



# CADIA VALLEY OPERATIONS MODIFICATION 15

## AGRICULTURAL IMPACT ASSESSMENT

Report Number: MS-065b\_Final V2  
Prepared for: Cadia Holdings Pty Ltd  
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# 1 INTRODUCTION

The objective of this report is to support the application for a Gateway Certificate following the verification of Biophysical Strategic Agricultural Land (BSAL) in accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (Office of Environment & Heritage (OEH) and Department of Primary Industries - Office of Agricultural Sustainability and Food Security (DPI-OAS&FS), 2013); (hereafter referred to as the *Interim Protocol*). This report provides an assessment of agricultural impacts relevant to the BSAL in accordance with the *Strategic Regional Land Use Policy Guideline for Gateway applicants* (Gateway Guideline) (Department of Planning & Infrastructure (DP&I), 2013)

## 1.1 CADIA VALLEY OPERATIONS BACKGROUND

The Cadia Valley Operations (CVO) are located approximately 25 kilometres (km) south west of Orange, in the Central Tablelands of New South Wales (NSW) (refer to **Figure 1**). Cadia Holdings Pty Limited (CHPL) is the owner and operator of the CVO and is a wholly owned subsidiary of Newcrest Mining Limited.

Project Approval (PA 06\_0295) for the Cadia East Project was granted by the NSW Minister for Planning under Part 3A of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) on 6 January 2010. PA 06\_0295 (as modified) includes all components of the CVO including the Cadia East underground mine (Cadia East), Tailings Storage Facility (TSF), the Ridgeway underground mine (Ridgeway), CVO Dewatering Facility and a wide range of ancillary and supporting infrastructure. These integrated operations are herein referred to as the CVO.

## 1.2 PROPOSED DEVELOPMENT

CHPL plans to seek a modification under the State Significant Development provisions of Section 4.55(2) of the EP&A Act. Amongst other things, Modification 15 (the Modification) proposes changes to the tailings storage facility (TSF) embankment footprints which are relevant to this assessment. The change to the embankment footprint has been identified following further detailed design, consistent with the evolution of an optimised design and construction program of this scope and magnitude. The proposed changes would extend the approved Tailing Storage Facility (TSF) embankment footprints, causing disturbance outside of the approved mining lease and enter area identified as BSAL. This will trigger a Gateway Application process.

CHPL engaged Minesoils Pty Ltd (Minesoils) to undertake an Agricultural Gateway Assessment for the component of the Modification subject to the Gateway Application.

## 1.3 BSAL ASSESSMENT

The *Agricultural Resources Assessment* was undertaken in May 2022 by Minesoils. A total of 13 sites were assessed in accordance with the Interim Protocol to obtain suitable representative soil profiles to determine soil type and characteristics.

The Proponent is seeking a Gateway Certificate over a 28.2 ha area that is not covered by an existing mining lease, hereby referred to as the Project Application Area (PAA) (refer **Figure 2**).

In accordance with the *Interim Protocol* a 100m buffer was applied to the PAA (excluding areas within a current mining lease) and these areas combined are referred to as the BSAL Assessment Area (72.8 ha) for the purposes of verifying any BSAL within or immediately surrounding the PAA.

A total of 41.3 ha of land was discounted within the BSAL Assessment Area during desktop analysis due to the presence of slopes >10 per cent (%), <20 ha of contiguous area and/or areas and disturbance associated with Panuara Road. These exclusions left 31.5 ha to be assessed.



A total of 7 sites satisfied the BSAL criteria. Therefore, verified BSAL is confirmed to be present over approximately 24.9 ha of the BSAL Assessment Area. The remaining 47.9 ha of the BSAL Assessment Area is verified Non-BSAL.

While there are no contiguous areas >20 ha within the BSAL Assessment Area, site observations, existing regional mapping, and concurrent studies viewed in the context of the findings of this assessment suggest the BSAL verified likely forms part of a larger contiguous mass (Minesoils 2023).

The PAA will largely be subject to minor landform changes resulting in temporary impacts as part of the Modification. Temporary impacts would consist of ancillary disturbance and infrastructure such as laydown areas, roads, soil stockpiles and water management/seepage dams.

Landform changes will be significant and permanent for a small area consisting of approximately 2.0 ha, where the TSF embankment footprint encroaches the PAA. Here, the embankment slope will remain as the final landform, which will have a final slope in the order of 1:3 vertical to horizontal and a final land use of native woodland for habitat, with more limited rehabilitation options.

No Critical Industry Clusters areas occur in the PAA or wider locality.

## 1.4 PURPOSE

This document is an Agricultural Impact Assessment in support of an application for a Gateway Certificate (Gateway Certificate Application), pursuant to clause 2.29 of the *State Environmental Planning Policy (Resources and Energy) 2021* (Mining SEPP).

The Gateway Certificate Application will be assessed by the Mining and Petroleum Gateway Panel (the Gateway Panel) for potential impacts of the Modification on strategic agricultural land and its associated water resources. The Gateway Panel undertakes its assessment in accordance with the relevant criteria, outlined in clause 2.31(4) of the Mining SEPP, that apply specifically to BSAL.

The purpose of this Agricultural Impact Assessment is to support the Gateway Certificate Application for the Modification.

## 1.5 ASSESSMENT APPROACH

Requirements of the Guideline for Gateway Applicants (DPI, 2012) are outlined in **Table 1**, which also identifies the relevant section of this report where requirements have been addressed. This report was prepared in accordance with:

- I. The Mining SEPP.
- II. *New England North West Strategic Regional Land Use Plan*, September 2012 by the Department of Planning & Infrastructure (DP&I) (DP&I 2012a).
- III. *Strategic Regional Land Use Policy Guideline for Gateway Applicants*, Fact Sheet, September 2013 (the Guideline) by DP&I (DP&I 2013).
- IV. *Strategic Regional Land Use Policy Guideline for Agricultural Impact Statements*, October 2012 by DP&I (DP&I 2012b).
- V. *Agricultural Impact Statement technical notes: A companion to the Agricultural Impact Statement guideline*, April 2013 by the Department of Primary Industries (DPI) (DPI 2013).
- VI. *Interim protocol for site verification and mapping of biophysical strategic agricultural land* (the Interim Protocol), by the Office of Environment & Heritage (OEH) and the Office of Agricultural Sustainability & Food Security (OAS&FS) (OEH and OAS&FS 2013).

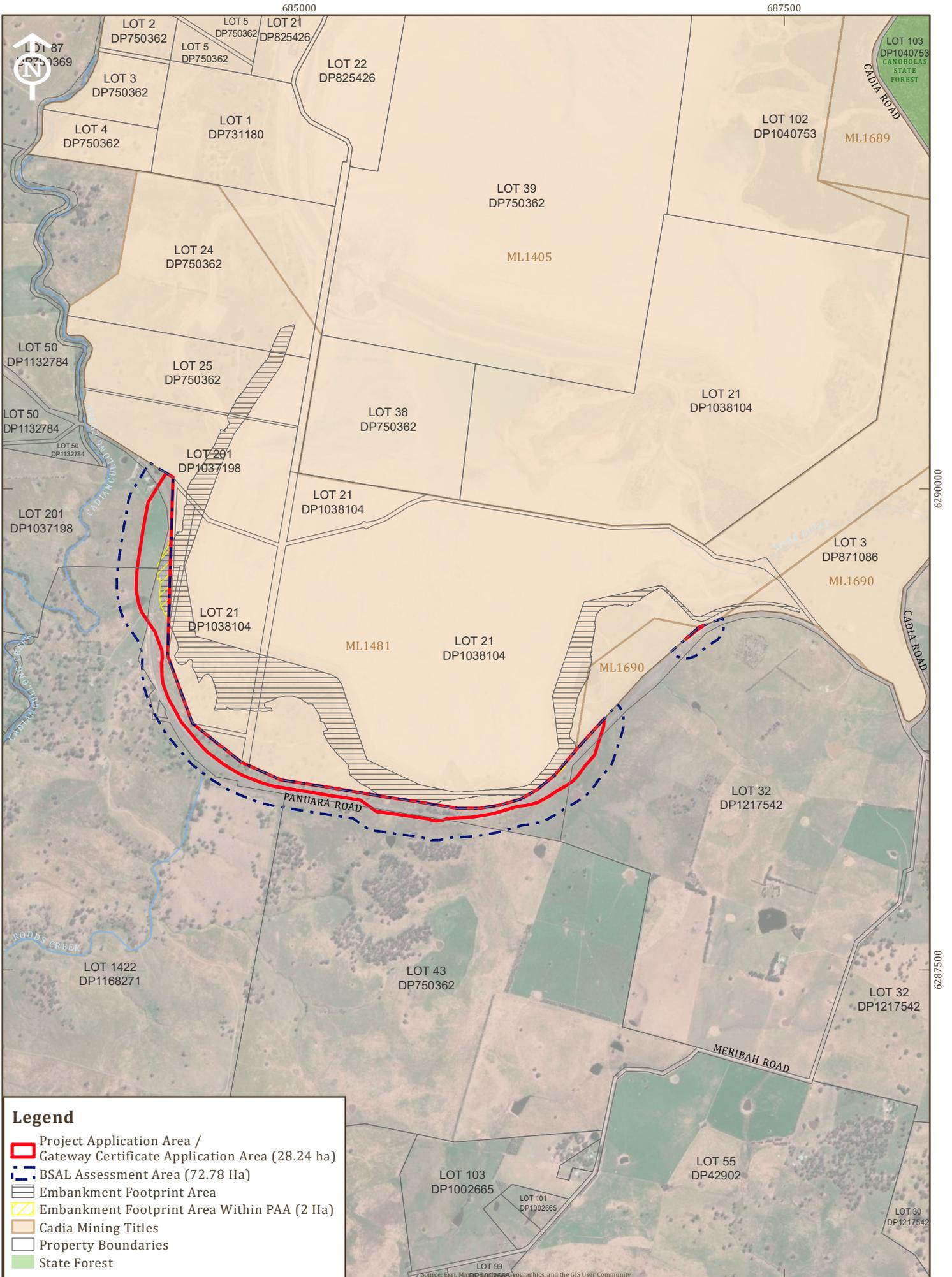


Table 1: Guideline Requirements for Supporting Documents and Where Addressed

Guideline Requirements for Supporting Documents	Where Addressed
Describes the proposal's impact in terms of relevant Gateway criteria and mitigation measures to address these impacts.	Sections 4.4 and 5
Provide high quality photographs, maps or figures that depict local and regional context	Throughout all reports
Explain why the site was chosen and discuss any alternatives considered	Section 5.1
Present relevant technical investigations	Minesoils, 2023 AGE, 2023
Supply maps and text to describe the areal extent of surface impacts	Throughout all reports
Describe land and soil capability (LSC) classes that will be affected	Minesoils, 2023 Section 4.
Estimate likelihood of full rehabilitation and how this might be achieved	Sections 5.2 and 5,3
Refer to the Interim Protocol	Throughout this Report
Refer to the Agricultural Impact Statement	Throughout this report
Provide information in a tabular form that demonstrates the pre-development and post development LSC and soil fertility classes	Minesoils, 2023
Estimate quantities of water likely to be taken from any water source on an annual basis	AGE, 2023
A strategy for obtaining appropriate water licence/s for the maximum predicted annual take	AGE, 2023
Establishment of baseline groundwater conditions	AGE, 2023
A strategy for complying with any water access rules	AGE, 2023
Estimates of potential water associated impacts on nearby water users	AGE, 2023
Estimates of potential water impacts on groundwater dependent ecosystems	AGE, 2023
Estimates of potential saline and contaminated water flow to aquifers and river systems	AGE, 2023
Estimates of the potential to cause or enhance hydraulic connectivity between aquifers	AGE, 2023
Estimates of the potential for river bank instability, or high wall instability or failure	AGE, 2023
Outline method for disposing of water inflows	AGE, 2023
A strategy for moving to groundwater modelling using more site-specific data should the proposal progress	AGE, 2023
Assess groundwater impacts against the AIP	AGE, 2023
Indicate whether the proposal will result in significant fragmentation of agricultural land use in terms of: area; critical farm and regional infrastructure; change in land use (agricultural intensity or to another land use); use of mine buffer land	Section 5
Quantify any potential reductions in the area of BSAL	Through all reports







**Legend**

- ▭ Project Application Area / Gateway Certificate Application Area (28.24 ha)
- - - BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area
- Embankment Footprint Area Within PAA (2 Ha)
- Cadia Mining Titles
- Property Boundaries
- State Forest

GDA 1994 MGA Zone 55

Meters  
Scale 1:25000 at A4

Project Application Area

FIGURE 2

## 2 AGRICULTURAL RESOURCES AND PRODUCTION OF SURROUNDING LOCALITY

### 2.1 AGRICULTURAL RESOURCES

#### 2.1.1 CLIMATE CONDITIONS

The closest Commonwealth Bureau of Meteorology (BoM) weather stations to the CVO are the Orange Airport Automatic Weather Station (AWS) (063303) and Orange Agricultural Institute (063254) (BoM, 2021).

