BARALABA SOUTH

Baralaba South Project

Environmental Impact Statement

CHAPTER 10

Land and Visual Amenity

arc ENVIRONMENTAL SOLUTIONS

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10 Land and Visual Amenity

This chapter details the existing characteristics of the Project site, the local and regional landscape setting, and aspects relevant to the visual amenity of the Project site. It also contains a discussion of the potential impacts of the proposed use of the land, and the mitigation measures that may be required to prevent or mitigate any adverse impacts.

To support this, a Soils and Land Assessment was undertaken by Environmental Earth Sciences (EES) and is provided at Appendix K.

Land

10.1 Environmental objectives and performance outcomes

This chapter has been prepared to assist the DES in carrying out the environmental objective assessment in respect of the following environmental objectives prescribed in Schedule 8, Part 3, Division 1 Operational Assessment and Division 2 Land use assessment, of the EP Regulation (collectively, the land use environmental objectives):

- the activity is operated in a way that protects the environmental values of land including soil, subsoils, landforms and associated flora and fauna;
- the choice of site of the Project site minimises serious environmental harm on areas of high conservation value and special significance and sensitive land uses at adjacent places;
- the choice of location for the activities proposed to be carried out at the Project site protects all environmental values relevant to adjacent sensitive land uses; and
- the design of the facility permits the operation of the Project site in accordance with best practice environmental management.

The detailed assessment presented in this chapter and detailed in the Soils and Land Assessment (Appendix K) demonstrate that the Project will achieve a performance outcome for each land use environmental objective, as outlined in Schedule 8 of the EP Regulation.

Specifically, the Project will achieve item 2 of the performance outcomes for **land** as listed in Schedule 8, Part 3, Division 1 of the EP Regulation as follows:

a) the activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of land;

b) the areas disturbed by the Project's activities will be rehabilitated or restored to ensure that the sites:

   i) are safe and stable; and

   ii) do not cause environmental harm; and

   iii) are capable of sustaining an appropriate land use after rehabilitation or restoration.

c) the Project's activities will be managed to prevent or minimise adverse effects on the environmental values of land use to unplanned releases or discharges, including spills and leaks of contaminants; and

d) the application of water or waste to the land, during the life of the Project, will be sustainable and managed to prevent or minimise adverse effects on the composition or structure of soils and subsoils.

Further, the Project will achieve:

1) item 1 of the performance outcomes for land use, in relation to **site suitability**, as follows:
    a) areas of high conservation value and special significance likely to be affected by the proposal are identified and evaluated and any adverse effects on the areas are minimised, including any edge effects on the areas; and
    b) the activity does not have an adverse effect beyond the site.
2) item 2 of the performance outcomes for land use, in relation to **location on-site**, as follows:
    a) the activity, and components of the activity, are carried out on the site in a way that prevents or minimises adverse effects on the use of surrounding land and allows for effective management of the environmental impacts of the activity; and
    b) areas used for storing environmentally hazardous materials in bulk are located taking into consideration the likelihood of flooding.
3) item 2 of the performance outcomes for land use, in relation to **critical design requirements**, as follows:
    a) all storage provided for hazardous contaminants will include secondary containment to prevent or minimise releases to the environment from spillage or leaks; and
    b) regulated structures comply with the document called 'Manual for assessing consequence categories and hydraulic performance of structures', published by DES (2016);
    c) containers are provided for the storage of hazardous contaminants that are secured to prevent the removal of the containers from the site by a flood event;
    d) the facility is designed to prevent or minimise the production of hazardous contaminants and waste; and
    e) in the event that the production of hazardous contaminants and waste cannot be prevented or minimised (as specified under paragraph (d) above), the design of the facility is able to contain and treat the hazardous contaminants, rather than releasing them.

10.2 Local planning context

The Project is located approximately 8 km south of the township of Baralaba and 115 km west of Rockhampton in the lower Bowen Basin region of central Queensland (shown on Figure 2.3 in Chapter 2, Project Description). The Project area is zoned as rural land use under the Banana Shire Council Planning Scheme (2021), which allows for mining where the specific outcomes, including environmental considerations, amenity and separation distances, can be met. The Banana Shire Council Planning Scheme's Mining Resources Overlay is also relevant in assessing mining developments and has the outcomes of protecting mineral resources of major economic significance and compatibility with nearby uses and works.

The Project is also located within the area covered by the 'Central Queensland Regional Plan' (DSDIP, 2013) which is intended to assist in resolving competing state interests on a regional scale by providing regional policy aimed at achieving specific regional outcomes. The plan also discusses other state interests relevant to land use planning in the region, including:

- housing and liveable communities;
- economic growth;
- environment and heritage; and
- hazards and safety.

Specifically, the plan identifies priority agricultural areas (PAAs) and priority outcomes for infrastructure. PAAs and other regional interests are discussed in section 10.3.8.

10.3 Description of existing values

10.3.1. Current local land use

The Project is located over eight freehold properties (Figure 2.11 in Chapter 2, Project Description), three local road reserves and four state perpetual leases.

Current local land use is predominately rural though several other coal mining operations exist in the region. Uses of the land underlying the Project area include:

- cattle grazing;
- stud farming;
- dryland and irrigated cropping; and
- improved pastures for grazing.

Crops are predominantly forage crops with cotton and wheat produced on an opportunistic basis. Irrigation has also been established in the area to the west of the tenement.

Prime agricultural land in the region surrounding the Project area is predominantly located on the floodplain of the Dawson River. These areas are used for irrigated cropping supported purchased water supply or cropping reliant on natural rainfall, along with beef cattle grazing on improved pastures. The Dawson River and its tributaries, and the area to the west of the river is mapped as PAA under the RPI Act (see also section 10.3.8). Away from the floodplain, cattle are grazed on native or improved dryland pastures.

Infrastructure in the local area consists of stock fencing, unsealed access tracks, local council roads and stock watering dams. Three private landholder bores / paired bores exist within 5 km of the Project. There is also a sealed local council road in the vicinity of the Project area, which is the Moura-Baralaba Road. This road is currently used for road travel between the towns of Moura and Baralaba, as well as for coal haulage from the Baralaba North Mine. The Benleith Water Scheme supplies water from the Neville-Hewitt Weir on the Dawson River to 23 rural properties for outdoor use—typically stock watering. The scheme's infrastructure consists of a pump station on the bank of the river, 2 x 136 kL (30,000 gallon) storage tanks situated on Mount Ramsay, 1 x 91 kL (20,000 gallon) storage tank on Red Hill, 30–40 km of underground pipework and 25–35 metered offtakes.

Further detail on the current local land uses is contained in section 2.2 of Chapter 2, Project Description.

10.3.2. Local topography and landforms

Two distinct topographical profiles are present in the immediate surrounds:

- the lower Dawson River floodplain to the west of the Project site; and
- the higher and prominent landform of Mount Ramsay to the east of the site.

Ground elevations across the site range between 75 mAHD and 110 mAHD, with the Project area best described as predominantly flat with only slight undulations. At 430 mAHD, Mount Ramsay, located approximately 1.2 km to the east of the ML 700057 (MLA) boundary, is a key topographical feature in the region (Figure 10.1).

The Project is located on the eastern floodplain of the Dawson River near the confluence of Banana Creek and the Dawson River, and near the Dawson River channel (Figure 10.1). The Dawson River, at its closest point, flows approximately 2 km to the west of the nearest Project mining activities; and forms a part of six major river catchments within the Fitzroy drainage basin that flow into the Coral Sea. The Dawson River flows north to north-west through a flat, alluvial floodplain before taking an easterly course towards the Baralaba township, joining the Mackenzie River just north of Duaringa.

The Dawson River has a lower floodplain extending approximately 1.5-3 km either side of a 150 m wide main river channel. An anabranch of the Dawson River, informally referred to as Shirley's Gully, lies to the north of the Project, re-joining the main channel 5 km downstream of the Neville-Hewitt Weir.

Banana Creek is a fifth order tributary which confluences with the Dawson River approximately 1 km to the west of the MLA. The MLA boundary closely follows the Banana Creek channel, remaining within 2 km of the channel over the length of the western boundary.

A Flood Impact Assessment undertaken by Engeny Water Management (Appendix C) summarises the baseline flooding behaviour as:

- Flood flows begin to break out of the Dawson River and Banana Creek channel in events greater than the 10% AEP flood event and flow across the eastern floodplain at the Baralaba South Project site. The Project MLA is partially inundated in the 2% AEP flood event but is not inundated in the 10% AEP flood event.
- The Dawson River floodplain has a flow width of approximately 5.5 km in flood events greater than the 10% AEP adjacent to the Project.
- Downstream of the Project there is a large anabranch of the Dawson River that travels towards the west between the Baralaba North and Central mines. There are levees surrounding the Baralaba Central and Baralaba North operations that provide pit flood protection up to the 0.1% AEP flood event.

A number of unnamed minor waterways (mapped as first and second stream orders) are present and flow through the Project area, as tributaries of one unnamed (third stream order). These are mapped as drainage features under the *Water Act 2000*. The unnamed waterways catchments extend from Mount Ramsay to the east and to the Dawson River to the west.

The local topography, landforms and waterways of the Project locality are shown in Figure 10.1.

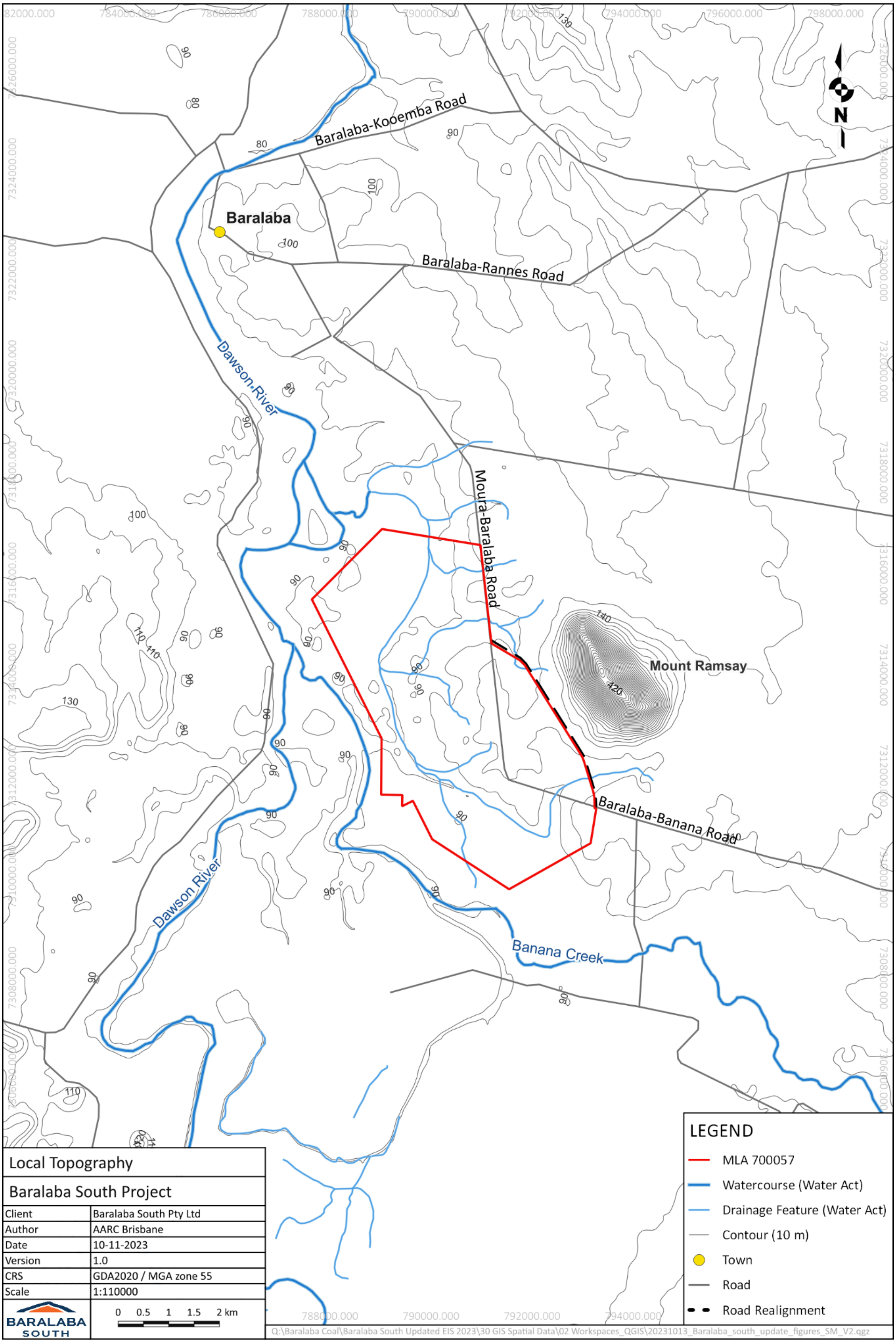

Figure 10.1: Topography of the study area

10.3.3. Geology

As discussed in Chapter 2, Project Description, the Project lies within the Permo–Triassic aged Bowen Basin. In the southern part of the Bowen Basin, the two significant basin structures are the Comet Ridge anticline in the west and the Mimosa Syncline in the east which formed during the early Permian extensional tectonic phase of the basin. The Project is situated in a structurally complex zone on the eastern limb of the Mimosa Syncline. The Bowen Basin is divided into broad morphotectonic zones, which represent areas of maximum sediment accumulation and adjacent shelf areas. Subdivision of these areas is broadly north-northwest to south southeast in the northern part of the basin and, typically, bounded by major faults.

The economic coal seams lie in the Permian Baralaba Coal Measures and correlate to the Rangal Coal Measures of the Blackwater Group, which are overlain by the Rewan Formation.

The Baralaba Coal Measures are almost entirely overlain by Quaternary sediments, with outcrops at the surface only observed along creeks and riverbanks. Surface geology of the Project includes Quaternary alluvium (Qa-Qld) and (Qr-Qld) dominated by volcanic and metamorphic rock comprised of clay, silt, sand, gravel and soil (Figure 10.2).

Immediately underlying the Baralaba Coal Measures is the Gyranda Formation (Kaloola Member). The Kaloola Member is known to contain minor coal horizons. The Kaloola Member strata are comprised of fine sandstones and siltstones, with subordinate carbonaceous shale, tuffs and banded coal having some coking and thermal properties. A detailed illustration of the regional geology is provided in Appendix K, Soils and Land Assessment.

The coal bearing section of the Baralaba Coal Measures is up to 400 m thick and contains up to 12 consistent seams. The Baralaba Coal Measures generally strike in a north-westerly direction throughout the Project deposit. The large Cretaceous trachyte intrusion to the east of the deposit, constituting Mount Ramsay, appears to have caused some increase in the structural complexity of the deposit. However, there is no evidence of igneous intrusion or alteration of the Baralaba Coal Measures related to this body.

10.3.4. Land systems

The land systems of the Project area are described by reference to the terms of the CSIRO Land Systems Series and the 'Land Management Manual for the Dawson/Callide Districts' (Shields, 1989; Gillespie *et al.*, 1991; Shields and Gillespie, 1991).

