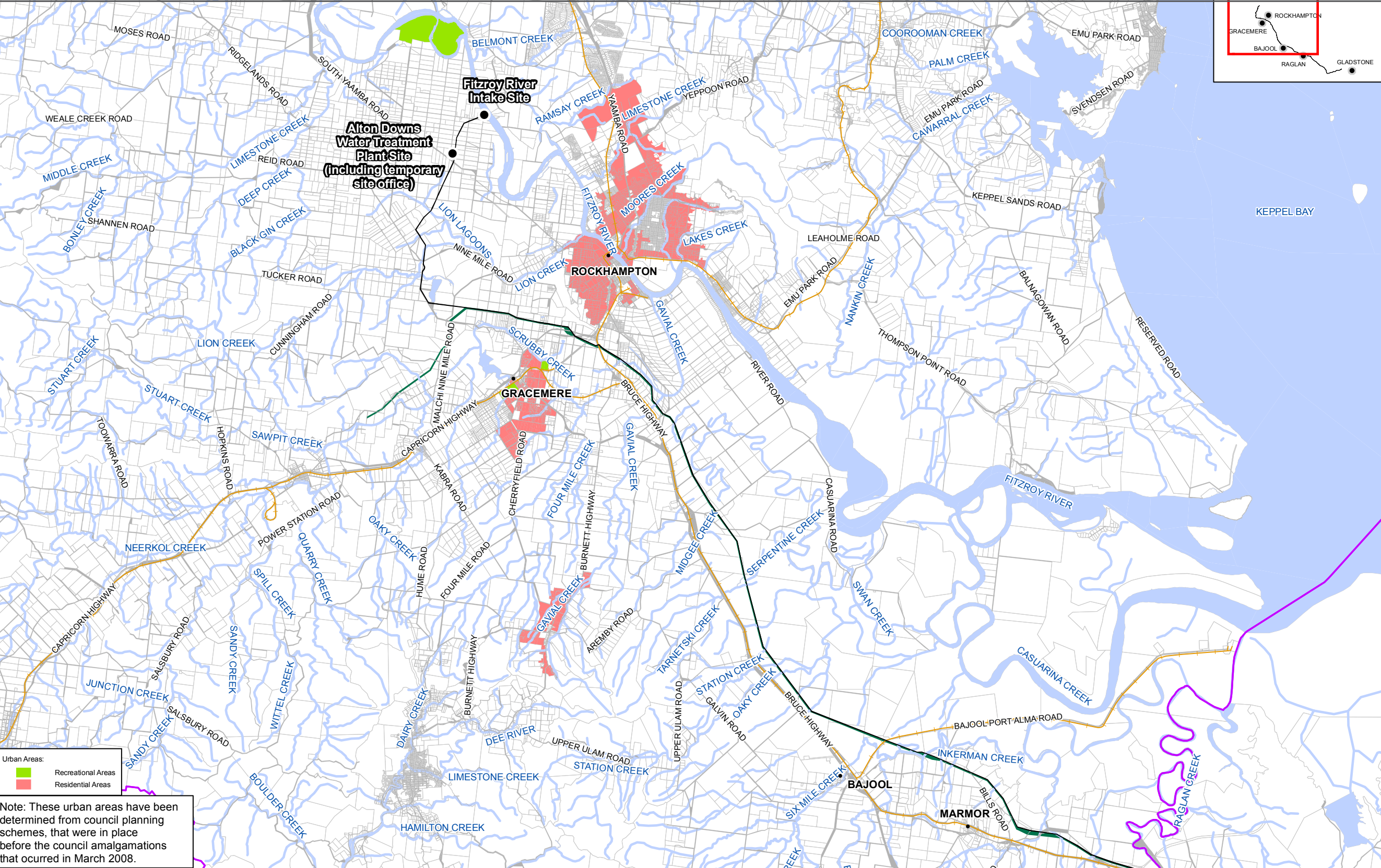
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Gladstone - Fitzroy Pipeline Project

**Figure 4.5 - Residential and Recreational Areas - Fitzroy to Bajool**

Sheet 1 of 1

**The Right of Way**

**Project Infrastructure**

**Railway Line**

**Road Reserve**

**Waterways**

**LGA Boundary**

**SGIC**

**GSDA**

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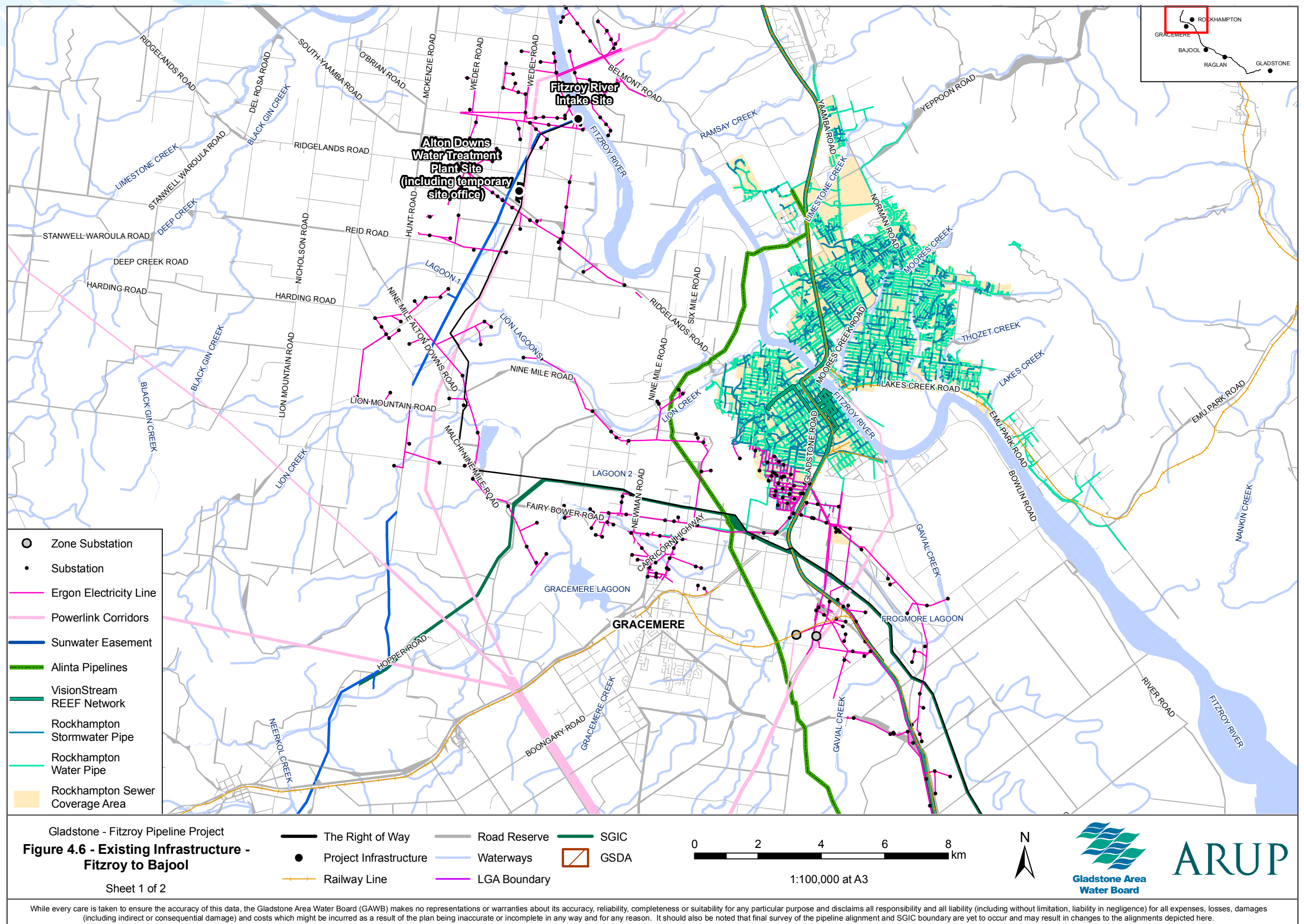
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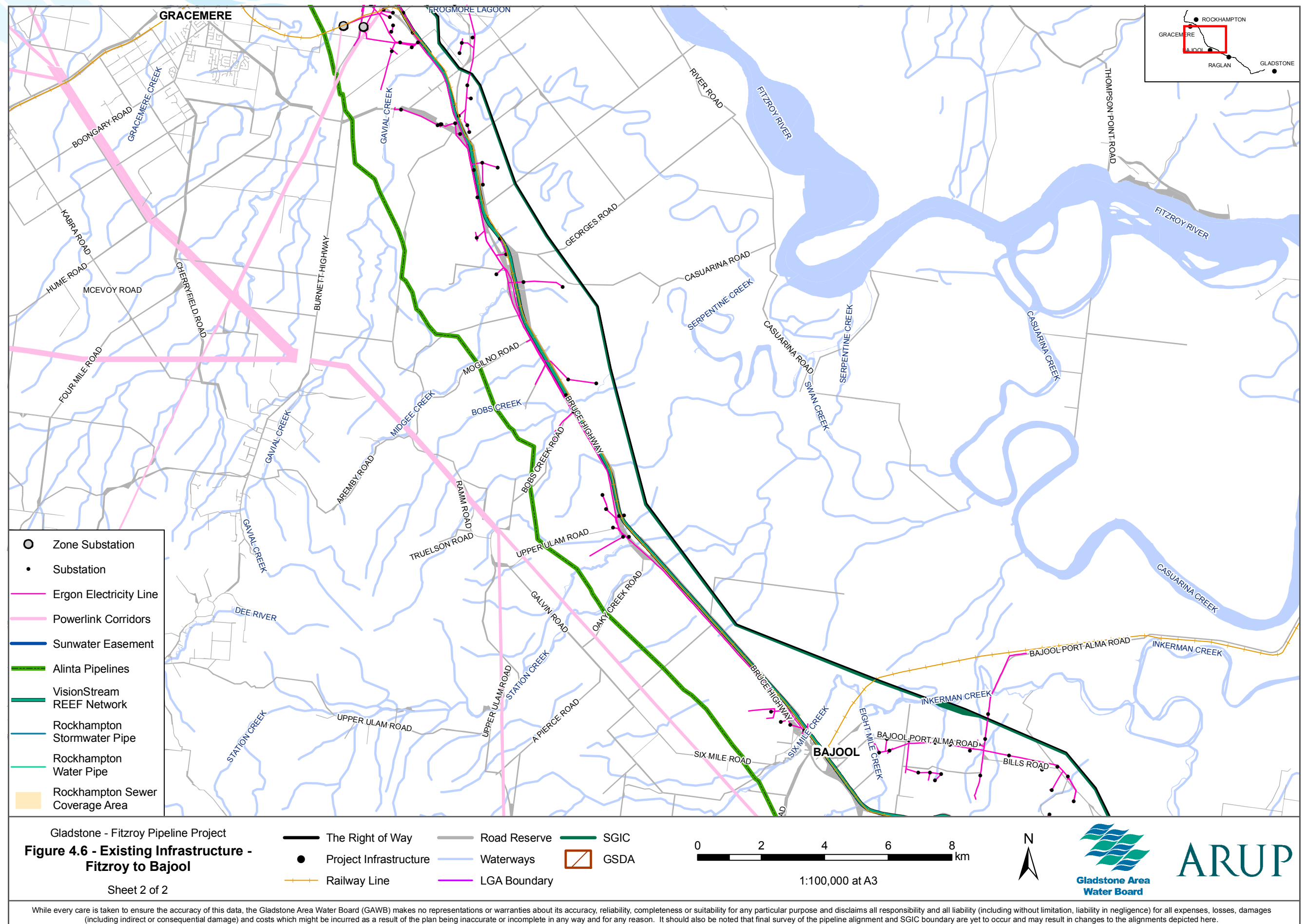