The warmest months within the region are November through to March, with cooler temperatures occurring from May to September. Mean annual rainfall is approximately 881.9 (millimetres) mm at the Orange Airport AWS and approximately 906.5 mm at the Orange Agricultural Institute. Records at the Orange AWS indicate that most rain occurs in December (mean rainfall 87.0 mm) and the least amount of rainfall occurs in April (mean rainfall 39.2 mm).

Relative humidity is variable and temperature dependent. Relative humidity at 9.00 am at the Orange Airport AWS varies from 63% in December, to 89% in June. Relative humidity at 3.00 pm varies from 40% in December to 70% in July (BoM, 2021).

The CVO operates two on-site meteorological stations, the Ridgeway and Southern Lease Boundary (SLB) stations. Wind roses from the two on-site meteorological stations show that on an annual basis wind flows typically from a south-west to north-east direction.

#### 2.1.2 REGIONALLY MAPPED SOIL LANDSCAPES

Soil landscape units for the PAA surrounds are mapped by the DPIE (2020) and are compiled into 40 published soil landscape maps that cover central and eastern NSW, based on standard 1:100,000 and 1:250,000 topographic sheets (Department of Environment, Climate Change and Water, 2010). The mapping provides an inventory of soil and landscape properties of the area and identifies major soil and landscape qualities and constraints. It integrates soil and topographic features into single units with relatively uniform land management requirements. In the associated reports, soils are described in terms of soil materials in addition to the *Australian Soil Classification Third Edition*, (Isbell, R. F, 2021) the Great Soil Groups, and the Northcote systems.

The PAA surrounds contain the Panuara, Towac, Quarry and Vittoria Blayney soil landscapes (refer **Figure 3**), which are described below.

##### **Panuara Soil Landscape**

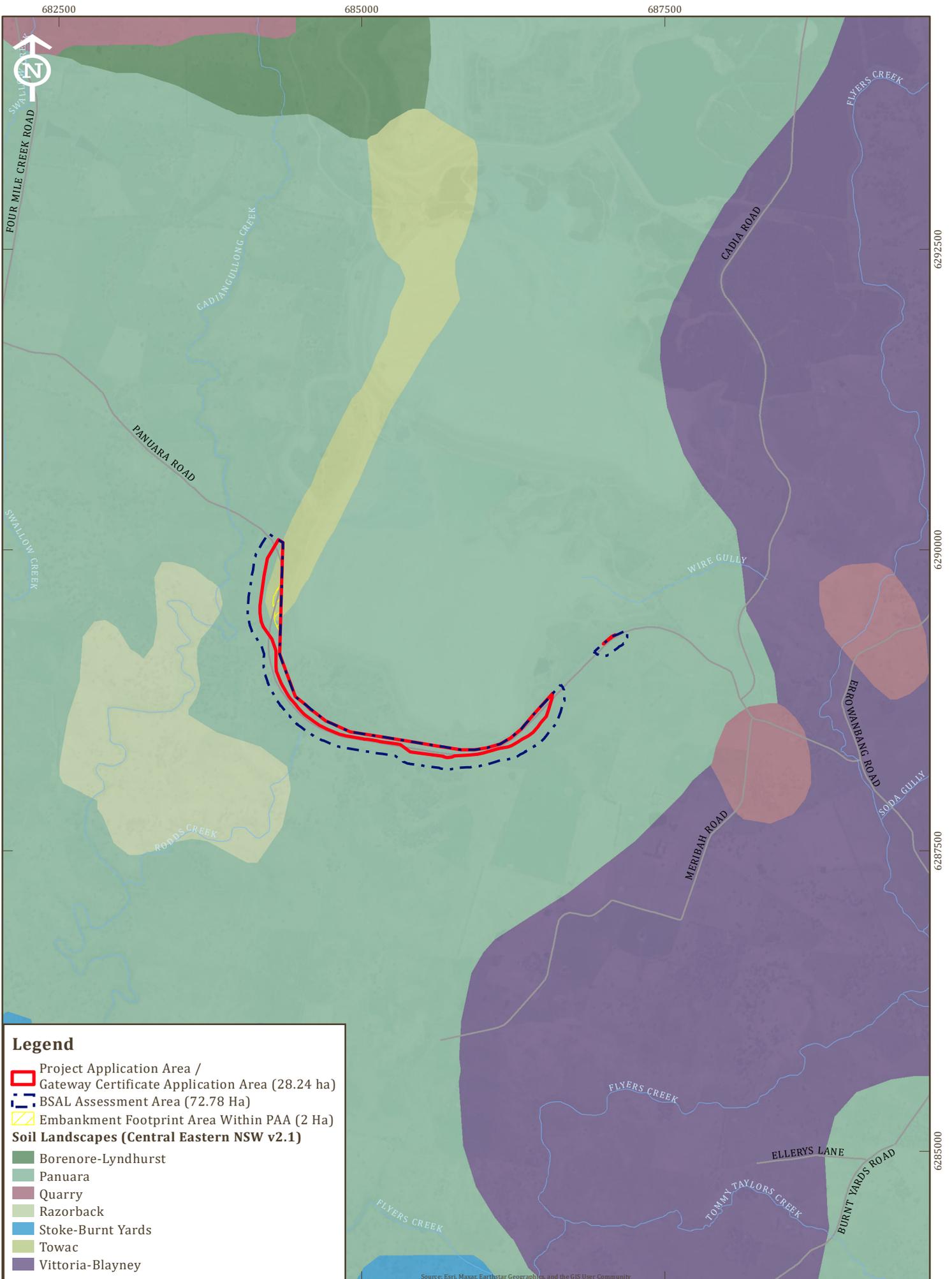
Undulating low hills to rolling hills, 500 – 965 m Australian Height Datum (AHD) in elevation. Local relief is usually between 100–120 m, although it can be as low as 60 m for undulating slopes around Panuara. Slopes vary from 5–8% but are up to 15% in the steeper terrain. Slope lengths vary from 500–800 m. Drainage lines run west and are spaced from 500–800 m apart.

Vegetation has been extensively cleared; however, remnant native vegetation consists of dry sclerophyll forest dominated by mountain gum and manna gum.



Plate 1: Representative Panuara Landscape





**Legend**

- Project Application Area / Gateway Certificate Application Area (28.24 ha)
- BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area Within PAA (2 Ha)

**Soil Landscapes (Central Eastern NSW v2.1)**

- Borenore-Lyndhurst
- Panuara
- Quarry
- Razorback
- Stoke-Burnt Yards
- Towac
- Vittoria-Blayney

GDA 1994 MGA Zone 55

Scale 1:40000 at A4

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Regionally Mapped  
Soil Landscapes

**FIGURE 3**

Soil distribution consists of Red Podzolic Soils on mid to upper slopes, Yellow Solodic Soils occur in drainage lines. Yellow Podzolic Soils occur on lower slopes with Red Earths or Brown/Red Earths. Chocolate Soils or Euchrozems occur on remnants of basaltic mesas.

### **Towac Soil Landscape**

Undulating hills to rolling low hills, from 980-1,080 mAHD in elevation. Local relief varies from 40-60 m, with some to 100 m. Slopes are between 6-10% but can be up to 20%. Slopes in drainage depressions range from 8% on higher areas to 1-2% in the lower lands.

Remnant native vegetation consists of savannah woodlands with yellow box communities including blakely's red gum, grey box, apple box, bastard box and broad-leaved peppermint on lower areas.

Soil distribution consists of Krasnozems which are dominant and occur on the upper to midslopes, Red Podzolic/Krasnozem intergrades found on upper slopes, and Yellow Podzolic/Solodic Soils in drainage depressions.



Plate 2: Representative Towac Landscape

### **Vittoria Blayney Soil Landscape**

Undulating to rolling hills with 800-1050 mAHD elevation, and local relief from 30-80 m but most to 50-60 m. Slopes are from 6-10%, with lengths averaging 600 m but ranging from 200-1500 m. Fixed drainage channels are spaced from 800-1000 m apart. Upland drainage depressions have slopes from 4-5%, but in lower areas slopes are less than 2%. Broad drainage depressions (500 m wide) have plains with 1-2% slopes.

Remnant native vegetation consists of savannah woodlands with yellow box communities. Blakely's red gum, grey box, apple box, bastard box and broad-leaved peppermint are commonly found on lower slopes.

Soil distribution consists of Red Earths on well-drained crests and sideslopes, with Yellow Earths on moderately to imperfectly drained footslopes. Yellow Soloths/Yellow Podzolic Soil intergrades are found in imperfectly to poorly drained drainage depressions. Other soils include red and yellow structured earths midslope, with shallow sands and loams on crests and upper slopes.



Plate 3: Representative Vittoria Blayney Landscape



### Quarry Soil Landscape

Rolling low hills, 860–980 mAHD in elevation with slope lengths ranging from 500–7,900 m, and slopes in the 12–15% range. Local relief is between 60–100 m.

Remnant native vegetation consists of Savannah woodland of yellow box with Blakely's red gum, grey box, apple box, bastard box and broad-leaved peppermint on slopes.

Soil distribution consists of pale Siliceous Sands on midslopes with Yellow Earths and Yellow Podzolic Soils on lower slopes. Shallow Sands and Red Podzolic Soils occur on upper slopes.



Plate 4: Representative Quarry Landscape

### 2.1.3 REGIONALLY MAPPED SOIL TYPES

The NSW regional soil mapping indicates the Australian Soil Classification (ASC) of soils within the CVO locality is primarily dominated by Kurosols and Kandosols, with a sporadic occurrence of Ferrosols and Tenosols (refer to **Figure 4**). An overview of these soil types is detailed below.

#### Kurosols

Kurosols are defined as soils with a clear or abrupt textural B horizon and in which the major part of the upper 0.2 m of the B2t horizon (or the major part of the entire B2t horizon if it is less than 0.2 m thick) is strongly acidic.