The Project is located in a region dominated by the Dawson River Valley, which is characterised by undulating to level plains and low rolling hills that are located between the main river valleys. The land systems that surround the Project area constitute the alluvial plains land resource areas, and are comprised of:

- the Coolibah land system, characterised by unstable recent alluvium of deep cracking clays and fine-textured alluvia in the more active channel zones; and
- the Juandah land system, characterised by more stable older alluvium of the anabranches and low terraces with loamier soil, often in texture-contrast forms.

Away from these alluvial plains, the landforms are dominated by the undulating plains and low rolling hills of the Mixed Brigalow Plains land resources areas. Those that occur through the Project area are:

- the Dakenba land system, comprising low colluvial/alluvial slopes and plains of older, higher, flood alluvia mixed with colluvial local sedimentary materials; and
- the Thomby land system, comprising colluvial, erosional slopes displaying both loamy, texture-contrast soils and cracking clays in localised patterns.

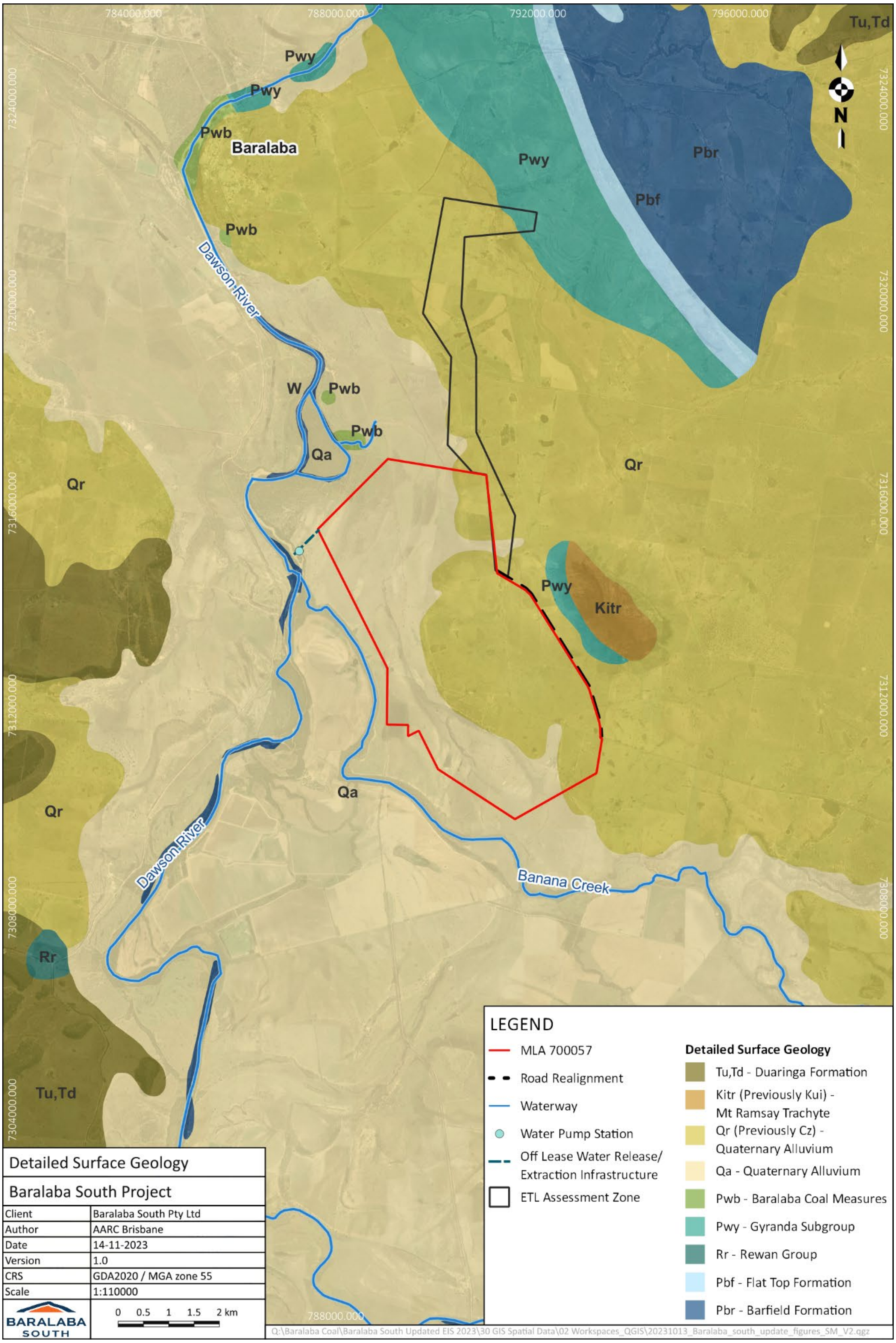

Figure 10.2: Surface geology

10.3.5. Soils characteristics

A Soils and Land Suitability Assessment for the MLA and Moura-Baralaba Road realignment disturbance areas, undertaken by EES for the Project is provided in Appendix K, Soils and Land Assessment.

Soil mapping units have been developed and characterised based on contiguous soils around which boundaries are drawn. These soil mapping units are composed of a dominant soil but may include other sub-dominant soils, often of a different soil type and Australian Soil Classification class, or they may be unspecified minor soils.

Based on 125 ground observations across the Project site, a total of seven soils on eight soil landscapes have been identified. Individual soil mapping units have been assigned a unique mapping area (UMA) code. Eighteen UMAs were identified across the Project. The spatial distribution of these soils and the corresponding UMAs are shown in Figure 10.3, with a summary of the Project soils and the soil landscape mapping units of the Project area, developed using Burgess (2010) and McClurg (2011), provided in Table 10.1.

Soil erodibility and the dispersion potential of soils were assessed for each soil profile using key soil characteristics. Soil erodibility, the susceptibility of soil to become detached and transported by erosive agents such as wind and water, is dependent on the mechanical, chemical and physical characteristics of the soil and is independent of the other factors influencing soil erosion such as topography and land use (DSITI, 2015).

A summary of the soil characteristics that contribute to soil erodibility and dispersion is as follows:

- Erodibility, represented as the factor ‘k’ represents the susceptibility of soil particles to detach and be transported by rainfall and runoff. Soils having a low k value have low erosion rates, while those with a high k value (greater than 0.4) represent soils that are highly susceptible to erosion (Roswell and Loch, 2002).
- Exchangeable sodium percentage provides a measure of soil sodicity where clays dominated by calcium ions are less likely to disperse compared to clays dominated by sodium ions.
- Ca:Mg ratio, being measure of the relative proportions of exchangeable calcium to exchangeable magnesium; and where relatively higher magnesium values tends to promote soil surface sealing, decreased infiltration and a deterioration of soil structure.
- Emerson aggregate test which determines the susceptibility of soils to surface sealing under rainfall or irrigation, that is the dispersivity of the soil and predisposition of the soil to becoming erosive under natural conditions (Appendix K, Soils and Land Suitability Assessment).
- Salinity rating which is directly correlated to the EC and percentage of soil clay contents (Appendix K, Soils and Land Suitability Assessment).

The key factors that are used to assess soil erodibility, sodicity and dispersivity for soils within the Project area and their assessed values are shown in Table 10.2.

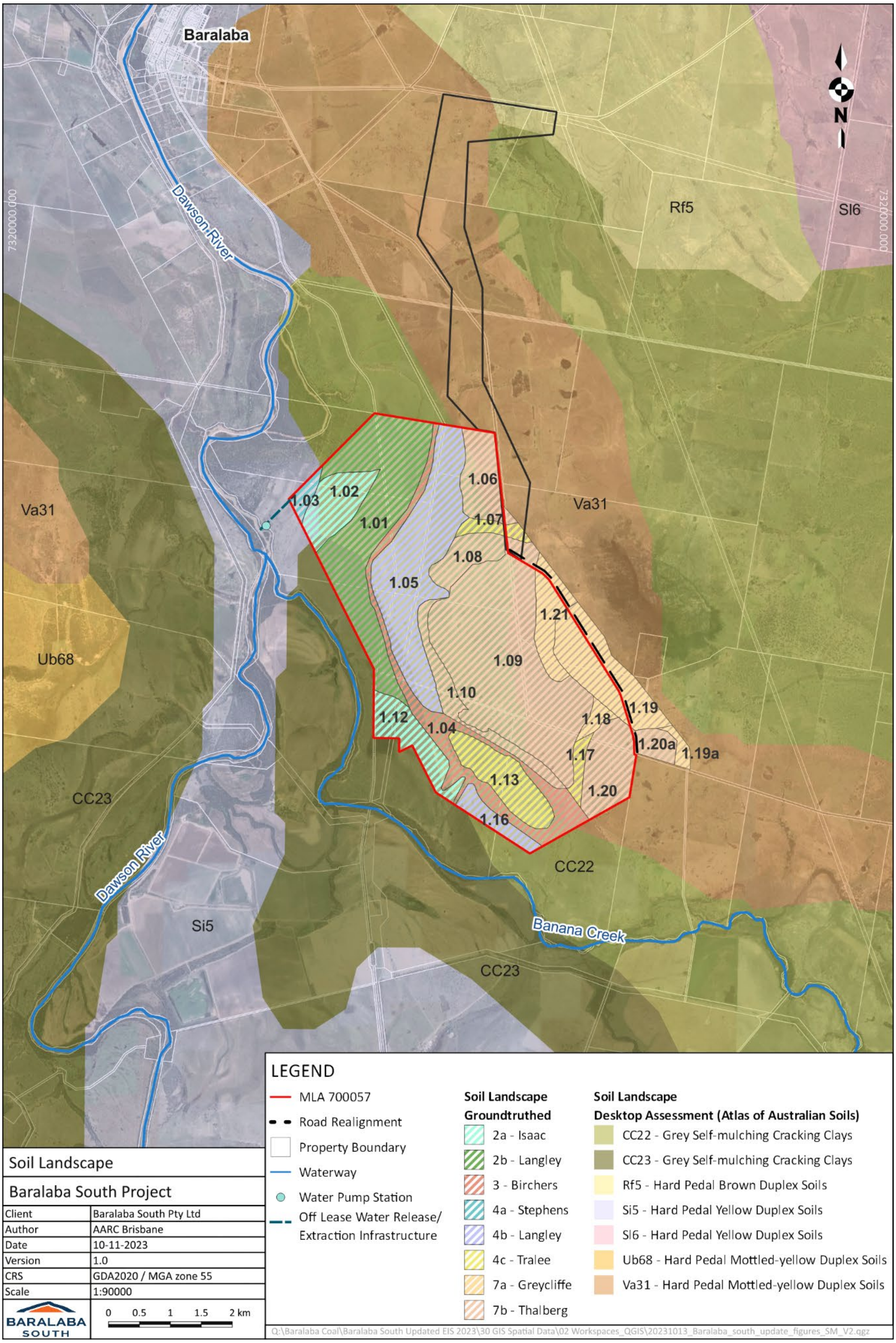

Figure 10.3 Distribution of soil management units

Table 10.1: Soil landscapes and soils of the study area

Soil landscape (SL code)	Soil landscape description	Soil name*	Dominant vegetation
Soils derived from Quaternary alluvium (Qa)			
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
Flood channels within upper floodplain—subject to both local and river inundation			
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 (Tl)	Brigalow
Soils derived from Cainozoic sediments (Cza)			
Elevated—level to gently undulating plains on unconsolidated tertiary sediments.			
7a (Cz.gp1)	Moderately self-mulching, grey to brown, cracking clay over mottled, grey saline subsoil. Includes melon hole phase.	Greycliffe (Gc)	Whipstick Brigalow
7b (Cz.gp2)	Hard-setting, moderately deep, sandy loam surface, sporadically bleached, grey to brown texture-contrast soil with prismatic or columnar structure on gently undulating rises.	Thalberg (Tb)	Dawson Gum – Brigalow, with emergent Bottle Trees, Sally Wattle. Extensively cleared.

Note: *Soil regional names have been adopted from Burgess (2003) and Muller (2008)

Table 10.2: Soil erodibility, sodicity and dispersibility

Soil name	Site	Layer (m)	K-Factor	Exchangeable sodium potential	Ca:Mg	Emerson aggregate test	Salinity rating	Comment
Bluchers	149	Topsoil (0–0.1)	0.041	5.4	4.1	3(1)	Very low	High erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.25–0.35)	0.040	12.9	2.7	3(3)	Low	Moderate erodibility, sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8–0.9)	0.042	20.0	1.1	4	Extreme	High erodibility, strongly sodic, negligible dispersibility but likely to become dispersive if salts are leached
Isaac	127	Topsoil (0–0.1)	0.044	2.6	2.3	3(3)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
		Upper subsoil (0.2–0.3)	0.048	9.1	3.1	3(4)	Very low	High erodibility, sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8–0.9)	0.045	16.6	2.7	3(3)	Moderate	High erodibility, strongly sodic, moderate dispersibility if mechanically disturbed
Greycliffe[1]	302	Topsoil (0–0.1)	0.051	3.9	3.9	3(2)	Very low	High erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.55–0.65)	0.040	5.8	2.9	2(1)	Extreme	Moderate erodibility, non-sodic, high to moderate dispersibility
Langley	132	Topsoil (0–0.1)	0.040	4.0	3.5	4	Low	High erodibility, non-sodic, negligible dispersibility
		Upper subsoil (0.2–0.3)	0.044	9.6	2.3	4	Low	High erodibility, sodic, negligible dispersibility
		Lower subsoil (0.8–0.9)	0.075	17.6	1.3	3(4)	Moderate	Very high erodibility, strongly sodic, moderate dispersibility if mechanically disturbed, likely to become dispersive if salts are leached
		Lower subsoil (0.8–0.9)	0.042	10.1	2.2	4	Moderate	High erodibility, sodic, negligible dispersibility

Soil name	Site	Layer (m)	K-Factor	Exchangeable sodium potential	Ca:Mg	Emerson aggregate test	Salinity rating	Comment
Stephens	125	Topsoil (0–0.1)	0.051	4.6	2.2	2(1)	Very low	High erodibility, non-sodic, high to moderate dispersibility
		Upper subsoil (0.25–0.35)	0.045	16.9	2.7	2(2)	Moderate	High erodibility, strongly sodic, high dispersibility
		Lower subsoil (0.8–0.9)	0.048	16.9	2.3	2(2)	High	High erodibility, strongly sodic, high dispersibility
Thalberg	146	Topsoil (0–0.1)	0.039	1.0	8.2	Not applicable	Very low	Moderate erodibility, non-sodic
		Upper subsoil (0.2–0.3)	0.036	0.6	12.3	3(3)	Very low	Moderate erodibility, non-sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8–0.9)	0.027	13.1	1.2	2(3)	Very low	Moderate erodibility, sodic, very high dispersibility
	147	Topsoil (0–0.1)	0.035	3.4	10.2	3(1)	Very low	Moderate erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.2–0.3)	0.04	4.2	4.9	3(4)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8–0.9)	0.022	9.5	1.8	2(1)	Low	Moderate erodibility, sodic, high to moderate dispersibility
	150	Topsoil (0–0.1)	0.033	1.2	47.7	3(1)	Very low	Moderate erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.55–0.65)	0.032	6.3	1.6	3(3)	Very low	Moderate erodibility, sodic, moderate dispersibility if mechanically disturbed
	158	Topsoil (0–0.1)	0.045	1.0	7.3	3(3)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
		Upper subsoil (0.55–0.65)	0.045	5.6	2.3	4	Moderate	High erodibility, non-sodic, negligible dispersibility