Table 4.3 Road Crossings (named roads) – Fitzroy to Bajool

Road name	Road name
Ski Gardens Road	Newman Road
Laurel Bank Road	Capricorn Highway
Ridgelands Road	Bruce Highway
Stracey Road	Bruce Highway
Stracey Road	Whyte Road
Nine Mile Road	Georges Road
Fogarty Road	Casuarina Road
Titman Road	Bajool Port Alma Road

Table 4.4 Railway Crossings – Fitzroy to Bajool

Crossing type	Comments
Rail only crossing	Bajool Siding Crossing (a branch of the North Coast Line)
Rail and Road Combined Crossings	Bruce Highway and Yeppen Rail (a section of the North Coast Line)

Table 4.5 Powerline Crossings – Fitzroy to Bajool

Powerline	Comments
132 kVa Powerline	Near where the pipeline crosses back into Fitzroy Shire from Rockhampton City
Powerline	Approximately 4 km south of Capricorn Highway Crossing

Table 4.6 Other Infrastructure Crossings – Fitzroy to Bajool

Infrastructure	Comments
Queensland Gas Pipeline	Where the pipeline passes between Gracemere and Bajool
Visionstream Fibre optic reef network	Adjacent to the Bruce Highway south of Rockhampton

#### 4.5.1.7 Fences and Gates

The exact locations of fences and gates to be crossed by the pipeline or to be constructed for pipeline access are not known at this stage. Survey crews will precede construction personnel ensuring that the pipeline alignment is clearly located prior to the installation of temporary or permanent gates. Temporary gates will be installed at locations where the pipeline crosses fence lines, in consultation with landowners and in accordance with the license conditions of the SGIC.

## 4.5.2 Bajool to Gladstone

### 4.5.2.1 Land Use

Between Bajool and Gladstone, the project will traverse land that is used for a mix of activities.

The Raglan Pump Station and Reservoir is planned for an area that has been historically cleared and used for cattle grazing or open pasture.

The northern end of the pipeline alignment between Bajool and Gladstone generally traverses land that has been cleared and open grasslands or pastures used for cattle grazing. The majority of properties traversed by the project area are zoned as rural in either the Fitzroy Shire Planning Scheme or the Calliope Shire Planning Scheme with the exception of the Gladstone State Development Area (GSDA), which has its own zoning classification.

Between Raglan and Mt Larcom, the pipeline alignment traverses land which is substantially treed. The pipeline passes to the east of the Mt Larcom township prior to entering the GSDA. Land use planning within the GSDA is undertaken by the Department of Infrastructure and Planning (DIP). The Gladstone-Fitzroy Pipeline alignment in this area has been selected by DIP to enable coordination between this project and other planned linear infrastructure projects in the GSDA.

Within the GSDA, the pipeline alignment traverses a large area of rural land, some of which is treed and some cleared. The pipeline route passes to the south of the site of the Aldoga Aluminium Smelter and to the north of the existing quarry operations at Yarwun.

Queensland land use data (Department of Natural Resources, Mines and Water 1999) indicates that 100 percent of the project footprint between Bajool and Gladstone traverses land mapped as 'Production from Relatively Natural Environments'. This land use is further classified as 'grazing natural vegetation'.

This existing land use pattern is illustrated in Figure 4.7.

### 4.5.2.2 Land Tenure

The pipeline traverses predominantly freehold lots. However, some Lands Lease, Reserve and State Land are located adjacent to the proposed pipeline route (see Figure 4.8).

Table 4.7 summarises the number of properties within the different types of tenure that the project corridor will traverse in the Bajool to Gladstone section.

Table 4.7 Land Tenure – Bajool to Gladstone

Type of tenure	Number of properties
Freehold	59 Includes the remainder of land not specified under a different tenure in this table
Lands Lease	4 After crossing Raglan Creek into Calliope Shire Easement running parallel to Quarry Road
State Land	1 Near Inkerman Creek crossing
Reserved Land	1 After crossing Raglan Creek into Calliope Shire
Road	18
Railway Corridor Land	2
Various Infrastructure Easements	8

There are no protected areas or reserves traversed by the project in this section of the project area. The nearest protected area is the Mt Stowe State Forest approximately 200 m south of the pipeline alignment in the GSDA.

#### 4.5.2.3 Native Title

The project corridor in the Bajool to Gladstone section of the project area is subject to two existing registered Native Title claims, one of which is the claim by the Darumbal People (NNTT File No.QC97/021), for the area between Bajool and approximately Raglan. This claimant area is illustrated in Figure 4.3. The other existing registered Native Title claim is the Port Curtis Coral Coast (PCCC) claim (NNTT File No.QC01/029) between Gladstone and approximately Raglan. This claimant area is illustrated in Figure 4.9.

Native title rights and interests are extinguished on certain land such as freehold property or impaired, for example, on some pastoral leases. The extent of land subject to native title intersected by the intake, pumping station, WTP, pipeline and associated infrastructure is being investigated by GAWB and is subject to legal advice. Further information on the likely legislative processes to be undertaken by GAWB with respect to native title is described in Section 4.6.

The native title process for the land affected by the project is being undertaken in accordance with all legislative requirements of the *Native Title Act*, in full consultation with relevant Native Title claimants. This is discussed in Chapter 14, Cultural Heritage.

#### 4.5.2.4 Economic Mineralisation and Extractive Resources

Some mining leases, mineral development licences and mineral exploration permits overlay land between Bajool and Gladstone, particularly at Targinie, which is outside the project corridor. Some of the leases/licences have not yet been granted and are still in the application/assessment process. This section of the pipeline dissects two expired or surrendered mineral exploration tenures which are being held under moratorium for a period of time to allow competitive applications for this land to be lodged. There are several areas of land where exploration permits for minerals are held. These are shown in Figure 4.10.

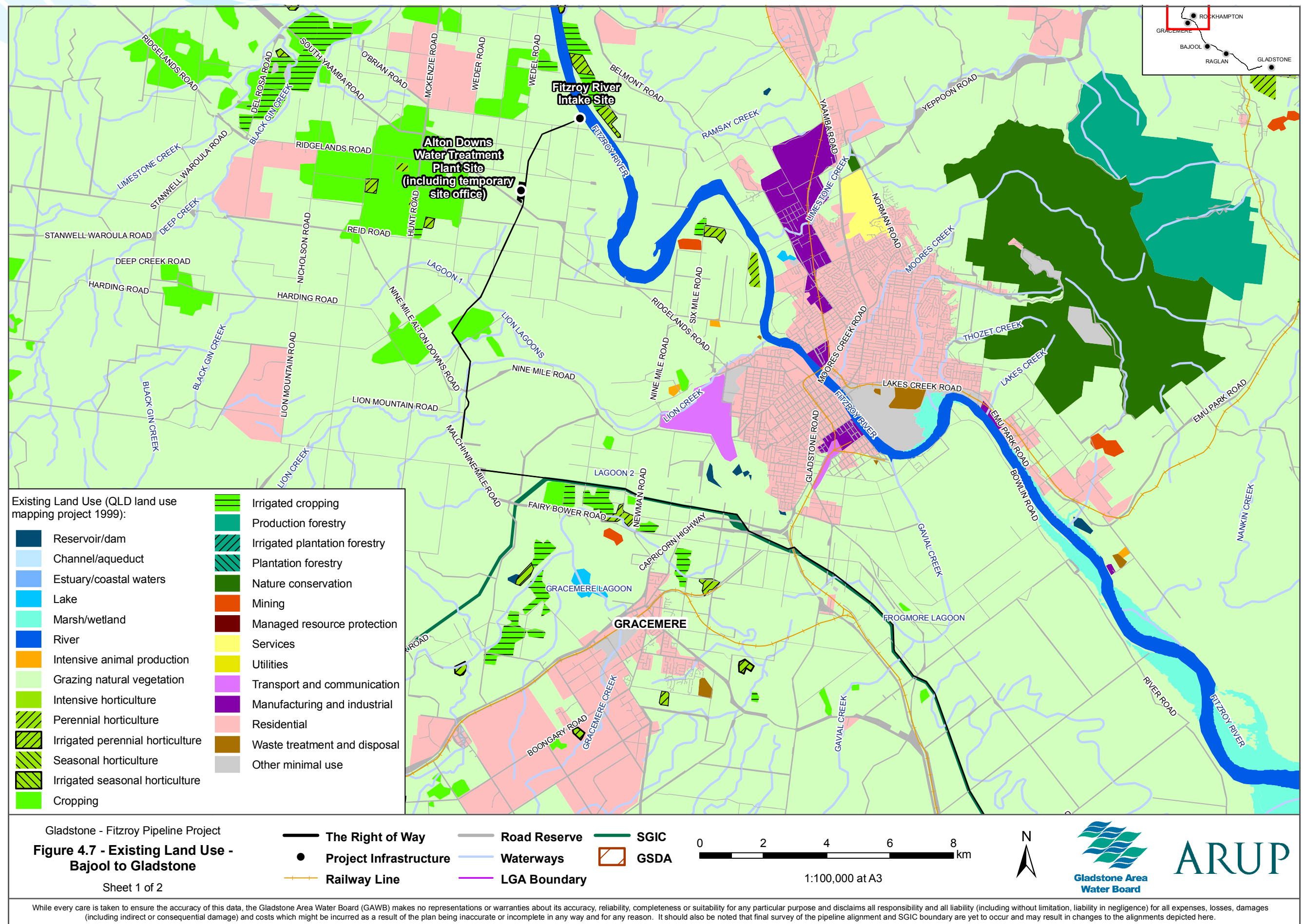
Within the GSDA the pipeline is aligned through the separation area of the Yarwun KRA as identified in *State Planning Policy 2/07 - Protection of Extractive Resources SPP 2/07*. The pipeline alignment also crosses Quarry Road which is the designated haulage route to the Yarwun KRA.