#### Kandosols

Soils other than Hydrosols which have all of the following:

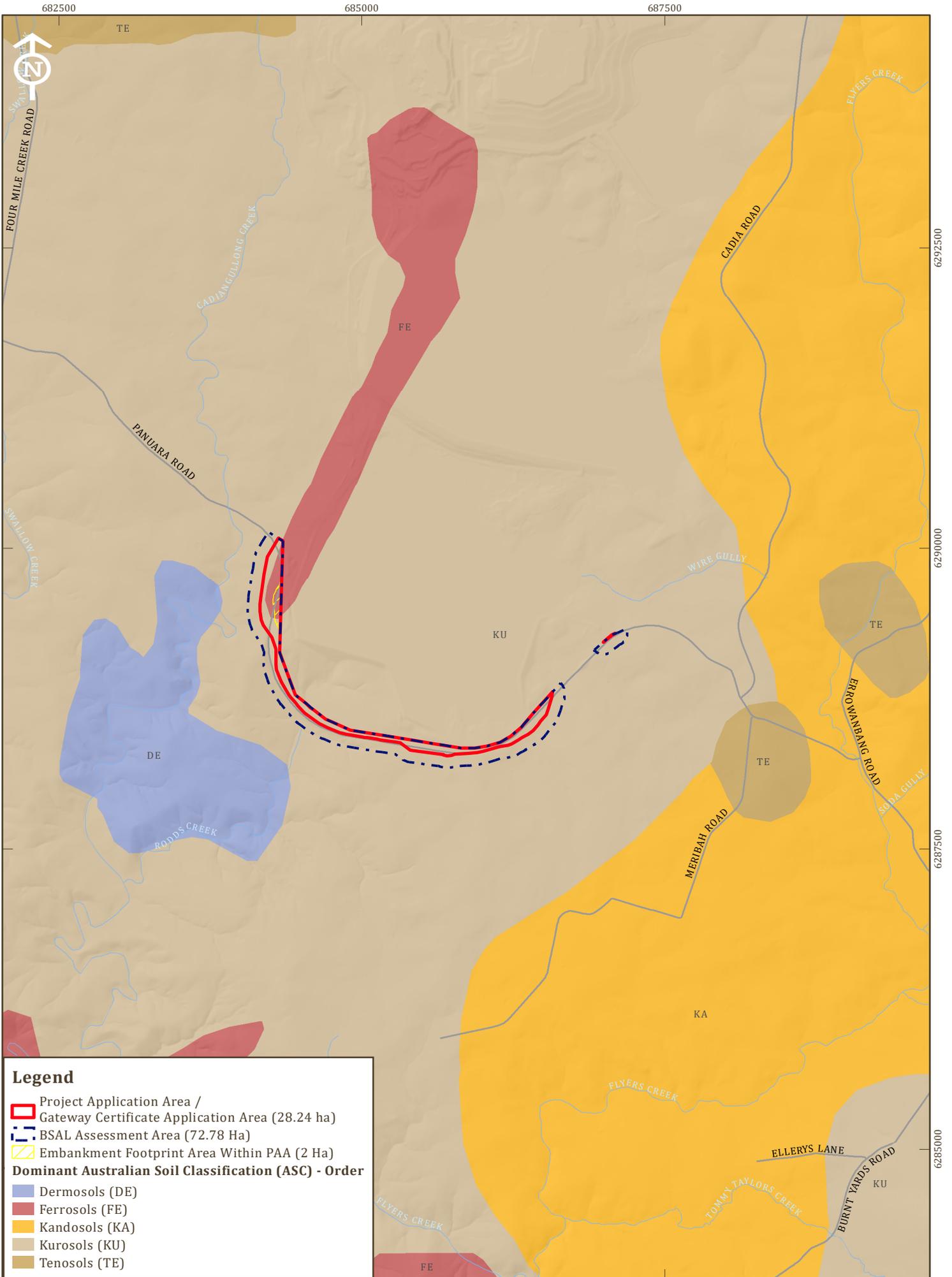
- I. B2 horizons in which the major part has a grade of pedality that is massive or weak.
- II. A maximum clay content in some part of the B2 horizon which exceeds 15% (i.e. heavy sandy loam [SL+] or heavier).
- III. Do not have a clear or abrupt textural B horizon.
- IV. Are not calcareous throughout the solum, or below the A1 or Ap horizon or to a depth of 0.2 m if the A1 horizon is only weakly developed.

#### Ferrosols

Ferrosols are defined as soils other than Vertosols, Hydrosols, and Calcarosols that:

- I. Have B2 horizons in which the major part has a free iron oxide content greater than 5% Fe in the fine earth fraction (<2 mm), and
- II. Do not have a clear or abrupt textural B horizon or a B2 horizon in which at least 0.3 m has vertic properties.





**Legend**

- Project Application Area / Gateway Certificate Application Area (28.24 ha)
- BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area Within PAA (2 Ha)

**Dominant Australian Soil Classification (ASC) - Order**

- Dermosols (DE)
- Ferrosols (FE)
- Kandosols (KA)
- Kurosols (KU)
- Tenosols (TE)

GDA 1994 MGA Zone 55

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0 250 500 1,000 Meters

Scale 1:40000 at A4

Regionally Mapped  
Australian Soil Classification

**FIGURE 4**

## Tenosols

The Tenosols will differ from Rudosols by virtue of having either a more than weakly developed A1 horizon, an A2, or a weakly developed B horizon. Tenosols do not fit the requirements of any other soil orders and generally have one or more of the following:

- I. A peaty horizon.
- II. A humose, melacic or melanic horizon, or conspicuously bleached A2 horizon, which overlies a calcrete pan, hard unweathered rock or other hard materials; or partially weathered or decomposed rock or saprolite, or unconsolidated mineral materials.
- III. A horizons which meet all the conditions for a peaty, humose, melacic or melanic horizon except the depth requirement, and directly overlie a calcrete pan, hard unweathered rock or other hard materials; or partially weathered or decomposed rock or saprolite, or unconsolidated mineral materials.
- IV. A1 horizons which have more than a weak development of structure and directly overlie a calcrete pan, hard unweathered rock or other hard materials; or partially weathered or decomposed rock or saprolite, or unconsolidated mineral materials.
- V. An A2 horizon which overlies a calcrete pan, hard unweathered rock or other hard materials; or partially weathered or decomposed rock or saprolite, or unconsolidated mineral materials.
- VI. Either a tenic B horizon, or a B2 horizon with 15% clay (SL) or less, or a transitional horizon (C/B) occurring in fissures in the parent rock or saprolite which contains between 10 and 50% of B horizon material (including pedogenic carbonate).
- VII. A ferric or bauxitic horizon >0.2 m thick.
- VIII. A calcareous horizon >0.2 m thick.

### 2.1.4 REGIONALLY MAPPED LAND AND SOIL CAPABILITY

Land and Soil Capability (LSC) Mapping uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards. The LSC are described in **Table 7**. Regional LSC Mapping indicates that the CVO locality contains Class 3, Class 4 and Class 7 land (refer to **Figure 5**).

#### **Class 3**

This classification indicates land that has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.

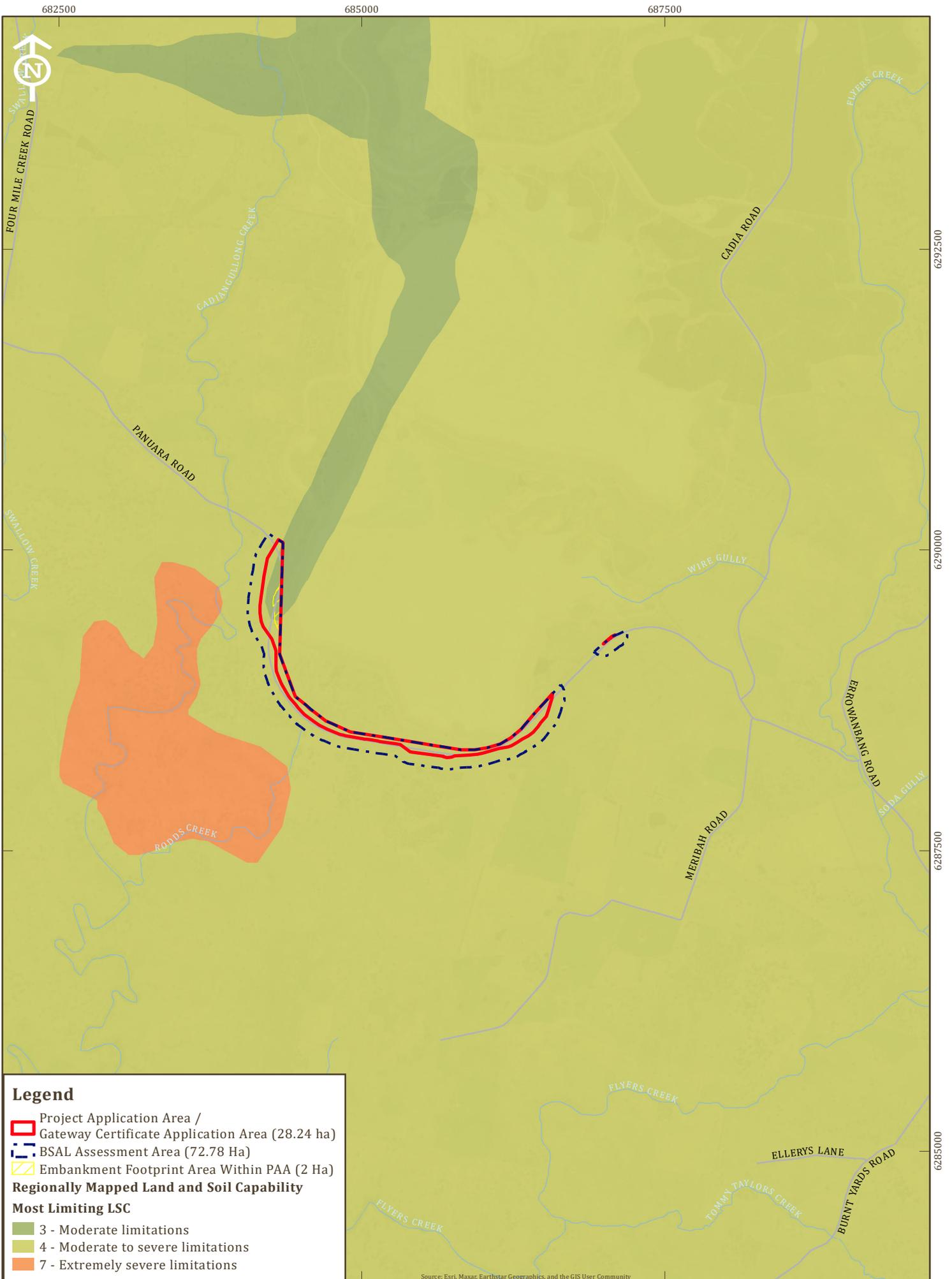
#### **Class 4**

This classification indicates moderate capability land that has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.

#### **Class 7**

This classification indicates very low capability land that has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.