Soil name	Site	Layer (m)	K-Factor	Exchangeable sodium potential	Ca:Mg	Emerson aggregate test	Salinity rating	Comment
	161	Upper subsoil (0.4–0.5)	0.047	3.2	2.0	3(4)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
	167	Lower subsoil (0.7–0.8)	0.035	4.2	3.4	4	Low	Moderate erodibility, non-sodic, negligible dispersibility
	170	Topsoil (0–0.1)	0.037	1.8	3.6	Not applicable	Very low	Moderate erodibility, non-sodic
		Upper subsoil (0.55–0.65)	0.035	5.4	9.6	Not applicable	Very low	Moderate erodibility, non-sodic
	176	Upper subsoil (0.4–0.5)	0.040	3.5	1.8	3(3)	Low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
	177	Upper subsoil (0.4–0.5)	0.037	5.0	1.5	3(4)	Very low	Moderate erodibility, non-sodic, moderate dispersibility if mechanically disturbed
Tralee	148	Topsoil (0–0.1)	0.051	3.6	3.3	4	Very low	High erodibility, non-sodic, negligible dispersibility
		Upper subsoil (0.25–0.35)	0.043	23.0	2.1	2(1)	Moderate	High erodibility, strongly sodic, high to moderate dispersibility
		Lower subsoil (0.8–0.9)	0.052	21.4	1.8	3(1)	High	High erodibility, strongly sodic, slight dispersibility if mechanically disturbed, likely to become dispersive if salts are leached
	153	Upper subsoil (0.55–0.65)	0.027	21.6	1.7	2(3)	High	Moderate erodibility, strongly sodic, very high dispersibility
	162	Topsoil (0–0.1)	0.048	6.2	3.0	4	Low	High erodibility, sodic, negligible dispersibility
		Upper subsoil (0.55–0.65)	0.049	17.2	1.6	4	Extreme	High erodibility, strongly sodic, negligible dispersibility, likely to become dispersive if salts are leached

Note: [1]The soil erodibility factors for Greycliffe were assessed for a sample location outside the final disturbance area

10.3.5.1 Energy supply infrastructure corridor

Modifications to the existing energy infrastructure are planned to provide power to the Project.

The Baralaba 132/22 kV Substation is located in central Queensland, approximately 6 km east of the Baralaba township. The station forms part of the network that provides electricity supply for central Queensland and the surrounding local area. The Baralaba Substation consists of four 132 kV feeder bays, one bus coupler bay and two 132 kV bus bars.

The Ergon Energy Corporation Limited (Ergon) local network includes a 12.6 kV Electricity Transmission Line (ETL) connecting properties in the vicinity of the ML and underlying the ML, directly to the Baralaba Substation A 22 kV line also traverses the ML in the north-west, providing surrounding properties with a grid connection via Baralaba township.

Modifications to existing energy infrastructure are planned to provide power to enable development of the Project. The electricity network infrastructure upgrades and/or construction will be subject to agreement with Ergon as the owner of the infrastructure and will be subject to separate approvals, for which the necessary permitting will be undertaken by Ergon.

The proposed ETL route is to be within the ETL assessment zone (Figure 10.4). Off-tenure components of the energy infrastructure corridor were not ground-truthed during the soil survey undertaken by EES. However, a desktop assessment of the values associated with the ETL assessment zone was undertaken by AARC. Minimal impact to land values is anticipated given the overhead ETL infrastructure proposed.

The soil types within the ETL assessment zone are described by the 'Digital Atlas of Australian Soils' (Bureau of Rural Sciences, 2009) as mapping units Va31, RF5, and CC22. The ETL assessment zone predominately occurs on soil mapping unit Va31 and covers a small portion of the soil mapping unit Rf5 and CC22 (Figure 10.3). Approximately 5.6 km of the powerline network occurs along soil class Va31, while 245 m of the powerline network overlies soil class CC22. The existing substation and approximately 875 m of the powerline network occurs on soil class Rf5. According to the Atlas of Australian Soils, these soil classes are described as follows:

- Va31—Hard pedal mottled-yellow duplex soils on gentle or moderately undulating lands with some more strongly dissected marginal slopes;
- Rf5—Hard pedal brown duplex soils on moderate or occasionally strongly undulating lands with some areas of gently sloping small plains; and
- CC22—Grey self-mulching cracking clays on gently undulation plains. Dominant soils are deep clays with a moderate (1-2 ft) gilgai microrelief.

The Atlas of Australian Soils mapping units were converted to an Australian Soil Classification soil order using the conversion table published on the Australian Soil Resource Information System website (ASRIS, 2011); resulting in the following classifications:

- Va31 - Sodosol
- Rf5 – Chromosol; and
- CC22 – Vertosol.

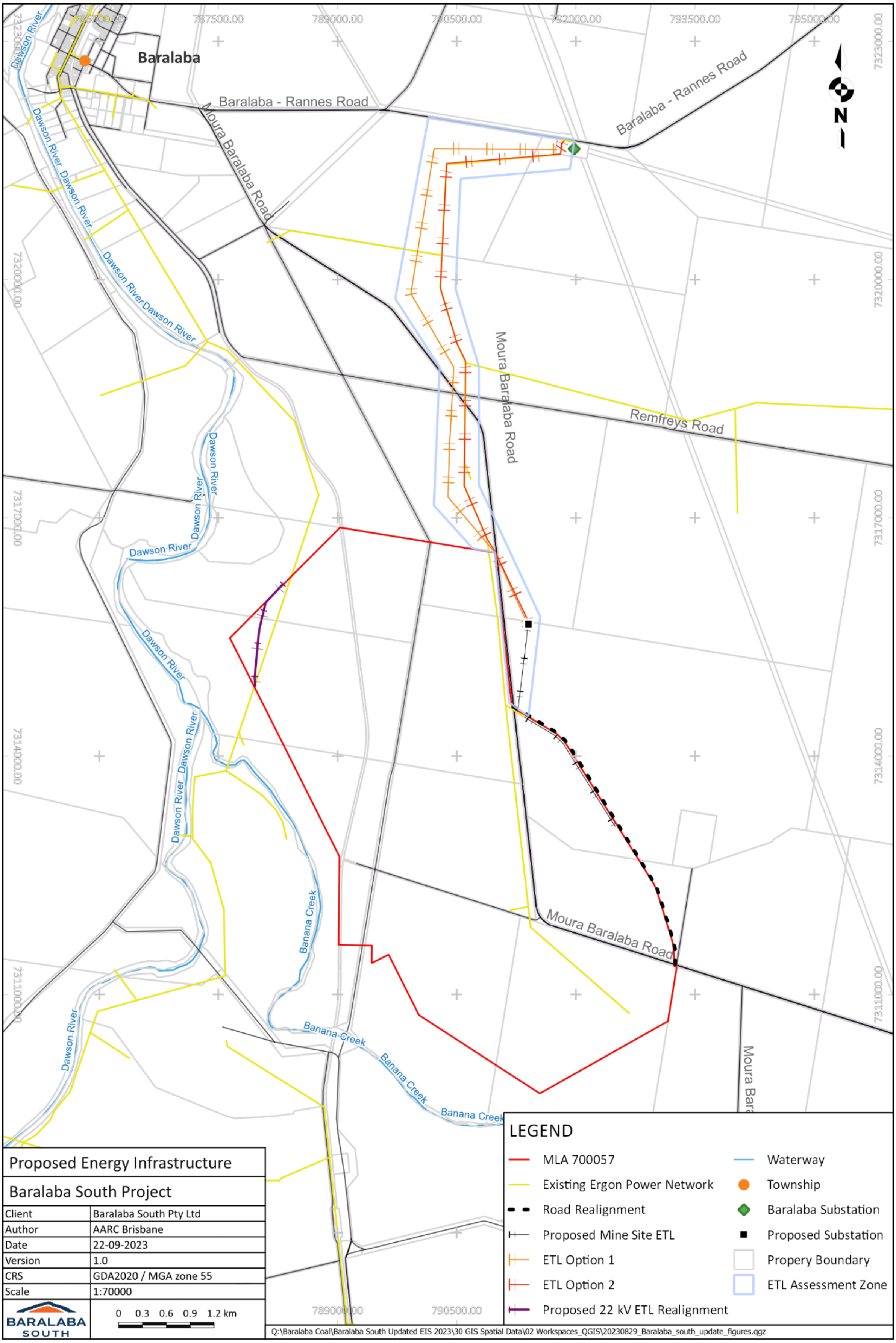

Figure 10.4 Proposed Energy Transmission Line (ETL) Corridor

10.3.5.2 Water release/extraction infrastructure

Water release and extraction infrastructure will be required to manage the Project's water demands. The water release/extraction infrastructure will be predominately located within the MLA boundary, however, approximately 600 m of the water release/extraction infrastructure will be located outside of the MLA within a 10 m easement that will also be used for maintenance and access (Figure 10.5). A high-capacity pump and pipeline will be used to release water from MWD01 directly to the Dawson River during medium and high flow conditions. The outlet pipe will extend over, and beyond the bank, of the Dawson River to minimise the risk of erosion. The location of the pipeline and release point have been located to minimise potential impacts to environmental values.

Off-lease components of the water release/extraction infrastructure easement were not ground-truthed during the soil survey undertaken by EES. A desktop assessment of the land values associated with the off-lease water release/extraction infrastructure components was undertaken by AARC. The off-lease water release/extraction infrastructure components occur on soil mapping unit Si5 - hard pedal yellow duplex soils on alluvial floodplains mostly associated with streams (Bureau of Rural Sciences, 2009). According to the Australian Land Classification soil mapping classification, Si5 is classed as Sodosol (ASRIS, 2011).

10.3.6. Land use suitability

The land use suitability assessment undertaken for the Project by EES (Appendix K, Soils and Land Assessment) considered a range of environmental factors including climate, soils, geology, geomorphology, erosion and topography. Additionally, the effects of past land use have been considered in defining the potential productivity of a tract of land.

Land suitability for various cropping purposes has been assessed in accordance with the methodology in 'Land suitability assessment techniques for the central Queensland coast area' (DNRM and DSITIA, 2013). In circumstances where the guidelines appeared to misclassify the landscape units, other relevant resources were considered including 'Land resource assessment of the Windeyers Hill area, Isaac-Connors and Mackenzie River Catchments, Central Queensland' (Burgess, 2003).

The five standard land suitability classes defined in the 'Guidelines for agricultural land evaluation in Queensland' (DSITI and DNRM 2015), and which were utilised in the land suitability assessment are:

- Class 1: suitable land with negligible limitations that is highly productive requiring only simple management practices to maintain economic production.
- Class 2: suitable land with minor limitations that either constrain production or require more than the simple management practices of class 1 land to maintain economic production.
- Class 3: suitable land with moderate limitations that either constrain production or require more than those management practices of class 2 land to maintain economic production.
- Class 4: unsuitable land with severe limitations where sustainable use of the land in the proposed manner is precluded. In some circumstances, the limitations may be surmountable with changes to knowledge, economics or technology.
- Class 5: unsuitable land with extreme limitations that preclude any possibility of successful and sustained use of the land in the proposed manner.

All land within the Project disturbance footprint was assessed to be of classes 4 or 5, as described in Table 10.3. The highest quality land for cropping was located on the floodplain of the Project area and consists of the Langley soil landscape. The suitability assessment indicates that the land has either extreme limitations that preclude it from cropping use or would require significant inputs to be considered suitable.

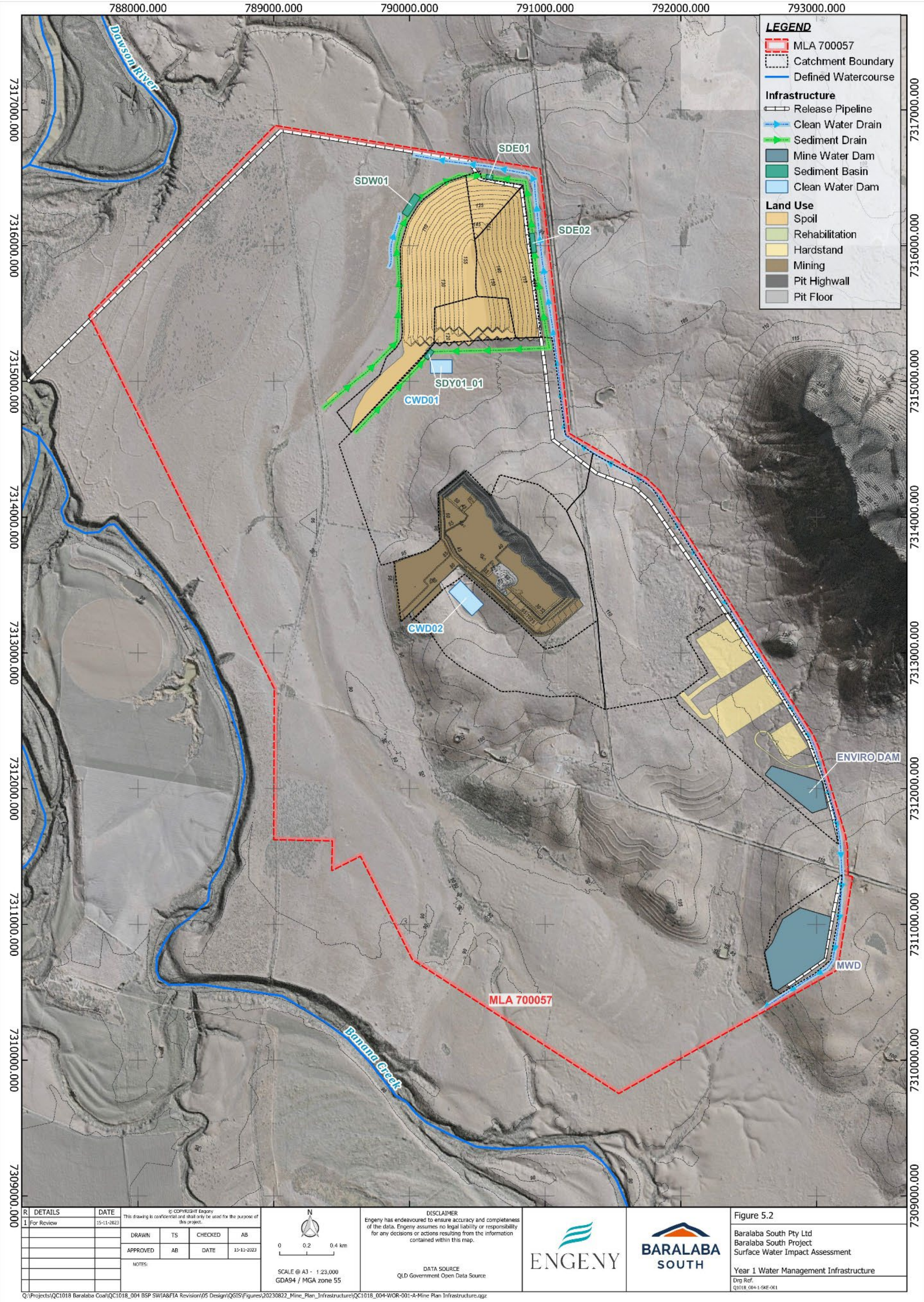

Figure 10.5: Baralaba South Project Surface water infrastructure

10.3.7. Areas of state interest

The State Planning Policy defines specific matters of state interest in land use planning and development. 'Integrating state interests in a planning scheme – guidance for local governments' (DSDILGP, 2021) nominates Important Agricultural Areas (IAAs) and the identification of Class A and Class B land to be protected for sustainable agricultural use using the Agricultural Land Classification (ALC) approach as core concepts of which local government planning schemes should be informed.