The Yarwun KRA consists of hardened sedimentary rocks adjacent to the railway line west of Yarwun. An operating quarry supplies a full range of crushed rock products, including road base, concrete aggregate, bitumen screenings, rail ballast, drainage aggregate and crusher dust.

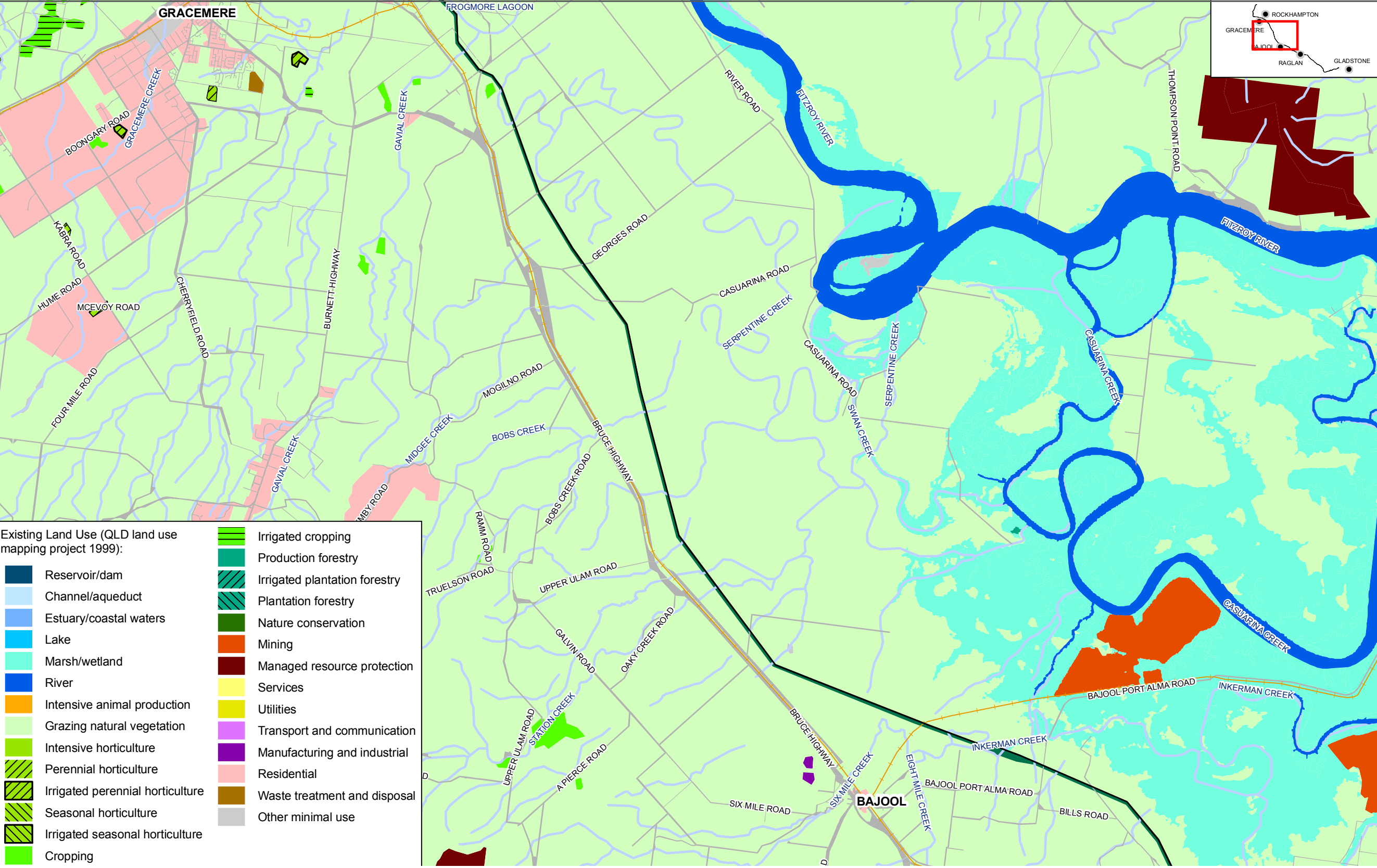
The resource is one of only two major sites currently supplying crushed quarry rock to the Gladstone region. Sizeable resources are present. The convenient location of the resource to Gladstone and the available range of products make it of strategic significance to the development of Gladstone and the surrounding district.

#### 4.5.2.5 Residential and Recreational Areas

The project corridor has been planned to largely avoid residential areas. The key residential and recreational areas along the corridor between Bajool and Gladstone are illustrated in Figure 4.11. They include Marmor, Raglan, Mt Larcom and Gladstone. The area of Raglan classified as 'village' in the Calliope Planning Scheme is more than 500 m from the proposed pipeline alignment and Raglan Pump Station and Reservoir. At Mt Larcom, areas classified as 'village' occur more than 200 m from the proposed pipeline alignment however there are some individual residential properties within 200 m of the alignment in this section of the project area.

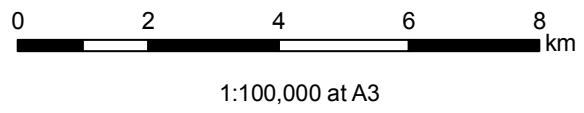






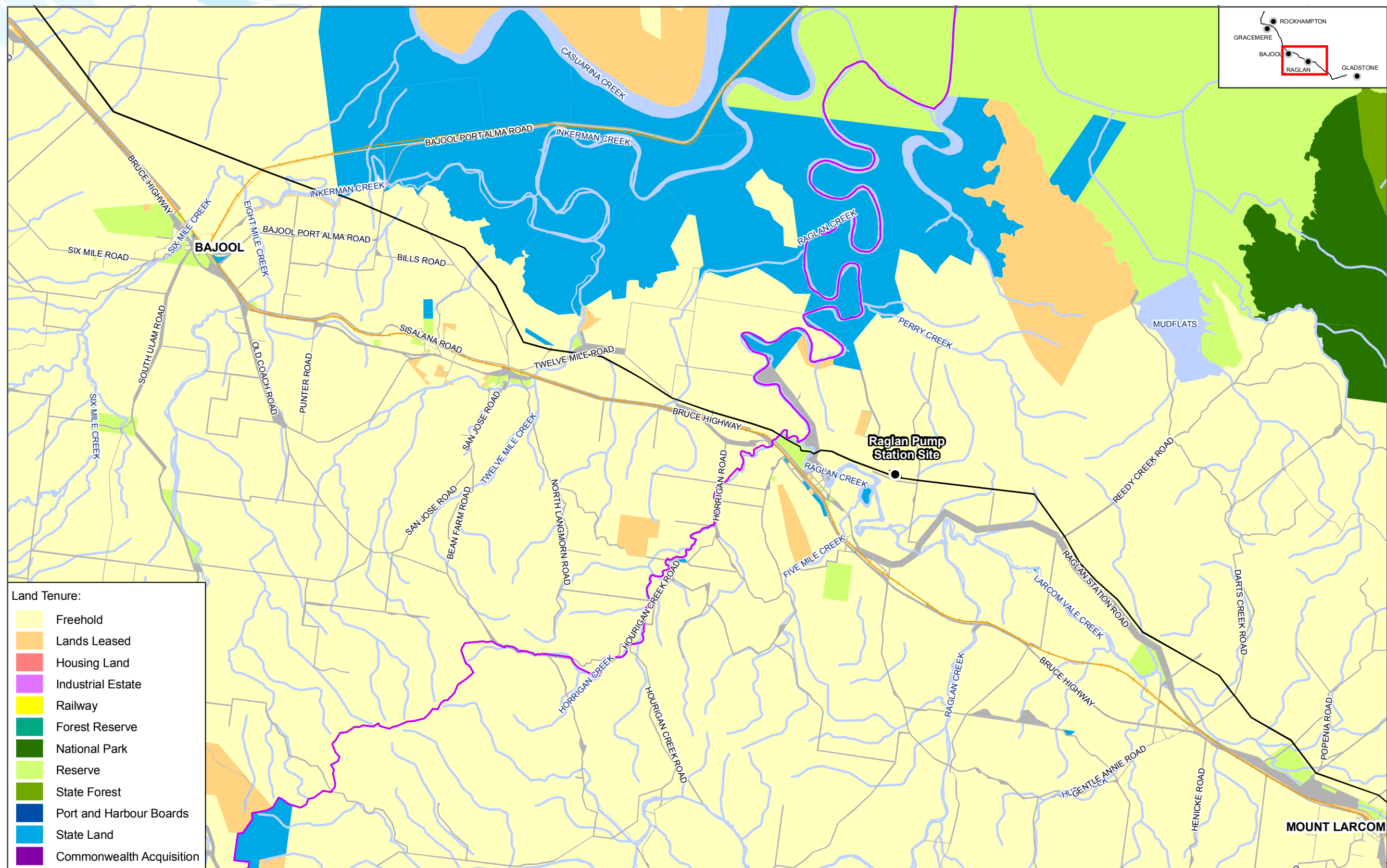
Gladstone - Fitzroy Pipeline Project  
**Figure 4.7 - Existing Land Use - Bajool to Gladstone**  
 Sheet 2 of 2

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



**ARUP**

While every care is taken to ensure the accuracy of this data, the Gladstone Area Water Board (GAWB) makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which might be incurred as a result of the plan being inaccurate or incomplete in any way and for any reason. It should also be noted that final survey of the pipeline alignment and SGIC boundary are yet to occur and may result in changes to the alignments depicted here.



