

BARALABA SOUTH PROJECT  
EA APPLICATION – SUPPORTING INFORMATION

PREPARED FOR  
MOUNT RAMSAY COAL COMPANY PTY LTD

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<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	THE PROPONENT .....	1
1.2	BACKGROUND.....	1
1.3	CONTENT OF SUPPORTING INFORMATION .....	2
1.4	TENURE.....	3
1.4.1	Tenements .....	5
1.5	ENVIRONMENTALLY RELEVANT ACTIVITIES.....	6
1.6	NOTIFIABLE ACTIVITIES.....	6
<b>2.0</b>	<b>PROJECT DESCRIPTION .....</b>	<b>8</b>
2.1	PROJECT TIMING.....	8
2.2	PROJECT OVERVIEW.....	8
2.3	CONSTRUCTION AND OPERATIONAL ACTIVITIES .....	10
2.3.1	Construction Materials .....	10
2.3.2	Construction Fleet.....	10
2.3.3	Mining Operations.....	10
2.3.3.1	Vegetation Clearing.....	10
2.3.3.2	Topsoil Stripping and Handling .....	10
2.3.3.3	Overburden Removal .....	10
2.3.3.4	Coal Mining and ROM Coal Handling .....	11
2.3.4	Workforce Requirements .....	11
2.4	MINE INFRASTRUCTURE .....	12
2.4.1	CHPP .....	14
2.4.2	Power Supply .....	14
2.4.3	Telecommunications .....	14
2.4.4	Fuel & Oil Storage .....	14
2.4.5	Workforce Accommodation.....	15
2.4.6	Sewage .....	15
2.5	WATER MANAGEMENT .....	15
2.5.1	Flood Protection.....	16
2.5.2	Wastewater .....	16
2.5.3	Water Consumption .....	16

2.5.4	Water Sources .....	16
<b>2.6</b>	<b>TRANSPORT INFRASTRUCTURE .....</b>	<b>17</b>
2.6.1	Mine Roads.....	17
2.6.2	Coal Haulage .....	17
<b>3.0</b>	<b>WASTE.....</b>	<b>18</b>
<b>3.1</b>	<b>WASTE MANAGEMENT STRATEGIES.....</b>	<b>18</b>
<b>3.2</b>	<b>MINE WASTE MANAGEMENT .....</b>	<b>18</b>
<b>3.3</b>	<b>GENERAL WASTE.....</b>	<b>18</b>
<b>3.4</b>	<b>REGULATED WASTE.....</b>	<b>18</b>
<b>4.0</b>	<b>REHABILITATION / POST MINE LAND USE.....</b>	<b>19</b>
<b>4.1</b>	<b>LAND USE .....</b>	<b>19</b>
<b>4.2</b>	<b>REHABILITATION.....</b>	<b>19</b>
4.2.1	Rehabilitation Goals.....	19
4.2.2	Rehabilitation Objectives .....	20
4.2.3	Indicators and Acceptance Criteria.....	20
4.2.4	Proposed Monitoring Strategy .....	20
<b>5.0</b>	<b>ENVIRONMENTAL VALUES, IMPACTS AND MANAGEMENT STRATEGIES.....</b>	<b>22</b>
<b>5.1</b>	<b>LOCAL CLIMATE.....</b>	<b>22</b>
5.1.1	Rainfall Data .....	22
5.1.2	Wind Speed and Direction .....	23
<b>5.2</b>	<b>LAND VALUES.....</b>	<b>24</b>
5.2.1	Land Use.....	24
5.2.2	Topography and Catchments .....	27
5.2.3	Regional Geology .....	29
5.2.4	Local Geology .....	29
5.2.5	Soil.....	29
5.2.6	Potential Impacts to Land .....	31
5.2.7	Proposed Mitigation and Management of Land Values.....	32
<b>5.3</b>	<b>SURFACE WATER VALUES .....</b>	<b>34</b>
5.3.1	Wetlands and Groundwater Dependent Ecosystems.....	34
5.3.2	Dawson River.....	36
5.3.3	Banana Creek.....	36
5.3.4	Water Use.....	38
5.3.5	Potential Impacts to Surface Water .....	38
5.3.6	Proposed Mitigation and Management of Surface Water.....	41
<b>5.4</b>	<b>GROUNDWATER .....</b>	<b>42</b>
5.4.1	Bores.....	44
5.4.2	Spatial Groundwater Levels.....	44

5.4.3	Temporal Groundwater Levels .....	45
5.4.4	Predicted Associated Water Take / Inflows .....	45
5.4.5	Potential Impacts to Groundwater .....	46
5.4.6	Proposed Mitigation and Management of Groundwater .....	48
<b>5.5</b>	<b>NOISE .....</b>	<b>50</b>
5.5.1	Potential Impacts .....	50
5.5.2	Proposed Noise Mitigation and Management of Noise .....	50
<b>5.6</b>	<b>AIR QUALITY .....</b>	<b>52</b>
5.6.1	Potential Impacts to Air Quality.....	52
5.6.2	Proposed Mitigation and Management of Air Quality .....	52
<b>5.7</b>	<b>FLORA AND FAUNA .....</b>	<b>53</b>
5.7.1	Regional Ecosystems .....	53
5.7.2	Threatened Ecological Communities .....	56
5.7.3	Drainage, Waterways and Wetlands .....	58
5.7.4	Essential Habitat .....	58
5.7.5	Threatened Species.....	58
5.7.6	Aquatic Flora and Fauna .....	59
5.7.7	Potential Impacts to Flora and Fauna.....	59
5.7.8	Proposed Mitigation and Management of Flora and Fauna .....	59
<b>5.8</b>	<b>CULTURAL HERITAGE (INDIGENOUS AND NON-INDIGENOUS).....</b>	<b>61</b>
5.8.1	Native Title / Indigenous Cultural Heritage .....	61
<b>6.0</b>	<b>REFERENCES .....</b>	<b>63</b>

## **LIST OF FIGURES**

Figure 1	Properties Adjacent and Underlying the BSP .....	4
Figure 2	Project Location .....	9
Figure 3	Proposed Mine Layout.....	13
Figure 4	BSP Regional Average Monthly Rainfall .....	23
Figure 5	Desktop Land Values of the Project .....	25
Figure 6	Strategic Cropping Land Trigger Area .....	26
Figure 7	Topography of the Project Area.....	28
Figure 8	Lower Dawson Sub-catchment Area .....	35
Figure 9	Local Watercourses .....	37
Figure 10	Year 1 Water Management Infrastructure (Engeny 2019) .....	40
Figure 11	Groundwater Management Areas.....	43
Figure 12	Queensland Government Regional Ecosystem Mapping.....	54
Figure 13	Field-validated Regional Ecosystem Mapping.....	55

Figure 14	Field Validated TECs .....	57
Figure 15	Native Title Claim.....	62

## **LIST OF TABLES**

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Table 1	EP Act Sec 125 Requirements for Supporting Information .....	2
Table 2	EP Act Sec 126A Requirements for Supporting Information.....	2
Table 3	Subject Land and Landholders .....	3
Table 4	Surrounding Mining Tenure .....	5
Table 5	Applicable ERAs for the Project.....	6
Table 6	Notifiable Activities for the Project .....	6
Table 7	Meteorological Weather Stations .....	22
Table 8	Soil Landscapes and Soils of the Study Area.....	30
Table 9	Model Predicted Groundwater Take / Inflows at the BSP .....	45
Table 10	BSP Government Mapped and Validated Regional Ecosystems.....	53
Table 11	Field-validated TECs.....	56

## LIST OF ABBREVIATIONS

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AARC	AustralAsian Resource Consultants Pty Ltd
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
ANZECC	Australian and New Zealand Environment and Conservation Council
BSP	Baralaba South Project
BNM	Baralaba North Mine
CHPP	Coal Handling and Preparation Plant
cm	centimetre(s)
CQCEN	Central Queensland Coal Network
DES	Department of Environment and Science
DOEE	Commonwealth Department of the Environment and Energy
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
EHP	Department of Environment and Heritage Protection
EIS	Environmental Impact Statement
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPP (Water)	Environmental Protection (Water) Policy 2009
ERA	Environmentally Relevant Activity
ESD	Ecologically Sustainable Development
GDE	Groundwater Dependent Ecosystem
ha	hectare(s)
IAS	Initial Advice Statement
km	kilometre(s)
LFA	Land Function Analysis
m	metre(s)

mg/L	milligram(s) per litre
MIA	Mine Infrastructure Area
ML	megalitres
ML	Mining Lease
MNES	Matters of National Environmental Significance
MRC	Mount Ramsay Coal
MSES	Matters of State Environmental Significance
Mt	Million tonnes
Mtpa	Million tonnes per annum
Project	Baralaba South Project
ROM	Run of Mine
SCL	Strategic Cropping Land
TLO	Train Load-Out
TOR	Terms of Reference
TSF	Tailings Storage Facility



## 1.0 INTRODUCTION

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AARC Environmental Solutions (AARC) was commissioned by Mount Ramsay Coal Company Pty Ltd (the Proponent) to prepare an Environmental Authority (EA) Application for the Baralaba South Project (BSP, the Project). This report provides the supporting information to be considered as part of the EA application to the Department of Environment and Science (DES).

The application has been prepared in consideration of Section 125 and 126A of the Queensland *Environmental Protection Act 1994* (EP Act). This document provides a description of the Project, Environmentally Relevant Activities (ERAs), environmental values, potential impacts on the identified environmental values, and any mitigation measures or management commitments, where deemed necessary.

### 1.1 THE PROPONENT

The Proponent for the Project is:

Mount Ramsay Coal Company Pty Ltd

Level 8, 10 Eagle Street, Brisbane City, QLD 4000

ACN 603 037 065

### 1.2 BACKGROUND

On 10 August 2011 Wonbindi Coal Pty Ltd (Wonbindi Coal) applied under Sections 70 and 71 of the EP Act for approval to voluntarily prepare an Environmental Impact Statement (EIS). Under Section 72 of the EP Act, DES, formerly the Department of Environment and Heritage Protection (EHP) approved the application on 16 August 2011.

An Initial Advice Statement (IAS) was submitted to EHP in September 2012 outlining the resource, operations and infrastructure of the proposed BSP. In October 2012, Wonbindi Coal made an application to the Department of Natural Resources and Mines for a new mining lease over the Project area (Mining Lease Application (MLA) 80193).

An EA application (ID AR034267) was made by Wonbindi Coal Pty Limited for the Baralaba South Project on 1 November 2012.

On 18 October 2012, the former Commonwealth Department of the Environment (DOE) determined the proposed project to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the controlling provisions being Sections 18 and 18A (listed threatened species and communities) and 20 and 20A (listed migratory species). On 22 October 2013, DOE made a decision under item 23 of Schedule 1 of the *Environment Protection and Biodiversity Conservation Amendment Act 2013* that Sections 24D and 24E of the EPBC Act, determining water resources, to be a controlling provision for the Project.

The Terms of Reference (TOR) for the BSP were finalised on 2 April 2013, however ceased to have effect on 2 April 2015. An updated IAS was submitted in 2017, commencing a new TOR application process for the Project. The TOR for the BSP were finalised on 19 July 2017. An extension to the submission period for the EIS was granted to 19 January 2020.

Mount Ramsay Coal Company Pty Ltd (MRC) is proposed as the new proponent for the BSP. MRC is seeking to replace the existing EA and ML application with new applications under this name. The existing EIS process will continue and will be transferred into the name of the new entity.

### 1.3 CONTENT OF SUPPORTING INFORMATION

In accordance with Section 125 of the EP Act, this Supporting Information document includes the components described in Table 1.

**Table 1 EP Act Sec 125 Requirements for Supporting Information**

Component	Relevant Section(s)
Describe all relevant activities for the application.	Section 1.5
Describe the land on which each activity will be carried out.	Sections 1.4 and 5.2
Description of any development permits in effect under the <i>Sustainable Planning Act 2009</i> for the carrying out of the relevant activity for the authority.	Not applicable to activities on the ML
Assessment of the likely impact of each relevant activity on the environmental values, including: <ul style="list-style-type: none"> <li>• Description of the environmental values likely to be affected by each relevant activity;</li> <li>• Details of any emissions or releases likely to be generated by each relevant activity;</li> <li>• Description of the risk and likely magnitude of impacts on the environmental values;</li> <li>• Details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and</li> <li>• Details of how the land, the subject of the application will be rehabilitated after each relevant activity ceases.</li> </ul>	Sections 4.0 and 5.0
Description of the proposed measures for minimising and managing waste generated by each relevant activity.	Section 3.0
Details of any site management plan that relates to the land the subject of the application.	Not applicable

In accordance with Section 126A of the EP Act, this Supporting Information document includes the components described in Table 2.

**Table 2 EP Act Sec 126A Requirements for Supporting Information**

Component	Relevant Section(s)
Any proposed exercise of underground water rights during the period in which resource activities will be carried out under the relevant tenure.	Section 5.4
The areas in which underground water rights are proposed to be exercised.	Sections 1.4 and 5.4
For each aquifer affected, or likely to be affected, by the exercise of underground water rights: <ul style="list-style-type: none"> <li>• A description of the aquifer;</li> <li>• An analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers and surface water;</li> <li>• A description of the area of the aquifer where the water level is predicted to decline because of the exercise of underground water rights; and</li> <li>• The predicted quantities of water to be taken or interfered with because of the exercise of underground water rights during the period in which resource activities are carried out.</li> </ul>	Section 5.4

Component	Relevant Section(s)
The environmental values that will, or may, be affected by the exercise of underground water rights and the nature and extent of the impacts on the environmental values.	Section 5.0
Any impacts on the quality of groundwater that will, or may, happen because of the exercise of underground water rights during or after the period in which resource activities are carried out.	Section 5.4.5
Strategies for avoiding, mitigating or managing the predicted impacts on the environmental values stated for paragraph (d) or the impacts on the quality of groundwater mentioned in paragraph (e).	Section 5.4.6

As the existing Mining Lease and Environmental Authority applications were made before 1 November 2019 (the PRCP start date), and replacement applications have been made before 1 November 2019, a progressive rehabilitation and closure plan and schedule will not be required to be prepared until a notice is given by the Department of Environmental and Science after the grant of the Environmental Authority.

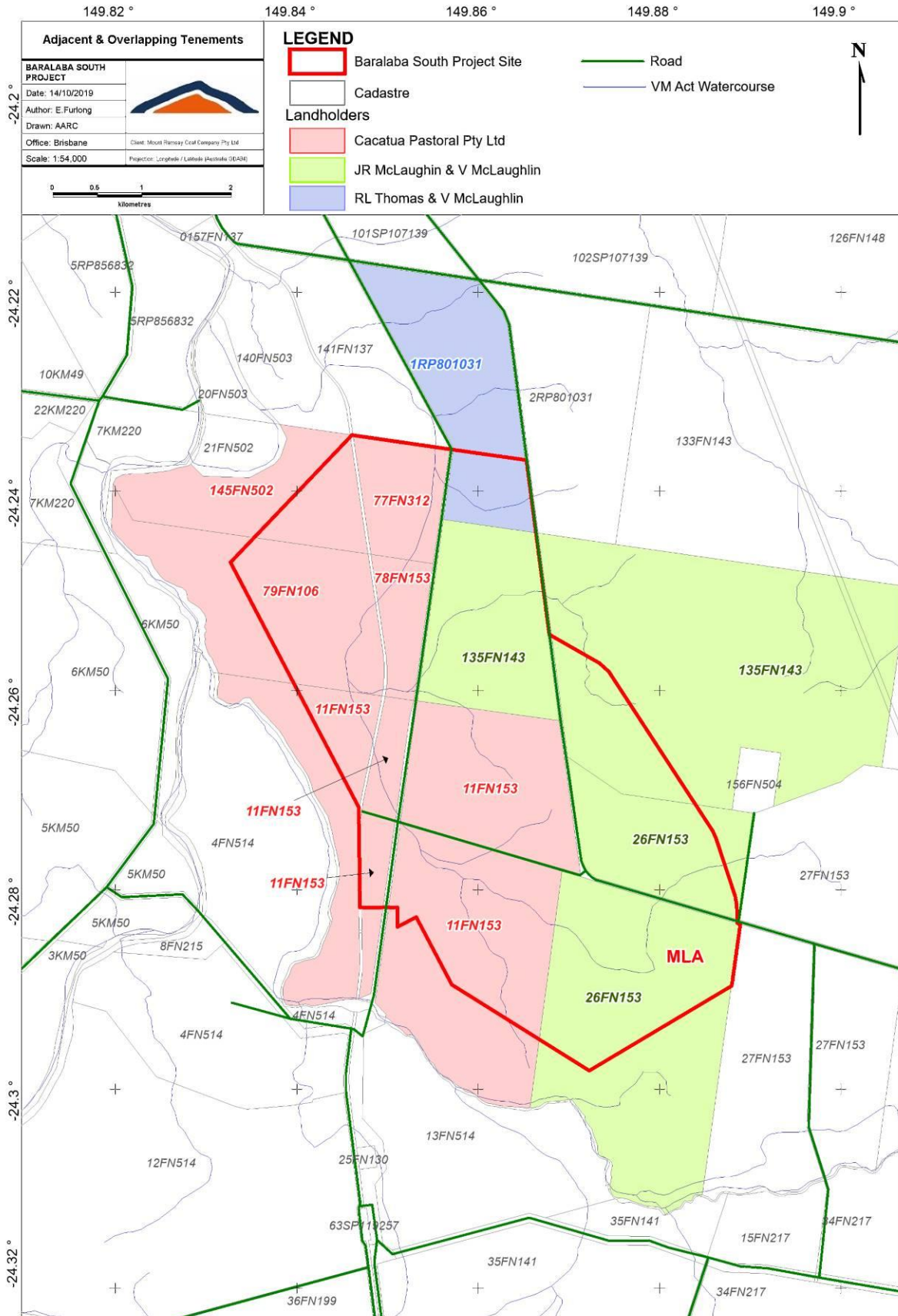
## 1.4 TENURE

The proposed Project is located within the Lots listed in Table 3 and displayed in Figure 1.

Initial access to site will be from a section of the Baralaba-Theodore Road which runs through the existing MLA area (MLA 81093).