10.3.7.1 Dawson River Valley IAA

The Dawson River Valley IAA is identified as a critical mass of land which satisfies the requirements for successful and sustainable agricultural activities (DAFF, 2013a). The Dawson River IAA covers a total of 786,800 ha extending from Theodore, 110 km south of the Project study area, to Duaringa approximately 166 km north (Figure 10.6). It forms part of three key IAAs of the Central Queensland region, including Central Highlands and Callide Valley.

The Dawson River IAA covers the western and northern portions of MLA 700057; an area of approximately 1,734 ha equivalent to approximately 0.2% of the Dawson River IAA.

The Dawson River IAA also underlies parts of the off-lease infrastructure areas including the release/extraction infrastructure easement (85% or 0.5 ha), the proposed Moura-Baralaba Road realignment (50% or less than 5 ha) and approximately 73% of the ETL assessment zone, although the overhead ETL infrastructure proposed is not anticipated to impact the underlying Dawson River IAA (Figure 10.6).

The total Project disturbance including off-lease infrastructure encompasses approximately 772 ha of the Dawson River IAA; equivalent to approximately 0.1% of the total Dawson River IAA.

In the Dawson Valley, land around Moura and Theodore has been identified as key areas for petroleum, coal seam gas and mining expansion. As such, agricultural land use, particularly cropping, has been constrained by competition with resource activities (DILGP, 2017a).

10.3.7.2 Agricultural land classification

ALC is a classification system developed in Queensland to assess land suitability for specific types of agricultural production (DSITI and DNRM, 2015). ALCs are based on a simple hierarchical scheme that is applicable across Queensland and used to indicate the location and extent of agricultural land that can be used sustainably for a wide range of land uses with minimal land degradation.

ALC classes are determined based on:

- the results of the land suitability classes that are assigned to each UMA; and
- the variety of crops and/or grazing pastures for which the land is suitable.

Three classes of agricultural land and one class of non-agricultural land are defined in the 'Guidelines for agricultural land evaluation in Queensland' (DSITI and DNRM, 2015):

- Class A: crop land that is suitable for current and potential crops with limitations to production that range from none to moderate.
- Class B: limited crop land that is marginal for current and potential crops due to severe limitations but suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
- Class C: pastureland that is suitable for grazing pastures.
- Class D: non-agricultural land that is unsuitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat and/or conservation.

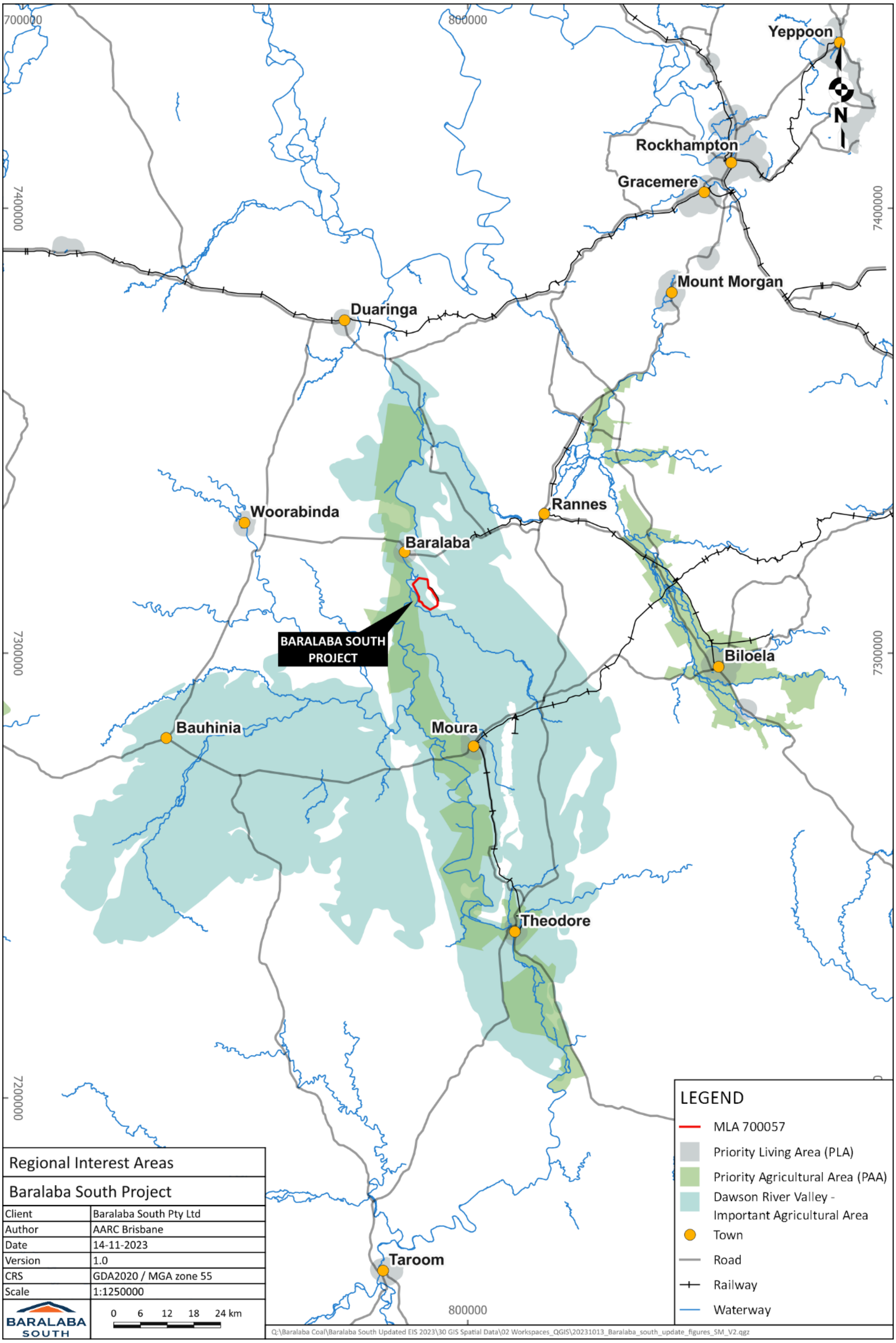

Figure 10.6: Areas of regional and state interest

Based on the ALC mapping prepared by EES within the Project disturbance footprint (Appendix K, Soils and Land Assessment) including the Moura-Baralaba Road realignment, the land has been classified as Class C pastureland.

Key land suitability constraints within the study area include the salinity and sodicity of the subsoil (the B horizon), including the effect these constraints have on plant water availability. Collectively, the common limitations to land suitability are identified as flooding, salinity, water availability and nutrient deficiency.

The pre-mining land suitability classes and respective limitations for cattle grazing and cropping are summarised in Table 10.3.

ALC desktop mapping of the Project's off-lease components was undertaken by AARC. The ETL assessment zone is mapped as Class A1 – land suitable for a wide range of broadacre crops, Class C1 – land that is the higher fertility grazing land typically used for beef cattle fattening and includes the brigalow and gidgee lands that are not suitable for cropping and Class A1/C1. Combined codes (i.e. A1/C1) are used in the absence of reliable information but local knowledge suggests a range of classes exist (DSITI and DNRM, 2015). The off-lease components of the water release/extraction infrastructure are mapped entirely as Class A1/C1.

The total Project disturbance including off-lease infrastructure encompasses approximately 1,279 ha of agricultural land.

The key factors that are used to assess soil erodibility and dispersivity for soils within the Project area and their assessed values are shown in Table 10.3.

Table 10.3: Summary of suitability classes of SMUs

Soil Landscape	Soil	Limiting factor/s	Suitability class	Agricultural land class (ALC)
2a (Qa.lf1)	Is	Soil water availability, wetness	5	C
2b (Qa.lf2)	Lg	Soil water availability, wetness	4	C
3 (Qa.td1)	Bc	Soil water availability, water erosion	5	C
4a (Qa.uf1)	St	Soil water availability, water erosion	5	C
4b (Qa.uf2)	Lg	Soil water availability, surface condition	4	C
7a (Cz.gp1)	Gc	Soil water availability, surface condition, wetness	5	C
7b (Cz.gp2)	Tb	Soil water availability, water erosion	5	C

10.3.8. Areas of regional interest

The RPI Act regulates the impact of resource activities on areas of regional interest, which contribute or are likely to contribute to Queensland's economic, social and environmental prosperity. Areas of regional interest that are specific to the Project area include PAAs, Strategic Cropping Land (SCL), Strategic Environmental Areas (SEAs) strategic environmental areas and Priority Living Areas (PLAs).

10.3.8.1 Priority agricultural areas

PAAs are areas identified in a regional plan as being regionally significant for agricultural production. Identifying PAAs helps ensure that resource activities operated in these areas will not unreasonably constrain, restrict or prevent ongoing agricultural operations.

No PAAs were located within the MLA, Moura-Baralaba Road realignment, ETL assessment zone or off-lease water release/extraction infrastructure. A large proportion of PAA is situated west of the Project over the Dawson River floodplain (Figure 10.6), where cattle are grazed on native or improved dryland pastures.

10.3.8.2 Strategic cropping land

Mapping identifies approximately 42 million ha of land across Queensland as SCL. SCL is comprised of five zones (DNRME, 2019d), with the Project located in the Western Cropping Zone. Within the Project site, 13 UMAs were identified as being overlain by SCL trigger mapping, as shown in Figure 10.7.

As part of the Project land suitability assessment conducted by EES, the Project area was assessed for SCL and verified in accordance with the RPI Act Statutory Guideline 'How to demonstrate that land in the strategic cropping area does not meet the criteria for strategic cropping land' (DSDILGP, 2019).

The verification identified six UMAs that failed to meet the criteria for SCL with respect to one or all of slope, rockiness, drainage, salinity and soil water storage. The remaining seven UMAs met the criteria for classification as SCL, resulting in a total of 556 ha being verified within the Project disturbance footprint as SCL. Table 10.4 provides a summary of the verification assessment which is included in full in Appendix K, Soils and Land Assessment. The relevant sections of the Land Suitability Assessment will form part of the proponent's application for Regional Interests Development Approval under the RPI Act.

Table 10.4: Summary strategic cropping land assessment

UMA	Soil	Area (ha)	SCL
1.01	Langley	342	Pass
1.02	Isaac	86	Pass
1.03	Stephans	19	Pass
1.04	Bluchers	183	Pass
1.05	Langley	311	Pass
1.06	Thalberg	85	Fail
1.07	Tralee	16	Fail
1.08	Thalberg	62	Fail
1.10	Thalberg	72	Fail
1.12	Isaac	87	Pass
1.13	Tralee	106	Pass
1.16	Langley	41	Fail
1.19	Greycliffe	94	Fail

Note: Red cells indicate soils that failed the SCL assessment
Green cells indicate soils that passed the SCL assessment

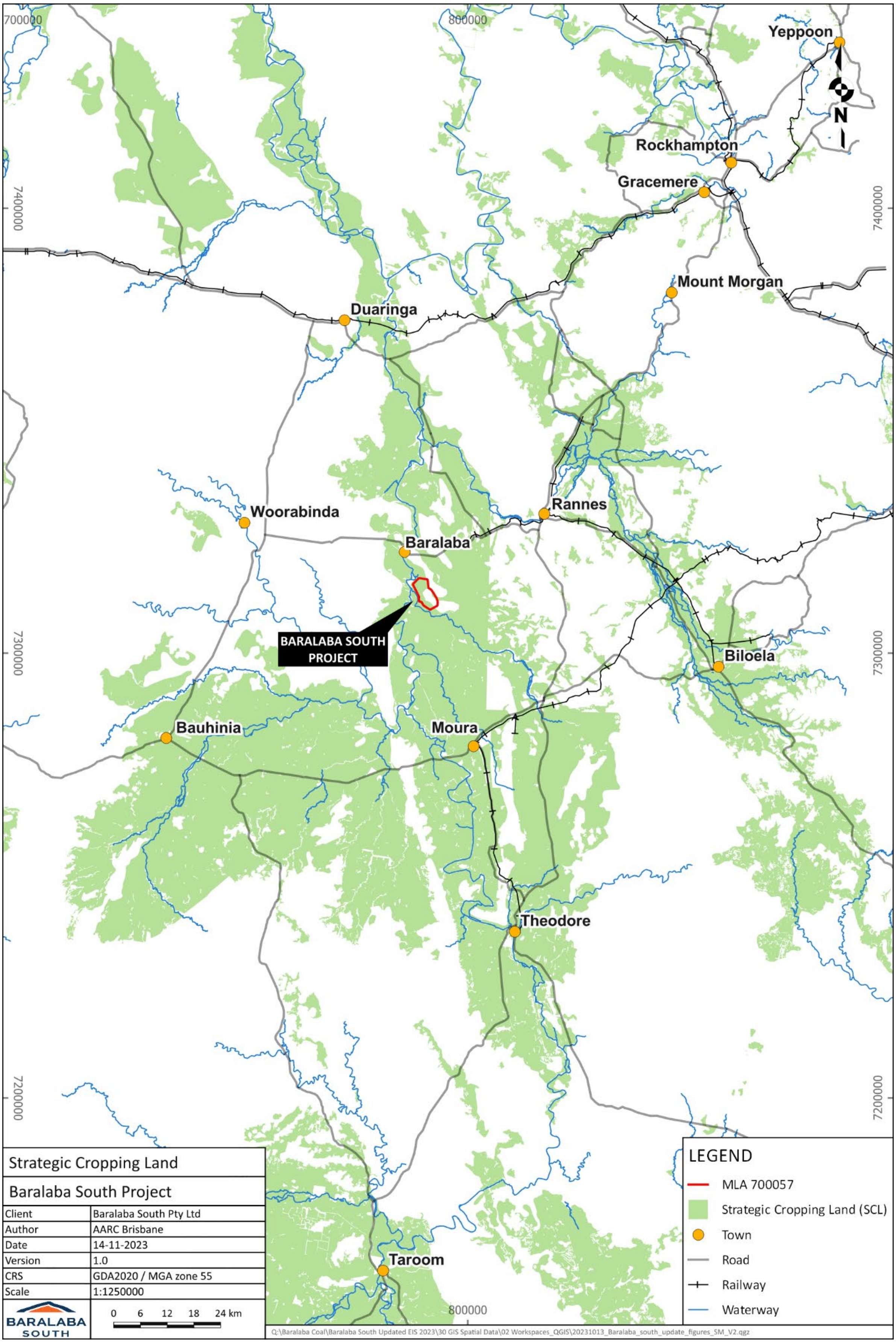

Figure 10.7: Strategic cropping land trigger mapped area

A desktop assessment of SCL mapping for the ETL assessment zone and off-lease components of the water release/extraction infrastructure was undertaken by AARC. Approximately 43% of the ETL assessment zone, 78% of the off-lease water release/extraction infrastructure easement (less than 0.5 ha) and a portion of the water pump station overlays SCL trigger mapping. Figure 10.8 indicates the extent of SCL that underlies the maximum total disturbance footprint of the Project. Surveys to validate SCL trigger mapping for these areas have not been undertaken. The proposed ETL is not anticipated to impact SCL and, as indicated in section 10.3.5.1 will be subject to a separate permitting process.