- Land Tenure:**
- Freehold
  - Lands Leased
  - Housing Land
  - Industrial Estate
  - Railway
  - Forest Reserve
  - National Park
  - Reserve
  - State Forest
  - Port and Harbour Boards
  - State Land
  - Commonwealth Acquisition

Gladstone - Fitzroy Pipeline Project  
**Figure 4.8 Existing Land Tenure -  
 Bajool to Gladstone**  
 Sheet 1 of 2

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

0 2 4 6 8 km

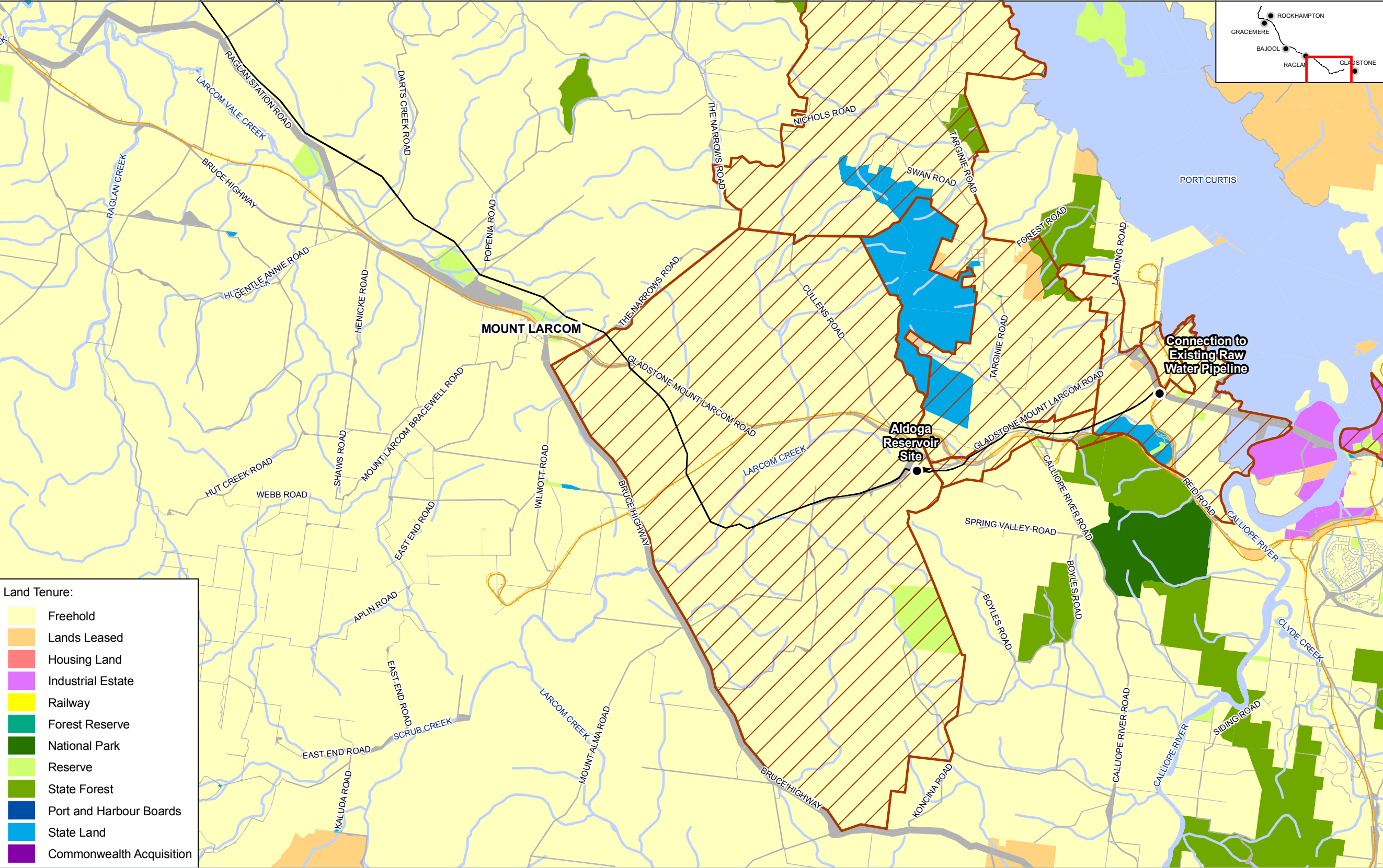
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Land Tenure:

- Freehold
- Lands Leased
- Housing Land
- Industrial Estate
- Railway
- Forest Reserve
- National Park
- Reserve
- State Forest
- Port and Harbour Boards
- State Land
- Commonwealth Acquisition

Gladstone - Fitzroy Pipeline Project

**Figure 4.8 Existing Land Tenure - Bajool to Gladstone**

Sheet 2 of 2

**The Right of Way**

**Project Infrastructure**

**Railway Line**

**Road Reserve**

**Waterways**

**LGA Boundary**

**SGIC**

**GSDA**

0 2 4 6 8 km

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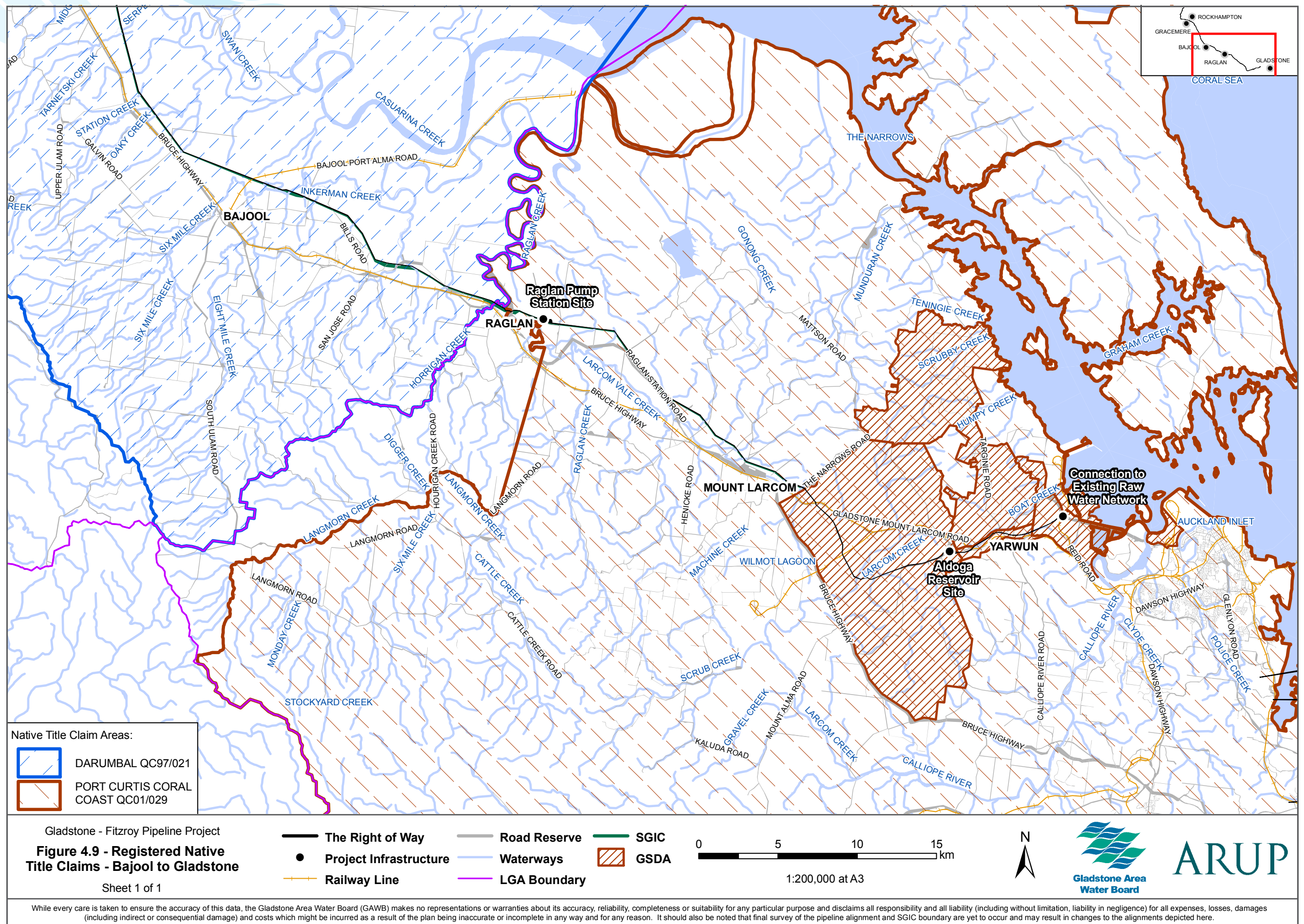
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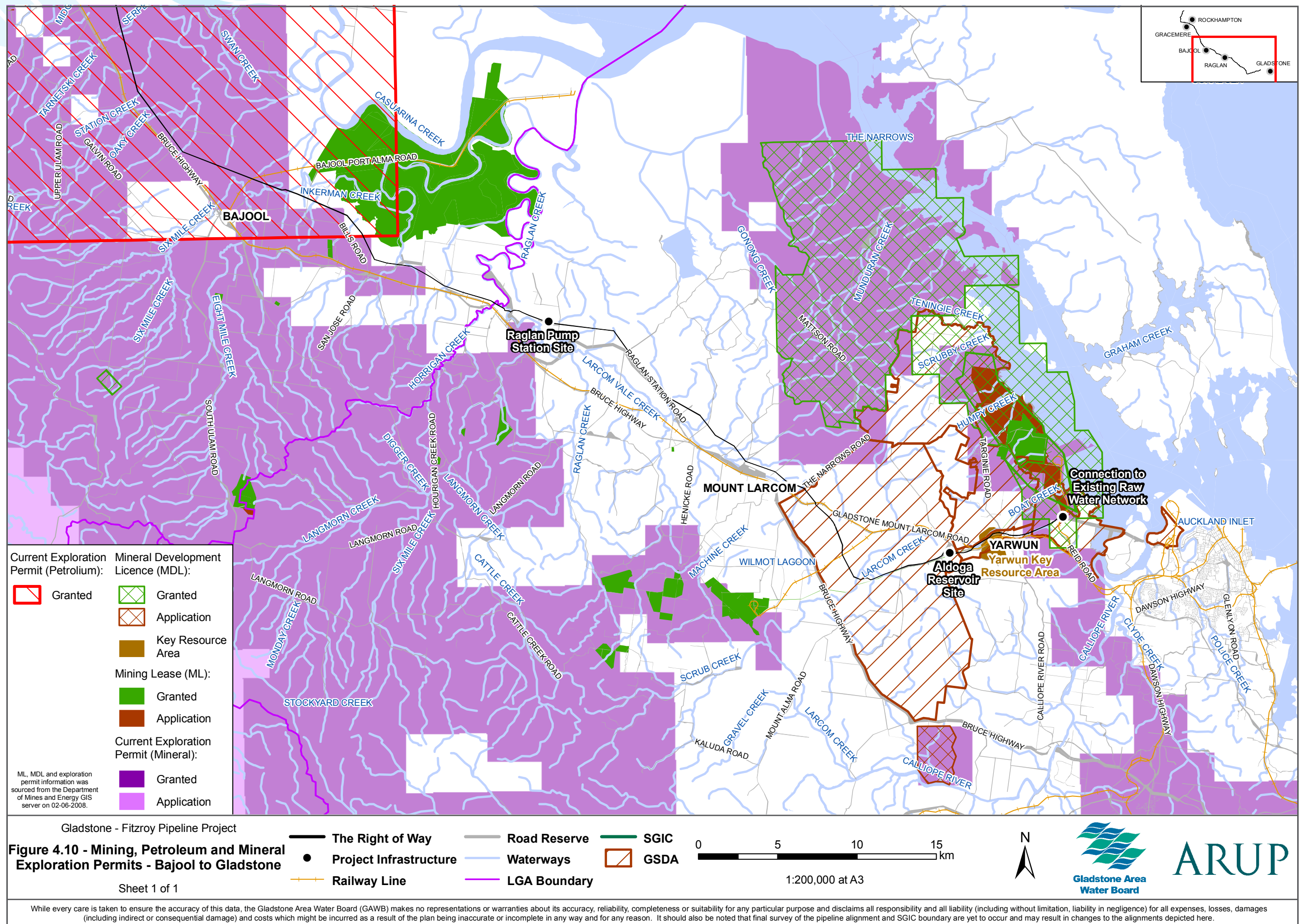
Gladstone Area Water Board