**Table 3 Subject Land and Landholders**

Landholders	Property Description	Tenure
Cacatua Pastoral Pty Ltd (100% owned subsidiary of Wonbindi Coal)	Lot 11 on FN153	Freehold
	Lot 78 on FN153	Freehold
	Lot 79 on FN106	Freehold
	Lot 145 on FN502	Freehold
	Lot 77 on FN312	Freehold
JR McLaughlin and V McLaughlin	Lot 26 on FN153	Freehold
	Lot 135 on FN143	Freehold
RL Thomas and V McLaughlin	Lot 1 on RP801031	Freehold
Banana Shire Council	Moura-Baralaba Road	Road Reserve
Banana Shire Council	Unnamed Road Reserve	Road Reserve
Banana Shire Council	Unnamed Road Reserve	Road Reserve
The State of Queensland	Lot 1 on FN109	Perpetual Lease, subleased by Cockatoo Coal Pty Ltd
The State of Queensland	Lot 2 on FN109	
The State of Queensland	Lot 2 on FN121	
The State of Queensland	Lot 3 on FN110	



**Figure 1 Properties Adjacent and Underlying the BSP**

### 1.4.1 Tenements

Wonbindi Coal holds the underlying Exploration Permit Coal (EPC) 1047, Mineral Development Licence (MDL) 352 and the existing MLA over the Project area. The existing MLA is being replaced with a new application under the name of MRC, in parallel with this replacement EA application. Wonbindi Coal has provided consent to a new MLA being made over the EPC and MDL.

Table 4 below lists adjacent resource and exploration tenure for the Project.

**Table 4 Surrounding Mining Tenure**

Tenement	Location Description
ML 5656 - ANGLO Coal (Dawson) Limited	Borders South of MLA (extends south to Moura)
EPC 1261 - Vitrinite Pty Ltd	Borders west of MLA

## 1.5 ENVIRONMENTALLY RELEVANT ACTIVITIES

ERAs include resource activities or other activities prescribed by the EP Act. Current prescribed ERAs and resource activities are defined in Schedules 2 and 3 respectively of the *Environmental Protection Act 1994* (EP Reg). The Project will include the resource activity of “Mining Black Coal” as well as the ancillary activities outlined in Table 5.

**Table 5 Applicable ERAs for the Project**

Environmentally Relevant Activity	Description
<b>Schedule 2 (Ancillary)</b>	
8 (1) (c) Chemical Storage	Chemical storage (the relevant activity) consists of storing more than 500 metres cubed (m <sup>3</sup> ) of class C1 or C2 combustible liquids under AS1940 or dangerous goods class 3.
31 (1) Mineral Processing	Processing, in a year, the following quantities of mineral products, other than coke (b) more than 100,000 t.
33 (1) Crushing, milling, grinding or screening	Crushing, milling, grinding or screening (the relevant activity) consists of crushing, grinding, milling or screening more than 5,000t of material in a year.
60 (1) (ii)(A) Waste Disposal	Waste: Tailings & rejects disposal in pit and potentially limited regulated waste. More than 200,000 t
63 1(a) Sewage Treatment	Sewage treatment of more than 100 but not more than 1500 equivalent persons.
<b>Schedule 3</b>	
13 Mining Black Coal	Mining black coal

## 1.6 NOTIFIABLE ACTIVITIES

Notifiable activities are activities that have the potential to cause land contamination. The operation’s requirement to conduct notifiable activities are outlined in Table 6.

**Table 6 Notifiable Activities for the Project**

Notifiable Activities	Description
<b>Schedule 3</b>	
1 Abrasive Blasting	Carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.
7 Chemical Storage	Storing more than 10t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.
15 Explosives production or storage	Operating an explosives factory under the <i>Explosives Act 1999</i> .
24 Mine Wastes	a) Storing hazardous mine or exploration wastes, including, for example, tailing dams, overburden or waste rock dumps containing hazardous contaminants; or b) Exploring for, or mining or process, minerals in a way that

	exposes faces, or releases groundwater, containing hazardous contaminants.
29 Petroleum Product or Oil Storage	<p>Storing petroleum products or oil:</p> <p>a) In underground tanks with more than 200 Litre (L) capacity; or</p> <p>b) In above ground tanks with:</p> <ol 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 2,500 L capacity; or</li> <li>II. For petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code – more than 5,000 L capacity; or</li> <li>III. For petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS 1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia – more than 25,000 L capacity.</li> </ol>
37 Waste Storage, treatment of disposal	<p>Storing, treating, reprocessing or disposing of waste prescribed under a regulation to be regulated waste for this item (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.</p>



## **2.0 PROJECT DESCRIPTION**

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### **2.1 PROJECT TIMING**

The construction of the mine is anticipated to commence in 2021 or 2022 following receipt of necessary approvals. It is expected to take approximately 18 months to establish the necessary infrastructure to commence mining, with production from the Project expected to commence in 2023. This timing is subject to the successful approval and granting of the Mining Lease and EA for the Project.

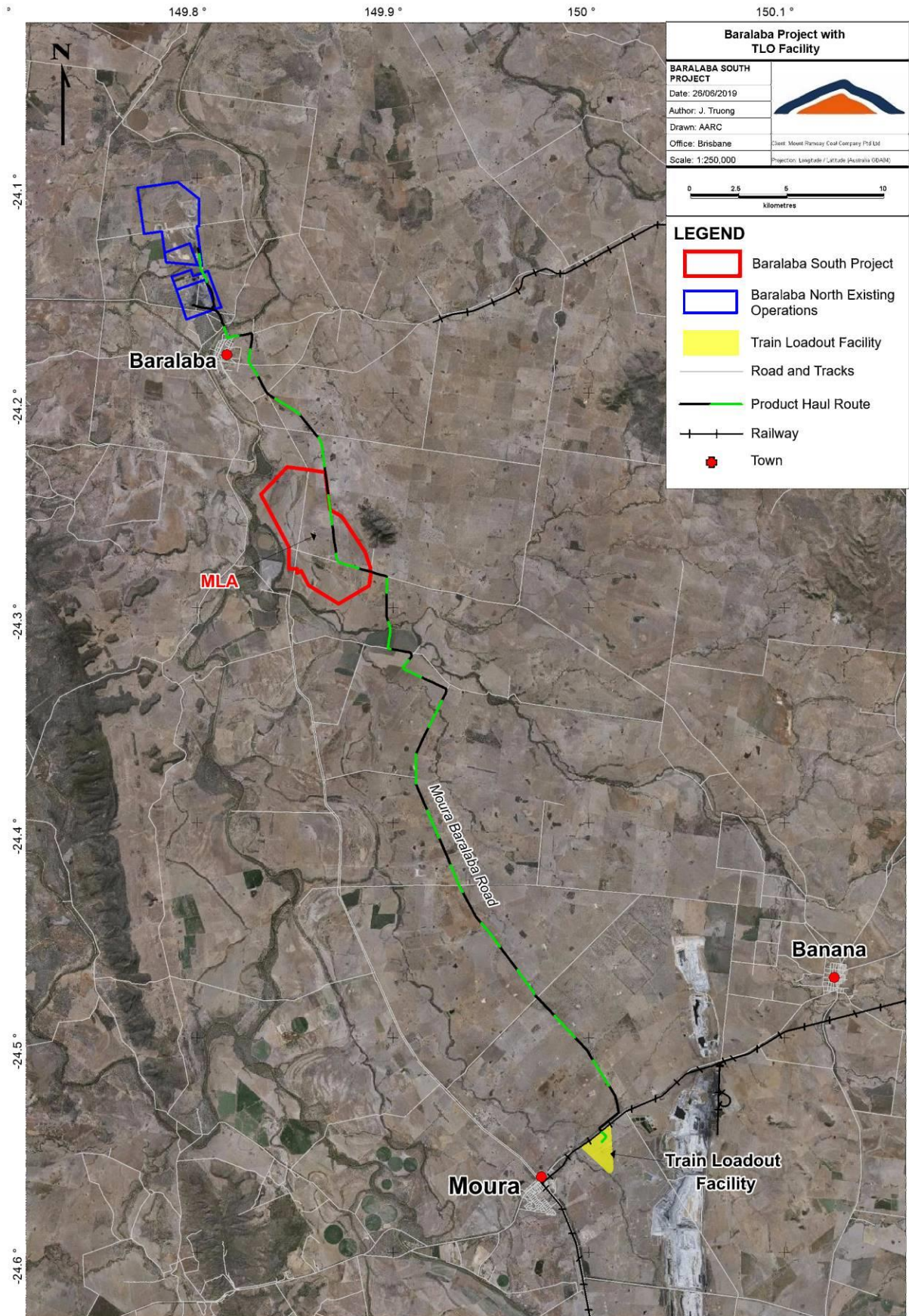
### **2.2 PROJECT OVERVIEW**

The following information provides an overview of the Project:

- The BSP is located approximately 8 kilometres (km) south of the township of Baralaba, 115 km west of Rockhampton, in the lower Bowen Basin region of Central Queensland. The Project is approximately 12 km south of the existing Baralaba North Mine (BNM) and is located within the Banana Shire Council Local Government Area (Figure 2).
- The identified resource area is designed to support a mine with a planned production rate of up to 5 million tonnes per annum (Mtpa) run-of-mine (ROM) PCI coal for an operational life of at least 20 years, though it is anticipated that with additional drilling and refinement of extraction and production schedules from further technical and financial studies, the final operational life will be between 30-40 years for the completion of the Project. Currently, approximately 91 Mt of ROM coal is estimated to be mined in the indicative mine schedule to produce approximately 75 Mt of product coal over the life of the Project.
- Coal will be transported via the existing Baralaba Mine Haul Route approximately 40 km by road south to the existing Train Load-Out (TLO) Facility east of Moura. Product coal will then be transported by rail to the Port of Gladstone for export to international markets.
- A Coal Handling and Preparation Plant (CHPP) will be constructed at the BSP site. Some product coal may be direct shipped after crushing and screening. Process waste is intended to be disposed of onsite via coarse and fine tailing treatment plant for dry disposal within the spoil.

Further detailed information will be provided in the Project Description Chapter of the EIS.





**Figure 2 Project Location**

## **2.3 CONSTRUCTION AND OPERATIONAL ACTIVITIES**

The open cut mining area for the Project would be mined using a conventional truck and shovel mining method with excavators and haul trucks. The open cut mining area would involve supporting infrastructure such as haul roads, bunding, soil stockpiles, hardstands and water management structures.

### **2.3.1 Construction Materials**

The majority of infrastructure components (e.g. CHPP, buildings, pipelines, etc.) would be manufactured offsite and transported to site for assembly and installation.

If suitable material is identified on-site for road construction, a quarry may be developed within the BSP disturbance footprint. Suitable clay and rock materials (for embankments, bunds, levees, cells, etc.) would also be predominantly sourced from the on-site BSP disturbance footprint. Alternatively, any existing hard rock quarries located in the region may be used to meet the BSP construction requirements. Other construction materials would generally be sourced from the region, where available, and subject to meeting material quality requirements (e.g. road base gravels, etc.).

### **2.3.2 Construction Fleet**

Equipment used during construction would include excavators, haul trucks, dozers, graders, scrapers, front end loaders and water trucks. There would be semitrailers coming to site with building materials and plant components as well as equipment in components to be erected.

Mine exploration activities would continue to be undertaken in the Proponents tenements in the vicinity of the Project. These activities would occur within, and external to, the proposed open cut extent and would be used to investigate aspects such as geological features, seam structure and coal/overburden characteristics as input to detailed mine planning and feasibility studies.

### **2.3.3 Mining Operations**

A summary of the general open cut mining activities and sequence is provided below.

#### **2.3.3.1 Vegetation Clearing**

Vegetation would be progressively cleared over the life of the Project ahead of the active mining and waste rock emplacement areas. Specific vegetation clearance procedures would be developed for the Project.

#### **2.3.3.2 Topsoil Stripping and Handling**

Where stripped topsoils cannot be used directly for progressive rehabilitation, the topsoil would be stockpiled separately. Specific soil management, stockpiling and re-application procedures would be developed for the Project.

#### **2.3.3.3 Overburden Removal**

Some overburden (e.g. clays and alluvium) would be removed by scraper, excavator and haul truck, with supporting dozers, and placed in out-of-pit mine waste rock emplacements, noise attenuation bunds, flood protection levees, or as infill in the mine void, behind the advancing mining operations.

Drill and blast techniques would be used for the removal of competent overburden and interburden material. Small quantities of underburden may also be drilled and blasted where it is required to be

mined for geotechnical stability in steeply dipping areas. To drill both overburden and interburden horizons, a combination of standard rotary drills and rock crawler drills would be used to accommodate both uncommon drill angles or confined bench space. Standard commercial products will be used, with the principal blasting agent being ammonium nitrate fuel oil.

Overburden and interburden removal would be undertaken by excavator and haul truck, with supporting dozers to expose the underlying coal seams. Overburden and interburden would be placed in out-of-pit mine waste rock emplacements, noise attenuation bunds, flood protection levees, or as infill in the mine void, behind the advancing mining operations.

#### **2.3.3.4 Coal Mining and ROM Coal Handling**

Coal mining would involve excavators loading ROM coal into haul trucks for haulage to a ROM pad.

It is proposed to establish a CHPP at the BSP. Optimisation of coal processing will be investigated during the EIS process. On site ROM coal handling and crushing facilities would be established and used at the ROM Pad.

#### **2.3.4 Workforce Requirements**

The BSP workforce is estimated to be 275 employees during construction and up to approximately 600 employees during peak operations.

It is expected that the majority of both the construction and operational workforce for the BSP will be sourced from the local area – that is within the Banana Shire and surrounding regions. Where non-local workforce is required, accommodation for workers can be provided at the existing Baralaba Caravan Park accommodation camp or in the local short- or long-term rental market.

The operational hours at the BSP would be 24 hours a day, seven days per week. It is anticipated that mining operations would be on a 12.5 hour shift cycle roster, working seven days on, seven days off. Senior management and staff would work on a five days on (Monday to Friday), two days off roster.

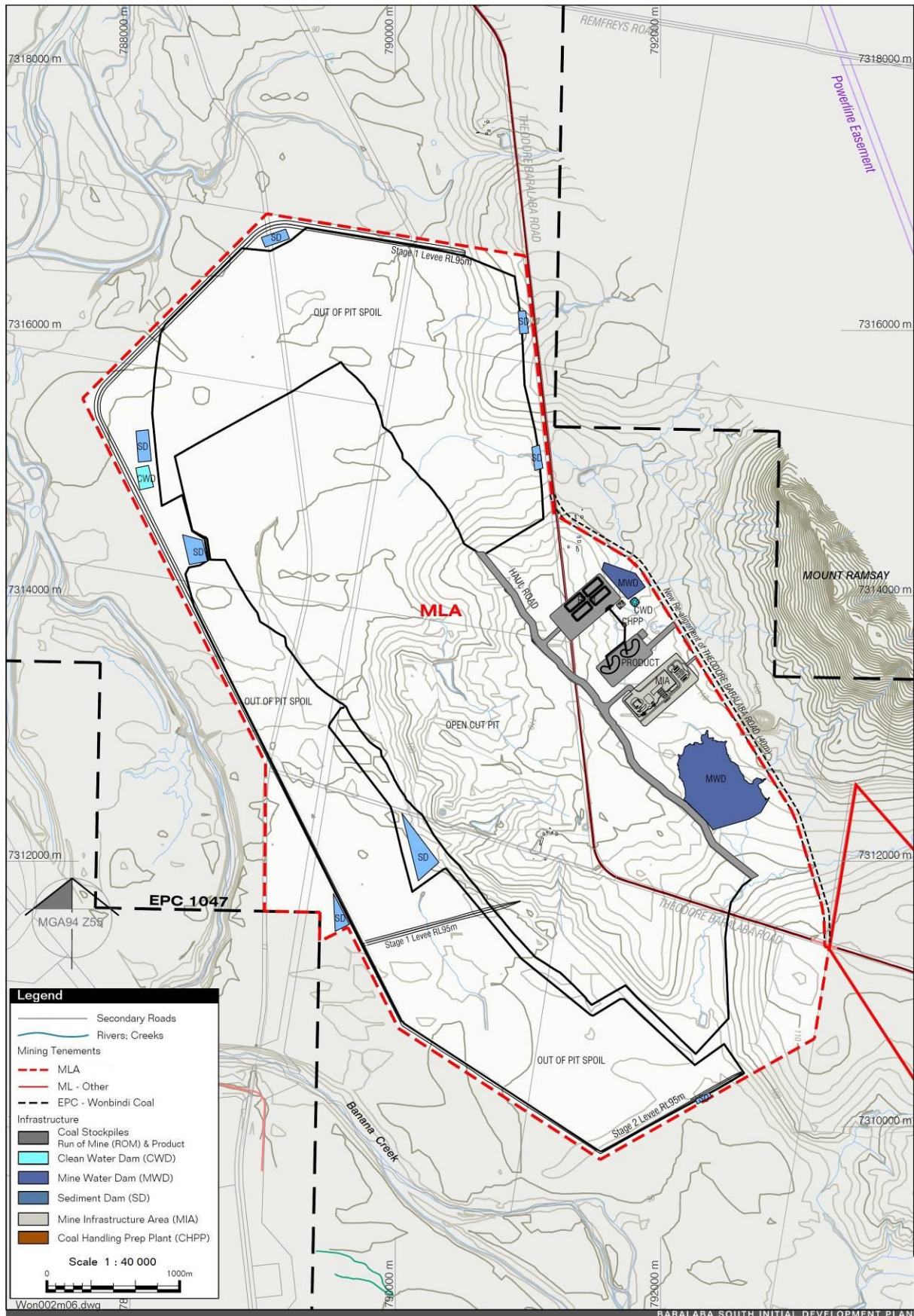


## 2.4 MINE INFRASTRUCTURE

The Mine Infrastructure Area (MIA) will be located in the east of the proposed MLA as shown in Figure 3. This location has been chosen to allow for excavated overburden material to be stockpiled in the west to enhance flood protection.

It is anticipated that construction of the infrastructure components to support the commencement of production would take approximately 18 months upon grant of all required approvals and include:

- ROM pads;
- Product coal stockpile pads;
- Topsoil stockpiles, laydown areas and borrow areas;
- Haul roads and internal roads;
- Water management infrastructure (e.g. dams, diversion drains);
- Flood protection levee around west and south-western boundary of the Project;
- Noise attenuation bunds;
- The CHPP;
- MIA including workshops, administration buildings, ablutions, fuel and chemical storage facilities, warehouse and hardstand areas;
- Other associated minor infrastructure, plant, equipment and activities;
- Communications infrastructure (i.e. towers, cabling);
- Transmission lines/poles and reticulation; and
- Other ancillary activities necessary to support the Project.



**Figure 3 Proposed Mine Layout**

### **2.4.1 CHPP**

A CHPP, with a conventional Bowen Basin design – dense medium cyclones, spirals and flotation, would be constructed to the east of the open cut pit near the MIA to accommodate washing of ROM coal to meet low volatile PCI coal product specifications.

The CHPP would have a capacity of up to 800 tonnes per hour (tph) feed and, when fully developed, would operate at a capacity of 5 Mtpa of ROM coal feed, producing up to approximately 4 Mtpa of product coal.

Processing is expected to occur 24 hours a day, 7 days a week.

### **2.4.2 Power Supply**

The peak permanent power demand during operational periods is approximately 8,200 kiloWatt (kW) with an average of 6,000 kW.