10.3.8.3 Strategic environmental areas

There are no SEAs located within the Project area. The closest SEAs are situated approximately 320 km east at Fraser Island. However, there are a series of environmentally sensitive areas located regionally, including:

- Dawson Range State Forest (approximately 14 km west);
- Mimosa Park Nature Refuge (approximately 30 km west);
- Roundstone State Forest (approximately 30 km south); and
- Overdeen State Forest (approximately 33 km east).

The Project is not anticipated to have any impact on SEAs.

10.3.8.4 Priority living areas

No PLAs were identified in the Project area, within the ETL assessment zone or associated with the off-lease components of the water release/extraction infrastructure. The closest PLA to the Project site is located approximately 4 km north of the northern boundary of the MLA, surrounding the township of Baralaba (Figure 10.6).

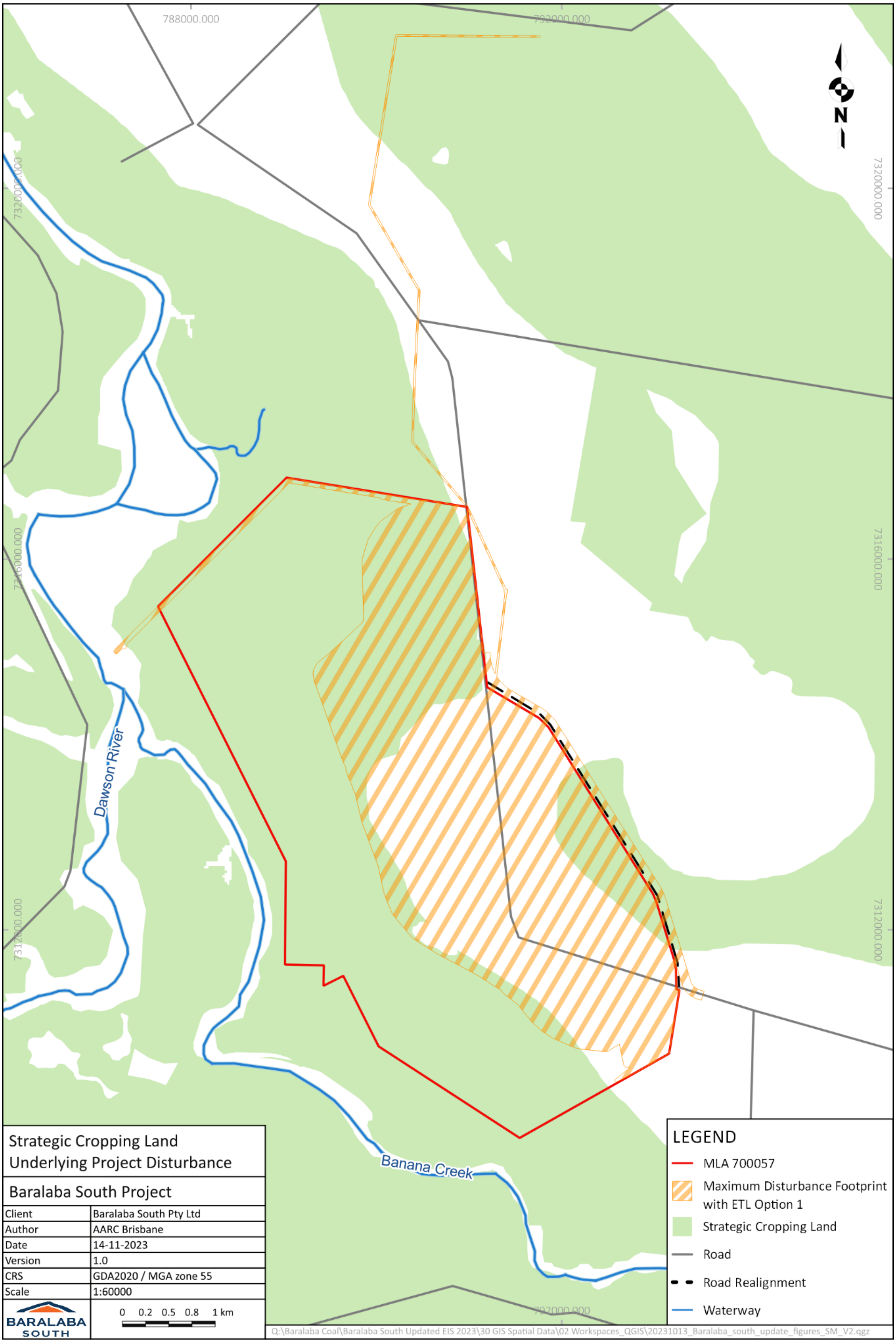

Figure 10.8: Strategic cropping land underlying the maximum Project disturbance footprint

10.3.9. Stock route network

No active stock routes intersect with the Project area, ETL assessment zone or the off-lease components of the water release/extraction infrastructure. A total of 11 stock routes (two active and nine inactive) have been identified within the surrounding region, as shown in Table 10.5. However, a review of the Banana Stock Route Mapping indicated that none of these stock routes have been identified to be primary routes.

There is also an additional inactive stock route that directly intersects with the central area of the Project (prior to heading east), parallel to Moura-Baralaba Road.

Table 10.5: Stock routes

Stock route	Jurisdiction	Description	Status
Leichhardt Highway	State	Two-lane, strategic highway provides access to the Project area. Extends from the Capricorn Highway in the north near Westwood to Goondiwindi in the south.	Active—minor
Dawson Highway	State	Two-lane highway connects Gladstone in the east to Springsure in the west.	Active—secondary
Baralaba–Rannes Road	State	Bitumen, two-lane road connects Baralaba and the surrounding district to the Leichhardt Highway.	Inactive—unused
Baralaba Kooemba Road	Council	Two-lane, sealed road extends north from Baralaba township, providing access towards BNCOP.	Inactive—unused
Baralaba Woorabinda Road	Council	Two-lane, sealed road extends east towards Woorabinda and connects to Fitzroy Development Road.	Inactive—unused
Harcourt Road	Council	Two-lane, unsealed road connects Harcourt-Baralaba Road and Moura-Baralaba Road.	Inactive—unused
Harcourt-Baralaba Road	Council	Two-lane, unsealed road connects to the north of Bindaree-Harcourt Road and to the west of Harcourt Road.	Inactive—unused
Moura-Baralaba Road	Council	Two-lane, sealed road with a less than 1.34 km section identified as a stock route where Moura-Baralaba intersects Harcourt Road.	Inactive—unused
Theodore Baralaba Road	Council	Two-lane, sealed road connects Baralaba–Rannes Road to the Dawson Highway in the south.	Inactive—unused
Wooroonah Road	Council	Two-lane, sealed road connects west into Baralaba township.	Inactive—unused
910BANA	Council	Disused rail corridor intersects study area and pivots south-east towards Banana parallel to Moura Banana Road.	Inactive—secondary

10.3.10. Native title

The Project is located within the Gaangalu Nation People Native Title Determination Application Area (QC2012/009), registered with the National Native Title Tribunal. However, under sections 15 and 23C of the *Native Title Act 1993*, native title has been extinguished over all lots within the Project operational lands as a result of various past dealings with the land which are inconsistent with the continued existence of native title, including freehold grants, perpetual leases and roads.

10.3.11. Existing resource tenements

Wonbindi Coal Pty Limited holds the underlying EPC 1047 and MDL 352. Baralaba South (a wholly owned subsidiary of Wonbindi Coal) has applied for MLA 700057 over these prerequisite tenures with the consent of Wonbindi Coal.

The Project area contains one overlapping tenure and there are several mining tenements surrounding the Project area. Exploration Permit for Minerals (EPM) 27983 (Wandoo Tenements Pty Ltd) underlies the Project MLA to the east. One resource tenement is located immediately adjacent the MLA boundary, which is ML 5656 (Anglo American's Dawson mine) to the south of the Project A comprehensive list of the surrounding mining tenements is provided in Chapter 2, Project Description.

10.3.12. Quarry resources

Queensland government mapping of state-owned quarry resources including quarry areas and quarry reserves indicates the following:

- no state-owned quarry resources have been identified within the Project MLA or off-lease infrastructure components; and
- no state-owned quarry resources have been identified within proposed offset areas.
- no state declared Key Resource Areas have been identified within the Project MLA or the associated off-lease infrastructure components.

10.3.13. Contaminated land

A preliminary site investigation for contaminated land was undertaken by EES (Appendix K, Soils and Land Assessment). The preliminary site investigation assessed the Project site by undertaking a desktop review, site inspection and a limited soil sampling program.

The desktop review involved interrogating the Environmental Management Register (EMR) and Contaminated Land Register (CLR), both of which are maintained by DES. These registers identify:

- properties that are at risk of being contaminated due to notifiable activities having been undertaken (EMR); and
- properties that have been established as contaminated through scientific investigation and where it is necessary to take action to remediate the land (CLR).

The registers do not list any of the properties underlying the Project area. However, there were four lots in the surrounding area that were listed on the EMR; three listed for livestock dip/spray race and one listed for livestock dip/spray race along with petroleum product or oil. The closest relevant notifiable activity is a cattle dip, which is in the northern part of Lot 140 Plan FN503, which directly borders the northern part of the MLA.

The former railway line was identified as a potential activity that contaminated the underlying land; however, it is not listed on either the EMR or CLR. It is possible that the railway line was decommissioned and closed prior to the establishment of the registers, as the EMR and CLR came into effect following commencement of the EP Act. Typically, rail lands are included on the EMR or CLR as the use of arsenic-based pesticides and herbicides for weed and termite control is known to have occurred. To test for contamination at the former railway line, soil samples were collected at regular intervals along the former railway line for analysis. The testing established that while there were elevated arsenic concentrations, the levels were within the prescribed guidelines and were not considered to be pose a risk to the environment or human health.

10.4 Potential impacts

Potential impacts that may result from the anticipated land disturbance during the construction and operation phases of the Project are discussed below with respect to the characteristics of land as described in the previous section. Regional cumulative impacts (reversible and irreversible) are also discussed.

10.4.1. Landforms and topography

The Project will alter the topography and landforms within the Project area. Some changes being temporary (e.g. sediment dams, bunds and drains) and others permanent (e.g. the rehabilitated WRE and the final void). The maximum area proposed to be disturbed within the MLA footprint is 1,211 ha. Disturbance associated with required supporting infrastructure located outside of the MLA are described in Chapter 2, Project Description and includes the electricity transmission line (approximately 16 ha disturbance), the access easement for the pump station and water release/extraction pipeline (less than 1 ha disturbance) and the Moura-Baralaba Road realignment (approximately 14 ha disturbance).

Throughout the operational phase of the Project, mined waste rock will be progressively placed behind the advancing open cut operation as well as being placed in a single out-of-pit WRE. At the cessation of mining, one rehabilitated out-of-pit emplacement and one final void will remain. Details relating to post-mining land uses and rehabilitation processes are provided in Chapter 3, Rehabilitation.

Achievement of the proposed post-mining land uses will ensure that impacts to land will be limited to the construction, operational and decommissioning phases of the Project. The management of consequent visual amenity impacts is discussed in section 10.8.

Mining activities during the life of the Project have the potential to increase erosion risk on disturbed land through:

- clearing of vegetation;
- topsoil stripping and stockpiling;
- construction of infrastructure;
- increased slopes; and
- a net reduction of pre-mine land suitability of the Project site.

Several topographical changes will be associated with the construction of roads, water management structures, infrastructure and erosion and sediment control features over the life of the Project. All on-lease infrastructure disturbance will be rehabilitated to a safe and stable landform unless otherwise agreed with underlying landowners and Ministerial consent is obtained under the *Mineral Resources Act 1989.*

10.4.2. Soils

The disturbance of soils and subsoils associated with a mining activity can result in impacts such as:

- erosion and downstream sedimentation;
- degradation of soil physical structure due to excavation and handling;
- loss of soil seedbank; and
- changes in soil fertility through the mixing of soils and subsoils and/or soil chemistry changes resulting from exposure to oxygen.

These impacts will be managed by developing and implementing a Topsoil Management Plan and an Erosion and Sediment Control Plan as outlined in Chapter 3, Rehabilitation.

With respect to anticipated upgrades to the energy supply network and off-lease water release/extraction infrastructure, minimal disturbance of soils is expected. Final design and development of the third-party energy infrastructure will be subject to agreement with owners and separate approval processes. Land disturbance associated with the upgrade of the Moura-Baralaba Road will be subject to a specific Erosion and Sediment Control Plan.

While some of the SMUs identified have sodic and/or dispersive subsoils, there are sufficient topsoil resources categorised as non-sodic and of moderate erodibility to support the rehabilitation of post-mining landforms, and that will be capable of sustaining the improved and native pastures proposed as the predominant PMLU. A significant majority of topsoil reclaimed will originate from the Thalberg SMU, which is characterised as a non-sodic soil with slight dispersibility when mechanically disturbed. Mitigation measures that target sodic and dispersive soils are not considered necessary but can be utilised should the need arise.

10.4.3. Land use and land use suitability

The Project's activities are likely to progressively disrupt existing agricultural activities within the area of the MLA until disturbance areas have been rehabilitated and the mine closed. There may be some potential for early re-commencement of grazing activities in undisturbed areas of the MLA and as rehabilitation areas become progressively available.

Chapter 3, Rehabilitation discusses the PMLUs considered feasible for the Project area. While much of the MLA will revert to its existing land use of improved pasture grazing, potential exists for higher value land uses to be contemplated. As a consequence of the existence of a final void, and conservatively assuming that some of the landform existing below the pre-existing natural topography may no longer be available for improved pasture grazing, there may be a net loss in the total area of improved pasture grazing land use limited to approximately 300 ha.

As identified in section 10.3.6 and Table 10.3, existing land use suitability for cropping within the Project disturbance footprint is defined as ‘class 4, agricultural land suitability (marginal land with severe limitations)’ through to ‘class 5, agricultural land suitability (unsuitable land with extreme limitations)’. The cropping land suitability ratings appear to be supported by the existing land use of grazing on improved pastures. The rehabilitated landforms proposed and available soil resources are such that there will not be any net loss in land suitability classification for those rehabilitated areas returned to an improved pasture grazing land use.

Apart from the net loss of land available for existing land uses, the various phases of the Project may impact on surrounding land uses are described in the following sections.

10.4.3.1 Potential impacts of dust on crops and pastures

The closest agricultural crops are located approximately 500 m west of the MLA boundary. The Air Quality and Greenhouse Gas Assessment (Appendix L) predicts dust deposition levels to be highest at this location during year 3 and 11, with a maximum 30-day average dust deposition level of approximately 65 mg/m^2/day (including background) at the closest edge only slightly over the adopted background level of 50 mg/m^2/day. For the year 1 scenario, the maximum 30-day average dust deposition level is predicted to be approximately 64 mg/m^2/day at the closest edge.