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Near Raglan the project passes through a property known as Racecourse Reserve which is State land and has a local committee as trustee. This property is classified as 'open space – recreational' in the Calliope Shire Planning Scheme.

The only known recreational area in this section of the project area is the public access area at Raglan Creek, which is used for recreational boating and fishing activities.

#### 4.5.2.6 Infrastructure

The location of various types of infrastructure (e.g. roads, railways, powerlines and other pipelines) in proximity to the project corridor is illustrated in Figure 4.12. The project corridor crosses a number of existing infrastructure corridors as set out in Table 4.8 to Table 4.11. All highways are bitumen sealed. A series of minor and local roads (and some farm access tracks) are traversed by the project corridor and will likely also be used by vehicles associated with construction activities as detailed in Chapter 13, Transport and Access Arrangements.

*Table 4.8 Road Crossings (named roads) – Bajool to Gladstone*

Road name	Road name
Toonda Port Alma Road	Gostevsky Road
Twelve Mile Road	The Narrows Road
Esplanade	Gladstone Mt Larcom Road
Reedy Creek Road	Calliope River Road
Darts Creek Road	

*Table 4.9 Railway Crossings – Bajool to Gladstone*

Crossing type	Comments
Rail only crossing	East End Mine Rail Link Crossing (a branch of the North Coast line)
Rail and Road Combined Crossings	Mt Larcom Road and Aldoga Rail (a section of the North Coast Line) Mt Larcom Road and Yarwun Rail (a section of the North Coast Line)

*Table 4.10 Powerline Crossings – Bajool to Gladstone*

Powerline	Comments
Powerline at Ambrose	Near the Dart Creek Road crossing
Powerline at Yarwun	Near Yarwun KRA on Quarry Road

*Table 4.11 Other Infrastructure Crossings – Bajool to Gladstone*

Other infrastructure	Comments
Queensland Gas Pipeline at Yarwun	Near Gladstone Mt Larcom Road in Yarwun

#### 4.5.2.7 Fences and Gates

The exact locations of fences and gates to be crossed by the pipeline or to be constructed for pipeline access are not known at this stage. Survey crews will precede construction personnel ensuring that the pipeline route is clearly located prior to the installation of temporary or permanent gates. Temporary gates will be installed at locations where the pipeline crosses fence lines in consultation with landowners and in accordance with the license conditions of the SGIC and GSDA.

### 4.6 Assessment of Impacts


This section documents the potential impacts of the project to land use and infrastructure within the project area. Measures to mitigate the identified impacts are also described and an assessment is then made of the likely residual impact once these measures have been implemented. Residual impacts are assessed with reference to the significance criteria described in Section 4.2.

#### 4.6.1 Fitzroy to Bajool

##### 4.6.1.1 Land use

The pipeline in this section of the project area traverses Alton Downs (to the north of the SGIC) and is within the SGIC for the majority of its length. As identified in Section 4.5.1.1, the land use in this section of the project area is largely rural grazing land. The impact of the project to this land use will be temporary disruption during construction while the ROW is cleared and pipeline is laid. Following construction the pipeline ROW will remain free of trees but will be revegetated with grasses. Existing grazing activities will be able to resume. Any proposed land uses that would result in damage to the pipe such as ploughing, installing irrigation or the building of new infrastructure may not be permitted subject to the terms of the pipeline easement agreement between the landowner and DIP. GAWB's access and use of the SGIC is through a licence agreement between GAWB and DIP.

The construction and operation of the Fitzroy River intake will occur adjacent to the existing SunWater intake and will be undertaken in consultation with SunWater to ensure that these activities do not impact upon their operations or access.



During operation the pipeline will be underground in most areas and as such will not form a physical barrier on the affected properties.

The WTP site is freehold land that has previously been cleared for grazing purposes. This site will be acquired by GAWB and the land use will therefore change to accommodate the WTP and associated accesses. The potential impacts of the WTP to surrounding land uses during operation are related to amenity issues such as air quality, noise impact, transport and access or visual impact. These issues are discussed further in Chapter 10, Air Environment; Chapter 12, Noise and Vibration; Chapter 13, Transport and Access Arrangements; and Chapter 17, Landscape and Visual Impact Assessment.

The project is likely to traverse some existing irrigated properties in this section of the project area. Consultation with the landowners is underway with the objective of ensuring that where possible there is minimal disruption of the existing irrigation infrastructure.

#### 4.6.1.2 Land Tenure

In the Fitzroy to Bajool section of the project area there are a range of land tenures along the pipeline route, the majority of which are freehold properties. In the Alton Downs easement (the northern section of the project alignment which is outside the SGIC), an easement will need to be acquired by GAWB on the traversed properties. This easement would be managed by GAWB but would still be available for use by the landowner under the terms of the easement agreement.

Within the SGIC, easements will be acquired by the State for the entire width of the SGIC. Management of the easement will be subject to the specific terms and conditions of the easement agreement.

The intake location will be subject to a sub lease agreement with SunWater.

The proposed WTP site is located on freehold land. A site will be acquired by GAWB for this purpose and will therefore be owned by GAWB.

The project does not impact any protected areas or reserves in this section of the project area.

#### 4.6.1.3 Native Title

In the case of the intake location, it has been assumed that Native Title rights may still exist within the boundaries of the Fitzroy River. Native Title will be addressed at this site pursuant to Section 24HA of the *Native Title Act*. This section of the *Native Title Act* provides a mechanism for the authorisation of acts in relation to the 'management and regulation of water and air space'. It provides that interested native title parties will have the opportunity to comment on the proposed activity. Also, under

Section 24HA the 'non extinguishment principle' applies. That is the grant of any permit authorising the intake pump does not extinguish Native Title rights but any inconsistent Native Title rights are suspended to the extent of inconsistency. Any right that Native Title holders may have to compensation for the effect of the project on their Native Title rights is preserved under Section 24HA.

Native Title at the proposed WTP site has been extinguished through past land tenure grants.

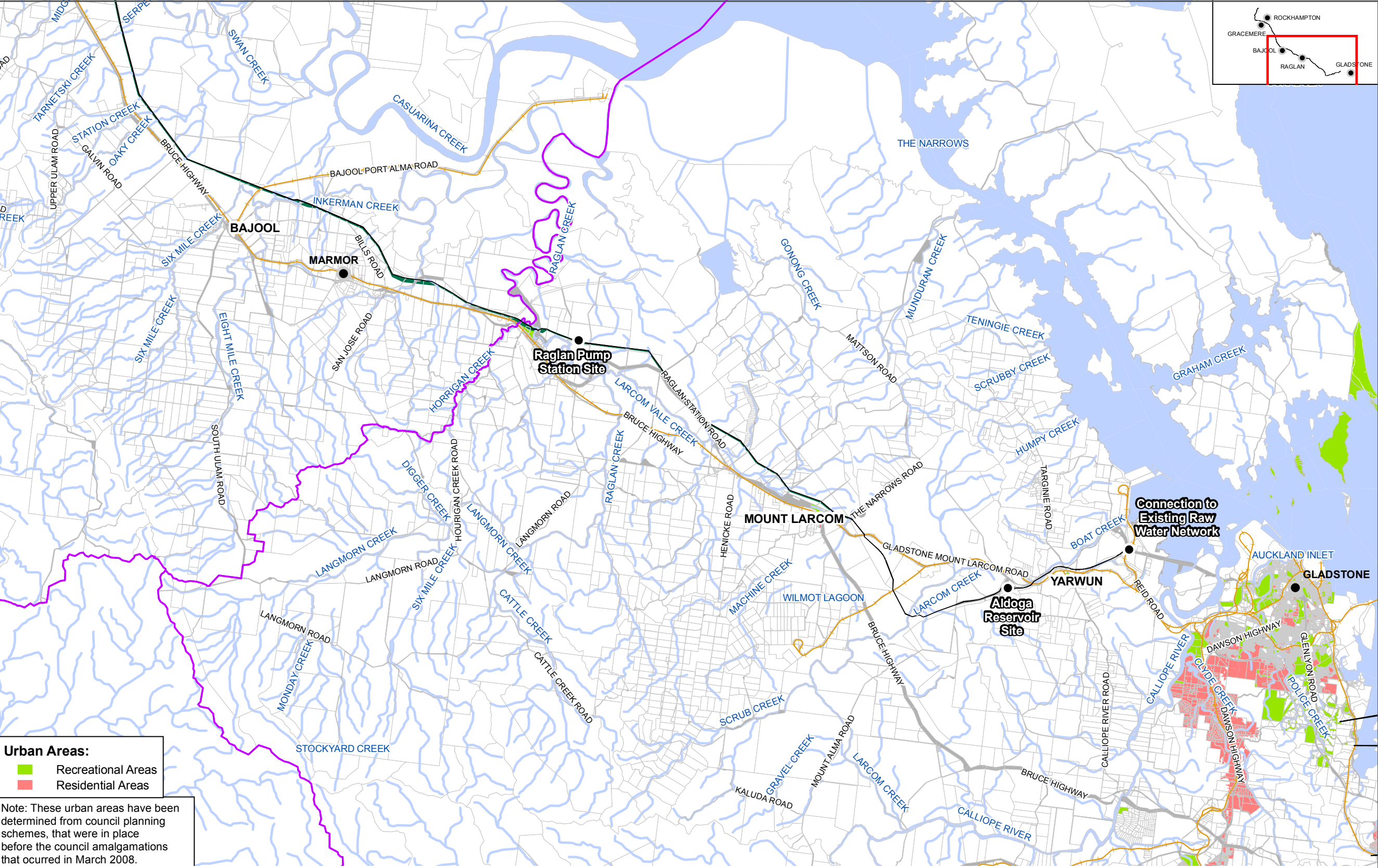
The pipeline itself passes through largely freehold tenure and it is likely that Native Title has been extinguished on some or all of these parcels of land. However as a Native Title extinguishment assessment has not yet been completed for the full length of the pipeline it is possible that Native Title may exist in some areas. Should this be the case, the construction of the pipeline is likely to address Native Title under section 24KA of the *Native Title Act*. Section 24KA applies to certain types of infrastructure, including water pipelines (as well as other water supply and reticulation facilities), which are operated for the general public. The pipeline meets the necessary criteria required under this section of the *Native Title Act*. As with section 24HA, any interested native title parties will be given the opportunity to comment on the pipeline and how it might impact native title interest. The non-extinguishment principle again applies and any right that Native Title holders may have to compensation for the effect of the project on their Native Title rights is preserved under Section 24KA.