Power supply is via a proposed grid connection. This includes a 22 kV feeder from the 132/22 kV Ergon Substation located east of Baralaba township on L152 FN473. The proposed connection point would be within the MIA, where a new 22 kV substation will be developed.

Final design of the off-lease transmission infrastructure will be developed with key stakeholders including Ergon Energy and may vary prior to approval and development. The corridor and infrastructure will be developed and operated by the service provider to a connection point on the mine site. Approvals associated with the development of this infrastructure will be the responsibility of the service provider.

### **2.4.3 Telecommunications**

The communications strategy at the BSP is to have comprehensive on and offsite communications established in time for the beginning of the construction phase. The underlying basis for having a pre-established network is to ensure that communication is never an obstacle in responding to and managing health and safety incidents, and cannot cause errors or omissions during construction and operation of the mine.

Baralaba Coal currently operates a data centre located at the Baralaba Town Caravan Park. MRC proposes to expand the existing communications systems to provide shared access to the BSP.

### **2.4.4 Fuel & Oil Storage**

Fuel would be delivered to the BSP by authorised contractors. Fuel will be stored on-site within bulk storages and will be used to operate various fixed plant and mobile equipment. The types and estimated amounts of fuel to be stored onsite will include;

Fuel:

- 4 x 150,000L horizontal diesel tanks

Oil:

- 1 x 35,000L hydraulic oil;
- 1 x 35,000L engine oil;

- 1 x 35,000L waste oil;
- 1 x 20,000L transmission oil;
- 1 x 15,000L gear oil;
- 1 x 15,000L final drive oil;
- 1 x 15,000L premixed coolant; and
- 1 x 10,000L waste coolant.

The MIA area will also house several Drum Store Facilities.

#### **2.4.5 Workforce Accommodation**

Baralaba owns and operates an accommodation camp at the Baralaba Caravan Park, approximately 8 km north of the Project. MRC will investigate options to expand this facility to house the commuting component of the workforce.

Accommodation needs and availability will be assessed in detail as part of the Project Description Chapter of the EIS.

#### **2.4.6 Sewage**

A packaged sewage treatment plant would be constructed as part of the MIA to treat effluent prior to returning it to the mine water dam and process water dam for re-use. The likely STP will incorporate a membrane bioreactor, with an appropriately sized pump station to minimise the retention of raw sewage. This will mitigate the potential for production of odour and volatile organic compounds.

The waste sludge is expected to be removed every 12-18 months for disposal. It will be removed by a regulated waste contractor for disposal.

### **2.5 WATER MANAGEMENT**

Water management infrastructure proposed for the Project includes diversion drains, sediment dams, storage dams, pumps and pipelines that will allow the transport of water around the site and onsite storage of the maximum amount of water for internal use.

A hydrological study as part of the EIS will consider overall water balance as a component of the Site Water Management Plan.

The key objectives of water management for the Project will include:

- Runoff from undisturbed areas will be diverted around mining and infrastructure areas and to continue in defined drainage corridors;
- Runoff from disturbed catchments will be diverted via adequately designed diversion drains to onsite sediment basins and collected for use onsite;
- Water from the CHPP will be recycled through a closed loop circuit whereby any wastewater from the CHPP is temporarily stored, then reused in the CHPP; and



- Mine affected water from contaminated runoff and groundwater inflow will be managed in dedicated storage facilities and used onsite.

### **2.5.1 Flood Protection**

A major study of Dawson River flood parameters and probabilities has been conducted for the Baralaba South Project. Flood protection of mine workings is a major component of mine design, operation and rehabilitation. A flood levee is proposed around the southern and western boundaries of the MLA. Flood protection in excess of 1:1000 AEP is proposed during operations and post closure.

The flood study and details of levee design will be included in the Surface Water Chapter of the EIS.

### **2.5.2 Wastewater**

Wastewater generated from the CHPP will be recycled in the processing circuit. Water availability and plant water consumption are major considerations in the selection of tailings disposal systems to recover water from fines and to reduce water loss to evaporation.

### **2.5.3 Water Consumption**

The water consumption requirements for the Project and site water balance would fluctuate with climatic conditions and as the extent of the mining operations change over time. A summary of main water demands for the Project (i.e. CHPP water supply and dust suppression) is provided below. In addition, water would be required for wash-down of mobile equipment and other minor non-potable uses, such as firefighting.

#### **CHPP Water Supply**

The CHPP make-up water demand rate is related directly to the rate of ROM coal feed to the CHPP, and the rate of production and moisture content of the CHPP rejects.

Based on a preliminary site water balance, it is estimated that the CHPP may require in the order of approximately 345 megalitres (ML) of water per annum (assuming peak production) over the life of the Project (based on the use of mechanical dewatering processing). A detailed site water balance will be completed as a component of the EIS to determine the CHPP water supply requirements.

#### **Dust Suppression**

The Project haul road dust suppression demand would be highly seasonal. The demand for haul road and ROM dust suppression is anticipated to be approximately 1.1 ML/day on average. In year 3, the stage with the longest haul route, dust suppression demands will peak at 1.8 ML/day.

### **2.5.4 Water Sources**

Project water sources would be supplied according to the following priority (excluding potable water supplies):

- Mine water supplied from pit dewatering (including groundwater inflows);
- Recycled process water recovered from the CHPP tailings thickener and belt press filters;
- Surface runoff water captured and stored within water dams;



- Water supply 'make-up' sourced from the Dawson River as required via a licensed agreement. The proponent holds over 1,400 ML of water allocation from the Fitzroy Basin, Zone Dawson D; and
- Product water from the water treatment plant.

The water supply infrastructure requirements would be aimed to ensure flexibility of water supply source options available within the mining and processing operations and cater for site conditions in the extremes of wet and dry conditions that may prevail throughout the life of the Project.

A detailed site water balance would be completed as a component of the EIS to determine the 'make-up' water supply requirements for the Project and assess the need and availability of any additional water sources.

## **2.6 TRANSPORT INFRASTRUCTURE**

### **2.6.1 Mine Roads**

As part of the construction phase, roads will be developed within the MLA to support the proposed operations. The construction of mine roads will involve the formation of the haul road for ROM transport from the pit area to the CHPP.

The haul road will be approximately 3 km long and built in accordance with industry standards at a width of ~27 m with earth side bunds appropriate for the proposed haul truck specifications. Noise bunds will be strategically located along sections of the haul road to minimise risk to neighbours.

### **2.6.2 Coal Haulage**

The existing BNM product coal road transport route is a network of public and private roads, and extends approximately 60 km from the existing BNM to the existing TLO facility on the southern side of the Dawson Highway between Moura and Banana. The route has posted speed limits varying from 60 km per hour (km/h) in the Baralaba urban area to 100 km/h in rural areas. The last 40 kms of the existing Baralaba Mine Haul Route, is proposed to be used to transport product coal from the BSP to the existing TLO Facility.

The development of the proposed mine will require the relocation of approximately 6 km section of the existing Baralaba Mine Haul Route from within to outside the MLA area. Baralaba will work with the relevant authorities to provide safe public traffic movement for road registrable vehicles with minimum disruption to existing patterns of movement while allowing mine operations to occur.

## **3.0 WASTE**

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### **3.1 WASTE MANAGEMENT STRATEGIES**

The overall waste management strategy for the Project will consider the values and objectives of the *Waste Reduction and Recycling Act 2011* including:

- Implementation of the hierarchy of waste and resource management (avoid, reduce, reuse, recycle, recover, treat and dispose);
- Separation of wastes into defined streams for appropriate treatment in line with waste disposal opportunities within the local area;
- Establishment of designated waste storage areas on site;
- Use of licensed waste management contractors and recycling and disposal facilities; and
- Waste tracking and reporting.

### **3.2 MINE WASTE MANAGEMENT**

The Project waste rock emplacement strategy would involve the progressive backfilling of mine voids with waste rock behind the advancing open cut mining operations and the placement of waste rock in out-of-pit emplacements adjacent to the pit extents.

CHPP rejects would be dried and disposed of on-site within mine voids behind the advancing open cut mining operations.

### **3.3 GENERAL WASTE**

General waste and waste from construction activities will be generated by the Project. This will be disposed of off-site according to the waste management strategies outlined in the Waste Chapter of the EIS and relevant local Council regulations.

### **3.4 REGULATED WASTE**

Regulated wastes generated on site will be segregated and temporarily stored awaiting collection from a certified transporter for disposal at an authorised facility.

Subject to demonstrating that no other use higher in the waste management hierarchy can be practicably implemented, waste tyres generated from mining activities would be disposed of on site in spoil emplacements, provided that their placement does not impede saturated aquifers, cause contamination or compromise the stability of the consolidated landform.

## 4.0 REHABILITATION / POST MINE LAND USE

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Rehabilitation goals, objectives, indicators and completion criteria will be developed and included in a Rehabilitation Management Plan. A Post Mine Land Use Plan will be developed for the Project describing how the rehabilitation goals and objectives for the Project will be achieved and include a Rehabilitation Monitoring Program.

### 4.1 LAND USE

For the portion of the land not owned by Baralaba, the predominant pre-mining land use of the MLA is cattle grazing. The site has been previously extensively cleared for this purpose. The land use of areas surrounding the BSP is generally similar i.e. cattle breeding and fattening although the area to the north and south of the proposed development is used for coal production at the Baralaba North Mine and the Dawson Coal Mine. Cropping land exists to the west of the Project, within the floodplain of the Dawson River.

The proposed post-mining land use will include the re-establishment and support of cattle grazing land and the establishment of ecosystems suitable for flora and fauna habitat. Habitat areas would typically be proposed where slopes within the final landform are not conducive to grazing, or where water accumulates in the final void.

In the post mining phase of the Project, the flood protection levee has been incorporated into the final landform design as a permanent feature of the landscape post mining. The final landform will provide for permanent flood protection of the levee.

The EIS will include a detailed rehabilitation chapter addressing post mining land uses.

### 4.2 REHABILITATION

The natural landscape in the Project area would be altered through the formation of both in-pit and out-of-pit waste rock emplacements and final voids. The change to land during mining operations would be managed through the rehabilitation of the majority of the site to a land use generally consistent with existing land use. A key element of the proposed BSP is the Proponents commitment to progressive rehabilitation to achieve the final land use objectives through:

- Progressive rehabilitation of the Project disturbance areas;
- Progressive rehabilitation of waste rock emplacement areas; and
- Final rehabilitation works and mine closure activities undertaken upon completion of ROM coal extraction.

Rehabilitation and decommissioning methods will be detailed in the Rehabilitation Chapter of the EIS.

#### 4.2.1 Rehabilitation Goals

The closure goals associated with final land uses for the BSP would include:

- maintain a safe landform for humans and fauna;
- stable;
- non-polluting; and

- sustainably support the identified post mining land use.

#### **4.2.2 Rehabilitation Objectives**

Rehabilitation objectives will be developed to assist in achieving the Rehabilitation Goals. The Project's rehabilitation objectives will incorporate the principles of Ecologically Sustainable Development (ESD).

The ESD principles for the mining sector include:

- 1) ensure mine sites are rehabilitated to sound environmental and safety standards, and to a level at least consistent with the condition of surrounding land;
- 2) provide appropriate community returns for using mineral resources and achieve better environmental protection and management in the mining sector; and
- 3) improve community consultation and information, improve performance in occupational health and safety and achieve social equity objectives.

#### **4.2.3 Indicators and Acceptance Criteria**

Rehabilitation indicators are parameters that provide measures of progress towards domain rehabilitation objectives. Acceptance criteria are the standards which provide a clear definition of successful rehabilitation for each domain. Acceptance criteria take the form of a set of measurable benchmarks against which the rehabilitation indicators can be compared, to determine if objectives are being met.

Evidence of the acceptance criteria having been addressed will be collected by BSP to assist the administering authority to assess whether the criteria have been successful. If it has been deemed successful, then rehabilitation certification will be achieved. Final certification will be issued upon final rehabilitation having achieved the success criteria. The domains within the Project site are deemed to be successfully rehabilitated when completion criteria for each rehabilitation goal and objective have been met.

#### **4.2.4 Proposed Monitoring Strategy**

Tongway and Hindley (2004) developed the Landscape Function Analysis (LFA) as the CSIRO's principal method for mine rehabilitation assessment. LFA is an indicator-based monitoring procedure that evaluates soil surface processes to examine how well a landscape is working as a biophysical system in relation to disturbance or rehabilitation. This methodology is proposed for the BSP.

LFA monitoring methods comprise assessing a suite of parameters at different landscape positions on each site, namely on flats, slopes and in troughs. Repeated edaphic (soil properties) and biological measurements are taken over time for various parameters that indicate changes in ecosystem function as rehabilitation proceeds. The goal of rehabilitation is to achieve a self-sustaining landscape. A self-sustaining ecosystem would not need further additions of nutrients, seed, water or other management inputs.

In general, the LFA method would involve monitoring of the following three groups of sites:

- natural site(s):

- disturbed analogue(s) may be utilised due to the presence of stock (grazing pressure) to consider the impact of stock.
- rehabilitated sites:
  - reference sites for rehabilitation performance, successful or otherwise.
- disturbance sites:
  - ROM pad
  - access tracks and haul roads
  - footprints of waste stockpiles/dumps.

Analogue sites would be chosen as close as possible to the rehabilitated area so that the same climatic and environmental conditions existed at both sites to the extent possible.

## 5.0 ENVIRONMENTAL VALUES, IMPACTS AND MANAGEMENT STRATEGIES

### 5.1 LOCAL CLIMATE

The climate of the Baralaba region is described as sub-tropical, with higher temperatures, higher rainfall and higher evaporation occurring over the summer months. A desktop review of long-term meteorological data has been used to develop an understanding of regional climate conditions accompanied by forecasted predictions. Records have been obtained from the following stations:

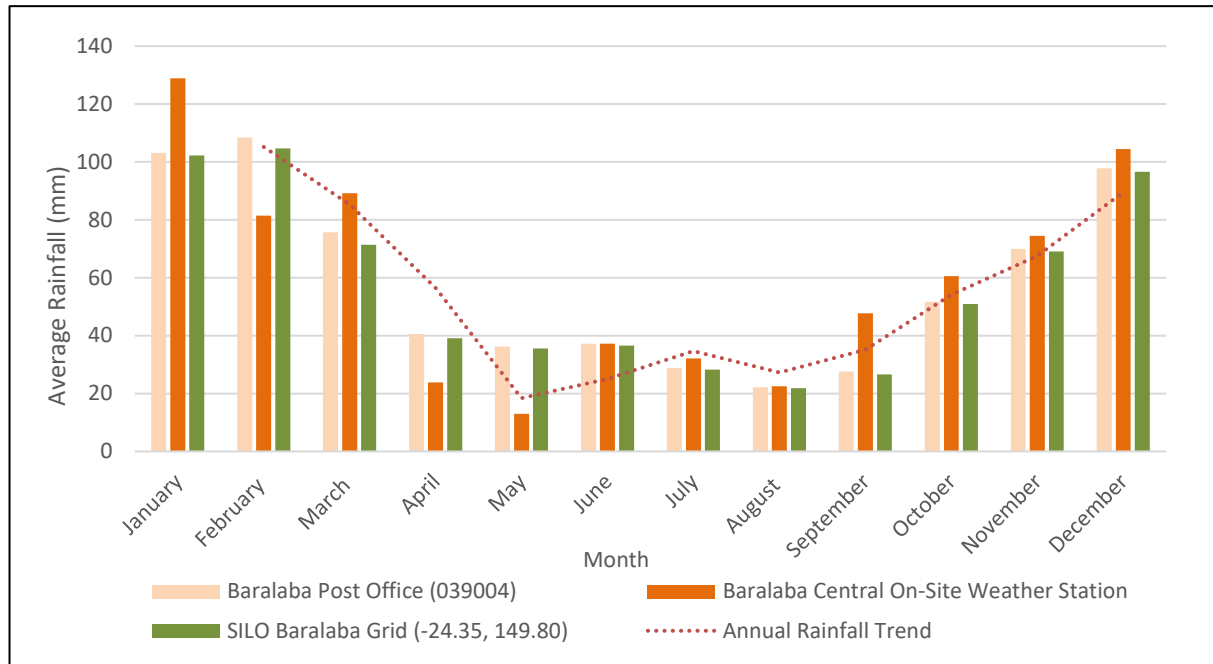
**Table 7 Meteorological Weather Stations**

Database	Weather Station	Approximate Distance to BSP
Bureau of Meteorology (BoM)	Baralaba Post Office (039004)	18 km north
	Thangool Airport (039089)	75 km south east
	Moura Post Office (39071)	35 km south east
Scientific Information for Landowners (SILO)	Interpolated Baralaba Grid Point	10 km south of the BSP
BNM On-Site	Central Baralaba Coal Mine	14 km north of the BSP

The long-term, monthly-average daily maximum and minimum temperatures measured at the meteorological stations are representative of Australia’s typical climate; temperatures are warmest during summer months before cooling during winter months. Temperatures of the Baralaba region ranged between 34.4°C measured at Baralaba Post Office (039004) during January through to 6.1°C at the Moura Post Office (39071) during July.

#### 5.1.1 Rainfall Data

The long-term annual rainfall average between the five stations was 686.21 millimetres (mm) based on records dating back to 1889. A clearly defined dry season is present from April to September as illustrated below in Figure 4. The lowest monthly average rainfall of 12.96 mm was recorded during May at Baralaba Central On-Site Weather Station. Comparatively, the highest average rainfall of 128.9 mm was recorded at the Central Baralaba Coal Mine during the wet season between December and February. More regionally, Queensland has experienced a general decrease in rainfall since 1970 (BoM, 2019). Climate modelling predicts a continuation of this trend with rainfall predicted to decrease during dry periods and undergo an increase in rainfall during extreme rainfall events.



**Figure 4 BSP Regional Average Monthly Rainfall**

### 5.1.2 Wind Speed and Direction

At the weather stations, wind speeds were measured at 9:00 am and 3:00 pm, observing an annual average of 8.6 kilometres per hour (km/hr) and 9.3 km/hr respectively at those times. The highest frequency of winds above 10 km/hr was recorded at Thangool Airport (039089) reaching a maximum of 11.5 km/hr during Spring through to Summer. Trends indicate a slight increase in wind speed during the later part of the day at all stations, however, tend to be higher at Thangool Airport (039089).

The direction of winds observed in Baralaba have primarily been south-east or north-west, tending to differ based on the season. Most commonly, north-easterlies have occurred throughout summer and spring, compared with south easterlies that are more frequent during winter and autumn.

## 5.2 LAND VALUES

### 5.2.1 Land Use

The area within and surrounding the Project site is zoned by the Banana Shire Planning Scheme 2005 as Rural and is predominantly used for cattle breeding and grazing. Beef production and coal mining are the major land uses in the local area. Most of the Project area has been cleared for agricultural purposes. Cropping land is located around the Project, particularly associated with low lying land adjacent to the Dawson River.