**Legend**

- Project Application Area / Gateway Certificate Application Area (28.24 ha)
- BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area Within PAA (2 Ha)

**Regionally Mapped Land and Soil Capability**

**Most Limiting LSC**

- 3 - Moderate limitations
- 4 - Moderate to severe limitations
- 7 - Extremely severe limitations

GDA 1994 MGA Zone 55

0 250 500 1,000 Meters  
Scale 1:40000 at A4

Regionally Mapped  
Land and Soil Capability

**FIGURE 5**

### 2.1.5 AGRICULTURE SUPPORT INFRASTRUCTURE

Agricultural industries within the NSW Central West region are diversified and are primarily associated with cropping, beef cattle, wool and prime lamb enterprises, and fruit production (Department of Primary Industries [DPI], 2012). The region's agricultural industries are well serviced by key support infrastructure including irrigation systems, livestock sale yards, livestock agents and cropping infrastructure such as silos and rail systems (DPI, 2012).

The main agricultural service centres are the towns of Orange and Blayney, with local businesses providing agricultural equipment and supplies, including animal fencing, animal vaccinations, livestock ID, stock supplements, seed, fertiliser and crop protection.

The PAA and surrounds are well connected to support infrastructure being located in proximity to the Mid-Western Highway and Mitchell Highway (refer **Figure 1**). Access to regional road transport routes is readily available from the PAA via approved CVO access routes and Panuara Road. The Central Tablelands Livestock Exchange (CTLX), located approximately 25 km from the PAA at Carcoar on the Mid Western Highway, provides the region with a state-of-the-art livestock auction facility. The CTLX opened in 2008 to replace council saleyards at Orange, Bathurst and Blayney.

General agricultural improvements (e.g. stock fences, cattle yards and existing access tracks) are present within the CVO locality which reflects the historical and current development of the local lands for cropping and livestock grazing.



Plate 5: Cattle being sold at the Central Tablelands Livestock Exchange, located 25km from the PAA

(Photo credit: The Blayney Chronicle, 2018).



## 2.2 AGRICULTURAL PRODUCTION

### 2.2.1 AGRICULTURE IN THE LOCALITY

The CVO lies within the Blayney Shire Council and Cabonne Shire Council local government areas (LGAs). Changing agricultural focus and rural settlement patterns are a key characteristic of the history of the region, responding to changes in short to medium term environmental conditions and to changes in economic, social and policy frameworks, often at a scale well beyond the CVO locality.

The CVO locality maintains strong ties with agricultural production, and agricultural industries remain a major employer the surrounding rural communities. The area is traditionally known for quality wool and lambs, with broadacre grain production and cattle grazing more recently becoming dominant commodities.

Beef cattle are now the established and prevalent agricultural industry in the wider region, Blayney and Cabonne Shire LGAs and the CVO locality. The industry defines the rural character of the region, contributes significantly to the economy and facilitates the ongoing management of rural resource lands.

Although the CVO includes both shires, the PAA is located in the Blayney LGA only. Therefore, this section outlines the importance of agriculture in the Blayney Shire LGA and highlights the dominance of cattle grazing as the most common agricultural enterprise, similarly for the wider regional setting and at a more local scale to the PAA.

The Blayney economy supports an estimated 2,991 jobs, almost a quarter (24.3%) of which are within the mining industry. Agriculture, fishing and forestry is the second largest industry by employment and accounts for 13.1 % of total jobs, closely followed by manufacturing which accounts for 12.3 % of total jobs (refer **Table 2**).

Estimated output by industry is a gross measure of the total sales of each industry sector in the Blayney Shire LGA. The Blayney economy generates an estimated \$1.896 billion in output. The largest contributor to annual economic output is mining, which represents 48.2 % of total output, followed by manufacturing which accounts 20.5 % of the total output. Agriculture, forestry and fishing is the third strongest performing industry sector, representing 6.2 % of total output (refer **Table 3**).



Table 2: Employment by Industry for Blayney Shire LGA 2019 - 2020

Industry	Employed	%
Mining	727	24.3
Agriculture, Forestry & Fishing	392	13.1
Manufacturing	368	12.3
Construction	218	7.3
Health Care & Social Assistance	196	6.6
Education & Training	184	6.2
Retail Trade	169	5.7
Accommodation & Food Services	149	5.0
Other Services	101	3.4
Public Administration & Safety	100	3.3
Wholesale Trade	84	2.8
Professional, Scientific & Technical Services	82	2.7
Transport, Postal & Warehousing	76	2.5
Administrative & Support Services	65	2.2
Electricity, Gas, Water & Waste Services	29	1.0
Rental, Hiring & Real Estate Services	20	0.7
Arts & Recreation Services	12	0.4
Financial & Insurance Services	10	0.3
Information Media & Telecommunications	9	0.3
Total	2,991	100

Source: REMPLAN 2021, based on ABS 2016 Census Place of Work Employment (Scaled), ABS 2017 / 2018 National Input Output Tables, and ABS June 2020 Gross State Product.



Table 3: Estimated Output by Industry for Blayney Shire LGA 2019 - 2020

Industry	\$	%
Mining	914,102,126	48.2
Manufacturing	389,538,299	20.5
Agriculture, Forestry & Fishing	118,179,679	6.2
Construction	113,417,419	6.0
Rental, Hiring & Real Estate Services	87,415,509	4.6
Wholesale Trade	36,809,236	1.9
Health Care & Social Assistance	26,755,091	1.4
Electricity, Gas, Water & Waste Services	26,664,091	1.4
Education & Training	25,415,670	1.3
Professional, Scientific & Technical Services	24,401,186	1.3
Accommodation & Food Services	22,791,462	1.2
Transport, Postal & Warehousing	22,454,888	1.2
Public Administration & Safety	21,567,773	1.1
Retail Trade	20,869,120	1.1
Administrative & Support Services	16,489,509	0.9
Other Services	14,652,846	0.8
Financial & Insurance Services	8,451,710	0.4
Information Media & Telecommunications	4,061,331	0.2
Arts & Recreation Services	1,961,202	0.1
Total	1,895,998,149	100

Source: REMPLAN 2021, based on ABS 2016 Census Place of Work Employment (Scaled), ABS 2017 / 2018 National Input Output Tables, and ABS June 2020 Gross State Product.

The 2015-16 Agricultural Census, run by the Australian Bureau of Statistics, calculated the total value of agricultural commodity values in Blayney Shire LGA was \$47m. Livestock slaughters was the dominant agricultural enterprise, representing 65 % of the total agricultural value (refer **Table 4**).



Table 4: Agricultural Commodity Value for Blayney Shire LGA 2015 - 2016

Commodity	Value (\$)	%
Livestock slaughtering's	31,206,315.46	65.1
Livestock products	9,359,721.85	19.5
Cropping	6,685,892.15	14
Vegetables	246,090.42	0.5
Fruit and nuts	285,741.83	0.6
Nurseries, flowers or turf	130,523.08	0.3
<b>Agriculture Total Value</b>	<b>47,914,284.79</b>	<b>100</b>

Source: ABS Value of Agricultural Commodities Produced, Australia, 2015-16

Further analysis highlights that cattle and calves for slaughter are the dominant regional enterprise, representing 83 % of the value of all livestock slaughtering's (refer **Table 5** below) and 55 % of total agriculture commodity value. Sheep and lambs are also shown to be a significant enterprise, representing 16 % of the value of all livestock slaughtering's.

Table 5: Agricultural Commodity Value for Livestock Slaughtering by Type for Blayney Shire LGA 2015 - 2016

Commodity	Value (\$)	%
Cattle and calves	25943081.57	83.1
Sheep and lambs	5116249.16	16.4
Poultry	18697.49	0.1
Pigs	90790.83	0.3
Goats	37496.42	0.1
<b>Total Value</b>	<b>31206315.46</b>	<b>100</b>

The above tables highlight beef cattle as the established and prevalent agricultural industry in the region. The industry defines the rural character of the region, contributes significantly to the economy and facilitates the ongoing management of rural resource lands.

Factors in favour of cattle grazing and the region's beef industry include the:

- III. Suitability of the climate, pasture types and landscape.
- IV. Available service suppliers (e.g. produce merchants, contractors).
- V. Proximity to infrastructure (abattoirs, saleyards, transport etc) and a range of markets.
- VI. Potential for higher returns from group marketing activities.
- VII. Increasing adoption of industry standards, such as Meat Standards Australia (MSA) grading, which provide a tool for producers to identify and differentiate their products.
- VIII. Good international and domestic market prospects and the opportunity for professional beef producers to increase productivity and become more competitive.



Much like the wider region, the prevailing agricultural land use of the area immediate adjacent to the PAA is cattle grazing. This is undertaken on gently undulating to steeper sloped areas cleared of vegetation as a result of historic agricultural use (refer Plates 6 and 7). Cattle and cattle yards are common to the visual amenity of the land adjacent to the PAA (refer Plate 8).

In the wider locality, areas to the west and south of the PAA also feature cropping activity as one of the primary land uses, along with livestock grazing. Agriculture is wholly excluded in mining areas to the north of the PAA, and the Canobolas State Forest area to the north east of the PAA, which is used for a forestry plantation of Pine trees (*Pinus radiata*) (refer Plate 9).



Plate 6: Gently undulating grazing land 1 km south of the PAA



Plate 7: Steeper grazing land 3 km south west of the PAA



Plate 8: Cattle yard infrastructure <500 m from the PAA



Plate 9: Forestry plantation 3 km north east of the PAA



## 3 AGRICULTURAL RESOURCES AND PRODUCTION IN THE PROJECT APPLICATION AREA

### 3.1 PROJECT APPLICATION AREA CHARACTERISTICS

The PAA is a stable, free draining landform with 90 – 100 % surface cover that has been highly disturbed in the past by land clearing for agriculture and Panuara Road. The PAA is now dominated by sustainable pasture with isolated areas of native trees on Panuara Road verge and scattered paddock trees.

The PAA encompasses Panuara Road, associated road verges and several farming lots (refer **Figure 2** and Plates 10 and 11). It is unknown if road verges have historically been subject to grazing. For the purpose of this report, road verges are assessed as agricultural land given the potential for grazing. General agricultural improvements are present within or in close proximity to the PAA, including stock fences, shedding, cattle yards, electric fencing and unsealed access tracks.

The farming lots covered by the PAA are used for breeding and fattening cattle, on a current estimated stocking capacity of 16 Dry Sheep Equivalent per unit. Cattle are watered through surface dams, and no additional feeding is carried out. Currently, the PAA is not fertilised, and weeds are managed through spot spraying of herbicides. No sensitive agricultural activities such as intensive plant or livestock agriculture are being undertaken within the PAA or its immediate surrounds. Refer to Section 6 for consultation details.



Plate 10: Panuara Road, road verge and grazing lands representative of the PAA and locality



Plate 11: Grazing cattle in the immediate vicinity to the PAA, representative of land use of PAA and locality

## 3.2 SLOPE AND LANDFORM CHARACTERISTICS

The PAA is located within the eastern Lachlan Fold Belt of NSW. The surficial geology of the region consists of andesite, tuff, limestone, siltstone, shale, feldspathic greywacke, chert and diorite, with coarse-grained intermediate rocks including syenite and monzonite, and in-situ and alluvial/colluvial materials derived from above parent rock less than 1m deep on crests and up to 10–40 m deep on lower slopes and in drainage depressions (Source: DMR (2002) in Murphy & Lawrie (1989) (DCEEW, 2010) (refer **Figure 6**). The PAA lies within the Belubula River catchment, a tributary of the Lachlan River.

The landscape within the PAA ranges from broad drainage lines into low hills with smooth, undulating slopes rising to crests. Slopes within the PAA range from 0 - 1% along the open drainage lines and flats up to rocky upper slopes and crest rises of 30 - 40%. 25.5 ha of the BSAL Assessment Area has a slope >10% (refer **Figure 7**).