#### 4.6.1.4 Economic Mineralisation and Extractive Resources

As described in the baseline section, a number of mining leases and mineral exploration permits exist in the area between Fitzroy to Bajool and are traversed by the pipeline, although there are no mining or extractive operations directly affected by the Gladstone-Fitzroy Pipeline project.

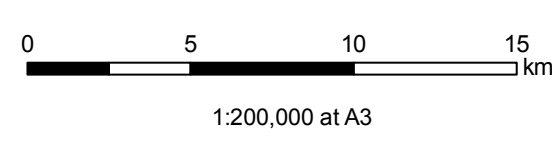
Land overlain by mining leases, licenses and permits is subject to the provisions of the *Minerals Resources Act 1989*. Under this *Act*, any mining tenement issued by the State of Queensland *does not create any estate or interest in land*. Therefore, the construction and operation of the pipeline and associated infrastructure will have a negligible impact upon existing mining tenements.





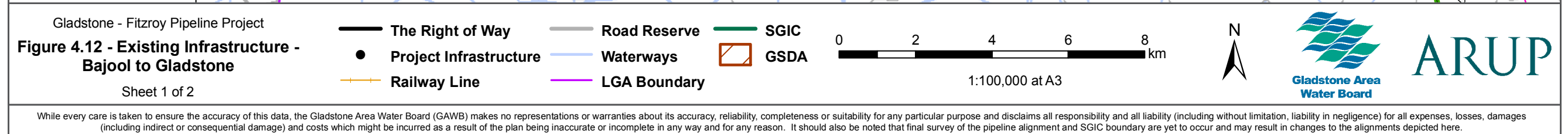
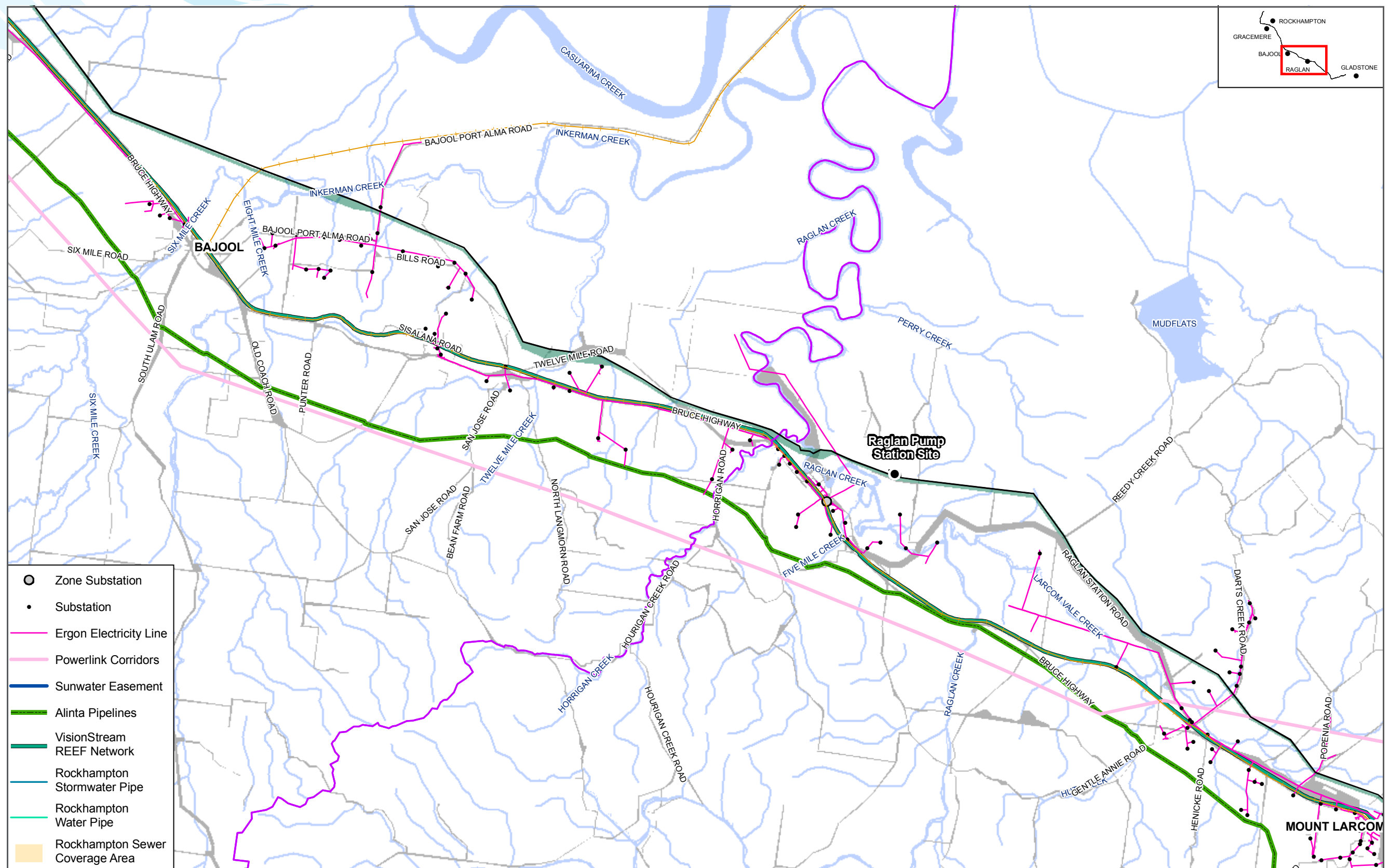
Gladstone - Fitzroy Pipeline Project  
**Figure 4.11 - Residential and Recreational Areas - Bajool to Gladstone**  
 Sheet 1 of 1

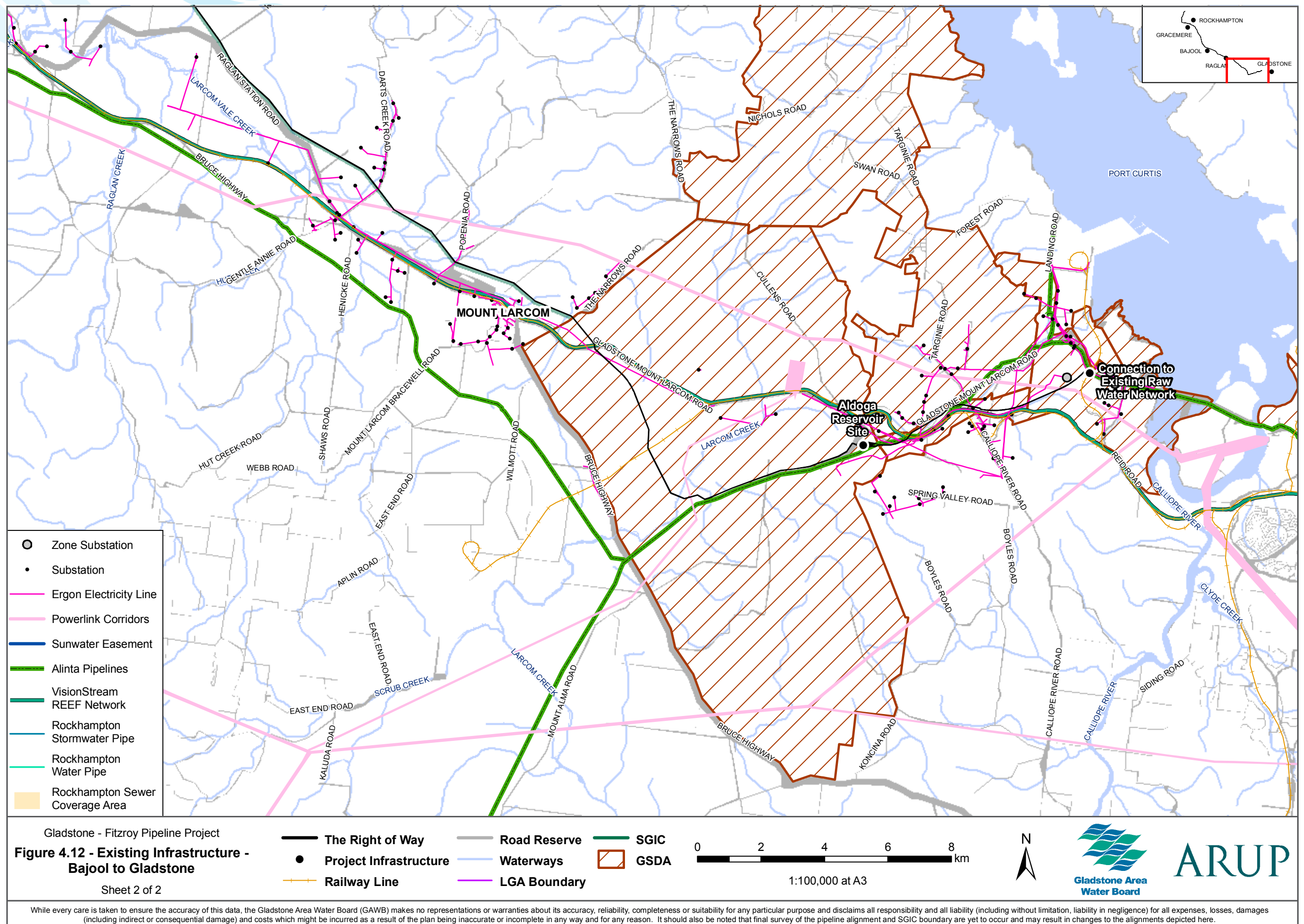
- The Right of Way**
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The proposed intake point for the pipeline at the Fitzroy River is located directly adjacent to the boundary of Pink Lily KRA, which harvests sand from the river. It is not anticipated that this will impact upon the intake site and associated infrastructure, due to the location of the pipeline outside the defined boundary and upstream of river mining activities. The boundary is the minimum distance required under section 3.8(a) of SPP2/07 (200 m) from the resource extraction and processing points. Similarly, it is not anticipated that activities during construction or operation of the pipeline will adversely impact operations within Pink Lily KRA.