#### Priority Agricultural Area

The BSP is not located within zones identified and mapped as Priority Agricultural Areas under the Central Queensland Regional Plan.

#### Strategic Cropping Land

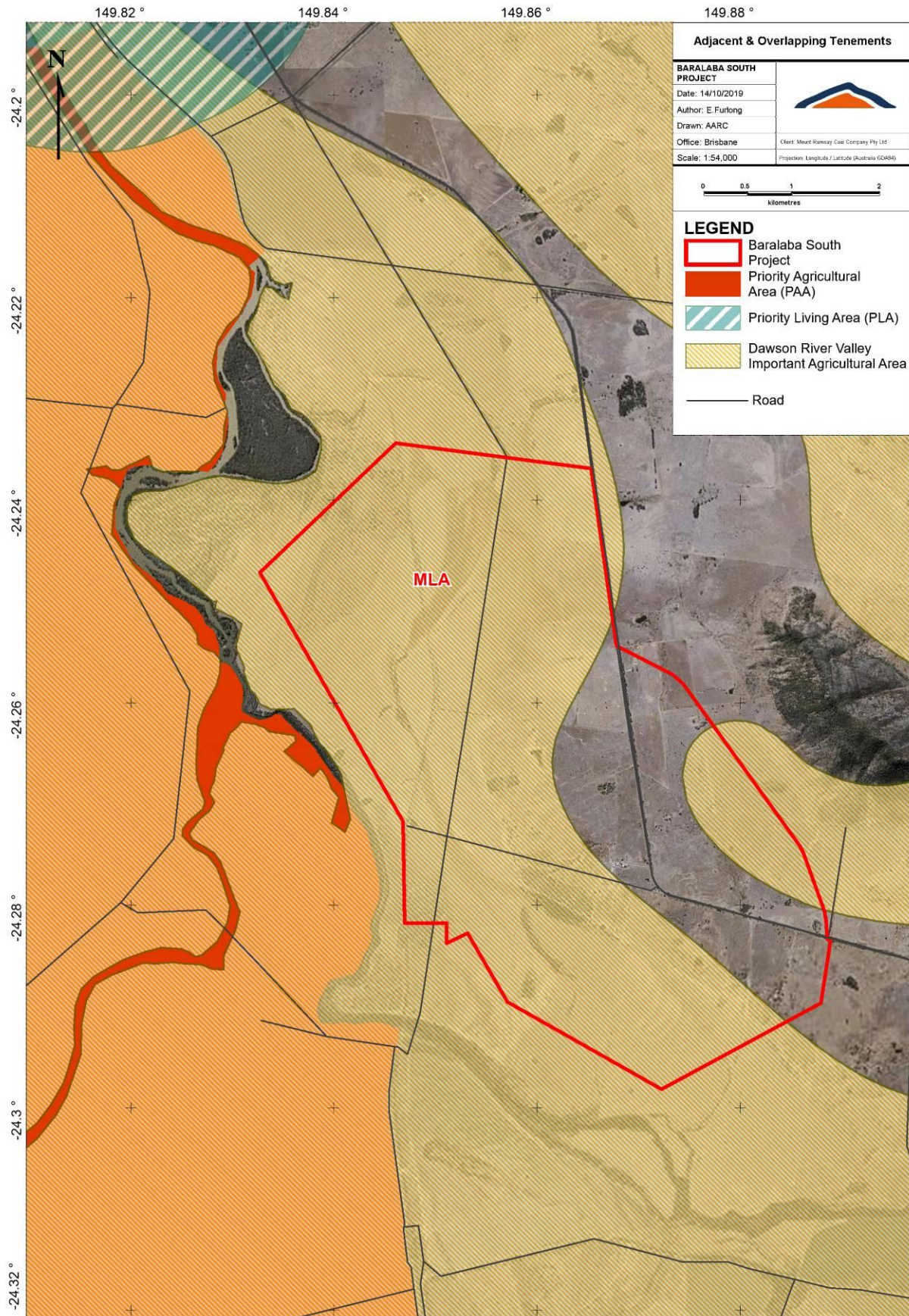
The BSP contains some strategic cropping area (SCA) under the *Regional Planning Interests Act 2014*. A Regional Interests Development Approval (RIDA) will be sought if required.

#### Dawson River Valley Important Agricultural Area

The Dawson River Valley Important Agricultural Area is identified as a critical mass of land of which satisfies the requirements for successful and sustainable agricultural activities (DAF 2018). The Dawson River IAA extends from Theodore 110 km south of the BSP study area, approximately 166 km north to Duaringa, covering a total of 788,500 ha. It forms part of three key IAA of the Central Queensland region, including Central Highlands and Callide Valley.

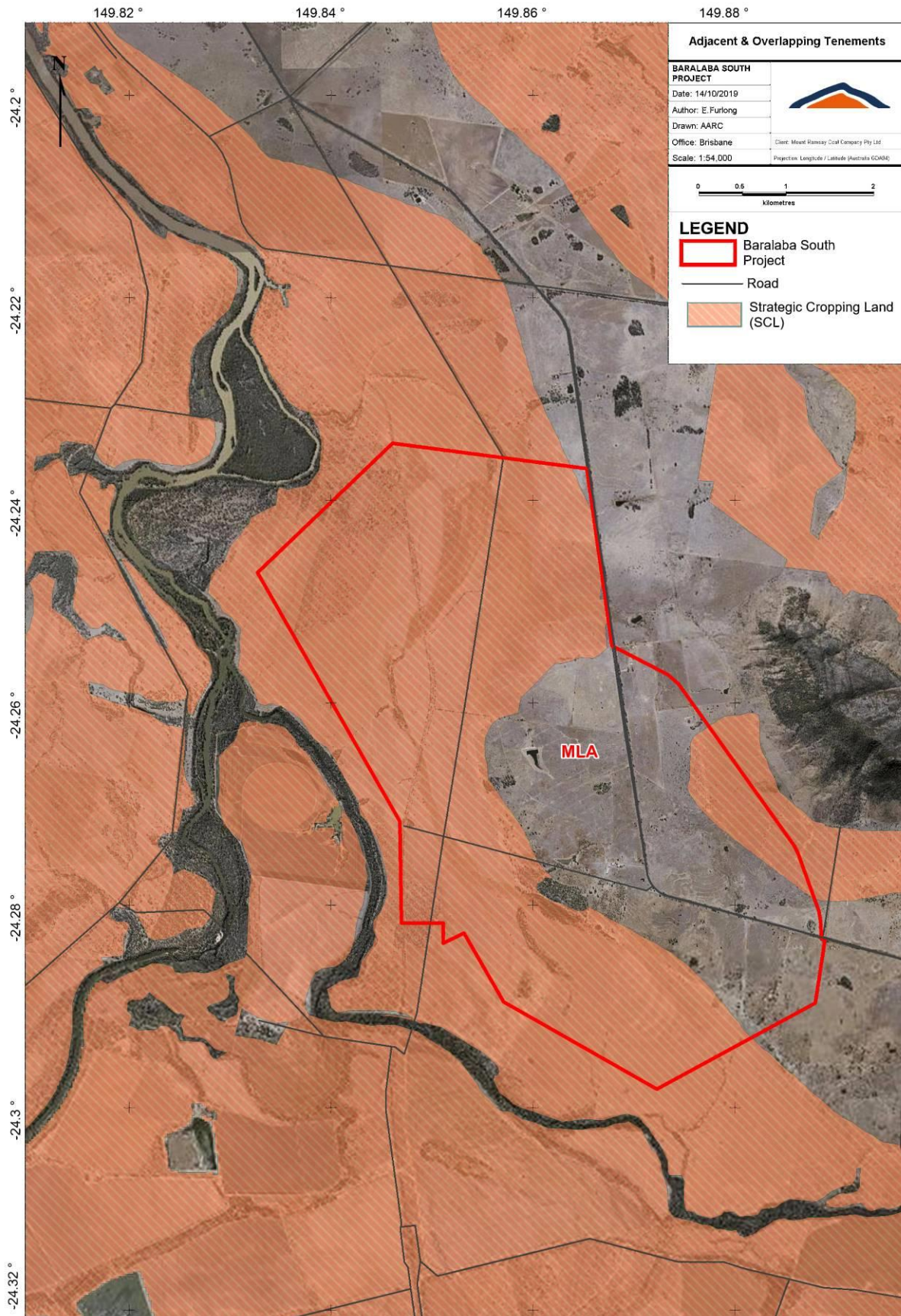
The Dawson River IAA underlays the entire west and north boundaries of the proposed BSP area, intercepting approximately 740 ha. This footprint equates to a potential disturbance of 0.094% of the Dawson River IAA total land mass.





**Figure 5 Desktop Land Values of the Project**





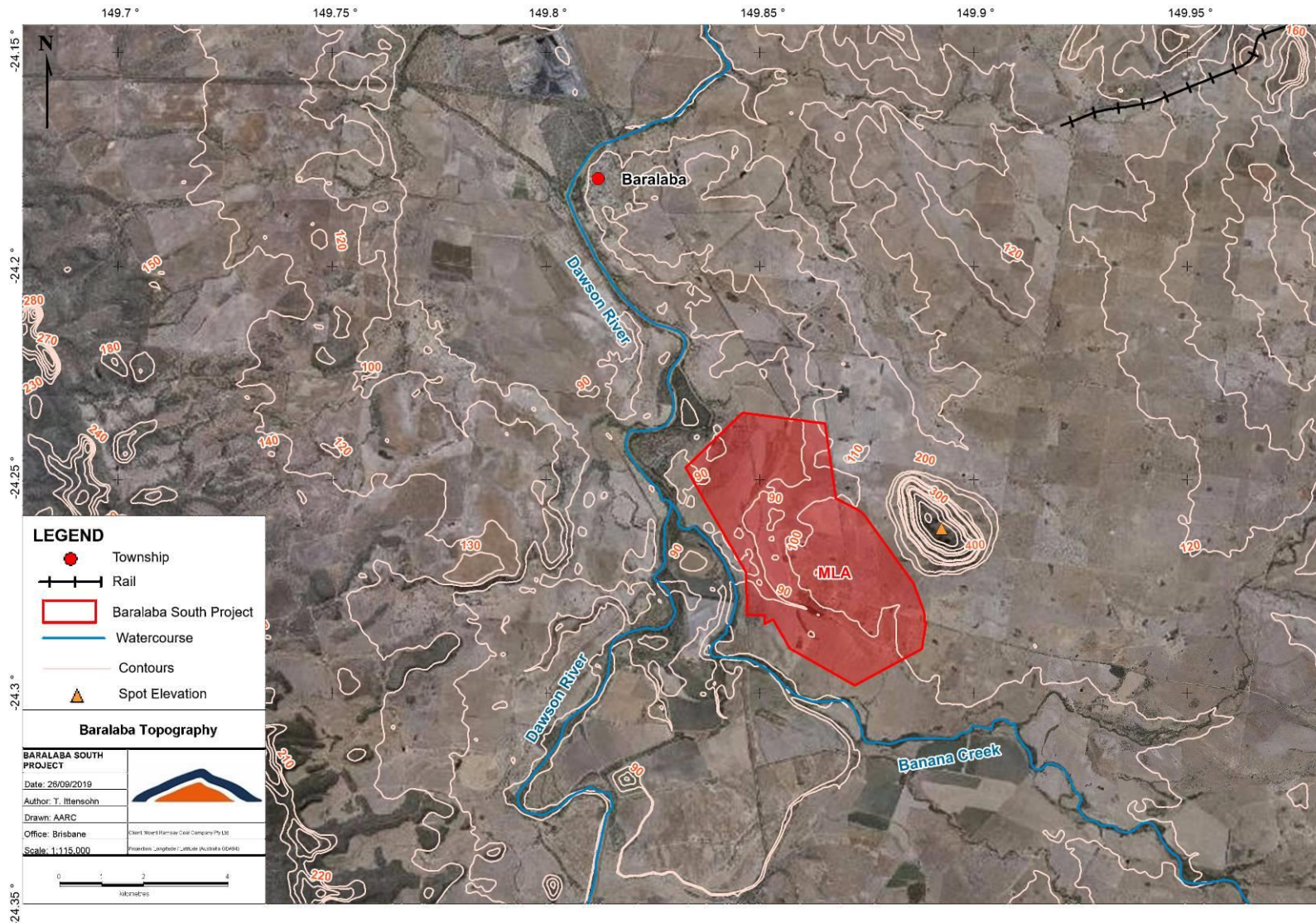
**Figure 6 Strategic Cropping Land Trigger Area**

## 5.2.2 Topography and Catchments

The topography of the BSP area is dominated by the Dawson River floodplain which overlaps the MLA, and Mount Ramsey which is located approximately 400 m outside the eastern boundary of the BSP (Figure 7). The MLA is relatively flat with only slight undulation. Ground elevations range between 75 m and 110 m Australian Height Datum (mAHD), generally rising towards the east with distance from the Dawson River. Mount Ramsay, which lies to the east of the MLA, is the most significant topographical high in proximity to the BSP, occurring as a single sharp rise to 430 mAHD.

The Dawson River, which flows northward, is located to the west of the MLA at a distance of 490 m at its closest point. Banana Creek is located along the southern and south western extents of the MLA and flows into the Dawson River. The point of confluence between Banana Creek and the Dawson River is approximately 750 m west of the MLA.





**Figure 7 Topography of the Project Area**

### 5.2.3 Regional Geology

The BSP lies within the Permo-Triassic aged Bowen Basin. In the southern part of the Bowen Basin, the significant elements are the Comet Ridge anticline in the west and the Mimosa Syncline to the east, which formed during the early Permian extensional tectonic phase.

The BSP is situated in a structurally complex zone on the eastern limb of the Mimosa Syncline in the southern Bowen Basin. The economic coal seams lie in the Permian Baralaba Coal Measures, which correlate to the Rangal Coal Measures of the Blackwater Group in other parts of the Bowen Basin (Terrenus Earth Sciences, 2019).

### 5.2.4 Local Geology

The coal bearing section of the Baralaba Coal Measures is up to 400 m thick and contains up to 12 consistent seams. The coal measures generally strike in a north-westerly direction throughout the BS deposit. The dominant interseam strata consist of sandstones and siltstones, though finer grained strata such as mudstones also exists throughout the coal measures, and typically adjacent to the roof and floor of the coal seams. The coal measures generally strike in a north to north-westerly direction, and dip relatively steeply at between 25 degrees (°) and 55° to the west. The strata are also variably folded and thrust faulted.

The Baralaba Coal Measures at BSP are almost entirely overlain by Quaternary sediments and outcrop at surface has only been observed along creek and river banks. Overlying the Baralaba Coal Measures and lying immediately west of where the Coal Measures outcrop at Baralaba South is the Rewan Formation of Triassic age. The unit comprises mainly siltstones and mudstones and is coal barren.

Immediately underlying the Baralaba Coal Measures and outcropping immediately east where the coal measures outcrop at BSP is the Gyranda Formation (Kaloola Member). The Kaloola Member is known to contain minor coal horizons. The Kaloola Member strata are dominantly fine-sandstones and siltstones with subordinate carbonaceous shale, tuffs and banded coal with some coking and thermal properties.

The general structure at BSP is dominated by a major eastern syncline, and western anticline. Smaller scale parasitic folding also exists within the limbs of both of these fold structures.

The western side of the syncline exhibits significant structural deformation. This has been interpreted as a major fault zone comprising east dipping thrust faults that trend sub-parallel to the fold hinge lines. The faults within this zone dip between 20° and 40° and exhibit throws of up to 100 m. Subsidiary smaller-scale (but still very substantial) faulting also exists probably related to the small-scale parasitic folding (Terrenus Earth Sciences, 2019).

### 5.2.5 Soil

A Soil and Land Suitability Assessment was undertaken for the BSP. Soil mapping units were developed and characterised by the contiguous soils of the BSP area. A total of 7 soils on 10 soil landscapes were described from the 125 ground observations. These soil mapping units are composed of a particular dominant soil but may include other, sub-dominant soils, often of a different soil type and Australian Soil Classification class, or unspecified minor soils.

A summary of the BSP soil mapping units developed are provided in Table 8.

**Table 8 Soil Landscapes and Soils of the Study Area**

Soil Landscape (SL code)	Soil Landscape description	Soil name*	Dominant vegetation
<b>Soils derived from Quaternary alluvium (Qa)</b>			
Active river channel of the Dawson River anabranches (includes banks and low-lying channel benches subject to frequent flooding).			
1 (Qa.rc1)	Firm to hard-setting, silty surfaced, black cracking clay on low-lying channel benches and banks	Isaac (Is)	Riparian Dawson gum – coolabah woodland or open forest.
Active channelled lower floodplain of the Dawson River anabranches (relatively low-lying and subject to regular flooding).			
2a (Qa.lf1)	Hard-setting, silty surfaced, black cracking clay on active scroll plains and benches.	Isaac (Is)	Dawson gum, brigalow, sally wattle
2b (Qa.lf2)	Strongly self-mulching black cracking clay on level floodplains.	Langley (Lg)	Brigalow
2c (Qa.lf3)	Firm to moderately self-mulching, black cracking clay on lower floodplains.	Tralee (TI)	Brigalow
<b>Flood channels within upper floodplain; subject to both local and river inundation</b>			
3 (Qa.td1)	Hard-setting, poached, grey cracking clay within narrow terrace drainage lines	Bluchers (Bc)	Coolibah, Dawson gum, brigalow, black tea-tree
Elevated upper floodplain; level and extensive backplains; commonly flooded			
4a (Qa.uf1)	Hard-setting to firm, silty, black non-cracking clay on indistinct levee deposits.	Stephens (St)	Poplar box, sally wattle
4b (Qa.uf2)	Strongly self-mulching, black cracking clay on level backplains	Langley (Lg)	Brigalow
4c (Qa.uf3)	Firm to moderately self-mulching, black cracking clay on level to gently sloping backplains	Tralee (TI)	Brigalow
<b>Soils derived from Cainozoic sediments (Cza)</b>			
<b>Elevated, level to gently undulating plains on unconsolidated Tertiary sediments</b>			
7a (Cz.gp1)	Moderately self-mulching, grey to brown cracking clay over mottled, grey saline subsoil. Includes melonhole phase.	Greycliffe (Gc)	Whipstick brigalow
7b (Cz.gp2)	Hard-setting, moderately deep, sandy loam surfaced, sporadically bleached, grey to brown texture-contrast soil with prismatic to columnar structure on gently undulating rises.	Thalberg (Tb)	Dawson gum – brigalow, with emergent bottle trees, sally wattle. Extensively cleared

Source: Terrenus Earth Sciences, 2019

## 5.2.6 Potential Impacts to Land

Land disturbance is anticipated to occur during construction and operation phases of BSP activities and may result in potential impacts. These will be discussed in detail in the EIS with regards to their impacts on topography, soils, land use suitability, contaminated land and regional cumulative impacts. Current rural agricultural operations in the direct footprint of the Project would be temporarily restricted in the short term until the mine's closure and all rehabilitation has been completed, successful and approved by the authorities.