## 3.3 SOIL RESOURCES

The soil survey undertaken by Minesoils (2023) found the PAA to contain two dominant soil mapping units (refer to **Figure 8** and **Table 6**). The soil mapping units consist of the following:

- Soil Mapping Unit 1: Chromosols; and
- Soil Mapping Unit 2: Dermosols.

### Soil Mapping Unit 1: Chromosols

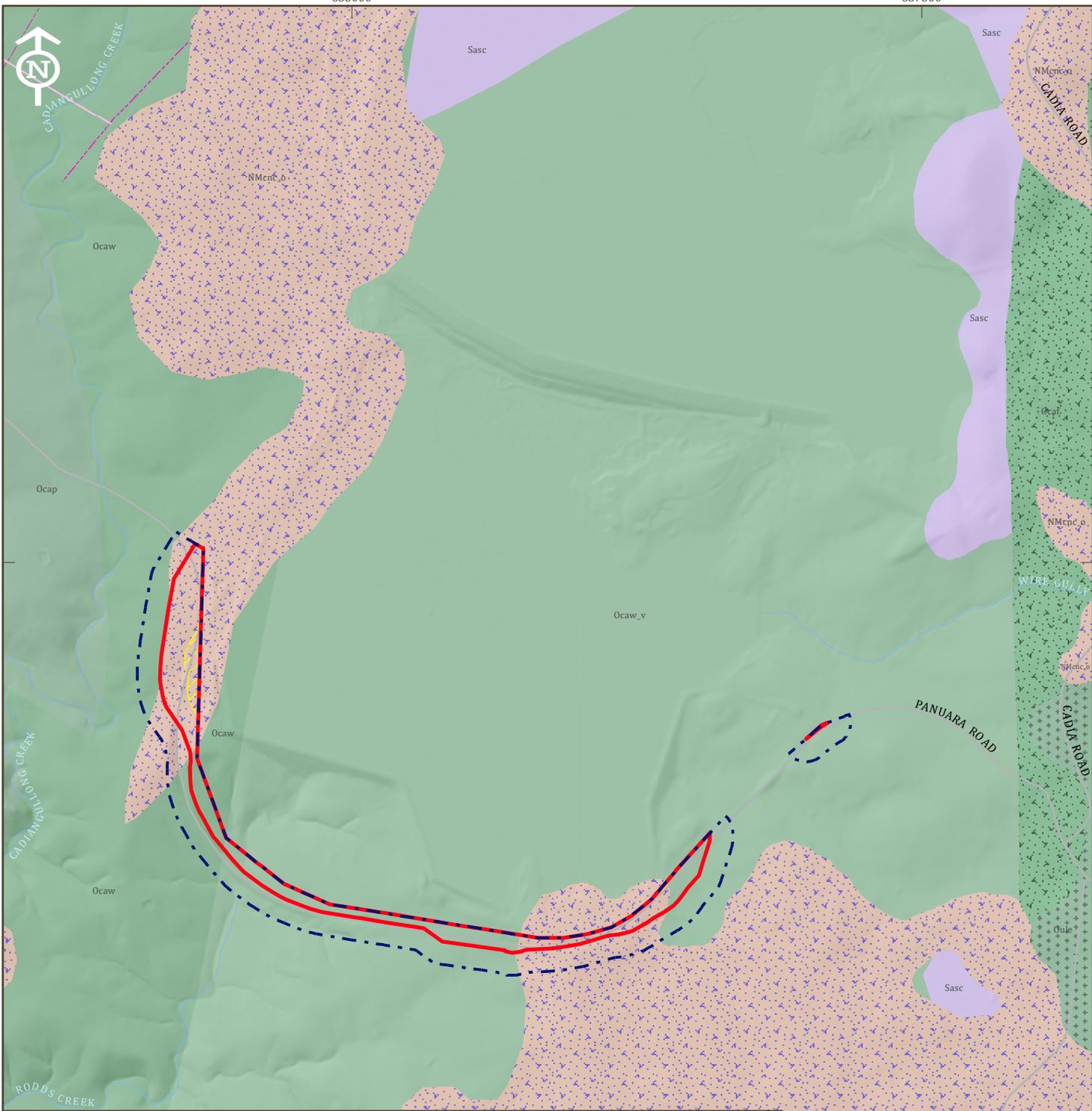
Chromosols are defined as soils with a clear or abrupt textural B horizon and in which the major part of the upper 0.2 m of the B2t horizon (or the major part of the entire B2t horizon if it is less than 0.2 m thick) is not sodic and not strongly acidic. Soils with strongly subplastic upper B2t horizons are also included even if they are sodic.

A subdominant soil profile exists within this mapping unit. M3 is a Sodosol, which is a duplex soil similar to a Chromosol, however, is defined as a texture contrast soil in which the major part of the upper 0.2 m of the B2 horizon (or the major part of the entire B2 horizon if it is less than 0.2 m thick) is sodic. Profile M3 represents this subdominant soil type occurrence.

### Soil Mapping Unit 2: Dermosols

Dermosols are defined as soils other than Vertosols, Hydrosols, Calcarosols and Ferrosols which have B2 horizons that have grade of pedality greater than weak throughout the major part of the horizon, and do not have clear or abrupt textural B horizon.





6290000

6287500

**Legend**

- Project Application Area / Gateway Certificate Application Area (28.24 ha)
- BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area Within PAA (2 Ha)

**Surficial Lithology**

**Cenozoic Igneous Province**

- NMcnc\_o

**Lachlan Orogen**

- Ocaf
- Ocafb
- Ocap
- Ocaw
- Ocaw\_v
- Oule
- Sasc

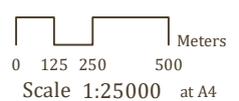
**Dominant Lithology**

- Basalt
- Fine grained igneous rock
- Mafic igneous rock
- Monzonite

**Trendlines**

- Lineament interpreted from geophysical data
- Trendline interpreted from geophysical data

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Surficial Geology

FIGURE 6



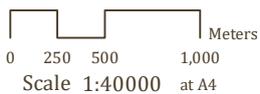
**Legend**

- Project Application Area /
- Gateway Certificate Application Area (28.24 ha)
- BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area Within PAA (2 Ha)

**Slope (%)**

- 0 - 1
- 1 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- > 50

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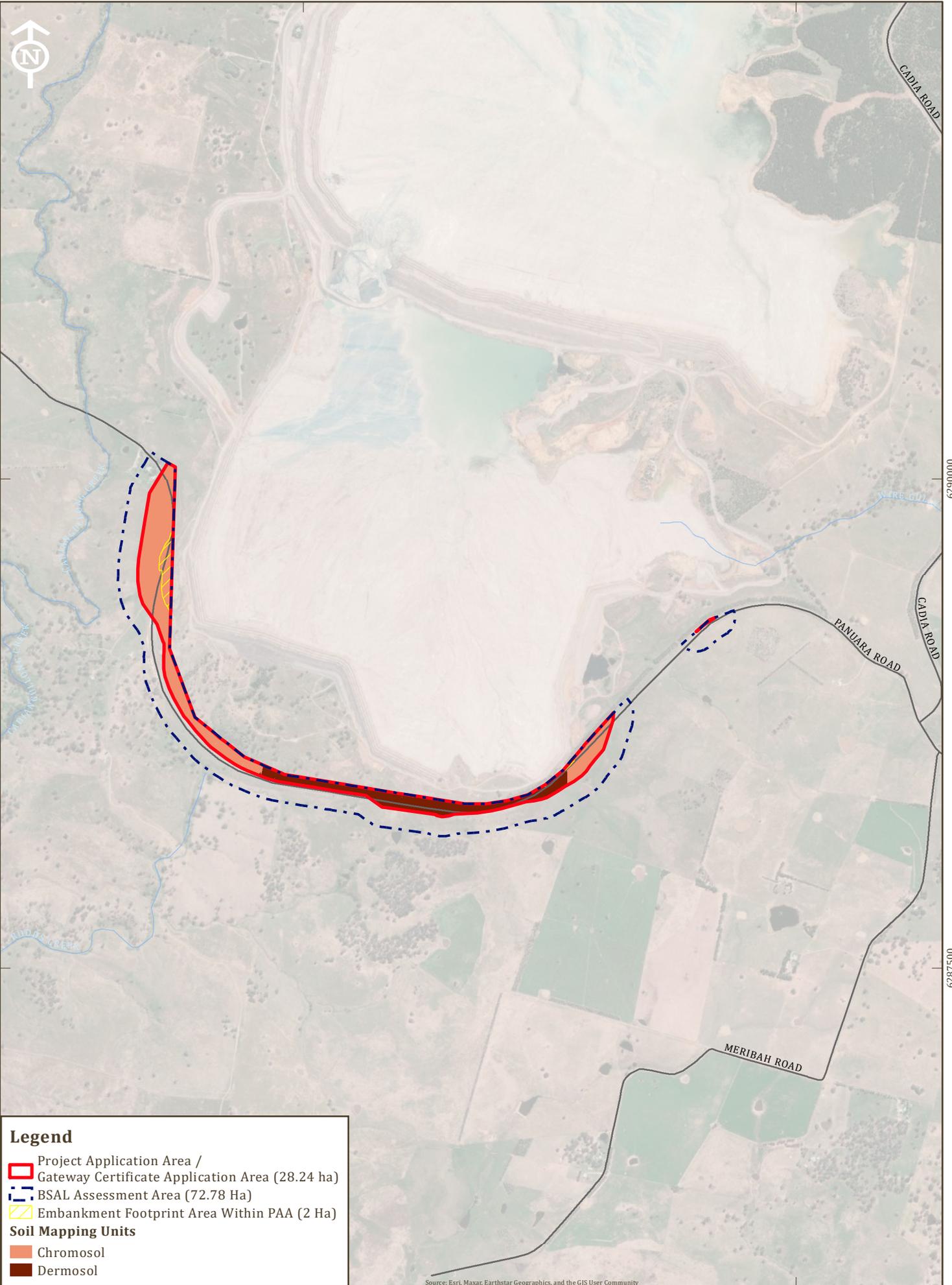


**MINESOILS**

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Slope Analysis

FIGURE 7



**Legend**

- Project Application Area / Gateway Certificate Application Area (28.24 ha)
- BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area Within PAA (2 Ha)

**Soil Mapping Units**

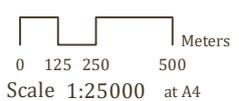
- Chromosol
- Dermosol

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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**MINE SOILS**

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Soil Mapping Units

**FIGURE 8**

Table 6: Soil Mapping Units and Soil Types Summary

Site #	Soil Map Units		Soil Profile - Australian Soil Classification (ASC)	ASC Family Criteria
	#	Name		
M1	2	Dermosols	Haplic Eutrophic Brown Dermosol	BEMOW
M2	2	Dermosols	Brown Dermosol	-
M3	1	Chromosols	Eutrophic Mesonatric Brown Sodosol	BFLMW
M4	1	Chromosols	Haplic Eutrophic Brown Chromosol	BFLOW
M5	1	Chromosols	Haplic Hypocalcic Brown Chromosol	BEKOW
M6	2	Dermosols	Brown Dermosol	-
M7	1	Chromosols	Haplic Hypocalcic Brown Chromosol	BEKMW
M8	1	Chromosols	Haplic Eutrophic Brown Chromosol	BEKOW
M9	1	Chromosols	Brown Chromosol	-
M10	1	Chromosols	Haplic Eutrophic Brown Chromosol	BFLOW
M11	1	Chromosols	Haplic Eutrophic Red Chromosol	BEMOW
M12	1	Chromosols	Haplic Eutrophic Red Chromosol	BEMOW
M13	1	Chromosols	Haplic Eutrophic Red Chromosol	BEMOW

Source: Isbell, R. F. (2021) *The Australian Soil Classification Third Edition*

### 3.4 LAND AND SOIL CAPABILITY

Land capability, as detailed in *The Land and Soil Capability Assessment Scheme; Second approximation* (OEH, 2012) (referred to as the LSC Guideline), is the inherent physical capacity of the land to sustain a range of land uses and management practices in the long term without degradation to soil, land, air and water resources. Failure to manage land in accordance with its capability risks degradation of resources both on and off-site, leading to a decline in natural ecosystem values, agricultural productivity, and infrastructure functionality.