#### **4.6.1.5 Residential and Recreational Areas**

Residential properties occur within 100 m of the proposed pipeline alignment in the Alton Downs easement. There is the potential for these properties to be affected by noise and dust during the construction and operation of the pipeline. Chapter 12, Noise and Vibration; Chapter 17, Landscape and Visual Impact Assessment; and Chapter 10, Air Environment, discuss the baseline noise, landscape and air environments and provide an assessment of the likely impacts of the project on residential land uses. Other zoned residential areas in Gracemere and Bajool are not in close proximity to the project area so it is not likely that they will experience amenity impacts.

The recreational use of the Fitzroy River for water skiing and the Rockhampton Water Skiing and Powerboat Club located in proximity to the proposed Fitzroy River intake may be temporarily disrupted whilst the intake point is constructed. There are not expected to be long-term operational impacts as there is an existing intake point adjacent to the site operated by SunWater and this does not impact water skiing activities.

#### **4.6.1.6 Infrastructure**

##### ***Roads and Railways***

During construction of the project, two major and several minor roads will be crossed during pipeline instalment either through trenching or micro-tunnelling (or other trenchless methods all described in Chapter 2, Project Description). Trenching is likely to occur on minor roads which experience lower traffic volumes and will require temporary lane closures or detours. This may result in some delays to local traffic however the delays are expected to be brief and temporary and access will not be lost entirely. Any impacts to local access are likely to be relevant to local road users such as landowners. Major roads will be crossed through trenchless techniques where practicable, which will not affect traffic flow or access.

Access by rail is not likely to be affected as rail corridors such as the North Coast rail line will be crossed through trenchless techniques which do not require the cessation or interruption of rail services. Possible safety issues associated with construction near electrified railway pylons will be managed through

appropriate permits and construction management plans. Chapter 13, Transport and Access Arrangements, provides a full assessment of the likely impacts to roads and access.

#### ***Electricity Transmission Lines***

The pipeline route crosses electricity transmission lines in two places in this section of the project area. Construction in the vicinity of electricity lines creates potential safety issues for construction personnel however there are not expected to be any direct impacts to the project or the operation of the transmission lines during construction.

#### ***Other Infrastructure***

The proposed pipeline alignment crosses the Queensland Gas Pipeline south of Rockhampton within the former Rockhampton City Council boundaries. Engineering design for construction will provide a safe and technically sound construction methodology at this crossing, in negotiation with the Queensland Gas Pipeline operator.

Other infrastructure such as the Visionstream fibre optic network will likely be traversed through hand excavation around the cable and then open trenching.

The three farm dams identified in this section of the project area would possibly be impacted by construction through the dam walls and if required, and in consultation with the landowners and the appropriate governing authority, reconstruction of the wall in an alternative location would be undertaken which is outside the ROW and, where possible, also outside the SGIC. Depending on the construction method undertaken, it is likely that there will be loss of water as a result of construction through these farm dams and any pondage/levee banks along the alignment.

#### **4.6.1.7 Fences and Gates**


Prior to commencement of construction the ROW will be precisely located and the pipeline centre line pegged. Temporary gates will be installed in the farm fences encountered, in consultation with landowners. On completion of pipeline construction, following the reinstatement of the ROW, the farm fences will be restored and permanent lockable gates may be installed. Any gates installed will be provided the State and infrastructure owners with permanent access along the SGIC in accordance with the requirements of the SGIC license.

### **4.6.2 Bajool to Gladstone**

#### **4.6.2.1 Land use**

The pipeline is aligned through rural zoned land for all of the southern section until the GSDA which has its own classification in the Calliope Planning Scheme. Currently the area is largely cleared for grazing activity. As identified for the northern





section of the project area, the impact of the project to rural grazing land will be temporary disruption during construction while the ROW is cleared and pipeline is laid. Following construction the pipeline ROW will remain free of trees but will be revegetated with grasses. Existing grazing activities will be able to resume. During operation the pipeline will be underground in most areas and as such will not form a physical barrier on the affected properties. The Raglan Pump Station and Reservoir will be located on freehold land and will therefore change the existing land use which is grazing.

Any proposed land uses above the pipeline that would result in damage to the pipe such as ploughing, installing irrigation or the building of new infrastructure may not be permitted within the pipeline easement subject to the terms of the pipeline easement agreement.

#### 4.6.2.2 Land Tenure

The pipeline alignment in the Bajool to Gladstone section of the project area is within either the SGIC or the GSDA on freehold land. Within the SGIC, easements will be acquired by the State for the entire width of the SGIC. Management of the easement will be subject to the specific terms and conditions of the easement agreement.

Within the GSDA the pipeline is located on freehold land owned by the State (administered by DIP) and the Central Queensland Port Authority (CQPA). The CQPA owns the Materials Transportation and Services Corridor. The Minister for Industrial Development owns the freehold land between the end of the Materials Transportation and Services Corridor and where the route enters the SGIC (i.e. within the Aldoga Industrial Area). It is expected that the Gladstone-Fitzroy Pipeline within the GSDA will be treated similarly to the SGIC. That is, a long-term licence to construct and operate a pipeline will be issued to GAWB.

The site for the Raglan Pump Station and Reservoir will be acquired by GAWB from the landowner. The Aldoga Reservoir site will be acquired by GAWB from the Queensland Government.

#### 4.6.2.3 Native Title

In this section of the study area the pipeline alignment passes through largely freehold tenure and it is possible that Native Title has been extinguished on some or all of these parcels of land. However as a Native Title extinguishment assessment has not been undertaken for the full length of the pipeline it is possible that Native Title exists in some areas. The construction of the pipeline is therefore likely to occur under section 24KA – Public Infrastructure of the *Native Title Act*. The pipeline meets the necessary criteria required under this section of the *Native Title Act*. As with section 24HA, the non-extinguishment principle applies and Native Title holders are entitled to compensation for the effect of the project on their native title rights.

Native Title at the proposed Raglan Pump Station and Reservoir site has been extinguished through past land tenure grants. Native Title rights with respect to the road access to the site are also extinguished through past land tenure grants on the majority of lots. Where this is not the case the road may be constructed under section 24KA – Public Infrastructure of the *Native Title Act*.

Native Title at the proposed Aldoga Reservoir site has been extinguished through past land tenure grants.

#### 4.6.2.4 Economic Mineralisation and Extractive Resources

As for the Fitzroy to Bajool section of the project area, a number of mining tenements exist in the area between Bajool and Gladstone and are traversed by the pipeline, although there are no mining or extractive operations directly affected by the Gladstone-Fitzroy Pipeline project.

Land overlain by mining leases, licenses and permits is subject to the provisions of the *Minerals Resources Act 1989*. Under this Act, any mining tenement issued by the State of Queensland *does not create any estate or interest in land*. Therefore, the construction and operation of the pipeline and associated infrastructure will have negligible impact upon existing mining tenements.

The pipeline in the Bajool to Gladstone section of the project area will be aligned through the Yarwun KRA. This is a regionally important quarry as it is one of the largest of only two sizeable quarries supplying crushed rock products to the development and construction industries. The pipeline crosses through the separation area – this is a buffer measure used to control and mitigate impacts associated with the mining of the product in the extraction zones of the quarry. These potential impacts relate to noise from blasting and machinery operation, dust and ground vibration.

The construction of the pipeline will require the crossing of Quarry Road which is the haulage route for the KRA. It is likely that this road will be crossed through micro-tunnelling which will not result in disruption of traffic flow. In the event that trenching is used for this crossing, the impact will be temporary and short-term. The impacts to traffic and access as a result of the project are assessed in Chapter 13, Transport and Access Arrangements.

#### **4.6.2.5 Residential and Recreational Areas**

As discussed in the baseline section, there are residential properties within 200 m of the pipeline route in the Bajool to Gladstone section of the project area. Chapter 12, Noise and Vibration; Chapter 10, Air Environment; and Chapter 17, Landscape and Visual Impact Assessment, discuss the possible amenity impacts to sensitive receptors in this section of the study area as a result of construction in the ROW or the Aldoga Reservoir site. Raglan Pump Station and Reservoir are well separated from the nearest residence therefore adverse impacts due to visual and noise amenity are not expected.

Other potential impacts to residents may include short-term traffic delays to local access during construction of the pipeline at road crossings. Chapter 13, Transport and Access Arrangements, provides an assessment of the likely impacts on local roads for this section of the project area.

Racecourse Reserve at Raglan is currently unused land so the construction of the pipeline will not have an impact on the current land use of this area. However the operation of the pipeline may limit the potential future uses of the property as any future land uses that may damage the pipeline (i.e. ploughing or construction of infrastructure) may not be permitted within the SGIC.

The identified recreational use of Raglan Creek is likely to be temporarily impacted during construction of the pipeline in this area, through the removal of vegetation and the presence of construction machinery.

#### **4.6.2.6 Infrastructure**

##### ***Roads and Railways***

Three major and several minor road crossings will occur in this section of the study area and will be undertaken through trenching for minor roads and most likely thrust boring for major roads (or other trenchless crossing methods).

Access by rail is not likely to be affected as rail corridors will be crossed through trenchless techniques which do not require the cessation or interruption of rail services. Possible safety issues associated with construction near electrified railway pylons will be managed through appropriate permits and construction management plans. The impacts to road and rail access are described fully in Chapter 13, Transport and Access Arrangements.

#### ***Electricity Transmission Lines***

The proposed pipeline crosses High Voltage line to the southeast of Bajool, at Raglan, just north of Mt Larcom (twice) and at Yarwun (five times). The Ergon Transmission Line is also crossed south of Mt Larcom, just west of Yarwun and again to the east of Yarwun. Construction in the vicinity of electricity lines creates potential safety issues for construction personnel however there are not expected to be any direct impacts to the project or the operation of the transmission lines during construction.