Potential impacts to land use and land suitability of the Project area may include:

- Temporary and permanent change to land uses within the Project Area due to reduced suitability for cattle grazing expected within some areas of the final landform;
- Potential impact to the SCA within the MLA;
- Cumulative impacts from surrounding operations that may restrict activities on other adjacent, local, upstream and downstream developments, land uses and landholders; and
- Land instability by creation of elevated landform and a final void.

Clearing and disturbance may have the potential to impact on land values through:

- Topsoil removal, loss, compaction or diminished viability;
- Increased soil erosion (wind and water); and
- Exposure of saline or sodic subsoils during soil stripping;
- Loss of soil physical structure due to excavation and handling;
- Loss of the soil seedbank; and
- Impact on soil fertility due to mixing with subsoils or resulting from changes in chemistry when subsoils are exposed to oxygen.

Potential land contamination may occur through:

- Spills from coal processing;
- Spills or mine-affected water runoff from coal processing, tailings and process water;
- Spills from mine-affected water storages;
- Effluent from sewage treatment plant; and
- Spillage of chemicals or fuel.



## 5.2.7 Proposed Mitigation and Management of Land Values

Detailed mitigation and management measures will be developed to minimise the potential for or avoid impacts arising from BSP land disturbance and will be detailed in the Land Chapter of the EIS. These will include as a minimum:

### Land Disturbance

Any disturbance of land would be undertaken in accordance with the following management protocols and measures, these include:

- Land disturbance will be limited to that authorised by the Projects EA. A land disturbance permit system to control and limit land clearing to the minimum amount required for the safe operation of the BSP.
- Development and implementation of a topsoil management plan to direct removal, replacement, and stockpiling management with the objective of promoting direct placement of topsoil, where possible, to preserve the seed bank and reduce erosion.
- Progressive rehabilitation of landforms will be undertaken to limit the total area of disturbance at any point in time during the mine life. Where possible, the pre-mining land use will be reinstated.
- Implementation of a water management plan on site including the diversion of overland flow/runoff around disturbed areas to limit the potential for contaminated release and erosion.

Should unanticipated, additional disturbance be required during the life of the Project, this will be detailed in the appropriate amendment to the EA and the Progressive Rehabilitation and Closure Plan.

### Erosion and Stability

An Erosion and Sediment Control Plan will be prepared in accordance with *Best Practice Erosion and Sediment Control* (IECA 2008) and *Soil Erosion and Sediment Control Engineering Guidelines for Queensland Construction Sites* (Witheridge and Walker 1996). These management controls would include:

- Elevated landforms would be remediated with a protective vegetation cover as soon as possible to minimise extent of time soil is exposed;
- Upslope diversion drains would be used to reduce run off from undisturbed areas onto disturbed areas;
- Downslope collection drains to divert surface water run to sediment dams (e.g. mulch berms, sediment ponds and drop inlet protection) used to contain sediment laden run off from disturbed areas;
- Sediment fences/filters would be used to retain and filter suspended solids; and
- Contour cultivation, deep ripping, levee banks, lined waterways where required on sloped landforms.



## Land Degradation or Contamination

The following management practices would be implemented to reduce the risk of land degradation and contamination:

- All unexpected contamination would be remediated and validated under supervision of a suitable qualified person in accordance with an Emergency Response Plan predefined for all hazardous materials stored onsite. Ensuring the administering authority would be notified immediately within 24 hours of detection being known;
- A contaminated land register and map would be maintained onsite detailing any contamination events, subsequent location and remediation protocols issued;
- All chemical and hydrocarbon storage and handling facilities will be appropriately bunded in accordance with Australian Standards, with spill kits available, and spills cleaned up immediately; and
- Compulsory staff training would be made available to ensure employees are equipped with the skills and knowledge to respond appropriately to contain any hazardous spills.

A detailed soils and land capability assessment will be prepared for the Project as part of the Land Chapter of the EIS.

### 5.3 SURFACE WATER VALUES

The BSP is located in the Lower Dawson Sub-catchment Area of the Fitzroy Basin under the *Water Resource (Fitzroy Basin) Plan 2011* (Qld) (Figure 8). The Project is located adjacent to the confluence of Banana Creek with the Dawson River.

Environmental Values (EVs) for this region are defined in the Dawson River Sub-basin Environmental Values and Water Quality Objective Basin No. 130 (par), including all waters of the Dawson River Sub-basin except the Callide Creek Catchment (DEHP, 2011). The Project is located adjacent to the Lower Dawson main channel. The EVs assigned to the Lower Dawson Sub-catchment Area are:

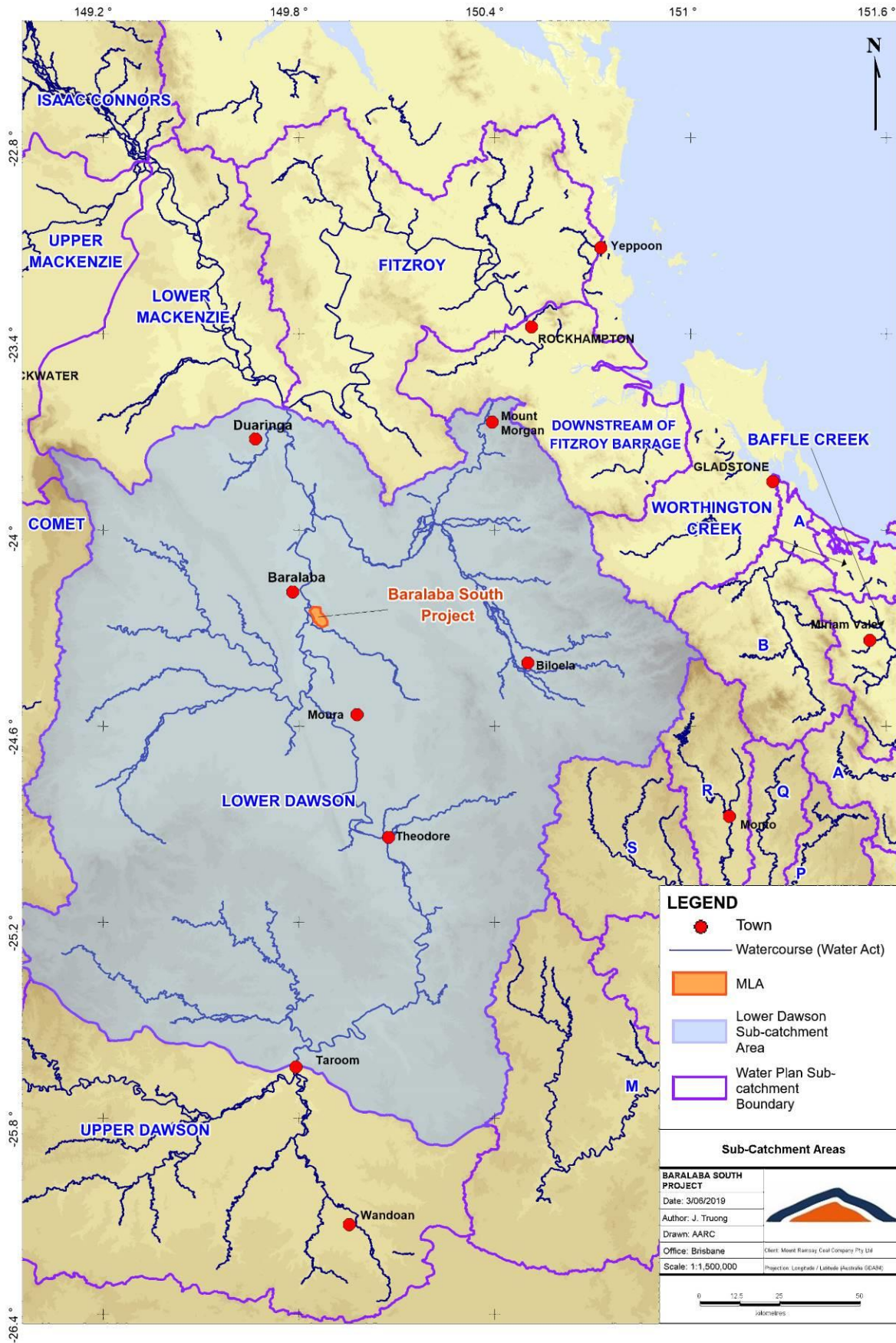
- Aquatic ecosystems;
- Irrigation;
- Farm supply/use;
- Stock water;
- Human consumer;
- Primary recreation;
- Secondary recreation;
- Visual recreation;
- Drinking water;
- Industrial use; and
- Cultural and spiritual values.

Within the vicinity of the BSP, agriculture has a significant presence and influence on the Dawson River and its tributaries. Farming of crops and livestock occurs along the Dawson River both upstream and downstream of the Project. A significant cropping operation exists on the western bank of Banana Creek at the confluence of Banana Creek with the Dawson River.

#### 5.3.1 Wetlands and Groundwater Dependent Ecosystems

A wetland of high ecological significance (and matter of state environmental significance [MSES]) is mapped in the west of MLA. Other small remnant non-riverine wetlands of lower conservation significance are also located within the MLA. Further information is provided in Sections 5.7.3.

The depth to groundwater is typically 12-15 m within MLA, therefore vegetation is not expected to be dependent on groundwater. Based on the available evidence (i.e. groundwater level monitoring and vegetation mapping) and site reconnaissance by Ecological Survey & Management (2019), it is very likely that the wetlands are reliant on direct rainfall, runoff and floodwaters, which are held near the surface by the shallow clays. Whilst it is possible that groundwater discharge from the underlying regional water table within the sandy alluvium could occur, it is more likely that after significant flooding there would be leakage from the surface toward the underlying water table rather than upward flow from the regional water table to the surface. Hence these wetlands should therefore be considered to be 'wetlands reliant on surface water inflow', rather than GDEs.



**Figure 8 Lower Dawson Sub-catchment Area**

### **5.3.2 Dawson River**

The Dawson River is one of the major tributaries to the Fitzroy River. The Dawson River sub-basin total catchment area is 50,800 km<sup>2</sup> and makes up 35% of the Fitzroy Basin catchment. The Dawson River headwaters are within the Carnarvon Range and the river drains generally east. Approximately 35 km downstream of the Project, the Dawson River confluences with the Don River, which has a catchment 25% of the Dawson's at the confluence.

The Dawson River is the most significant watercourse in the Project's locality (Figure 9) and is a perennial watercourse subject to seasonal flooding. Local to the project, the Dawson River can be characterised as having a main channel approximately 150 m wide, bordered by a lower floodplain extending 1.5-3 km on either side. The Dawson River exhibits a number of anabranch channels both upstream and downstream of the Project indicating it is reasonably laterally active.

The Dawson River experiences consistent flows throughout the year as it obtains inflow from groundwater sources throughout its length. Water resources are managed in the Lower Dawson River with water supply storages. The nearest upstream and downstream storages are the Moura Weir (40 km) and the Neville Hewitt Weir (12 km), respectively.

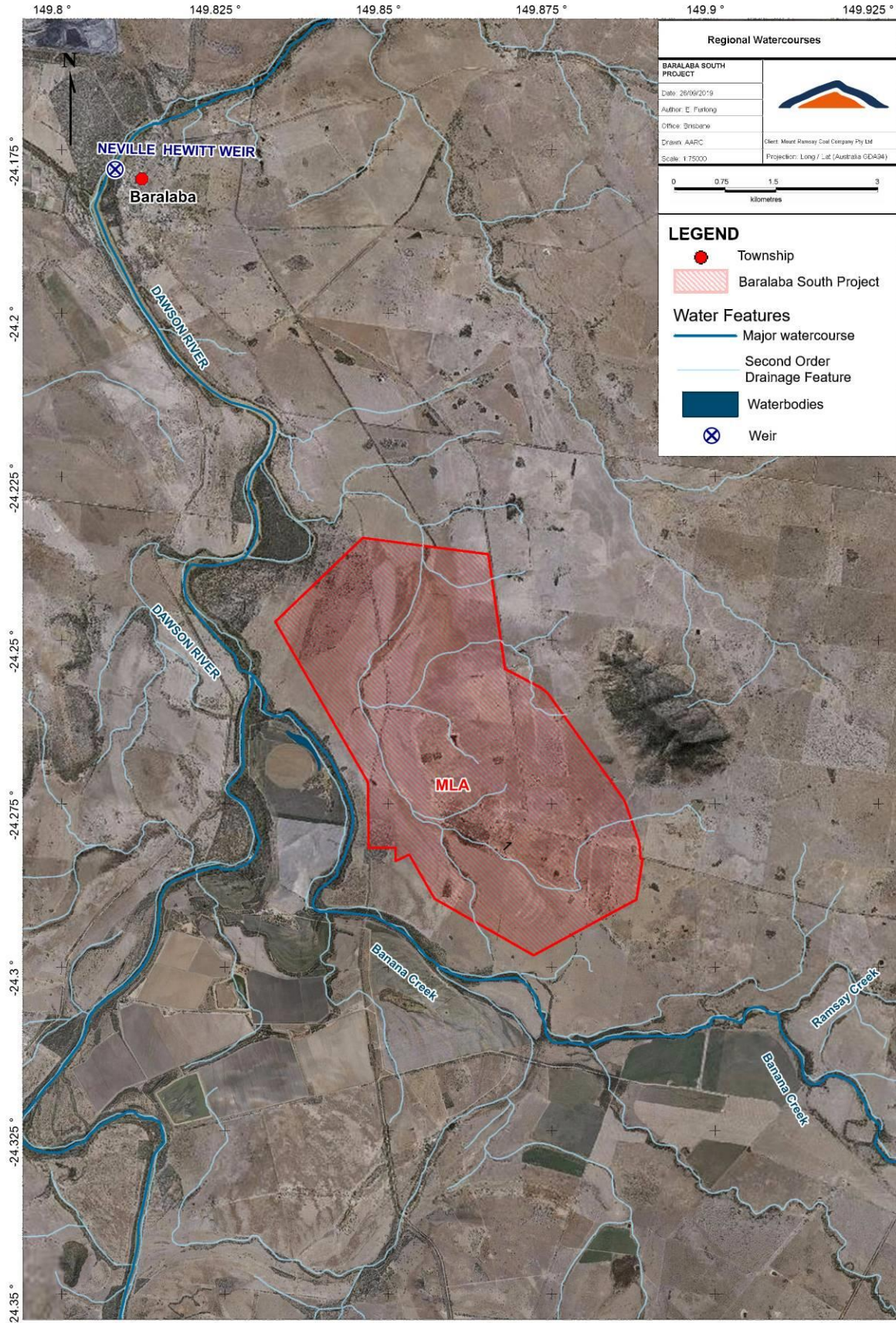
The Dawson River is defined as a watercourse under the *Water Act 2000*.

### **5.3.3 Banana Creek**

Banana Creek is an ephemeral, fifth order tributary to the Dawson River which flows in a north-westerly direction from south of Banana township towards the Project (Figure 9). Banana Creek and the Dawson River confluence to the north-west of the MLA. The western and northern MLA boundaries follow Banana Creek and the Dawson River respectively. At the nearest point, the MLA is within 1 km of the Dawson River channel and a significant portion of the site lies within the natural floodplain.

Banana Creek is defined as a watercourse under the *Water Act 2000*.





**Figure 9 Local Watercourses**

### 5.3.4 Water Use

#### Municipal

The Banana Shire Council provides water supply services to the townships local to the Project. Banana Shire Council supplies potable water from a number of sources including Callide Dam and the Dawson River. Baralaba township source their potable water supply from the Dawson River at Neville Hewitt Weir, approximately 12 km downstream of the Project (Figure 9).

#### Agricultural

Agricultural users dominate the land nearby the Project. Many agricultural users have Dawson River water allocations under the Lower Dawson River Water Sharing Plan.

#### Industrial

The Baralaba North and Dawson coal mining complexes are located on the Dawson River while remaining nearby industrial sites are in different catchments. Wonbindi Coal Pty Ltd has water entitlements under the Lower Dawson River Water Sharing Plan.

#### Recreational

The Lower Dawson main channel, and its tributaries, are used for both primary and secondary recreational purposes. The Baralaba golf course sits on the western bank of the Dawson River 1 km upstream of the township. On the eastern bank upstream of town is the Neville Hewitt Weir campground and picnic area. Neville Hewitt Weir is also a popular local fishing destination.

### 5.3.5 Potential Impacts to Surface Water

The Project has the potential to impact values identified for surface water resources through direct disturbance associated with open cut mining, diversion of drainage features and through the potential release of sediments or contaminated water to the receiving environment.

#### Uncontrolled Release

Engeny (2019) determined that there were no modelled overflows from either of the mine water dams in 95% of years, which is in accordance with the design containment requirement of 1:20 AEP. Overflows from the mine water dams in greater than 95<sup>th</sup> percentile wet years:

- Are of minimal volume and short duration compared to the volume and duration of flow in the receiving waterway;
- Have low-moderate EC (<2,000  $\mu\text{S}/\text{cm}$ ); and
- Occur while the Dawson River is experiencing medium-high flow events.

Impacts due to overflows from the mine water dams are expected to be localised to within 1 km of the release point. It is expected that the dilution provided by the Dawson River during these extreme events will result in associated releases having no impact on environmental values in the receiving waterway (Engeny, 2019).

#### Seepage

There is potential for seepage to be generated in both the out of pit dumps and the in-pit dumps.

Seepage generated by in pit dumps will report to pits and be managed in the mine water system. Seepage generated in out of pit dumps can be expected to follow the natural topography under the dump. This would lead to out of pit dump seepage draining to backfilled voids or the open cut pit.

Uncontrolled release of seepage is not expected to occur from site and recovered seepage flows will be managed in accordance with the mine water management system. Seepage is expected to be of low salinity and neutral to alkaline pH. It is not expected that seepage from waste rock dumps will cause any additional impacts to water quality in the receiving waterway.