The LSC Guideline uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards. The LSC Guideline consists of eight classes, which classify the land based on the severity of long-term limitations. The LSC classes are described in **Table 7** and their definition has been based on two considerations:

- The biophysical features of the land to derive the LSC classes associated with various hazards; and
- The management of the hazards including the level of inputs, expertise and investment required to manage the land sustainably.



The biophysical features of the land that are associated with various hazards are broadly soil, climate and landform, specifically noted as slope, landform position, acidity, salinity, drainage, rockiness; and climate. The eight hazards associated with these biophysical features that are assessed by the LSC Guideline are:

1. Water erosion
2. Wind erosion
3. Soil structure decline
4. Soil acidification
5. Salinity
6. Water logging
7. Shallow soils and rockiness
8. Mass movement

Each hazard is assessed against set criteria tables, as described in the LSC Guideline, with each hazard ranked from 1 to 8 with the overall ranking of the land determined by its most significant limitation.

Table 7: LSC Guideline Land and Soil Capability Classification

Class	Land and Soil Capability
<b>Land capable of a wide variety of land uses (cropping, grazing, horticulture, forestry, nature conservation)</b>	
1	<b>Extremely high capability land:</b> Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices.
2	<b>Very high capability land:</b> Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation.
3	<b>High capability land:</b> Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.
<b>Land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)</b>	
4	<b>Moderate capability land:</b> Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.
5	<b>Moderate-low capability land:</b> Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.
<b>Land capable for a limited set of land uses (grazing, forestry and nature conservation, some horticulture)</b>	
6	<b>Low capability land:</b> Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.
<b>Land generally incapable of agricultural land use (selective forestry and nature conservation)</b>	
7	<b>Very low capability land:</b> Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.
8	<b>Extremely low capability land:</b> Limitations are so severe that the land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation.



The LSC of the PAA is dominated by high and moderate capability land, with limited areas of low capability land. The PAA is defined by the classes presented in **Table 8** below (Minesoils, 2023) (refer **Figure 9**).

Table 8: LSC of the Project Application Area

LSC	Project Application Area	
	ha	%
3	12.2	43
4	11.6	41
6	4.4	16
Total	28.2	100

### 3.5 HISTORY OF AGRICULTURAL IN THE PROJECT APPLICATION AREA

Based on aerial photography, site observation, soil and land capability, and anecdotal evidence, it is determined that cleared areas of land within the PAA have historically been used for cattle grazing on native pastures, in much the same way as they are managed and stocked presently (refer Section 3.1). Improved pastures have been maintained with no fertiliser inputs, and no sensitive agricultural activities such as intensive plant or livestock agriculture have been undertaken within the PAA. The breeding and fattening of cattle has generally been undertaken on an estimated stocking capacity of 16 DSE per unit over the previous ten year period, with the exception of the drought conditions of 2017 – 2019, where it is estimated that stocking capacity was reduced to 6 DSE per unit.

An area of approximately 10 ha immediately adjacent to the PAA (within 150m) was used for cultivation of a fodder crop of oats in 2013 – 2014. There is anecdotal and photographic evidence of similar agricultural activities being undertaken sporadically in paddocks further afield with some areas being used for cultivation of fodder crops for cattle within the last ten years between the droughts of 2012 and 2017.

Refer to Section 6 for consultation details.

### 3.6 AGRICULTURAL PRODUCTIVITY

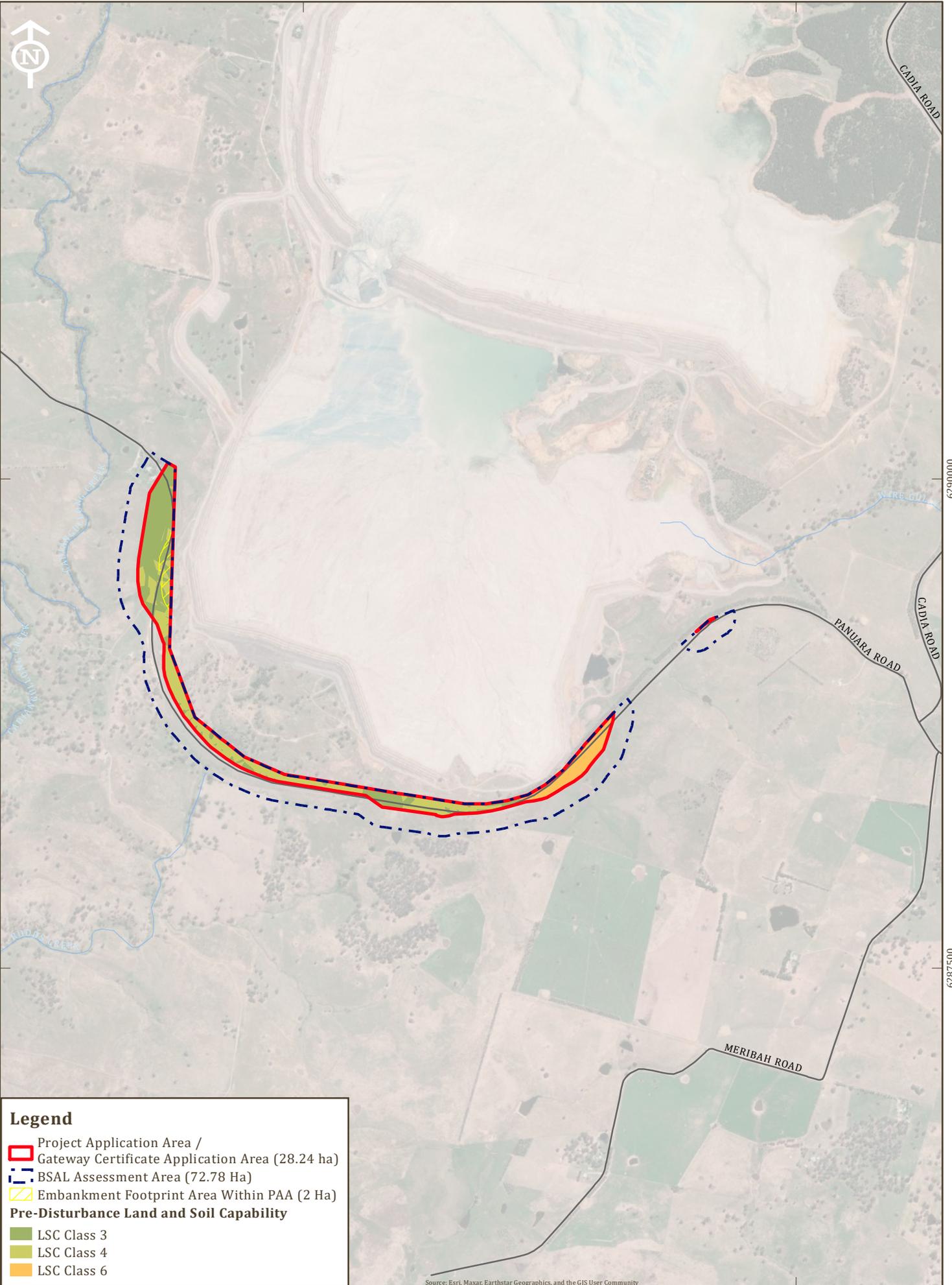
The NSW Department of Primary Industries (2019) Gross Margin Budgets for Livestock can be used to provide an estimation of the productivity of the land for grazing within the PAA. Based on enterprises including inland weaners and growing out steers (240 – 460 kilograms [kgs]), the estimated productivity of the PAA ranges from \$3,659.80 - \$11,619.53 per annum as summarised in **Table 9**.

Table 9: Estimated Productivity of the PAA

Enterprise	Estimated Gross Margin (\$/ha/year)	Grazing Land (ha)	PAA Gross Margin (\$/year)
Inland Weaners	129.78	28.2	3,659.80
Growing-out Steers 240 – 460 kg	412.04	28.2	11,619.53

Source: NSW Department of Primary Industries, 2019





**Legend**

- Project Application Area / Gateway Certificate Application Area (28.24 ha)
- BSAL Assessment Area (72.78 Ha)
- Embankment Footprint Area Within PAA (2 Ha)

**Pre-Disturbance Land and Soil Capability**

- LSC Class 3
- LSC Class 4
- LSC Class 6

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Meters

0 125 250 500

Scale 1:25000 at A4

Land and Soil Capability

**FIGURE 9**

## 4 AGRICULTURAL IMPACT ASSESSMENT

The impacts mining activities can have on land resources and agricultural productivity range from short term, temporary impacts, to long term and permanent impacts. Temporary impacts can include the removal of agriculture from service over a period of the life of the CVO. Permanent impacts may include changes to land and soil capability and agricultural resources of the PAA. Permanent impacts are irreversible and compromise the reinstatement of agricultural lands and land productivity.

The PAA will largely be subject to minor landform changes resulting in temporary impacts. Temporary impacts would consist of ancillary disturbance and infrastructure such as laydown areas, roads, soil stockpiles and water management/seepage dams. However, the Modification would result in some minor permanent landform changes in the PAA associated with the STSF embankment. This embankment would be rehabilitated post mining and would have a final slope in the order of 1:3 vertical to horizontal.

This section assesses the temporary and permanent impacts of the Modification on agricultural resource, enterprises and agricultural related socio-economic impacts.

### 4.1 IMPACTS ON AGRICULTURAL RESOURCES

#### 4.1.1 SOILS

The Chromosol and Dermosol soils that characterise the PAA would generally be subject to minor disturbance as part of the construction or maintenance of site infrastructure, where earthworks are necessary for the construction of roads, dams and other site facilities. Higher impacts are anticipated on the STSF embankment.

All soil that is proposed to be disturbed as part of the Modification would be stripped and directly placed or stored for re-use in rehabilitation efforts. It is anticipated that for the minor, temporary disturbance associated with infrastructure, soil stripping and re-use would be localised; soil would be respread from where it is stripped, reinstating the soil profile to its original condition. In these areas, the depth of soil salvaged will be as deep as excavations or surface disturbance as required, or to a depth where parent material is encountered.

In areas subject to significant landform disturbance associated with the embankment footprint (2.0 ha), a soil stripping operation should be undertaken to a nominated depth of 1 m or until a point at which parent material is reached to maximise the recovery of soil resources prior to disturbance. This material should be stockpiled and re-spread on the final landform embankment slopes and/or used to bolster rehabilitation efforts on returning areas subject to minor impacts to their original LSC.

For rehabilitation efforts being undertaken in the broader CVO at the time of stripping, stripped soils may be directly placed onto rehabilitation lands outside the PAA. This reduces the need for double handling and stockpiling of soil material. If soil resources within the PAA are used for rehabilitation elsewhere at the CVO, CHPL will source supplementary soil materials elsewhere on site with suitable physical and chemical characteristics for use in rehabilitation within the PAA in order to meet LSC class and BSAL commitments.