Dust deposited onto the surface of the crops will be washed off regularly during irrigation as well as during rainfall. The most-affected areas of dust would be at the edge where drying winds would have similar effect and where winds may dislodge dust to a greater extent. Hence, effects of dust deposition onto these irrigated crops are likely to be indiscernible.

For unirrigated crops and pastures surrounding MLA 700057, predicted dust deposition rates are equal to or only marginally above background levels. As mining activities will commence in the centre of the MLA and progress in a southerly direction, dust deposition levels at any location will vary over the BSP life. While dust may accumulate on pasture foliage during the dry season, the growth of these pastures is dominated by water availability, and during the dry periods, leaves of unirrigated pastures are most likely inactive. Hence dust deposition on to these pastures is less likely to have harmful effects on production.

With respect to grazing land uses, Andrews and Skriskandaraha (1992) found that cattle did not prefer feed free of coal dust over feed containing coal dust equivalent to deposition rates of up to 8,000 mg/m^2/day indicating that dust presence on fodder does not adversely affect foraging selection by cattle. In the instance that dust laden fodder is ingested, the New Acland Noise and Dust Project (NDP) (*Pembroke Olive Downs Pty Ltd v Sunland Cattle Co Pty Ltd & Anor* [2020] QLC 27) determined cattle grazing near an active mine where dust deposition was greater showed similar weight gain compared to animals grazing the control site.

In relation to ambient air quality impacts, in the NDP, where the concentration of PM_{10} was 29% higher at the trial site compared with the control site the difference in weight gain for the cattle on the two sites was negligible and there was no material difference between the stress level of cattle at the two sites.

10.4.3.2 Potential impacts of noise/blasting on cattle

Predicted noise levels under a worst-case scenario and under night adverse meteorological conditions are provided in Figure 12.5, Figure 12.6, Figure 12.7 and Figure 12.8 of Chapter 12, Noise and Vibration. The Project will increase noise levels above background levels in the surrounding landholdings where grazing occurs, although any increase will be below the acoustical quality objectives adopted for the Project at all identified sensitive receptors outside the Project boundary.

There are two types of acoustical impacts associated with the operations: noise from plant and equipment and high energy impulse noise (blast overpressure) generated by blasting. However, most noise associated with mining is low frequency noise outside of the audible range of hearing for cattle (*Pembroke Olive Downs Pty Ltd v Sunland Cattle Co Pty Ltd & Anor* [2020] QLC 27).

In a grazing trial on rehabilitated land cattle did not avoid grazing near an active mine indicating that noise impacts were not negatively impacting the behaviour of cattle (*Pembroke Olive Downs Pty Ltd v Sunland Cattle Co Pty Ltd & Anor* [2020] QLC 27). In the same study, weight gain for cattle on the rehabilitation site was comparable to a control site and there was no material difference between the stress level of cattle at the two sites.

The potential impacts of overpressure created by blasting were considered in a study using sonic boom as a surrogate for blast overpressure. In the study of 10,000 commercial beef cattle, 100 horses, 150 sheep and 320 lactating dairy cattle, only 19 of 104 events produced even a mild reaction (e.g. raising of heads). Reactions of the beef cattle, sheep and horses were slight, and milk production in dairy cattle was not affected in the test period (*Pembroke Olive Downs Pty Ltd v Sunland Cattle Co Pty Ltd & Anor* [2020] QLC 27). In the rehabilitation grazing trial discussed above, cattle quickly adjusted to disturbance and did not alter their grazing behaviour during blasting events.

While there will be some increase in noise audible to cattle as a result of the Project, as well as occasional instances of airblast overpressure, it is considered unlikely that a negative effect on cattle behaviour or productivity will be observed from either type of acoustical impact.

Blast exclusion zones are required to address safety hazards associated with blasting activities. An assessment of Project blast exclusion zones based on the proposed pit limit highlights only occasional exposure to neighbouring properties outside of the MLA. This exposure can be further limited by blast design and orientation where blasts are in proximity to ML boundaries. Only blasts occurring on the most southern pit limit will require a blast exclusion zone beyond the MLA boundary and/or properties not owned by the proponent. In these circumstances, arrangements will be made with the landowner to manage any short-term impacts to land use.

10.4.3.3 Potential impacts of lighting on cattle

It is unlikely artificial light from the Project will cause a significant impact to nearby grazing cattle. The Project would result in some increase to artificial lighting, potential impacts of light spill are limited and restricted to infrastructure areas around the MIA, ROM and CHPP; any light spill outside these areas will be minimal. If cattle do interact with any additional artificial light spill, there is little to no data on the impact of light from mining projects on livestock production. Notably, although the effect of artificial light sources was not addressed explicitly, a rehabilitation grazing trial of cattle grazed near an active mine did not demonstrate any negative impacts (*Pembroke Olive Downs Pty Ltd v Sunland Cattle Co Pty Ltd & Anor* [2020] QLC 27).

10.4.3.4 Potential impacts on the organic status of neighbouring properties

Project activities (e.g. blast fume generated from blasting, pesticide and/or herbicide use, or other chemical, synthetic or inorganic fertiliser use), where this results in inorganic compounds drifting to pasture or soils, could potentially impact the organic certification status for a livestock or crop, or a farming operation. Relevant organic certification schemes (e.g. USDA, Korean and Australian certification schemes) generally prohibit synthetic substances in the production of livestock or crops unless specifically allowed or only allow natural substances unless specifically prohibited (e.g. the use of strychnine under USDA certification). Any operations in the surrounding areas that have achieved or are aiming to achieve organic certification for produce under a relevant scheme need to consider the application of synthetic substances on their own or adjoining properties.

The Project may seek to use synthetic pesticides and herbicides to control pest and weeds on the Project area in accordance with biosecurity obligations. Although wind drift could potentially transport chemicals to neighbouring properties during application, the risk of this is considered unlikely as recommended application methods and rates will be utilised - controls which are intended to address issues such as unintended drift. In the event that properties neighbouring the Project are known to hold organic certification, operations with the potential to impact that property's certification status will be discussed and coordinated with the neighbouring property owner.

Blasting, in addition to the release of naturally occurring particulate matter in the form of dust, has been known to occasionally result in the formation of various gaseous products of combustion (predominantly nitrogen dioxide but possibly small amounts of nitrous oxide, nitric oxide, carbon monoxide and sulphur dioxide) which, depending on wind conditions can drift to the immediate and surrounding environment. Blast fume management at the Project will be undertaken in accordance with contemporary mining practice and DoR requirements and is not expected to impact organic certification under any relevant scheme.

10.4.3.5 Potential impacts of blast vibration on neighbouring infrastructure

Impacts to nearby infrastructure from blast-induced ground vibration and airblast overpressure are addressed in detail at Chapter 12, Noise and Vibration, including an assessment of potential impacts on the Benleith Water Scheme infrastructure; comprising two buried pipelines and two storage tanks on Mount Ramsay (refer section 10.3.1).

Potential impacts were assessed with reference to the Noise and Vibration Assessment (Appendix N), the set of safe vibration limits adopted for the Project (Richards and Moore, 2008) and the criteria in AS 2187.2.

The Benleith Water Scheme infrastructure in proximity to the Project comprises a water pipeline made of 1¼ inch (3.2 cm) polyethylene plastic located approximately 0.5 km distant from the pit and a section of asbestos cement pipeline is approximately 1 km from the proposed open cut put.

While Richards and Moore (2008) provide a general recommendation of 100 mm/s for 'buried communication cables and pipelines', they further suggest that a 'safe' level of vibration for buried pipes is 10% of the yield strength of the pipe material, as well as being dependent on the type of soil within which the pipeline is laid; with clay considered the most sensitive ground type. Given the Project conditions, a maximum peak particle velocity (PPV) of 34 mm/s is recommended for PVC pipes in clay and a maximum PPV of 35 mm/s is recommended for asbestos cement pipes in clay. For the distances to the respective pipeline types, the ground vibration levels are well below these 'safe' recommended values.

The associated water storage tanks on Mount Ramsay are also susceptible to potential impacts from airblast overpressure. The predicted airblast overpressure at distances greater than 1.5 km is 113 dB(Z). section J5.3 of AS 2187.2 indicates that damage to infrastructure, even of a cosmetic nature, does not occur at airblast levels below 133 dB(Z).

A single earthen dam exists on a neighbouring property. However, given the distance to the earthen dam, blast vibration is expected to be well within the adopted safe vibration limit of 100 mm/s (Richards and Moore, 2008) and is not expected to impact the dam.

In summary, ground vibration and airblast overpressure due to blasting have been assessed as not having an impact on nearby infrastructure including infrastructure associated with the Benleith Water Scheme.

10.4.3.6 Potential impacts from flooding

The Flood Impact Assessment undertaken by Engeny is provided at Appendix C and provides a detailed assessment of flooding impacts.

10.4.3.7 Potential impacts on surface water quality

Impacts to local surface water quality could potentially arise as a result of controlled mine water releases, or releases from sediment dams where storm events exceed the agreed design and containment standard. The design containment standard for the mine water dams has been based on water balance modelling results to minimise the discharge of contaminants to waters that may or have the potential to cause an adverse effect on identified environmental values.

Sediment dams have been designed in accordance with the International Erosion Control Association Guidelines methodology for “Type D” sediment basins, and the expected soil types. The catchments reporting to the sediment dams will be progressively rehabilitated over the Project life to reduce sediment runoff generation further improving the performance of the sediment dams.

A detailed assessment of impacts to surface water quality is provided in section 4.4 of Chapter 4, Surface Water.

In relation to seepage from groundwater, the localised hydraulic sink that will form as mining develops will minimise the potential migration of saline or poorer quality groundwater from within the open cut pit to other aquifers, (e.g. from the coal seams to surrounding alluvium or colluvium) as the groundwater level will remain in the Permian strata. Consequently, there will be negligible impacts on surface water quality in downstream waters due to interaction with groundwater.

10.4.3.8 Potential impacts on groundwater dependent assets

A detailed assessment of potential impacts from the Project on the availability of groundwater for agricultural uses and groundwater quality is provided in section 5.3 of Chapter 5, Groundwater.

The impact of the Project on groundwater drawdown in private landholder bores is predicted to be negligible, where the maximum predicted drawdown of 0.15-0.7 m at Ross Bore during the mining phase is within the natural variation previously recorded (section 5.3 Chapter 5, Groundwater).

There is not expected to be any measurable change in the quality of groundwater due to mining of any of the strata (section 5.3 Chapter 5, Groundwater). The localised hydraulic sink that will form as mining develops will minimise the potential migration of saline or poorer quality groundwater from within the open cut pit to other areas, as the groundwater level will remain in the Permian strata (e.g. from the coal seams to surrounding alluvium or colluvium). Consequently, there will be negligible impacts on surface water quality in downstream waters due to interaction with groundwater. As such, it is not expected the Project will have a significant impact on the supply of groundwater for agricultural uses.

10.4.4. State interests

Potential impacts to the Dawson River IAA will generally be equivalent to those discussed in section 10.4.3. Most of the impacts will be temporary in nature. The permanent impact, defined as net loss of area equates to less than 0.04% of the total area of the Dawson River IAA.

Land within the Project area is not classed as land suitable for cropping, as such there will be no loss of ALC Class A or Class B land. There is anticipated to be a loss of no more than 300 ha of ALC Class C land.

10.4.5. Resource utilisation

The proposed mining method, sequence and layout have been selected with consideration of both economic and environmental factors. Options for mining the Baralaba South deposit are limited by the steeply dipping multiple coal seam formation. The complex nature of the faulted, steeply dipping seams at shallow depth within the MLA are not conducive for underground mining techniques.

Open cut terrace mining has proven to be the optimal mining technique for the Baralaba South deposit. Strip mining using draglines or similar equipment is not practicable with the multiple steep dipping and faulted seams. Terrace mining from the north of the sequence and a mining rate of up to 2.5 Mtpa is considered most appropriate in the context of resource efficiency, taking into consideration Project viability, environmental impacts, impacts on stakeholders and the reinstatement of a safe and stable post-mining landform/use, as:

- The defined coal resource has relatively low stripping ratios across the entire sequence.
- There is no known economic underground coal resource that will be sterilised by the development of the open cut mine.
- The mining method minimises potential for flooding of the void during operations and post-closure.
- The mining sequence has enabled the design of a final landform that supports several beneficial post-mining land uses for the site.
- The selected mine plan also retains the ability to access coal seam gas which may be available down-dip of open cut mining or in coal seams much deeper in the sequence than the seams which will be targeted by open cut mining.
- The revised mine plan of up to 2.5 Mtpa (ROM) reduces the potential impacts on the Dawson River flood plan and associated flood impacts.

The placement of infrastructure, including the CHPP, MIA, administration buildings and workshops to the east of the mining void ensures that infrastructure is positioned well outside the economic mining footprint and will not result in sterilisation of resource.

A cost–benefit analysis, at a state level, for the Project was undertaken by AEC (Appendix Y, Economic Impact Assessment) where the potential impacts resulting from the Project were identified and compared to a 'without the Project' scenario. The cost–benefit analysis identified that the Project is economically desirable for Queensland, that is, the benefits from the Project outweigh the costs associated with the Project across the four discount rates assessed (Appendix Y, Economic Impact Assessment). The Project cost–benefit analysis is discussed further in Chapter 16, Social and Economic and in section 8.0 of Appendix Y, Economic Impact Assessment.

10.4.6. Regional interests

No PAAs are mapped within the MLA, ETL assessment zone, Moura-Baralaba Road realignment or off-lease components of the water release/extraction infrastructure. However, a PAA is situated west of the Project over the Dawson River floodplain.

The closest strategic environmental area is over 320 km away, east of Fraser Island. The Project is not anticipated to have any impact on SEAs.

The Project, including the ETL assessment zone, Moura-Baralaba Road realignment and off-lease components of the water release/extraction infrastructure, is not located within a PLA. The closest PLA is 4 km north of the MLA. The Project is not anticipated to have any impact on PLA.

The Project on-lease activities will temporarily disturb approximately 495 ha of mapped SCL. According to Queensland Government mapping, approximately 71% (approximately 0.7 ha) of the off-lease water release/extraction infrastructure and a portion of the water pump station overlays SCL trigger mapping. These areas will temporarily be disturbed during the life of the mine.

Management and mitigation measures for the Project (section 10.5) have been developed to minimise/or avoid impacts to SCL. Rehabilitation for the Project will reinstate a land use suitability similar to that existing pre-mining. Mine planning processes have minimised, where possible, disturbance to SCL whereby placement of the final void is located within land that failed the SCL assessment.

Chapter 3, Rehabilitation describes the rehabilitation objectives, activities, performance indicators and completion criteria proposed for the Project.

The proposed ETL is not anticipated to impact SCL and, as indicated in section 10.3.5.1, will be subject to a separate permitting process.

10.4.7. Stock route network

No active stock routes intersect with the area of the Project, ETL assessment zone, Moura-Baralaba Road realignment or the off-lease components of the water release/extraction infrastructure, and as such there are no impacts to active stock routes as a result of the Project.