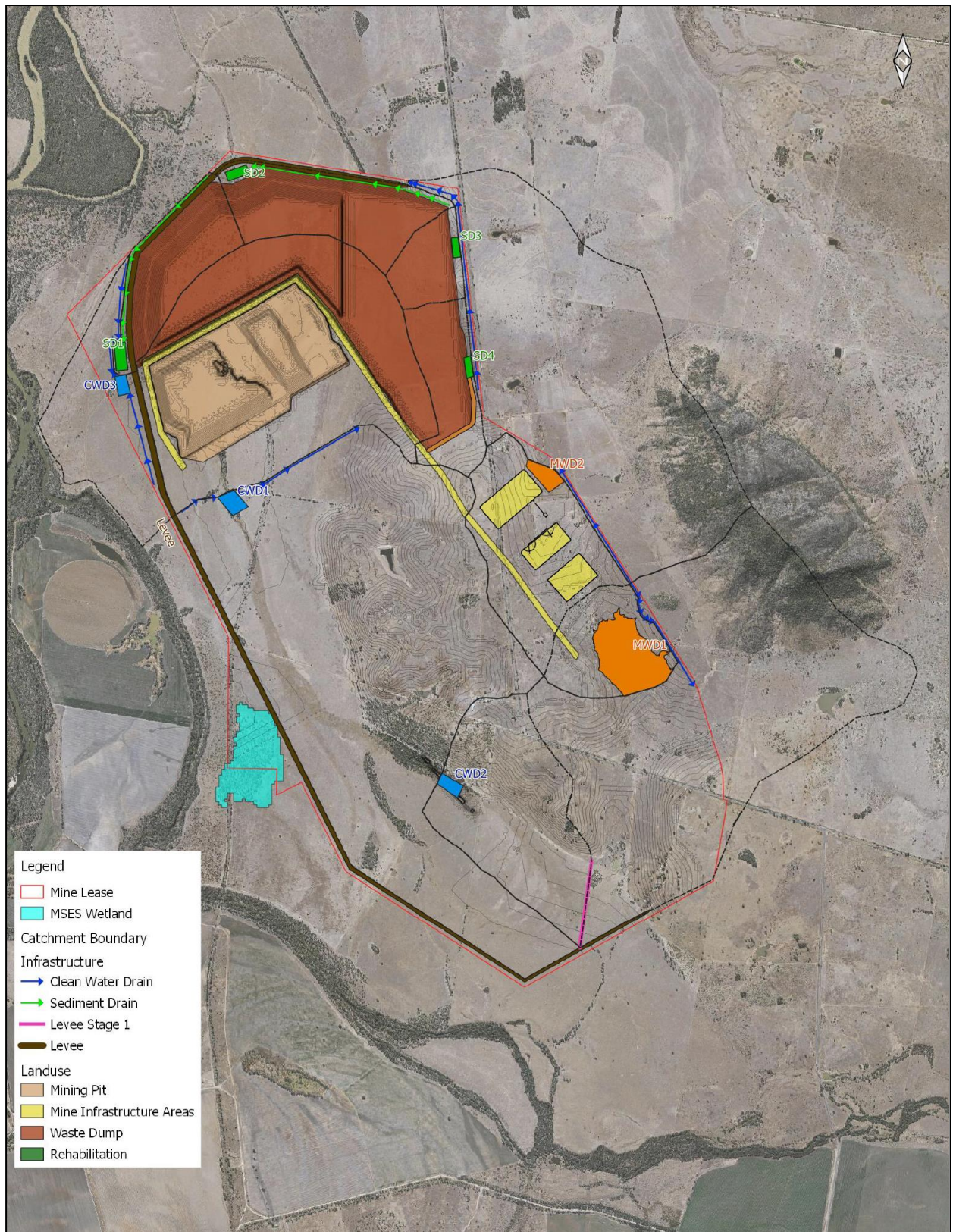
### **Wetlands**

As discussed in Section 5.3.1, there is a mapped wetland classified as a MSES high significance wetland situated within the MLA between the Dawson River and the proposed flood protection levee (Figure 10). The proposed mine water management system has been designed to minimise alteration to the existing wetland catchment. The levee and associated mine infrastructure intercepts approximately 13% of the wetland catchment.

A water balance assessment was undertaken to determine the existing case time exceedance of water levels in the wetland and the associated impact due to the reduction in catchment area from the Project. The water balance assessment of the wetland was undertaken using the climate data and runoff parameters.

Modelling of the wetland water levels show that the reduction in catchment has minimal impact on the hydrology of the wetland. The modelled outcome shows the wetland is dry, greater than 80% of the time in the existing case which remains unchanged in the post-development scenario. Historical aerial imagery of the area also shows the wetland dry. The maximum reduction in water level is 5 cm. On 99% of days, the reduction in level is less than 1 cm and on 95% of days there is no reduction in water level (Engeny, 2019).





**Figure 10 Year 1 Water Management Infrastructure (Engeny 2019)**

### 5.3.6 Proposed Mitigation and Management of Surface Water

A number of mitigation and management measures are proposed to address potential impacts to water values:

- Contingency measures for directing excess runoff inflows to the mine pit will be implemented;
- Water efficient plant design with capacity to run off recycled water;
- Management through control of contaminated run-offs (mine affected water, chemical wastes);
- Development of an Erosion and Sediment Control plan to control soil erosion and minimise sediment transport in response to changing climate conditions;
- Integrate a Water Management System designed to minimise risks associated with Project water supply and consumption. The system will incorporate water storage with tolerances suitable for changes in annual rainfall;
- Release to waters will be in accordance with industry standard release criteria, as conditioned in the EA;
- Proposed management through water efficiency programs, recycling and a Water Management Plan;
- Implementation of a Receiving Environment Monitoring Program that incorporates regular monitoring of ecosystem health using physical, chemical and biological indicators; and
- Incorporate flood management infrastructure and monitoring as necessary to ensure offsite water quality and management of flood runoff. Routine maintenance of infrastructure such as, water storage pits, and overland flow management will be conducted to avoid impacts associated with flooding events.

A detailed surface water assessment will be prepared for the Project as part of the Surface Water Chapter of the EIS.

## 5.4 GROUNDWATER

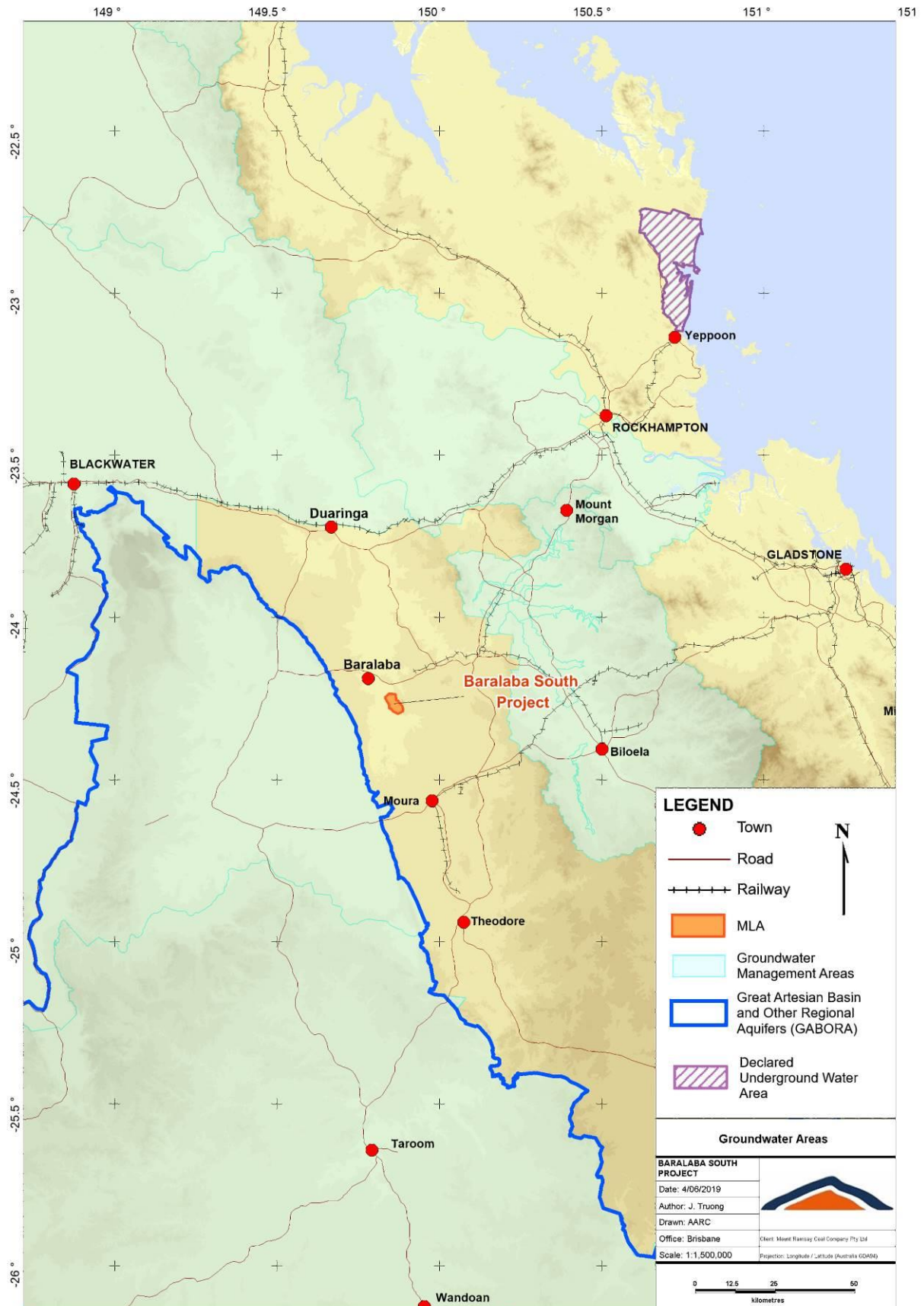
The BSP is located outside of declared Groundwater Management Areas under the *Water Resource (Fitzroy Basin) Plan 2011 (Qld)*. The BSP is not situated within a declared sub-artesian groundwater area under the *Water Regulation 2016 (Qld)*, nor is it within the Great Artesian Basin and Other Regional Aquifers Water Plan (Figure 11).

The Rewan Formation (overlying the Coal Measures) and Gylanda Formation and other older units (underlying the Coal Measures) are known aquitards. The Rewan Formation in particular is thick and intervenes between the Baralaba Coal Measures and the Clematis Sandstone aquifer (Australian Government 2018; John T. Boyd Company 2017).

Of the Permo-Triassic strata in the Baralaba region, only the Clematis Sandstone and potentially the Duaringa Formation are thought of as significant aquifers, in the sense of producing useable quantities of groundwater. However, the Clematis Sandstone is distant (more than 10 km) from the BSP, and there are no bores penetrating the Duaringa Formation where it does exist approximately 13 km north-east of the BSP.

To the west of Dawson Range (along which the Clematis Sandstone aquifer outcrops) water table elevations decrease, and flow is in a westerly direction into the Mimosa Syncline / Great Artesian Basin area.





**Figure 11 Groundwater Management Areas**

## 5.4.1 Bores

### Standpipe Bores – Alluvium

The alluvium monitoring bores with the highest recorded groundwater elevations are those nearest to the Dawson River. The other monitoring bores in the alluvium, at greater distance from the Dawson River, indicate the recharge mechanism is, as expected, from the Dawson River to the alluvium (i.e. losing conditions). All alluvium bores in the southern transect (furthest from the Dawson River and its confluence with Banana Creek) are recorded as dry.

### Existing Users – Groundwater Bores

In total, three private landholder bores were initially identified within 5 km of the BSP using desktop methods, which were subsequently refined based on the results of the on-grounds landholder bore survey (4T Consultants, 2019). The results of the bore survey concluded:

- **Ross Bore** – 26/FN153 (McLaughlin JR McLaughlin V). Approximately 500 m east of BSP; total drilled depth of 52.67 m, intersecting mapped Cretaceous Intrusives (Igneous Trachyte) associated with Mt Ramsay. The recorded groundwater elevation is at approximately 102-103 m Australian Height Datum and is much higher than the surrounding Permian coal measures. It is understood the private landholder bore is currently not in use with no pump fitted.
- **Riverland 1 & 2** – 4/FN514 (Austin DI & MJ) – RN 128188. Paired bores approximately 3 m apart) located approximately 1.5 km west of BSP between the Dawson River and Banana Creek, and immediately south of their confluence, adjacent the Dawson River. The bores were recorded as being 18 m and 22 m deep (respectively), intersecting the sands and gravels of the Quaternary alluvium. Aerial imagery shows that two centre-pivot irrigation areas exist nearby on the property, however it is understood that the supply of irrigation water is sourced from the Dawson River, not the groundwater bore(s). Neither bore was equipped.
- **Webb Bore** – 35/FN141 (Webb LC) – RN 100077. Approximately 3.5 km south of the BSP on the southern side of Banana Creek. The total hole depth recorded was deep (approximately 78 m) and was not equipped for production.

Only one private landholder bore (Ross Bore) is predicted to have any model predicted drawdown (0.3 m), however being <0.5 m, it is within the natural variation in the recorded groundwater levels at the bore. All other private landholder bores identified are located at further distances, or different geology, beyond that predicted to be measurably impacted by drawdown resulting from the open cut mine pit extent.

## 5.4.2 Spatial Groundwater Levels

Flow directions can be inferred from a groundwater elevation contour map, as flow occurs from areas of high head to those of low head. The inferred groundwater flow directions in the vicinity of the BSP are predominantly topographically controlled:

- Toward the west from Mt Ramsay to the Dawson River; and
- Convergent along Banana Creek toward the confluence of and northward along the Dawson River.

It is also noted that the locally elevated groundwater table closer to the Dawson River is evidence that the Neville Hewitt Weir has likely raised the Dawson River stage above the natural levels upstream of the weir, including areas to the west of the BSP.

More regionally, at the existing Baralaba Central / BNM, the lower groundwater table levels at the site suggest that the maximum water levels recorded in that area had already been affected by past mining.

To the west of the Dawson Range (along which the Clematis Sandstone aquifer outcrops) water table elevations decrease, and flow is in a westerly direction into the Mimosa Syncline / GAB area. The central ridge of the Dawson Range is congruent with a groundwater divide, at least in the upper levels of the groundwater system.

### 5.4.3 Temporal Groundwater Levels

The main conclusions based on the monitoring observations of the local aquifer testing conducted for the purposes of confirming hydraulic properties are:

- Mild correlation with rainfall and stage surface water levels at the alluvial bores nearest to the Dawson River;
- The groundwater flow direction within the Blackwater Group is shown to be towards the west and southwest, consistent with the dip of the Blackwater Group (i.e. groundwater flow is down-dip) but also towards the Dawson River.
- Natural decline in potentiometric head with depth; and
- Mining drawdowns evident at bores installed in the coal measures at the Baralaba Central / North Mines.

Prior to recent reforms to the *Water Act 2000* and the EP Act, groundwater use in the vicinity of the Project was regulated by the Fitzroy Basin Water Resource Plan (2011) and the Fitzroy Basin Resource Operations Plan (2004), which were prepared in accordance with the *Water Act 2000*. Since the above reforms, groundwater licensing to take or interfere with groundwater in the course of mine dewatering (ie a water licence) is not required. However, the Project will be subject to reporting, monitoring modelling and make good obligations under these two Acts which will be detailed in the Groundwater Chapter of the EIS.

### 5.4.4 Predicted Associated Water Take / Inflows

Groundwater take/inflows to the BSP open cut mining operations have been extracted from the predictive model. The model predicted groundwater take/inflows estimates, presented as a daily average for an average annual period, for the BSP are presented in Table 9.

For the period 2020-2038, the calibrated model configuration predicts average groundwater inflows (associated water take) to range up to 3.3 ML/day (peaking in Year 2), with an average of 2.0 ML/day for the operational life of the mine (SLR, 2019). It is noted that the predicted groundwater inflow estimates are before evaporative losses from pit floor or walls and does not account for direct rainfall or surface water ingress.

**Table 9 Model Predicted Groundwater Take / Inflows at the BSP**

Year	BSP [ML / day]
------	----------------

2020	2.6
2021	3.3
2022	2.3
2023	2.0
2024	1.8
2025	1.6
2026	1.5
2027	1.5
2028	1.7
2029	1.7
2030	1.7
2031	1.6
2032	1.9
2033	2.7
2034	2.8
2035	2.7
2036	1.9
2037	1.4
2038	0.7
<b>Total (Average)</b>	<b>2.0</b>

\*It is noted that the predicted groundwater inflow estimates are before evaporative losses from pit floor or walls and does not account for direct rainfall or surface water ingress.

#### 5.4.5 Potential Impacts to Groundwater

As part of the BSP, the Proponent is proposing to exercise underground water rights during the period in which resource activities would be carried out at the MLA.

The following impacts may occur as a result of the BSP:

- A localised groundwater sink would develop during the first few years from open cut pit excavation below the groundwater table in the northern extent of the BSP operations. The hydraulic sink would gradually deepen as mining operations progress towards the south-east.
- Maximum groundwater level drawdown in the worse-case scenario, assuming mining at 5 Mtpa would be largely contained within the Permian coal measures extending from the open cut pit extent up to approximately 650 – 700 m to the north and north-west, 350 – 500 m to the south and south-west and 500 – 800 m to the east and south-east. Sensitivity and uncertainty analysis suggest that drawdown could elongate a little further north and south along the strike of the Baralaba Coal Measures, however it is not predicted to encroach to any appreciable extent into the saturated alluvium of the Dawson River. Modelling results indicate negligible and/or immeasurable drawdown effect at all private landholder bores identified in the vicinity of the BSP.
- Any surface and groundwaters captured within the final void would evaporate from the lake surface, concentrating salts in the void water body slowly over time. This gradually increasing salinity would not pose a risk to the surrounding groundwater regime as the final void would remain in the long-term as a permanent, localised hydraulic sink.
- Predicted groundwater drawdown due to the BSP in the Permian strata would be limited in the shallow groundwater systems and incidentally transfer directly to some, albeit immeasurable,



leakage from the Dawson River to the surficial geology by up to approximately 0.14 ML/day (1.5% reduction in 5-year median flow). Modelled leakage predicted from Banana Creek is considered negligible as it only flows on occasions following rainfall events.

- Equilibrium groundwater inflows predicted to the final void are predicted to reduce to approximately 1.0 ML/day after several decades post-mining. The corresponding leakage from the Dawson River at post closure equilibrium is predicted to steadily reduce to be less than 0.03 ML/day, which when compared to the passing flow condition prescribed for the Dawson River of 2,592 ML/day, is less than 0.01%.
- No drawdown impacts are predicted at the HES wetland west of the MLA (regional groundwater table approximately 12-15 mbgl) and available evidence (i.e. groundwater level monitoring and vegetation mapping) in conjunction with site reconnaissance by ESM (2019) do not indicate vegetation to be dependent on groundwater and therefore no drawdown impacts are predicted. The model predicted no drawdown at this location in the hydrogeological units at depth below the HES wetland.
- Changes in hydraulic properties within the mined extent would occur due to the backfilling/replacement of the heterogeneously layered/anisotropic rock (i.e. alluvium, colluvium and Permo-Triassic coal measures) by higher permeability emplaced spoil. Enhanced infiltration/recharge and potential reductions in localised hydraulic gradients within the spoil material would occur.
- Higher gradients immediately around the open cut pit may be observed if water table mounding was to occur in out-of-pit spoil emplacements.
- Stygofauna are not predicted to be significantly impacted considering the limited groundwater level drawdown predicted in the shallow groundwater systems, whilst groundwater level drawdown would be largely contained within the Permian coal measures wherein no stygofauna had been recorded during either the 2012 and 2017-18 sampling programs by Stygoecologia (2017; 2018).
- No springs were observed or noted within the MLA and therefore no drawdown impacts are predicted due to the BSP, whilst, no appreciable decline in the availability of groundwater in the GAB units would occur.