Refer soil stripping and handling recommendations in *Modification BSAL Site Verification Assessment* (Minesoils, 2023).

#### 4.1.2 LAND AND SOIL CAPABILITY

Following the end of life for the CVO, minor landform impact areas will be re-graded (where required) and stockpiled topsoil and subsoil be placed over disturbed areas and rehabilitated with either native vegetation or improved pastures depending on the intended final land use. This strategy, along with good soil management practices, will facilitate the rehabilitation in returning this land to equivalent LSC Classes as outlined 3.4.



For the area of 2.0 ha where the tailing dam embankment footprint encroaches the PAA, the landform changes will be significant and permanent. Here, the embankment slope will remain as the final landform, with more limited rehabilitation options, and become LSC class 7 land which is considered low capability land generally incapable of agricultural land use.

#### 4.1.3 WATER

The Cadia Groundwater Review to Support Gateway Application by Australasian Groundwater and Environmental Consultants (AGE, 2023) determined that the Modification would not result in water being taken from the groundwater regime during operations or post closure. There is expected to be minimal, if any change to water access licensing as a result of the reinforcement of the TSF embankment footprint outside the CVO mining lease, as there would not be groundwater take.

Additionally, there will be no water level changes from the Modification as there is no groundwater take and the landholder bores are outside the influence of the zone where loading/compaction may induce water level rises. Although landholder bores are in several cases located hydraulically downgradient from the PAA there is likely to be no changes in water quality for these bores from the Modification.

Further, there is anticipated to be no changes in water levels from the Modification on Groundwater Dependant Ecosystems in the area as there is no groundwater take, and it is unlikely to result in increased saline and contaminated water inflow into underlying aquifer systems due to the underlying rocks mainly being of poor permeability below the weathered zone (Ordovician volcanics), and the presence of the pump back systems (AGE, 2023).

#### 4.1.4 EROSION AND SEDIMENTATION

Generally, both Soil Mapping Unit 1 and Soil Mapping Unit 2 represent suitable materials for re-use in rehabilitation (Minesoils, 2023). These soils are physically desirable and chemically stable, resulting in a low erosion risk. Nonetheless, appropriate erosion and sediment control measures should be implemented during any disturbance of these materials.

One exception is the sub-dominant sodosol soil type associated with Soil Mapping Unit 1, which represents a dispersion risk due to its sodic nature. Soil amelioration is recommended where the subsoils of this soil type are exposed to disturbance. This may include deep ripping and application of dry gypsum and organic matter to improve soil structure and dispersity. Additional erosion management would also be required in order to reduce risk. Upon respreading, these soils should be used exclusively as a subsoil, and encapsulated by the loamy topsoils and/or subsoils associated with non-sodic soil type. (Minesoils 2023).

#### 4.1.5 INFRASTRUCTURE

The Modification would have a negligible negative impact on local and regional agricultural reliant infrastructure.

Stock fences and other farm improvements will be established as part of the rehabilitation of the site to accommodate a final land use of livestock grazing.

### 4.2 IMPACTS ON AGRICULTURAL ENTERPRISES

#### 4.2.1 MODIFICATION LOCALITY ENTERPRISE IMPACTS

Agricultural productivity of land within the CVO locality would not be affected by the Modification as the associated agricultural resources would not be affected. Therefore, the Modification would not negatively impact any existing agricultural enterprise outside of the PAA.



## 4.2.2 PROJECT APPLICATION AREA ENTERPRISE IMPACTS

There will be a temporary removal of 28.2 ha of agricultural land from service during the life of the CVO. Current agricultural enterprises will cease.

Due to the minimal disturbance to the landform in areas associated with infrastructure, following the life of the CVO, 26.2 ha removed from agriculture in the PAA would be returned to agricultural use, with no reductions in LSC. Agricultural enterprises can then re-commence at an equivalent agricultural productivity.

For the area of 2.0 ha subject to significant landform modification associated with the TSF embankment, land will be changed to a LSC of class 7, which will prohibit future agricultural use.

## 4.3 SOCIO-ECONOMIC IMPACTS

### 4.3.1 AGRICULTURE SUPPORT SERVICES

Changes to the supply and viability of agricultural support services in the nearby villages and regional centres are driven by social and market trends of a large scale. There are no local industry support services or specialised agribusinesses that would be affected by the temporary or permanent change in land use associated with the Modification. In addition, at a comparable scale to the regional land available for cattle grazing, the reduction in cattle being sold would not be a significant impact on the regional saleyards, as this reduction will represent an estimated <0.001% of all cattle sold.

### 4.3.2 VISUAL AMENITY, LANDSCAPE VALUES AND TOURISM

Visual amenity is an important value in rural areas for landowners who have attachment to the rural landscape, and for enterprises that attract visitors because of the rural ambience and lifestyle experience. Landscape value corresponds to an attachment or emotional bond that people develop with places. There are strong cultural ties to landscapes and feelings for the visual beauty of mountains, lakes, coasts, forests, etc., which are a common bond among people or social groups of a given region.

The impact of the Modification on visual amenity and landscape values is expected to be small and the economic value of any changes to visual amenity experienced at properties and vantage points in the CVO locality is expected to be negligible, due to the present dominance of mining operations which includes the NTSF and STF along with areas of disturbance which form part of the existing viewsheds and characteristic and consistent with the visual amenity and landscape values of the general area. The Modification is therefore consistent with the local context.

Further, there are no established tourism operations that would be affected by the Modification.

### 4.3.3 LOCAL AND REGIONAL EMPLOYMENT

Due to the limited scale and agricultural productivity of the PAA, there are no anticipated local and/or regional employment impacts.

### 4.3.4 CRITICAL MASS THRESHOLDS

Due to the limited reduction in agricultural activity in the region, namely in the scale of cattle farming as a result of the Modification, there would be no impact to critical mass thresholds of agricultural enterprises needed to attract and maintain investment in agricultural service industries and infrastructure.

## 4.4 AGRICULTURAL IMPACTS AGAINST CRITERIA

**Table 10** provides a summary of potential impacts with reference to the relevant criteria in the mining SEPPs.



Table 10 Potential Impacts Against Mining SEPPs Criteria

Criteria	Assessment
Any impacts on the land through surface area disturbance	The Modification would result in permanent landform changes in the PAA associated with the STSF embankment over an area of 2.0 ha. This embankment would be rehabilitated post mining and would have a final slope in the order or 1:3 vertical to horizontal.
Any impacts on soil fertility, effective rooting depth or soil drainage	Evidence from the CVO, other sites within Australia and the Soils, Land and BSAL Gateway Assessment (MineSoils, 2023) undertaken for the Modification, indicate that there would be no significant impact to soil fertility or soil rooting depth in the areas of the PAA subject to minor disturbance. The 2.0 ha which are subject to significant landform impact associated with the STSF embankment would likely result in a reduction of effective rooting depth, and changes to drainage due to slope.
Increases in land surface micro-relief, soil salinity, rock outcrop, slope and surface rockiness or significant changes to soil pH	The 2.0 ha associated with the STSF embankment would be subject to localised increases to land slope in the order of 1:3 vertical to horizontal, post mining. With appropriate management and rehabilitation there will be negligible impacts on soil salinity, rock outcrop, surface rockiness and soil pH, both in the STSF embankment area and the remainder of the PAA subject to minor impacts associated with infrastructure.
Any impacts on highly productive groundwater (Aquifer Interference Policy)	The reinforcement of the STSF embankment would not change groundwater take, and therefore would not affect water access licensing. The main concern is potential seepage from the TSF into the underlying bedrock and creeks. The TSF embankment would be designed with a very low permeability core to minimise seepage through the wall.
Any fragmentation of agricultural land uses	Throughout the Modification life, the PAA would not be used for agricultural production. Therefore, there would be minor temporary reduction in the land available for agricultural use. The use of the PAA would not result in the fragmentation or isolation of any existing agricultural land use, as it immediately adjoins the CVO TSF operational area. Following the Modification life, areas subject to minor impacts would be returned to an LSC class that facilitates agricultural land use, while areas associated with the STSF embankment (2.0 ha) would not be suitable for agricultural land use. Therefore, there would be a minor permanent reduction in the land available of agricultural land use. No permanent fragmentation of agricultural use will result from the Modification.
Any reduction in the area of biophysically strategic agricultural land	BSAL (Interim Protocol Verified and Potential BSAL) within the PAA will be subject to minor surface disturbance associated with the development of ancillary surface infrastructure and major landform disturbance associated with the STSF embankment. All areas within the PAA that are anticipated to be disturbed by the Modification would be subsequently rehabilitated, however, due to the changes in slope – a key factor in BSAL qualification, there will be a minor reduction in BSAL of 0.8 ha.

Source: Department of Planning and Infrastructure (2013) Strategic Regional Land Use Policy Guideline for Gateway Applicants, Fact Sheet, September 2013.



## 5 MITIGATION MEASURES

The Modification will include a number of measures to prevent, minimise and manage adverse impacts on agricultural resources. This incorporates procedural mitigation measures along with a land management process that ensures the Modification has negligible impact on agricultural resources. The Modification is not expected to negatively impact any existing agricultural enterprise outside of the PAA and as such mitigation is not proposed.

In addition to the specific measures described in this assessment, the Modification, will outline how all activities associated with the Modification will be conducted in consideration of CVO obligations and environmental management measures in site specific environmental management plans.

### 5.1 MODIFICATION ALTERNATIVES AND DESIGN

The Modification is needed to increase the structural strength of the STSF embankment, which is the reason for this Gateway Application. Given the STSF location is fixed (i.e. it is a large existing tailings dam) there are no practical alternatives to the Modification. The proposed changes are driven by new information which has come to light since the 14<sup>th</sup> Modification to the CVO, including, recent drilling results and a higher engineering significance rating which require a larger foundation footprint for the TSFs embankment.

### 5.2 MONITORING PROGRAMS

Monitoring programs are instituted to assess predicted verses actual impacts as the Modification progresses.

All current operations at the CVO are undertaken in accordance with approved Environmental Management Plans and Strategies. The management plans include detailed environmental monitoring programs. CVO continually monitors environmental performance and legislative compliance of the existing operations.

Mining operations are managed through the existing Environmental Management System (EMS) to minimise impacts on the surrounding environment and community. The EMS provides for the monitoring and reporting of all key environmental aspects of the current operations.

Key management plans currently in effect that assist in managing impacts on agricultural land include:

- Rehabilitation Strategy;
- Blast Monitoring Program;
- Noise Monitoring Program;
- Air Quality Monitoring Program;
- Water Management Plan; and
- Land and Biodiversity (Landscape) Management Plan

These management plans will be reviewed and revised where necessary to incorporate requirements associated with the Modification and the nature of the ancillary disturbance within the PAA, prior to commencement. A key component of this revision will be the development of trigger levels and Trigger Response Action Plans including remedial actions, in consultation with stakeholders. The environmental monitoring program and data collected listed in **Table 11** below will form the basis in this regard.

In addition, an Annual Review will be prepared for the Modification. This document will summarise Modification activities and performance in the areas of health, safety, environment and community and will be publicly available. All management plans and monitoring data will also be publicly available on the CVO website.