An inactive stock route directly intersects with the central area of the Project (prior to heading east, parallel to Moura-Baralaba Road). While the use of the stock route would be temporarily hindered by the Project, given the stock route is inactive, the Project's impacts would be negligible. See Chapter 13, Transport for further details on stock routes.

10.4.8. Existing resource tenements

The Project is unlikely to have any impacts on the adjacent resource tenures EPC 1261 and ML 5656 due to the following:

- the mine layout has been designed so that the out-of-pit WREs will not be on land that directly adjoins the ML 5656 boundary;
- the land mitigation and management measures outlined in section 10.5 have been designed to minimise the risk of erosion and unnecessary disturbance and to promote land stabilisation through rehabilitation; and
- after mining, the disturbed land will be rehabilitated to the post-mining land uses outlined in section 10.4.3 and Chapter 3, Rehabilitation.

The cumulative impacts of the Project on the environmental values of land, including existing resource tenements, are described in section 10.4.11.

10.4.9. Quarry resources

An approximate 56,200 m^3 of quarry material is estimated to be required for Project construction. If suitable material is identified on-site for road construction, the material will be won from borrow pits within the Project disturbance footprint. Suitable clay and rock materials (for embankments, bunds, etc.) will be predominantly sourced from the box cut spoil. Any quarry materials extracted from within the MLA are deemed a mineral under the *Mineral Resources Act 1989* and no additional authorisations are required to be held for the extraction of quarry materials.

The extracting, processing and handling of quarry material will be undertaken within the Project disturbance footprint. The EIS provides an assessment of the Project’s activities on the environmental values within the Project disturbance and adjacent areas, no additional impacts due to extracting quarry material are predicted.

The potential land impacts and mitigation measures discussed in sections 10.4 and 10.5 respectively are relevant to quarry resources.

If required, additional quarry materials needed to meet the construction requirements for the Project will be sourced from existing hard rock quarries located in the region. Material sourced from state-owned quarries may be subject to permitting requirements under the *Forestry Act 1959.* Haulage routes for quarry material sourced from existing quarries outside the MLA will be identified as required, however, haulage will be undertaken on existing state-owned and local government roads located between the Project and the quarry site.

There are 45 state-owned quarry resources located within a 125 km radius of the Project, including 17 with current sales permits under the *Forestry Act 1959* and 25 identified potential quarry sites (DAF, 2020a; DAF, 2020b). Seven hard rock quarries producing on average greater than 200,000 tonnes of material (2015-2016) have been identified between the Project and Gladstone / Rockhampton (DNRM, 2015).

Proposed offset areas for the Project have not been identified as either state quarry areas or quarry reserves under the *Forestry Act 1959*. The proposed offset areas are not anticipated to impact future access to significant quarry material.

No state-owned quarries have been identified within the MLA or the Project's off-lease infrastructure components and no extractive or quarry resources will be sterilised due to the Project.

10.4.10. Contaminated land

Certain activities that are ancillary to the proposed mining operation have the potential to contaminate land. These activities are referred to as 'notifiable activities' and are listed in Schedule 3 of the EP Act. The Project will involve the following notifiable activities:

- **Item 7:** Chemical storage (other than petroleum products or oil under item 29);
- **Item 15:** Explosives production or storage;
- **Item 29:** Petroleum product or oil storage; and
- **Item 37:** Waste storage, treatment or disposal.

There is a risk of contamination to land within the Project area as a result of the inappropriate storage and handling of chemicals, explosives and waste. To address these concerns and mitigate the risk of contamination, hazardous material storage and handling measures and standards will be implemented.

Soil may be unexpectedly contaminated as a result of either:

- the prior land uses; or
- the operation of the Project itself, including accidents such as:
  - spills from coal processing, tailings or process water operations;
  - leakage or spills of sewage treatment plant effluent;
  - spills from the waste collection area; or
  - accidental spillage of chemicals or fuel.

A preliminary site investigation for contaminated land has been undertaken and is discussed in more detail in Appendix K, Soils and Land Assessment. The assessment investigated pre-mining land uses that may have contributed to the contamination of soils. For example, soil sampling at the decommissioned railway route was assessed. While the assessment ultimately determined that there was no risk to the environment or human health, this past activity is still considered to have potentially caused land contamination.

If any unexpected contamination due to prior land uses is identified, work will cease in that area and appropriate actions taken to delineate the contaminated area. If required, further investigation and/or remediation works will be undertaken. The proposed mitigation methods are outlined in section 10.5.5.

10.4.11. Cumulative impacts

The Project will result in up to an estimated 1,279 ha of land disturbance, in addition to the disturbance footprints of currently operating mines and any future resource developments at early stages of assessment. As detailed in section 10.4.3, most of the disturbance footprint has been identified as land of either class 4 (marginal land with severe limitations) or class 5 (unsuitable land with extreme limitations). With the exception of the final void and highwall areas, the Project proposes to reinstate land to at least these land suitability classes within 10 years following revegetation activities (seeding), with the exception of the final void ecosystem.

Existing and potential future resource activities within the region (refer Chapter 2, Project Description) have been evaluated based on their cumulative (reversible or irreversible) disturbance of areas of regional agricultural importance (section 10.3.8). The closest operating resource permits to the Project are located approximately:

- 7.3 km north;
- 3.7 km south; and
- directly adjacent to the southern extremity of the Project boundary.

A database search of regional mining tenements undertaken on 10 October 2023 indicated that there are currently 69 resource tenements within approximately 45 km of the MLA (Table 10.6). With regard to areas of regional interest, and with reference to Table 10.6, Figure 10.6 and Figure 10.7, and Figure 2.13 and 2.14 of Chapter 2, Project Description, there are currently:

- 58 resource tenements that contain SCL;
- 59 resource tenements overlapping the Dawson River Valley IAA;
- 19 resource tenements that overlap PAA; and
- 13 resource tenements that overlap PLA.

Further detail regarding the location and ownership of the surrounding resource tenements is provided in Chapter 2, Project Description.

Currently, approvals exist allowing for the disturbance of ALC classes A and B land, PAAs, SCLs and the Dawson River Valley IAA within the regional extent. Land within the Project area is not classed as land suitable for cropping (ALC A or B). Mining operations for the Project will occur on class C land (i.e. pastureland that is suitable only for improved or native pastures due to limitations) and will result in 556 ha of field verified SCL and approximately 803 ha of the Dawson River Valley IAA subject to potential impacts.

Table 10.6: Resource tenements and regional interests

Tenement type	Existing tenements	Tenements containing SCL	Tenements overlapping with PAA	Tenements overlapping with PLA	Tenements overlapping the Dawson River Valley IAA
Mineral Lease	32	23	7	6	29
Mineral Development Licence	3	3	2	1	3
Exploration Permits Coal	20	18	6	4	16
Exploration Permit Minerals	10	10	0	0	7
Petroleum Lease	3	3	3	2	3
Authority to Prospect	1	1	1	0	1
Total	**69**	**58**	**19**	**13**	**59**

10.5 Mitigation and management measures

A series of mitigation and management measures have been developed to reduce or avoid impacts to local land values arising from disturbance associated with the Project. Additional rehabilitation and decommissioning protocols are detailed in Chapter 3, Rehabilitation, to meet the requirements of Schedule 8, Divisions 1 and 2 of the EP Regulation. Implementation of the proposed mitigation and management methods is expected to achieve the performance outcomes outlined in section 10.1.

10.5.1. Land disturbance

Any disturbance of land will be undertaken in accordance with the following management protocols and measures:

- a land disturbance permit system to control and limit land clearing to the minimum amount required for the safe operation of the Project (section 4.4.2 in Chapter 7, Flora and Fauna);
- implementation of a water management plan that will achieve successful water management and diversion of overland flow/runoff around disturbed areas (section 5.5.5 in Chapter 4, Surface Water); and
- development and implementation of a Topsoil Management Plan to direct removal, stockpiling and replacement, and to promote the direct placement of topsoil where possible to preserve the seed bank and reduce erosion

In addition, throughout the life of the Project, landforms will be progressively rehabilitated to limit the total area of disturbance at any point in time.

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

10.5.2. Erosion and stability

Erosion and sediment controls aimed at reducing the risk and impacts of erosion will be implemented 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). Erosion and sediment controls will include the following:

- Topsoiled areas will be deep ripped to reduce compaction from heavy machinery, encourage infiltration of water and prevent erosion. Areas will be ripped along the contour to reduce the velocity of runoff water down the slope. Ripping depths will vary depending on the type of spoil material, depth of topsoil and equipment used for rehabilitation operations.
- Topsoil within each soil mapping unit (SMU) will be stripped to the depths determined in the Soils and Land Assessment (Appendix K).
- Where required, topsoil stockpiles will be constructed to less than 3 m high and contoured to encourage water drainage.
- Where required, seeding of topsoil will take place as soon as possible after placement onto rehabilitated areas to assist in preventing erosion.
- The placement of topsoil stockpiles away from drainage areas, roads, machinery, transport corridors and stock grazing areas.
- Maintenance of a topsoil inventory for the life of the Project which will account for the volume and locations of topsoil to be progressively stripped, stockpiled and reapplied.
- Preservation of vegetation around drainage lines and riparian zones to reduce the exposure of the B horizon if excavation is necessary.
- The strategic application of vegetation debris to rehabilitation areas.
- The remediation of elevated landforms by contour cultivation, deep ripping where required and seeding with a protective vegetation cover as soon as possible to minimise the extent of time bare soil is exposed.
- Use of upslope diversion drains to reduce runoff from undisturbed areas onto disturbed areas.
- The use of downslope collection drains to divert surface water to sediment dams (e.g. mulch berms, sediment ponds and/or drop inlet protection) to contain sediment-laden runoff from disturbed areas.
- The use of sediment fences and filters to retain and filter suspended solids.

Installed erosion and sediment control structures will not be removed until disturbed areas have been stabilised.

10.5.3. Topsoil management

General topsoil resource management practices will be implemented, including stripping and either immediate reuse for rehabilitation purposes, or stockpiling for subsequent use. A Topsoil Management Plan will be developed to:

- ensure the full recovery of usable soil reserves prior to mining operations;
- manage soil reserves to maintain their viability; and
- advise on effective soil amelioration procedures to maximise the revegetation benefits associated with topsoil resources.

10.5.4. Land use sustainability

Post-mining, the rehabilitated WRE's PMLU objective of grazing will target the achievement of a land use capability of at least class 4 agricultural land suitability (marginal land with severe limitations). Grazing would form the primary expected land use, with the rehabilitated land capable of sustaining improved pastures. Revegetation activities will utilise flora species consistent with the surrounding pre-disturbed land.

The management measures proposed to achieve the target PMLUs, including land use suitability criteria are detailed in Chapter 3, Rehabilitation.

To mitigate impacts to surrounding land uses, management measures will include:

- Management of fugitive dust emissions through regular watering of haul roads, coal stockpile watering, early rehabilitation of WRE and/or temporary revegetation to minimise the extent of bare ground, and continuous monitoring of weather conditions to ensure that operations are adjusted during periods of adverse weather.
- Regular visual checking of light spill to ensure that fixed and mobile lights are located and shielded sufficiently to mitigate excessive light spill.
- Planning and consultation with neighbours to ensure that all operations that may result in herbicide, pesticide or fertiliser drift are conducted in a manner that reduces the potential for impact to neighbouring properties, regardless of the organic certification status of those properties.
- Monitoring of blast vibration and air blast overpressure to ensure that predicted levels of both parameters are achieved and within limits.
- Monitoring of all blasts to identify any occurrences of blast fume and, where warranted, to undertake appropriate investigations and mitigating actions to limit adverse impact from blast fume.
- Management measures proposed to manage surface water in and around the Project site area, as detailed in Chapter 4, Surface Water.

10.5.5. Land contamination

Management measures used to prevent or reduce the risk of land degradation or contamination will include, where appropriate, the following:

- All unexpected contamination will be remediated and validated under supervision of a suitably qualified person in accordance with an Emergency Response Plan predefined for all hazardous materials stored on-site. The administering authority will be notified within 24 hours of detection being known.
- A contaminated land register and map will be maintained on-site detailing any contamination events, subsequent location and remediation protocols issued.
- Chemical and hydrocarbon storage areas will be designed and bunded in accordance with AS 1940:2017, 'The storage and handling of flammable and combustible liquids' (Standards Australia, 2017).
- Provision of training to staff on the prevention of spills and the use of spill kits.
- A register of spill kits will be maintained, and all kits will be inspected for completeness at least quarterly.
- Sediment dams will be installed and adhere to the design parameters of the 'Manual for assessing consequence categories and hydraulic performance of structures' (DES, 2016a).
- Explosives storage will be managed in accordance with AS 2187:2006 'Explosives—Storage, transport and use' (Standards Australia, 2006).
- Waste products including oil and other chemicals will be stored and disposed of according to the relevant material data safety sheets to minimise contamination risk.

- If an STP is constructed, the STP will be designed to cater for the maximum number of personnel that can be accommodated on-site at any one time, and in accordance with the recommendations contained in Appendix Q, Land-Based Effluent Disposal Assessment Report and MEDLI modelling.
- Waste management strategies to reduce the risk of land contamination from waste generated during the life of the Project including waste associated with the STP as outlined in detail in Chapter 14, Waste Management.

Visual amenity

10.6 Description of existing environmental values

The land surrounding the Project is predominately flat with undulating slopes. The most prominent natural landscape features in the local area are Mount Ramsay and the Dawson River, as described in section 10.3.2.

Aside from coal mine operations, regional land use is predominately rural. The land within the Project area and its immediate surrounds is primarily categorised as land used for agricultural activities (refer to section 10.3). The use of this land for predominantly agricultural uses has resulted in significant changes to the natural visual landscape.

Built infrastructure in the local area consists of stock fencing, unsealed access tracks, stock watering dams and occasional farming infrastructure (e.g. sheds), and roads (both sealed and unsealed).

With the exception of Mount Ramsay with a height of 430 mAHD, a key topographical feature in the region, the visual amenity in the vicinity of the Project can be described as being of low to moderate scenic quality, akin to that typically associated with an agricultural setting having low topographic variation and scattered stands of remnant vegetation.

10.7 Potential impacts

10.7.1. Visual impact assessment methodology

The key visual modifications to the local topography and landscape will be the WRE, the final void and the MIA. The final void, being a depression surrounded by the elevated WRE will not be visible from any vantage points. The revised mine plan is smaller in scale (from 5 Mtpa revised to 2.5 Mtpa ROM coal), with mining operations to be located outside the 0.1% AEP design flood extent. Therefore, the WRE in the revised plan is smaller and located east of the previous proposed location and therefore closer to the Moura-Baralaba Road.

One out-of-pit WRE running approximately parallel to the eastern MLA boundary is required to provide sufficient working space for operations to proceed. The WRE will be formed from overburden and spoil material initially to the north of the pit at the northern end of the MLA to approximately 60 m to 70 m above the existing surface. As operations continue, waste rock will be progressively placed in-pit, commencing from the northern end of the pit and progressing to the south. The location of the WRE is shown in Figure 3.10 of Chapter 3, Rehabilitation. A final landform 3D visualisation is shown in Figure 10.9.