#### ***Other infrastructure***

The proposed Gladstone-Fitzroy Pipeline alignment crosses the Queensland Gas Pipeline at Yarwun. Detailed design for construction will determine how this crossing is managed and what design features will be required to ensure a safe passing of the two pipelines. It is not anticipated that there will be any long-term compatibility issues with the two pipelines.

The three farm dams identified in this section of the project area would possibly be impacted by construction through the dam walls and, if required, and in consultation with the landowners and the appropriate governing authority, reconstruction of the wall in an alternative location would be undertaken which is outside the ROW and, where possible, also outside the SGIC. Depending on the construction method undertaken, it is likely that there will be loss of water as a result of construction through these farm dams and any pondage/levee banks along the alignment.

#### **4.6.2.7 Fences and Gates**

Prior to commencement of construction the ROW will be precisely located and the pipeline centre line pegged. Temporary gates will be installed in the farm fences encountered, in consultation with landowners. On completion of pipeline construction following the reinstatement of the ROW, the farm fences will be restored and permanent lockable gates may be installed. Any gates installed will provided the State and infrastructure owners with permanent access along the SGIC in accordance with the requirements of the SGIC license.



## 4.7 Mitigation Measures

This section outlines the proposed mitigation measures to address the impacts identified in Section 4.6 for the Fitzroy to Bajool and Bajool to Gladstone sections of the project area with respect to land use and infrastructure. The mitigation measures proposed for both sections of the project area are similar and have been described together.

### 4.7.1 Land Use

Impacts to SunWater's existing operations adjacent to the Fitzroy River intake site will be minimised through consultation with SunWater and adherence to traffic and access protocols.

Regular communication with landowners and relevant stakeholders, and development of plans to ensure timely notification of planned construction and operational activities, will be undertaken to mitigate or avoid impacts to land where possible.

Impacts to grazing land, which is the dominant land use in the project area, will be mitigated through rehabilitation of the pipeline ROW to ensure that the area is revegetated with grasses as soon as possible. This will enable grazing activities to continue as soon as possible following construction.

Significant vegetation or habitat within the ROW will be managed in accordance with the measures set out in Chapter 6, Terrestrial Flora and Chapter 7, Terrestrial Fauna.

No other land units requiring specific management measures have been identified within the ROW.

### 4.7.2 Land Tenure

The impacts to land tenure such as the land acquisition process to be undertaken by GAWB for the WTP, Raglan Pump Station and Reservoir, Aldoga Reservoir and the easement procurement process in the Alton Downs section of the pipeline will be managed through the legislative framework and in negotiation with landowners. In the SGIC and the GSDA the licensing process will be undertaken through the State.

### 4.7.3 Native Title

The Native Title process will be undertaken in accordance with the provisions of the *Native Title Act* and in consultation with the native title claimants – the Darumbal and the Port Curtis Coral Coast groups. In the SGIC and GSDA, the Native Title process will be undertaken by the State Government.

### 4.7.4 Economic Mineralisation and Extractive Resources

As there is not expected to be an impact to the Pink Lily Key Resource Area in the Fitzroy River and the project is outside the separation area boundary, no mitigation measures are proposed.

With respect to the Yarwun KRA, impacts to the haulage route will be mitigated through the construction process e.g. micro tunnelling, and through adherence to a traffic management plan.

Impacts to extractive industries at Yarwun will be mitigated through consultation with the operators to discuss appropriate crossing methods for the haulage route/s.

### 4.7.5 Residential and Recreational Areas

Any temporary impacts to the Rockhampton Water Skiing and Powerboat Club through construction of the intake will be avoided if at all possible and if not, mitigated through consultation with Club personnel to ensure they are aware of the construction plans and have input into the mitigation measures proposed. This will include regular updates so that Club members are aware of construction timing and any restrictions this will place on their activities.

Potential amenity impacts to the residential properties near the intake point, WTP, Aldoga Reservoir and the ROW during construction will be mitigated through the measures described in Chapter 12, Noise and Vibration; Chapter 17, Landscape and Visual Impact Assessment; and Chapter 10, Air Environment. Detailed design for construction will include measures will avoid and mitigate possible impacts to the nearby residential properties as far as reasonably possible.

### 4.7.6 Infrastructure

Road and rail impacts will be mitigated where possible through the detailed design for construction process, so that major roads with high traffic volumes and railways will not be trenched and therefore not cause interruptions to road or rail traffic during construction. Potential safety issues associated with construction near railway pylons will be mitigated through appropriate buffer distances and adherence to a safety management plan.

The impacts to minor roads as a result of trenching will be managed through a construction traffic management plan which will specify traffic control measures to reduce the delay times and provide detours as necessary.

Approval will be obtained from the Department of Main Roads under the *Transport Infrastructure Act 1994* for works within the State-controlled road corridors in this section of the project area.

Approval will also be obtained from Queensland Transport under the *Transport Infrastructure Act 1994* for works within a railway corridor.

Crossing of transmission lines and pipelines in this section of the project area will be managed with reference to a safety management plan that will form part of the project EMP. Consultation will also be undertaken with Alinta, Visionstream and other infrastructure owners to discuss appropriate crossing methods.

Impacts to the six farm dams will be mitigated where possible through small realignments of the final ROW to minimise the impact to the dam walls. Where avoidance of dam walls or levee banks is not possible, they will be reconstructed in consultation with the landowners and the appropriate governing authority, in an alternative location which is outside the ROW and, where possible, also outside the SGIC.

#### 4.7.7 Fences and Gates

The impact to fences and gates will be mitigated through prior survey of the corridor to ensure correct placement of temporary and permanent gates and this will be undertaken in consultation with landowners and corridor owners.

### 4.8 Residual Impacts

The residual impacts to land use and infrastructure have been assessed as **negligible to minor adverse** for the different aspects, which are summarised in Table 4.12.

### 4.9 Cumulative and Interactive Impacts

Cumulative impacts associated with land use may arise as a result of the future construction of other pipeline infrastructure in the region which would result in further disturbance to land use and infrastructure in the project area. The purpose of the SGIC is to reduce the potential cumulative effects of multiple projects in the region by lessening the disruption caused by investigation and construction 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.

Within the GSDA the land is currently being used for, or is planned for, large scale industrial development. The use and planning of the area for that purpose reduces cumulative impacts to other land uses.

Interactive impacts to land use and infrastructure may arise from air quality, noise and traffic impacts during construction. Each of these has the potential to impact land uses adjacent to or within the construction area and have been addressed in Chapter 10, Air Environment; Chapter 12, Noise and Vibration; and Chapter 13, Transport and Access Arrangements.

### 4.10 Summary and Conclusions

The majority of land in the project area is freehold rural land used for grazing. Low density residential areas occur adjacent to the pipeline at some locations in the project area and some recreational areas have been identified within the project footprint. There are also a number of mineral development permits and leases relevant to the project area.

In both sections of the project area the pipeline will traverse road and rail corridors, transmission lines and some other pipelines.

Land tenure will be impacted through acquisition of land at the WTP and Raglan Pump Station and Reservoir sites and through the acquisition of easements along the pipeline alignment. Acquisition processes in the Alton Downs section of the pipeline alignment will be undertaken by GAWB in consultation with landowners or in the case of the SGIC, will be undertaken by DIP in accordance with relevant statutory requirements.

The Native Title process will be undertaken in accordance with the provisions of the *Native Title Act* and in consultation with Native Title claimants.

Due to the rural nature of the project area and the characteristics of the project (i.e. the pipeline is underground for the majority of its length) the impacts to land use and infrastructure are manageable and have been assessed as **negligible to minor adverse** with the proposed mitigation measures.

Table 4.12 provides an assessment summary for land use and infrastructure.

Table 4.12 Assessment Summary Matrix

EIS Area: Land Use and Infrastructure Feature/Activity	Current value + Substitutable Y:N	Description of Impact		
		Description in words	Mitigation inherent in design/ Standard practice mitigation	Residual impact using significance criteria
Land use	<ul style="list-style-type: none"> <li>Grazing and irrigated properties</li> <li>Partially substitutable</li> </ul>	<ul style="list-style-type: none"> <li>Temporary disruption during construction</li> <li>Restrictions to future uses that may impact the pipeline</li> <li>Acquisition of land</li> </ul>	<ul style="list-style-type: none"> <li>Consultation with landowners</li> <li>Easement license agreements</li> <li>Compensation to landowners</li> </ul>	Minor adverse
Land tenure	<ul style="list-style-type: none"> <li>Freehold tenure</li> <li>Not substitutable</li> </ul>	<ul style="list-style-type: none"> <li>Acquisition of land</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with the <i>Acquisition of Land Act 1967</i></li> </ul>	Minor adverse
Native Title	<ul style="list-style-type: none"> <li>Native Title value</li> </ul>	<ul style="list-style-type: none"> <li>Non- extinguishment of Native Title</li> </ul>	<ul style="list-style-type: none"> <li>Processes under the <i>Native Title Act</i></li> </ul>	Negligible
Economic Mineralisation and Extractive Resources	<ul style="list-style-type: none"> <li>Economic value</li> <li>Substitutable</li> </ul>		<ul style="list-style-type: none"> <li>Construction methods</li> </ul>	Negligible
Residential and Recreational Areas	<ul style="list-style-type: none"> <li>Local amenity</li> <li>Not substitutable</li> </ul>	<ul style="list-style-type: none"> <li>Noise and air quality amenity impacts</li> </ul>	<ul style="list-style-type: none"> <li>Environmental management plan</li> <li>Consultation with landowners</li> <li>Design standard</li> </ul>	Minor adverse
Infrastructure	<ul style="list-style-type: none"> <li>Provision of services and access</li> <li>Not substitutable</li> </ul>	<ul style="list-style-type: none"> <li>Pipeline construction may result in temporary road closures or reduced accessibility to services/ amenities for a short period of time.</li> <li>Possible safety issues with construction near transmission lines and railway pylons</li> <li>Possible impacts to farm dams</li> </ul>	<ul style="list-style-type: none"> <li>Traffic management plan</li> <li>Safety management plan</li> <li>Buffer zone around railway pylons</li> <li>Realignment around dam or reconstruction in consultation with landowner</li> </ul>	Minor adverse
Fences and Gates	Local access Substitutable	Addition of new gates as required	Consultation with landowners and corridor owners	Negligible
<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		