There is not expected to be any measurable change in the quality of groundwater, either in Permo-Triassic strata (within which groundwater level drawdown would be largely contained) or in younger units such as alluvium or colluvium, as a consequence of mining (albeit limited). The localised hydraulic sink that would form as mining develops would minimise the potential migration of saline or poorer quality groundwater from within the open cut pit to other areas (e.g. from the coal seams to surrounding alluvium or colluvium) (SLR, 2019). Consequently, it is expected that there would be negligible impacts on surface water quality in downstream waters due to interaction with groundwater.

Based on the review of groundwater datasets and dependent assets, the absence of active groundwater users in the vicinity, the common dryness of the alluvial sediments (away from the Dawson River), the brackish-saline nature of the groundwater, and the fact that the BSP is not in a regulated groundwater management area in the Fitzroy Basin confirm that the identified groundwater systems are not significant aquifers. That is, despite being the main hydrogeological units in the BSP area, the groundwater systems at the BSP are of limited potential. Nevertheless, from an industrial use perspective, associated groundwaters that would be accessed by the BSP would provide a beneficial industrial use through the use in the site water balance / supply (SLR, 2019).

Further information on the numerical modelling will be included in the groundwater assessment, to be included in the EIS.

## **5.4.6 Proposed Mitigation and Management of Groundwater**

### **Proposed Groundwater Monitoring Program**

A Groundwater Monitoring Program (GMP) would be prepared to improve the knowledge of aquifer definition and interaction, whilst detect any changes in groundwater levels and quality as a result of mining operations. The existing groundwater monitoring network would facilitate the GMP to detect any changes in groundwater levels and quality. The network would be regularly reviewed and maintained by the BSP proponent regardless of the limited groundwater use and quality.

Notwithstanding, to verify and confirm that the predicted impacts of the BSP would not have any consequential effects or result in changes in the function, targeted monitoring of the following would be undertaken:

- Private landholder bores;
- HES wetland within the MLA; and
- Banana Creek surface water flows.

### **Groundwater Pit Inflow Monitoring Program & Associated Water Reporting**

The GMP would also be complemented with a Groundwater Pit Inflow Monitoring Program during the open cut mining operations. This program will account for the annual take of associated water. During the operation of the BSP, the partition of groundwater inflow/seepage rates would be estimated through annual review of the following:

- Pit dewatering/pumping records;
- Site water balance model catchment (rainfall runoff);
- Coal moisture; and
- Evaporation considerations.

Periodic (e.g. quarterly), water quality sampling from representative in-pit dumps would also be conducted to allow for comparisons with groundwater quality sampling conducted in the surrounding groundwater monitoring network. Any observations of unexpected or significantly increased groundwater inflows directly to the open cut pit would be recorded during the operation of the BSP.

### **Private Landholder Bores**

Periodic (e.g. seasonal/quarterly, or less frequently if otherwise agreed) water level monitoring would be conducted at private landholder bores in the vicinity of the BSP during the mine's operational life to confirm/verify the predictions.

### **High Ecological Significance Wetland**

Targeted investigative drilling and monitoring would be undertaken prior to operations to verify the HES wetland mapped within the MLA is a localised perched system recharged via direct rainfall and

runoff (and separate to the shallow/deep groundwater systems). Shallow logging of the substrate material and installation of shallow piezometers or soil moisture probes/penetrometers would be used to confirm results prior to BSP operations.

In conjunction with investigative drilling and monitoring, details of any present water at the surface in the wetland would also be measured and recorded to complement drilling results and demonstrate how the wetland functions separate to the shallow/deep groundwater systems at the BSP.

### **Groundwater Quality Triggers**

No specific groundwater quality triggers have been derived, nor currently proposed. The BSP is not considered to have a significant impact on groundwater quality, whilst also confirmed not a significant aquifer. The common dryness of the alluvial sediments (away from the Dawson River), the brackish-saline nature of the Permian strata groundwater, and the fact that the BSP is not in a defined groundwater management area in the Fitzroy Basin confirms the limited potential.

Importantly, it is noted that baseline groundwater quality results within the MLA have recorded levels beyond and/or above ANZECC & ARMCANZ (2000) default trigger values for several parameters including pH (<6.5), EC (>2,200  $\mu\text{S}/\text{cm}$ ), Sulphate (>1,000 mg/L) and a number of metal concentrations for 95% level of species protection (e.g. As, Cd, Cr, Cu, Pb, Hg, Ni and Zn).

### **Annual Monitoring Review and Reporting**

An Annual Monitoring Report would be prepared each year, consistent with the requirements of the Water Act and contemporary EA reporting requirements for relevant groundwater datasets to the Queensland Government for the annual return period.

The Numerical Groundwater Model would be also reviewed, and if necessary updated at least every three years in accordance with the guideline, '*Underground Water Impact Reports and Final Reports*' (DES 2017). Any details of verification of the numerical groundwater model predictions, or updates to the numerical groundwater model (e.g. recalibration, additional sensitivity analysis or revised forward predictions) would be accounted for in these reports.

### **Mitigation/ Make Good Measures**

A series of make good measures will be formulated to adequately respond to any unexpected adverse impacts on existing groundwater supply users/private landholder bores. Should investigations conclusively attribute drawdown impacts to the BSP operational activities, the following measures would be made:

- Deepening the affected groundwater supply bore;
- Construction of a new groundwater supply bore; and
- Provision of a new alternative water supply source, provided that any such attributed impacts is demonstrated to be due to mining at the BSP and not due to natural variations such as rainfall deficit or other factors.

A detailed groundwater assessment will be prepared for the Project as part of the Groundwater Chapter of the EIS.

## 5.5 NOISE

The project site is typically rural where noise sources are related to agricultural activities and road transport.

A Noise and Vibration Assessment is currently being prepared for the Project and will be presented in the EIS. This expert technical study may include the following critical components to inform the BSP EIS:

- Identification of the key sources of noise and vibration emissions from the construction and mining activities associated with the Project;
- Identification of receptors surrounding the Project that could be sensitive to noise, vibration or blasting emissions;
- Monitoring of the environmental noise levels to quantify and characterise the existing noise environment at locations representative of the sensitive receptors;
- Defining noise, vibration and blasting assessment criteria for sensitive receptors in accordance with relevant acoustic policy, legislation and guidelines;
- Prediction of noise emission levels at sensitive receptors for the proposed construction and mining activities, including noise emissions from road and rail transport;
- Calculation of potential air-blast overpressure and blast vibration from anticipated blasting activities;
- Assessment of the calculated noise and blasting levels against the adopted assessment criteria and, where applicable, a review of the potential cumulative noise and blasting levels from significant existing mining activities near the Project; and
- Where necessary, provide recommendations for the implementation of management and mitigation measures to, where reasonable and feasible to do so, minimise potential acoustic impacts.

### 5.5.1 Potential Impacts

The Project will result in an increased level of noise during construction and operations, primarily through the operation of motor driven truck and earth moving equipment, as well as, operation of the CHPP. The increase has the potential to affect a limited number of sensitive locations in the surrounding rural area. The impact of the noise operations will be quantified in the noise modelling presented in the EIS.

### 5.5.2 Proposed Noise Mitigation and Management of Noise

BSP will implement noise controls to protect or minimise impacts on the amenity of nearby sensitive places. This may include:

- Ensuring the equipment will be regularly serviced and kept in good working order;
- Design surface level haul roads with noise bunds in strategic locations to minimise noise emissions;

- The use of broad band (buzzer type) alarms to fixed and mobile equipment rather than traditional 'beeping' alarms which can have tonal noise characteristics;
- 'Hornless' horns may be used on mobile vehicles to avoid horn blasts, which have an audible alarm system that sounds within the cabin of the vehicle and alerts the driver to vehicles in the work area, as opposed to a conventional broadcast horn.

### **Noise Monitoring**

Noise monitoring will be undertaken in response to *bona fide* complaints from nearby sensitive places. Where monitoring indicates potential for noise nuisance at the place, MRC will investigate and implement additional controls to ensure future compliance. This may include controls at the source and/or mitigation at the sensitive place.

### **Noise and Blasting Management Plan**

A Noise and Blasting Management Plan will be prepared and detail the management, mitigation and monitoring (auditing) measures that will be implemented for the control of noise, vibration and blasting during mining activities.

As a minimum the plan will include the following:

- Roles and responsibilities for employees for the implementation of the plan;
- Relevant limits and criteria for noise, vibration and blast overpressure and blast vibration;
- Identification of sensitive receptors;
- Activities with potential to generate noise, vibration and blast emissions;
- Noise and blast management measures;
- Noise and blast monitoring programs;
- Review and auditing of environmental performance; and
- Management and reporting of incidents, complaints and non-compliances.

Noise quality impacts and mitigation and management strategies will be discussed in further detail in the Noise Quality Chapter of the EIS.

## 5.6 AIR QUALITY

Air quality associated with the BSP is characteristic of a remote rural landscape with influences from resource development and agriculture prevalent in the region. Existing sources of dust and particulate matter emissions at BSP may include:

- Vehicle movements on unsealed roads;
- Existing mining and processing activities at the BNM. During operations, dust emission sources include mining equipment, haul trucks and blasting;
- Dust from cultivation and harvesting;
- Occasional bushfires and control burns;
- Wind-blown dust from dry inland areas;
- Exploration activities; and
- Pastoral and agricultural activities on surrounding properties.

### 5.6.1 Potential Impacts to Air Quality

The Project will result in increased dust and particulate matter emissions, primarily as a result of:

- Vehicle movements on unsealed roads;
- Wind blown emissions from stockpiles; and
- Generation from disturbed, non-vegetated areas.

The increase has potential to affect a limited number of sensitive locations in the surrounding rural area. Existing cropping and grazing practices may also be potentially impacted. The impact of dust emission will be quantified in the noise modelling presented in the EIS.

### 5.6.2 Proposed Mitigation and Management of Air Quality

Mitigation measures will be implemented as required to protect values:

- A complaints register will be maintained to record and investigate all *bona fide* complaints;
- Vehicle speed within infrastructure areas and on mine roads will be limited and road trains covered during product transfer;
- Stockpiles and unsealed mine roads will be watered to suppress dust generation;
- Ongoing rehabilitation and revegetation of previously disturbed areas will be undertaken to minimise exposed land; and
- Routine monitoring of dust deposition will be undertaken. Monitoring of suspended particulates will be undertaken in response to a *bona fide* complaint.

Air quality impacts and mitigation and management strategies will be discussed in further detail in the Air Quality Chapter of the EIS.

## 5.7 FLORA AND FAUNA

### 5.7.1 Regional Ecosystems

The Queensland Government RE mapping defines the majority of the study area as supporting non-remnant vegetation with two REs in the central southern portion of the MLA (RE 11.4.1 and RE 11.4.2) (Figure 12). Field-validated mapping of the remnant vegetation with the study area was found to be inconsistent with the Queensland Government mapping, wherein neither of the two mapped REs were recorded within the study area. Instead, two different REs were identified (Figure 13). Details of government mapped and ground-truthed REs are provided below (Table 10).

**Table 10 BSP Government Mapped and Validated Regional Ecosystems**

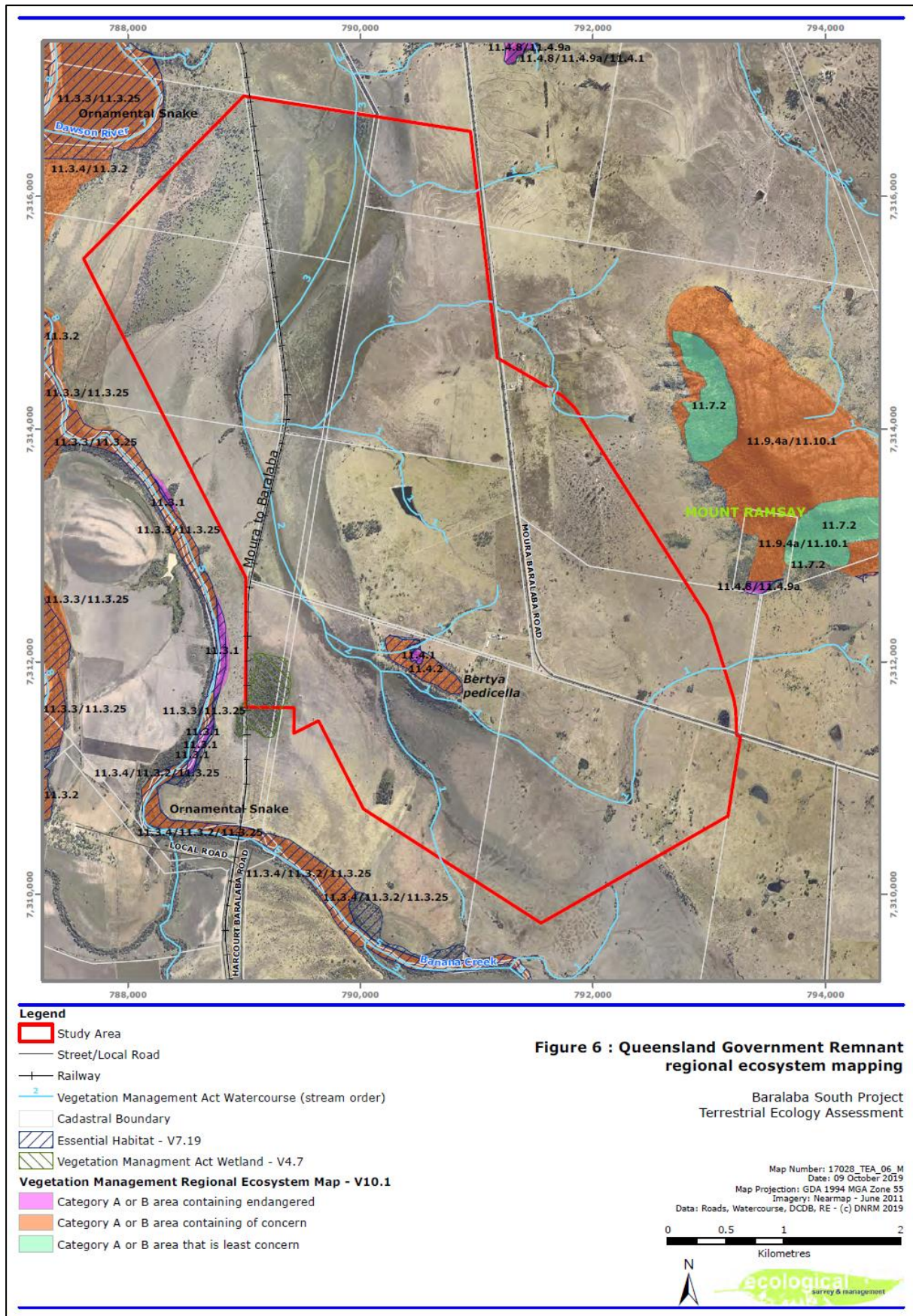
RE	Short Description (Queensland Herbarium 2018)	VM Act Status	EPBC Status	REDD Biodiv ersity Status	BVG (1M)	Total area (ha)
<b>Government Mapped REs</b>						
11.4.1	Semi-evergreen vine thicket +/- <i>Casuarina cristata</i> on Cainozoic clay plains	E		E	7a	-
11.4.2	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. grassy or shrubby woodland on Cainozoic clay plains	OC		OC	17a	-
<b>Field Validated</b>						
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	OC	OC	E	16c	16.5
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. And <i>Corymbia</i> spp. Woodland on Cainozoic sand plains and/or remnant surfaces	LC	NC	NL	18b	10.1
<b>Total</b>						<b>26.6</b>

CE	= Critically Endangered	NL	= Not Listed
E	= Endangered	OC	= Of Concern
V	= Vulnerable	LC	= Least of Concern
T	= Threatened	NC	= Not of Concern
NT	= Near Threatened		

The vegetation community (RE 11.5.9) is situated on deeply weathered sands towards the western boundary was found moderately intact. Major disturbances to this community include selective harvesting, extensive cattle grazing and competition of exotic grasses and environmental weeds.

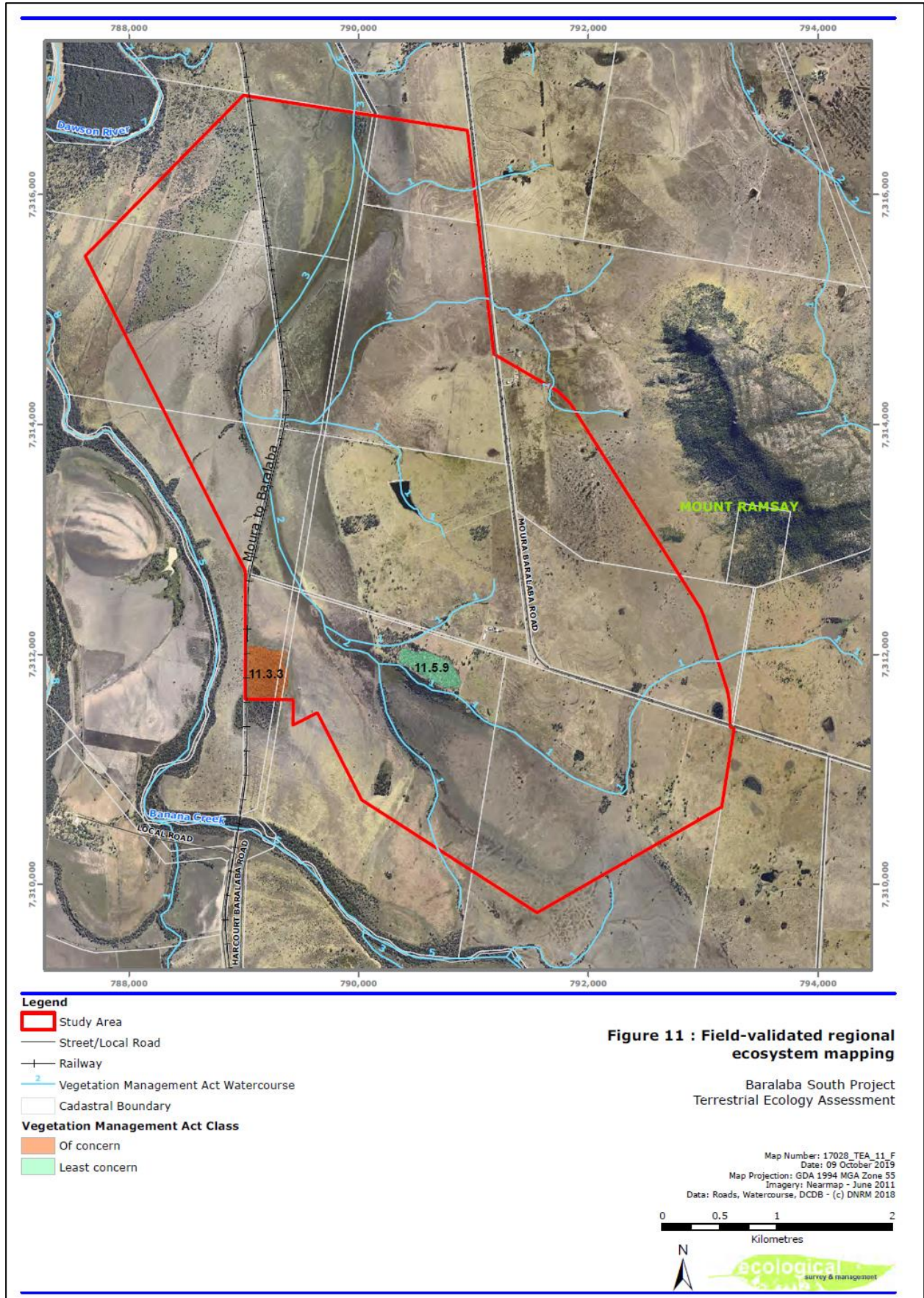
Whilst, another community described as coolibah woodlands (RE 11.3.3), slightly smaller in size is situated on the floodplain between the 1<sup>st</sup> and 2<sup>nd</sup> order drainage lines within the south-western portion of the study area and Dawson River to the west. This community is currently mapped as high-value regrowth vegetation on the Queensland Government's vegetation mapping. However, data collected in the field indicates this patch has the height and cover requirements to be mapped as remnant vegetation. The major disturbance to this community has been historical clearing.