The mine infrastructure area is to be located immediately to the west of the realigned Moura-Baralaba Road and will include industrial buildings such as the CHPP and elevated materials handling equipment including conveyors and stackers. The most elevated structure will have a height less than 25 m above ground level including any top-storey lighting infrastructure.

AARC carried out photographic visual assessments of the Project area and surrounds utilising a wide angle (panoramic) perspective at vantage points selected to be representative of views from residences proximate to the Project.

Descriptions of each vantage point are provided in Table 10.7, and the locations shown in Figure 10.10.

Figure 10.9: Final landform 3D visualisation – looking south, if MIA pad retained

Minserve was commissioned to develop visual simulations for each vantage point superimposing the anticipated visual landscape features resulting from the Project onto the panoramic imagery. The visual simulations undertaken represent the visual landscape during both the post-mining and rehabilitation phases of the Project, excluding any post-mining vegetation growth.

Potential visual impacts were then identified and assessed by evaluating the level of visual modification associated with the Project in the context of the visual sensitivity of relevant surrounding land use areas. The assessment utilised the visual impact matrix approach developed by EDAW (2006).

10.7.2. Vantage points

Visual receptors in the vicinity of the Project site include rural residences and passing traffic. The ten vantage points established are located at the entrances to farming properties and/or homesteads within a 5 km radius of the MLA boundary. The locations of the vantage points also reflect relatively high traffic areas within the local region. Ground elevations at the vantage points and nearby residences range from 90 to 110 mAHD in localities of slight undulation, consistent with the topography of the Project site.

Table 10.7: Description of vantage points

Vantage point	Location description	Approximate distance from MLA boundary (km)
VA1	Eastern side of Moura-Baralaba Road in front of entrance gate to the residence on the Mount Ramsay property	1.0
VA2	Southern side of Remfrey's Road in front of entrance gate to the residence on the Murrindindi property	2.9
VA3[1]	Western side of Moura-Baralaba Road in front of entrance gate to the residence on the Mount Ramsay property	0.2
VA4	Western side of Baralaba-Banana Road at intersection of Baralaba-Banana Road and access track to the residence on the Mount Cooper property	4.2
VA5	Eastern side of Bindaree-Harcourt Road near access track to the residence of the Belvedere property	4.1
VA6	In front of entrance gate to the residence of the Harcourt property	2.2
VA7	Along dirt road near entrance gate to the Riverland property	1.2
VA8	Along dirt road at access point to the residence on the Alberta property	1.5
VA9[2]	Along dirt road on the western side of Hat Creek Road	5.5
VA10	Along dirt road near entrance gate of the residence on the Alberta Vale property	3.0

Notes: [1]Vantage point VA3 is within the FIFOA
[2]Vantage point VA9 was assessed outside the 5 km radius as a precautionary assessment

While visual simulations have not been undertaken for every sensitive receptor, the vantage points selected are representative for dwellings proximal to the Project. There is some potential for sensitive receptors located in a sector that stretches from due north to north-north-east of the central MIA area to have a view of some of the MIA infrastructure, given the flat topography to the north of this location. Any direct lines of view to the MIA will be broken by existing vegetation in this area.

Figure 10.10: Vantage points and visual receptor locations

Dwellings located to the north and north-west of the Project are well represented by VA1 and VA10. Sensitive receptors located to the west of the Project are represented by vantage points VA7, VA8 and VA9. Long views from the west towards Mount Ramsay are unlikely to be impeded by the WRE given the relatively low elevation of the WRE in comparison to Mount Ramsay which rises some 300 m above ground level (refer Figure 10.19).

10.7.3. Visual sensitivity

Visual sensitivity is used to determine how critical a change to the existing landscape is when viewed from various viewpoints. Visual sensitivity is a function of both land use and duration of exposure, particularly as individuals will generally perceive changes in the visual setting of their residence more critically than changes in the visual setting of the broader area in which they work or travel.

According to the visual assessment methodology used by EDAW (2006), the visual sensitivity for rural residences can be classified as:

- high if a rural residence is within 2.5 km of development;
- moderate if a rural residence is 2.5–5 km from development; or
- low if the rural residence is more than 5 km from development.

A total of five vantage points were classed as having ‘high’ visual sensitivity, four as of ‘moderate’ visual sensitivity and one as ‘low’ visual sensitivity. Results of the visual sensitivity assessment are provided in Table 10.9.

10.7.4. Visual modification

The extent of the visual modification arising from a proposed development can be measured as the level of visual contrast between the Project development and the existing visual environment. The level of visual modification generally decreases as the distance from the development to the vantage point being assessed increases. The descriptors used for the level of visual modification are as follows (EDAW, 2006):

- Very low (or negligible): development is distant or relates to a small proportion of the overall view.
- Low: minimal visual contrast and a high-level of integration of form, line, shape, pattern, colour or texture value(s) between the development and the landscape. In this situation, the development may be noticeable but does not markedly contrast with the existing modified landscape.
- Moderate: one or more components of the development are visible and contrasts with the landscape while at the same time achieving a level of integration. This occurs where surrounding topography, vegetation or existing modified landscape provide some measure of visual integration or screening.
- High: major components of the development contrast strongly with the existing landscape.

Seven out of the ten vantage points were classed as having ‘very low (or negligible)’ visual modification. Results of the visual modification assessment are provided in Table 10.9. The potential visual modification associated with the Project is related primarily to the elevated areas of the overburden emplacements.

The results of the visual simulations undertaken to portray the visual modification resulting from the Project are shown in Figure 10.11 to Figure 10.20.

10.7.5. Visual impact

Visual impacts have been assessed by evaluating the level of visual modification associated with the Project in the context of the visual sensitivity of relevant surrounding land use areas, as per the matrix in Table 10.8.

Table 10.9 shows the visual sensitivity, visual modification and overall visual impact at each vantage point.

Table 10.8: Visual impact matrix

		Viewer Sensitivity		
		High	**Moderate**	**Low**
Visual Modification	**High**	High	High	Moderate
	Moderate	High	Moderate	Low
	Low	Moderate	Low	Low
	Very low	Low	Very low	Very low

Source: EDAW (2006)

Table 10.9: Overall visual impact

Vantage point	Visual sensitivity	Visual modification	Visual impact
VA1	High	Low	Moderate
VA2	Moderate	Low	Low
VA3	n/a	n/a	n/a
VA4	Moderate	Very low	Very low
VA5	Moderate	Very low	Very low
VA6	High	Very low	Low
VA7	High	Very low	Low
VA8	High	Very low	Low
VA9	Low	Very low	Very low
VA10	Moderate	Very low	Very low

Views of the Project's elevated landforms are not expected to be significant from vantage points VA2, VA4, VA5, VA6, VA7, VA8, VA9 and VA10 due to the long separation distances and partial screening from vegetation. Therefore, the visual changes of the Project will have a very low to low impact at these vantage points and nearby visual receptors during the rehabilitation and post-mining phases.

A portion of the WRE will be visible from vantage point VA1, which has a high-level of visual sensitivity during the rehabilitation and post-mining phases (Figure 10.11). The landform design is intended to integrate with the existing landscape such that the final rehabilitated landform is not anticipated to have a significant visual impact from vantage point VA1. Therefore, the Project is assessed to have a moderate level of visual impact from this vantage point and nearby visual receptors.

The direct impact to vantage point VA3 has been excluded from the assessment. VA3 is within the WRE footprint. It should be noted that the property represented by this vantage point is located within the MLA.

During the operations phase of the Project, mining equipment used while constructing the WRE may exacerbate the visual impact at certain vantage points; in particular, vantage points VA1 and VA2, which have clear views of the northern out-of-pit dump. However, the mining schedule indicates that this emplacement will be constructed between approximately year 1 and year 6, effectively limiting the period of visual amenity impact.

In summary, the visual elements of the Project are not anticipated to have a significant visual impact for people residing in nearby properties or using nearby roads.

10.8 Mitigation and management measures

The following actions and measures will further minimise the potential visual impacts of the Project:

- the revegetation of the out-of-pit WRE after progressive rehabilitation will reduce the contrast between altered landforms and the unaffected surrounding landscape;
- the use of vegetation as a visual buffer of the MIA view from the Moura-Baralaba Road realignment will reduce the visual impact to the local community;
- design of the WRE to have a final landform that does not contrast significantly with the existing topography;
- placement, configuration and direction of lighting to reduce light emissions during the operational phase of the Project, in accordance with AS 4282:1997 ‘Control of the obtrusive effects of outdoor lighting’ (Standards Australia, 1997a); and
- the use of neutral tones for cladding of infrastructure, to blend in with the surrounding environment.

PHOTO SITE VA1

SOUTH-EAST EAST

Figure 10.11: Visual simulation at vantage point VA1

PHOTO SITE VA2

SOUTH NORTH-EAST

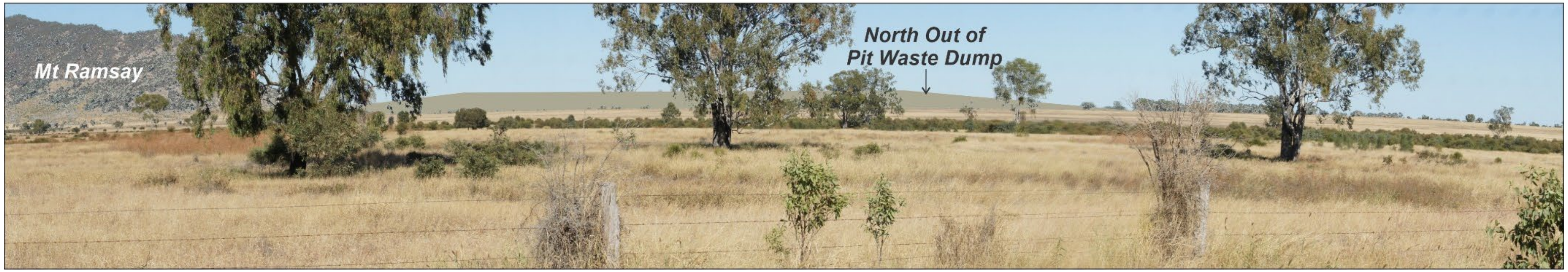

Figure 10.12: Visual simulation at vantage point VA2

PHOTO SITE VA3

WEST NORTH

Figure 10.13: Visual reference site VA3

PHOTO SITE VA4

WEST NORTH-WEST

Figure 10.14: Visual simulation at vantage point VA4

PHOTO SITE VA5

NORTH EAST

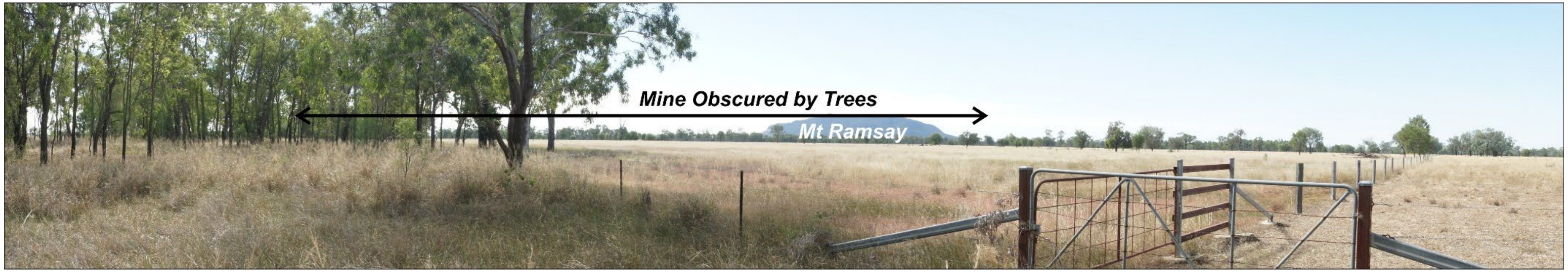

Figure 10.15: Visual simulation at vantage point VA5

PHOTO SITE VA6

NORTH-WEST EAST

Figure 10.16: Visual simulation at vantage point VA6

PHOTO SITE VA7

NORTH | SOUTH-EAST

Figure 10.17: Visual simulation at vantage point VA7

PHOTO SITE VA8

NORTH-EAST | SOUTH-EAST

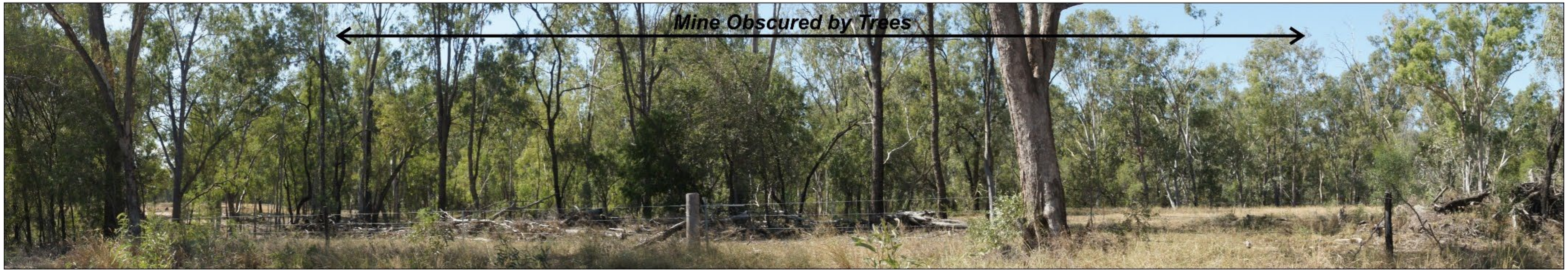

Figure 10.18: Visual simulation at vantage point VA8

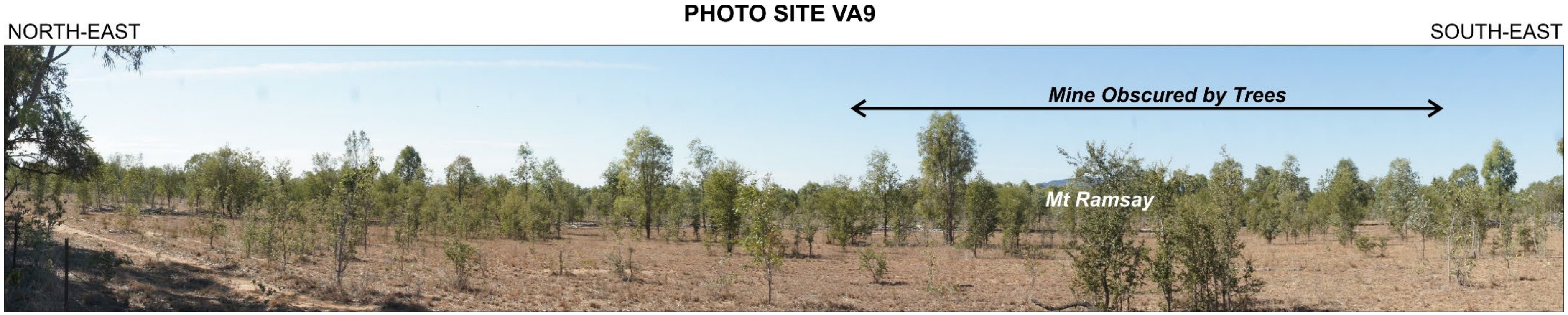

Figure 10.19: Visual simulation at vantage point VA9

Figure 10.20: Visual simulation at vantage point VA10