**Figure 12 Queensland Government Regional Ecosystem Mapping**





**Figure 13**

**Field-validated Regional Ecosystem Mapping**

## 5.7.2 Threatened Ecological Communities

Four threatened ecological communities (TECs) were identified by the desktop assessment as potentially occurring within the study area (Table 11). Field-validated vegetation mapping identified two of the four preliminary TECs communities consistent the desktop assessment under the EPBC Act. The spatial extent and distribution of the field validated TECs is illustrated in Figure 14.

**Table 11 Field-validated TECs**

TEC	Short Description	Associated REs	EPBC Act Status	Field Validated Mapped Area (ha)
Brigalow	<i>Acacia harpophylla</i> dominant and co-dominant	11.3.1	E	1.2
Coolibah – Black Box Woodlands	Coolibah - Black box woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	11.3.3		49.7
Semi-Evergreen Vine Thickets	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	-		-
Weeping Myall Woodlands	Weeping Myall Woodlands	-		-

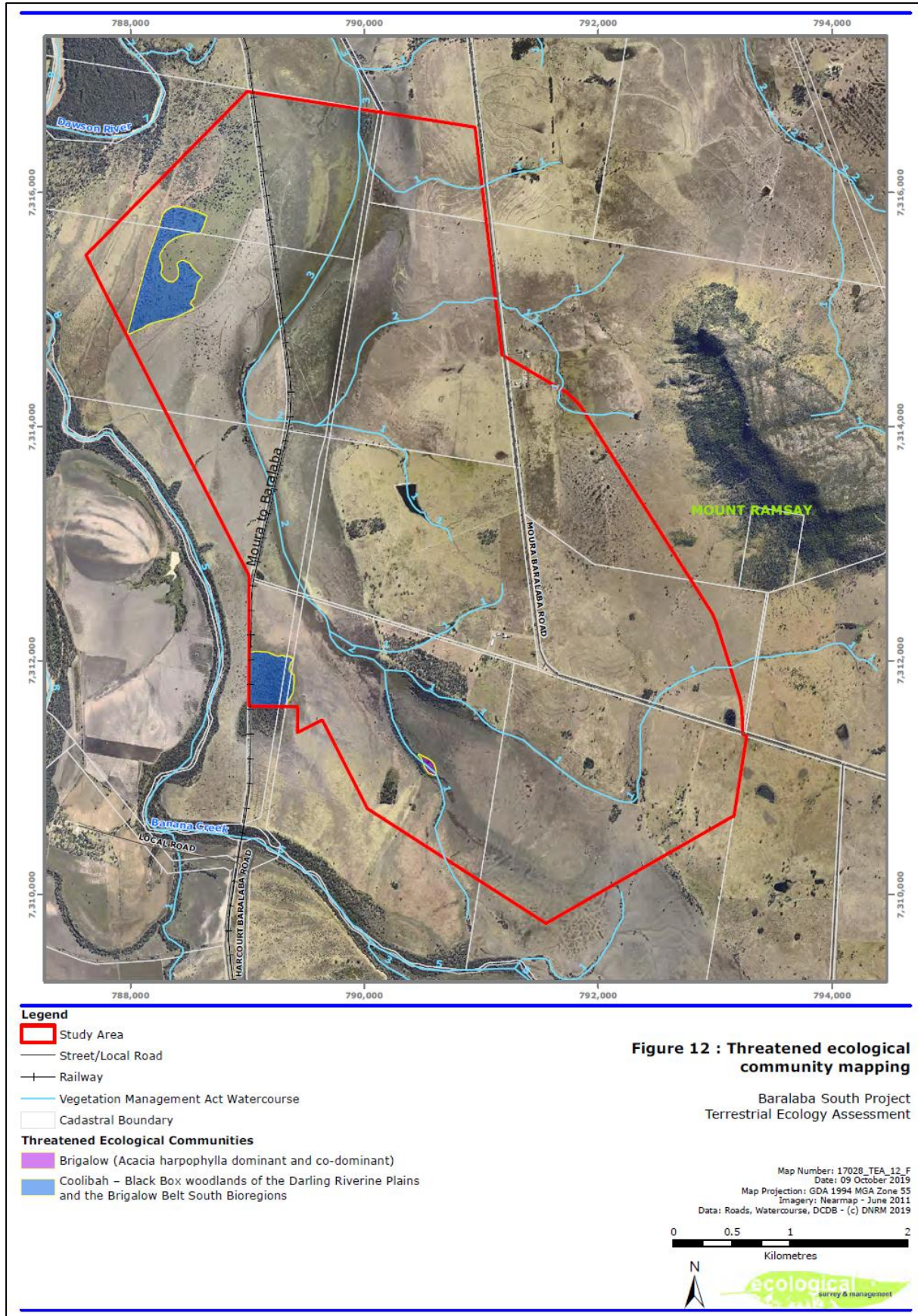
CE	= Critically Endangered	OC	= Of Concern
E	= Endangered	LC	= Least of Concern
V	= Vulnerable	NC	= Not of Concern
T	= Threatened		
NT	= Near Threatened		

A total of 1.2 ha of Brigalow TEC has been identified in the study area (Figure 14). A patch of regrowth Brigalow woodlands (comprised of the floristic and structural elements of RE 11.3.1) was mapped associated with the drainage line in the south-western portion of the study area. While this vegetation does not have the height and patch size to be mapped as remnant vegetation under Queensland’s VM Act, this RE type is recognised as forming part of the Brigalow TEC (TSSC 2013a). Evaluation of key diagnostic criteria and condition threshold concludes, the cover of exotic perennial plants was less than 50% and therefore, this patch satisfies the RE type, area and condition criteria for the Brigalow TEC.

A total of 49.7 ha of Coolibah - Black Box Woodlands TEC has been mapped within two patches of woodland vegetation (i.e. RE 11.3.3) located in the north-western and south-western portions of the study area (Figure 14). The south-western patch of this TEC has been cleared in the past but currently supports a relatively consistent cover (32-42%) of mid-mature Coolibah. The north-western patch is characterised by a canopy layer dominated only by Coolibah with a cover ranging from 8-20%. The extent of weed infiltration is relatively low for both patches, but the density of infestation increases at the interface with the adjoining cleared and cultivated land.

Overall, this community meets the cover, area and condition listing criteria of the Coolibah - Black Box Woodlands TEC, although fails to have the height and cover requirements to be mapped as remnant vegetation under Queensland’s VM Act.





**Figure 14 Field Validated TECs**

### 5.7.3 Drainage, Waterways and Wetlands

#### Vegetation Management Wetlands and Watercourses

The Queensland Government Vegetation Management Supporting Map indicates that there are no vegetation management wetland areas within the study area.

All of the first, second and third order drainage features in the study area are mapped as vegetation management watercourses under the VM Act. Therefore, required clearing of mapped remnant vegetation within a defined distance of these watercourses is likely to trigger environmental offsets.

#### Referrable Wetlands

Referable Wetlands are identified and mapped by the Queensland Government as wetlands requiring specific protection under the EP Act. A search of the referable wetlands map shows there is a wetland protection area (WPAs) mapped within the study area. This wetland is also identified as being of high ecological significance (HES).

There are two wetlands of general ecological significance (GES) identified within the study area. GES wetlands are mapped for the purpose of establishing environmental values and are not protected wetlands.

#### Groundwater Dependent Ecosystems

The potential for GDEs to be present within the study area was evaluated, with the review consisting of:

- A search of the Queensland Springs Database; and
- A search of the Bureau of Meteorology's (BoM) GDE Atlas.

A search of the Queensland Springs Database indicated that no spring wetlands are located within the study area. The BoM GDE mapping identifies relatively small, disjunct areas of GDEs potentially reliant on surface expression of groundwater (rivers, springs and wetlands) within the study area. The polygon of Queensland Government mapped remnant endangered vegetation is identified as a GDE reliant on subsurface groundwater, but with a low potential for interaction.

### 5.7.4 Essential Habitat

Remnant and regrowth vegetation located centrally within the study area is mapped as essential habitat for *Bertya pedicellata*. This essential habitat is reportedly based on a record for this species.

There is no essential habitat mapped within the study area for fauna (Ecological Survey and Management, 2019). However, mapped remnant and regrowth vegetation associated with the adjacent Dawson River and Banana Creek is identified as essential habitat for the Ornamental Snake (*Denisonia maculata*). This species is listed as vulnerable under both the EPBC Act and NC Act.

### 5.7.5 Threatened Species

No threatened flora or fauna species have been recorded on the Project site, despite targeted surveys.



### 5.7.6 Aquatic Flora and Fauna

An assessment of aquatic flora and fauna values within the Project area, and potential impacts to these values, will be undertaken as part of the EIS.

### 5.7.7 Potential Impacts to Flora and Fauna

Open cut mining activities and infrastructure development associated with the Project has the potential to directly disturb terrestrial and aquatic vegetation and fauna habitat. Mining activities also have the potential to introduce weeds and feral animals to the Project area.

The following potential impacts may occur as a result of the BSP:

- Direct impacts from vegetation clearing and earthworks required as part of site clearance and construction, and mining operations; and
- Indirect impacts such as the effects to groundwater, of noise and vibration, vehicle strike, lighting, dust, erosion and sedimentation, and the introduction or spread of invasive species.

In areas where impacts to vegetation communities and flora and fauna habitat cannot be avoided, control measures will be implemented to minimise these impacts as far as practical. These measures are discussed in further detail in the EIS.

The terrestrial and aquatic ecological assessments being prepared for the Project EIS are being developed in consideration of the Queensland Environmental Offsets Policy and the Commonwealth EPBC Act Environmental Offsets Policy.

### 5.7.8 Proposed Mitigation and Management of Flora and Fauna

A number of controls are proposed in order to minimise impacts on habitat and areas of vegetation to be retained. These controls include:

- Clearing would be undertaken sequentially and in accordance with the 'Permit to Disturb' process, whereby any and all disturbance that involves individual trees (dead or alive), vegetation and soil disturbance requires approval from the site's Environmental Officer. This would confirm the area of vegetation and habitat to be cleared is that which is required for the safe construction and operation of the project and delineating the approved clearing area on the ground.
- Particular care would be taken in relation to any work in or adjacent to drainage features, particularly in high flow or prolonged rainfall periods. Any necessary sediment control works would be implemented, particularly if remnant pools are located adjacent to construction activities. Any necessary rehabilitation of drainage features and watercourses would be undertaken using native flora species. A pre-clearing inspection would be undertaken ahead of construction of powerlines, roads or other linear infrastructure across drainage features and watercourses to determine if individual trees can be retained during construction works.
- Minimising impacts to animal breeding places, whereby a species management plan would be developed and implemented for all vegetation clearing and earthworks during construction and mining operations. This plan will outline the requirements for pre-clearance inspections and spotter/catcher activities during clearance works to detect and safely protect or remove animals and animal breeding places.

- A receiving environment monitoring program will be implemented to monitor ecosystem health in the receiving waterways. The program will include the high ecological significance wetland.

Impact assessment and mitigation and management strategies will be addressed in detail in the Flora and Fauna and Offsets Chapters of the EIS. This will include aquatic ecology values.

## 5.8 CULTURAL HERITAGE (INDIGENOUS AND NON-INDIGENOUS)

### 5.8.1 Native Title / Indigenous Cultural Heritage

The BSP is located within the Gaangalu Nation (QC2012/009) Native Title Determination Application Area registered with the National Native Title Tribunal (Figure 15). Under sections 15 and 23C of the *Native Title Act 1993*, Native Title has been extinguished over all lots within the BSP operational land due to freehold grants.

The Proponent has entered into a Cultural Heritage Investigation and Management Agreement (CHIMA) with the former registered native title claimants for the Project area, the Gangalu People (QUD6144/98). The CHIMA was approved as a Cultural Heritage Management Plan (CHMP) pursuant to Section 107 of the ACH Act by the Department of Aboriginal and Torres Strait Islander and Multicultural Affairs on 16 October 2012, and will secure compliance with the cultural heritage duty of care under the ACH Act in relation to Project activities.

Under the CHMP, before the Proponent conducts any disturbance works, it will notify the Gangalu People and, where relevant, conduct a cultural heritage assessment, which allows for an assessment of the Aboriginal cultural heritage values within the proposed area of disturbance, and for the development of appropriate management strategies.

The Proponent will liaise with the Gangalu People to arrange for the nomination of a technical adviser, who will assist in the conduct of cultural heritage assessments.

Mitigation and management strategies may include the following:

- Record, assess, manage, mitigate and/or conserve or preserve any significant Indigenous cultural heritage;
- Report findings of any item with the potential to be Aboriginal remains in accordance with Section 20 of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* and Queensland Government guidelines for the discovery, handling and management of human remains;
- Promote an understanding of Indigenous cultural heritage values and legal obligations within the Project workplace through the inclusion of Indigenous cultural heritage awareness information in employee/contractor induction programs; and
- In the circumstance that items of cultural heritage value are discovered, operations would cease, and management strategies agreed upon in the CHMP will be enforced.

Further detail regarding Indigenous Cultural Heritage will be addressed in the Cultural Heritage Chapter of the EIS.

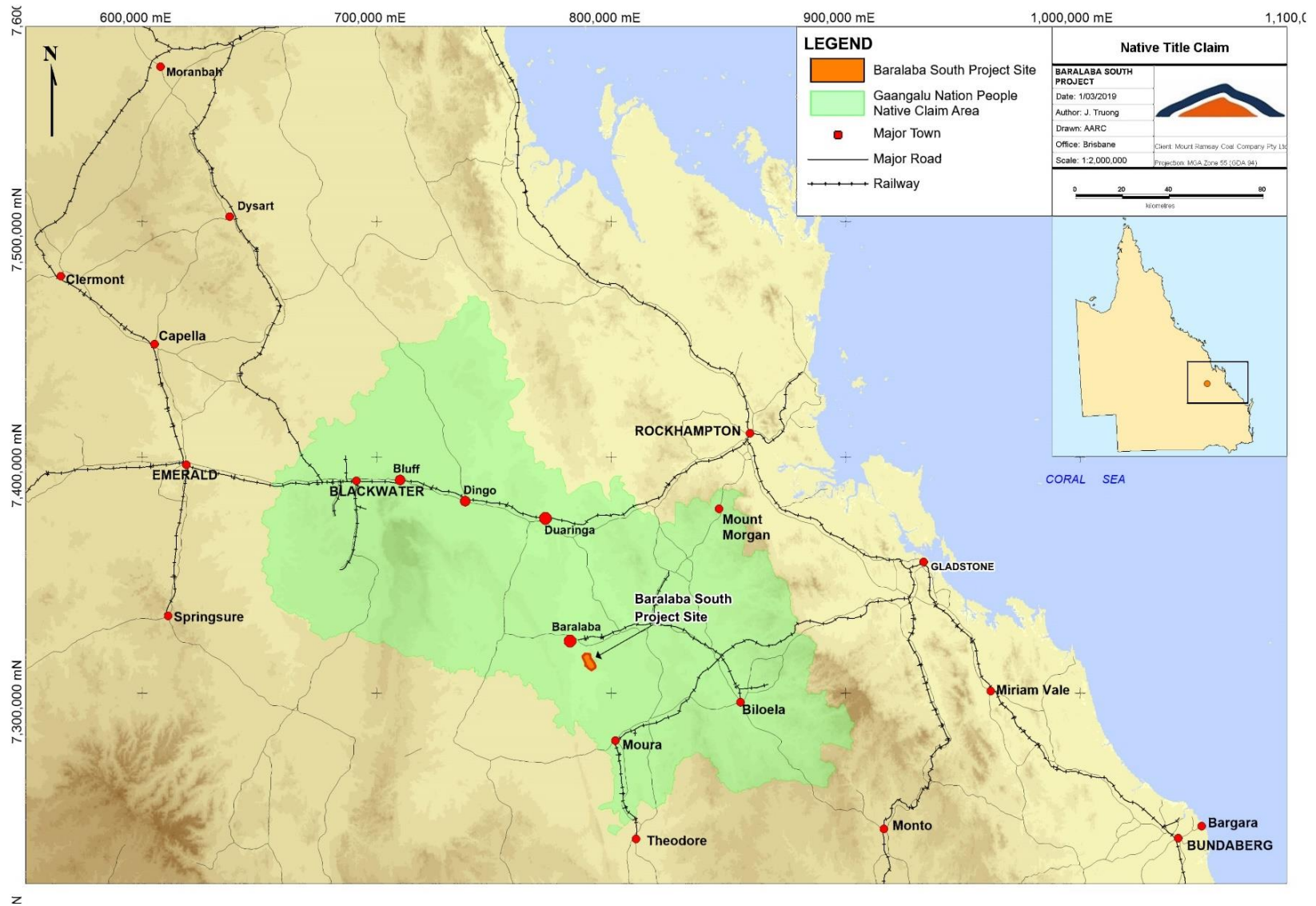


Figure 15 Native Title Claim

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