Table 11: Monitoring Program and Trigger Responses

Parameter	Management Plan	Monitoring	Frequency
Rehabilitation	Rehabilitation Strategy Farm Management Plan	<ul style="list-style-type: none"> <li>- Estimated pasture yield (kg/ha)</li> <li>- Visual assessment of general health</li> <li>- Visual assessment of cultivation performance</li> <li>- Ground cover (%)</li> <li>- Target species present (%)</li> <li>- Presence of weeds</li> <li>- Soil monitoring</li> <li>- Photo records</li> <li>- Geotechnical stability</li> <li>- Surface water and groundwater monitoring</li> </ul>	Quarterly
Blasting	Blast Management Plan	<ul style="list-style-type: none"> <li>- Air blast overpressure (dB(Linear Peak))</li> </ul>	As required
Noise	Noise Management Plan	<ul style="list-style-type: none"> <li>- Predictive meteorological forecasting</li> <li>- Real-time noise monitoring for day to day planning</li> <li>- (Supplementary attended monitoring)</li> </ul>	Daily  (Quarterly)
Water	Water Management Plan	<ul style="list-style-type: none"> <li>- Base flow monitoring</li> <li>- Surface water quality</li> <li>- Stream flows</li> <li>- Rainfall, as recorded at Cadia's weather stations</li> <li>- Water level monitoring of water management dams</li> <li>- Algae levels in Cadiangullong and Rodds Creek Dams</li> <li>- Offsite discharges</li> <li>- Mine water quality</li> <li>- Spring SPR03 water quality and flows</li> <li>- Groundwater levels</li> <li>- Groundwater quality</li> </ul>	Annually Monthly to Quarterly Monthly Daily  Daily  Weekly  Daily  As required for each bore
Air Quality	Air Quality Management Plan	<ul style="list-style-type: none"> <li>- Predictive meteorological forecasting</li> <li>- PM10 and PM2.5 ambient air quality</li> <li>- Dust deposition monitoring</li> <li>- Visual dust monitoring</li> <li>- Total Suspended Particulate (TSP)</li> </ul>	Monthly
Land and Biodiversity	Land and Biodiversity (Landscape) Management Plan	<ul style="list-style-type: none"> <li>- Inspection of impact to livestock</li> <li>- Fauna surveys</li> <li>- Pest surveys</li> <li>- Weed monitoring</li> <li>- Aquatic ecosystems monitoring</li> <li>- Erosion control monitoring</li> </ul>	Annually

### 5.3 REHABILITATION

Following the end of life for the Cadia East Project, minor landform impact areas will be re-graded (where required) and stockpiled topsoil and subsoil placed over disturbed areas and rehabilitated with improved pastures. This strategy, along with good soil management practices, will facilitate the rehabilitation in returning this land to an equivalent LSC class. Once these areas are rehabilitated, they will be returned to a productive agricultural capacity as soon as practicable. An appointed Farm Manager will assist in developing and implementing a property specific Farm Management Plan for rehabilitated areas as part of the wider operations.



The area of agricultural land disturbed by the Modification at any one time should be minimised so that agricultural uses can continue, if practicable. A detailed progress plan will minimise land disturbance in advance of construction and operation activities and include provisions for localised progressive rehabilitation. This may assist in reducing net impacts to agricultural lands at any one time, (although this is unlikely to be significant given the scale and nature of impacts on the PAA).

For the area of 2.0 ha where the tailings dam embankment footing encroaches the PAA, the landform changes will be significant and permanent. Here, the embankment slope will remain as the final landform, which will have a land use of native woodland for habitat, with limited rehabilitation options for agricultural use.

The nature of rehabilitation measures undertaken at CVO on the approved Projects suggests a capacity for land management and rehabilitation that far exceeds the requirements for the PAA.



## 6 CONSULTATION

Direct consultation to inform this assessment was undertaken with landowner Geoff Knox and Cadia employee and farm manager Teiya Thornberry regarding current management of former land and agricultural practices on the PAA and its surrounds.

Geoff Knox owned “Meribah”, a 1400 hectare property located immediately to the south and adjoining Cadia Valley Operations for 40 years. In addition to Mr Knox’s long term presence in the district he has also been a long term member of Cadia Valley Operations Community Consultative Committee as a Landowner Representative for the Errowanbang district.

As part of the ongoing operation of the CVO, a community and external relations procedure has been developed to help manage all community and stakeholder consultation activities. All stakeholder engagement activities as part of the Modification will be undertaken in accordance with the existing procedure.



## 7 ASSESSMENT CERTAINTY AND SUMMARY

There is a high level of certainty about the moderate to high quality of agricultural resources in the PAA, based on soil survey, site inspections and desktop studies carried out. There is good information regarding the agricultural resources and productivity of the CVO locality and the broader region. There is a high level of certainty about the CVO's activities, surface disturbance requirements and commitments to rehabilitation to pre-disturbance agricultural status. The risk based impact assessment outcomes discussed in Section 4 and presented in Appendix A indicate that the risks of the Modification on agriculture ranges from low to moderate. The moderate risk permanent impact items are summarised as the following:

- Permanent reduction of land used for agricultural purposes;
- Permanent decreased productivity of agricultural land;
- Changes to landform, slope and topography of the PAA;
- Permanent downgrading of LSC classes within the PAA; and
- Direct reduction of BSAL.

Despite the moderate risk status of these impacts, given the scale and nature of the activities in the PAA permanently impacting a limited area of 2.0 ha, the overall impact of the Modification on agriculture and agricultural resources is considered to be minor on a property scale and negligible at the scale of the locality. Viewed in context of the CVO, the Modification represents negligible additional impact.



## 8 REFERENCES

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- REMPAN (2021) *Economy, Jobs and Business Insights – Blayney Shire* (using Australian Bureau of Statistics 2016 Census (Scaled), 2017 / 2018 National Input Output Tables, and June 2020 Gross State Product).



## APPENDIX A – RISK ASSESSMENT

Based on the impact assessment of agricultural resources and productivity (Section 4) and the mitigation measures outlined for the Cadia East Project (Section 5), the key risk considerations for agriculture can be summarised as the following:

- Temporary reduction of land used for agricultural purposes;
- Permanent reduction of land used for agricultural purposes;
- Temporary decreased productivity of agricultural land;
- Permanent decreased productivity of agricultural land;
- Impacts to existing agricultural enterprises in the PAA;
- Impacts to existing agricultural enterprises in the CVO locality;
- Changes to landform, slope and topography in the PAA;
- Loss of soil resources within the PAA;
- Erosion and sedimentation of agricultural resources;
- Permanent downgrading of LSC classes within the PAA;
- Direct reduction of BSAL;
- Changes to availability of surface water used by local landholders;
- Changes to availability of groundwater used by local landholders;
- Changes to site run-off water quality;
- Impacts to agricultural resources outside the PAA;
- Impacts to agricultural support infrastructure in the CVO locality and wider region;
- Changes to farm improvements within the PAA;
- Impacts on agricultural support services;
- Impacts to the visual amenity and landscape values of the CVO locality.
- Impacts on agriculture based tourism;
- Effects on local and regional employment;
- Proliferation of pest species;
- Introduction of biosecurity threat to agricultural enterprises;
- Changes to air quality and dust in CVO locality;
- Increase in traffic volume in CVO locality;
- Increase in noise levels in CVO locality;
- Effects on the critical mass threshold of the cattle industry; and
- Poor rehabilitation outcomes.

An assessment of the above potential risks to agriculture has been conducted in accordance with the Agricultural Impact Risk Ranking methodology described in the *Guideline for Agricultural Impact Statements at the Exploration Stage* (DTIRIS, 2012). Tables 1A and 2A list the probability and consequence descriptors that were used in the Agricultural Impact Risk Ranking, as described by DTIRIS (2012). The level of risk was assessed according to the risk matrix presented in Table 3A (DTIRIS, 2012).

The outcomes of the risk assessment are presented in Table 4A. The risk rating constitutes an impact assessment by taking into consideration the findings of this investigation, findings of technical studies and available management and mitigation options for each risk.



Table 1A Agricultural Impact Risk Ranking – Probability Descriptors

Level	Descriptor	Description
A	Almost Certain	Common or repeating occurrence.
B	Likely	Known to occur or it has happened.
C	Possible	Could occur or I've heard of it happening.
D	Unlikely	Could occur in some circumstances but not likely to occur.
E	Rare	Practically impossible or I've never heard of it happening.

Table 2A Agricultural Impact Risk Ranking – Consequence Descriptors

Level 1	Severe Consequences	Example of Implications
Description	<ul style="list-style-type: none"> <li>Severe and/or permanent damage to agricultural resources, or industries</li> <li>Irreversible</li> <li>Severe impact on the community</li> </ul>	<ul style="list-style-type: none"> <li>Long-term (e.g. 20 years) damage to soil or water resources</li> <li>Long-term impacts (e.g. 20 years) on a cluster of agricultural industries or important agricultural lands</li> </ul>
Level 2	Major Consequences	Example of Implications
Description	<ul style="list-style-type: none"> <li>Significant and/or long-term impact to agricultural resources, or industries</li> <li>Long-term management implications</li> <li>Serious detrimental impact on the community</li> </ul>	<ul style="list-style-type: none"> <li>Water or soil impacted, possibly in the long-term (e.g. 20 years)</li> <li>Long-term (e.g. 20 years) displacement/serious impacts on agricultural industries</li> </ul>
Level 3	Moderate Consequences	Example of Implications
Description	<ul style="list-style-type: none"> <li>Moderate and/or medium-term impact to agricultural resources, or industries</li> <li>Some ongoing management implications</li> <li>Minor damage or impacts but over the long-term</li> </ul>	<ul style="list-style-type: none"> <li>Water or soil known to be affected, probably in the short to medium-term (e.g. 1-5 years)</li> <li>Management could include significant change of management needed for agricultural enterprises to continue</li> </ul>
Level 4	Minor Consequences	Example of Implications
Description	<ul style="list-style-type: none"> <li>Minor damage and/or short-term impact to agricultural resources, or industries</li> <li>Can be effectively managed as part of normal operations</li> </ul>	<ul style="list-style-type: none"> <li>Theoretically could affect the agricultural resource or industry in the short-term, but no impacts demonstrated</li> <li>Minor erosion, compaction or water quality impacts that can be mitigated</li> <li>For example, dust and noise impacts in a 12 month period on extensive grazing enterprises</li> </ul>
Level 5	Negligible Consequences	Example of Implications
Description	<ul style="list-style-type: none"> <li>Very minor damage or impact to agricultural resources, or industries</li> <li>Can be effectively managed as part of normal operation</li> </ul>	<ul style="list-style-type: none"> <li>No measurable or identifiable impact on the agricultural resource or industry</li> </ul>

Source: DTIRIS (2012)



Table 3A Agricultural Risk Ranking - Matrix

Consequence	A Almost Certain	B Likely	C Possible	D Unlikely	E Rarely
1. Severe and/or permanent damage. Irreversible impacts.	A1	B1	C1	D1	E1
2. Significant and/or long-term damage. Long-term management implications. Impacts difficult or impractical to reverse	A2	B2	C2	D2	E2
3. Moderate damage and/or medium-term impact to agricultural resources or industries. Some ongoing management implications, which may be expensive to implement. Minor damage or impacts over the long-term.	A3	B3	C3	D3	E3
4. Minor damage and/or short-term impact to agricultural resources or industries. Can be managed as part of routine operations.	A4	B4	C4	D4	E4
5. Very minor damage and minor impact to agricultural resources or industries. Can be managed as part of normal operations	A5	B5	C5	D5	E5

Source: DTIRIS (2012)

	High Risk
	Medium Risk
	Low Risk



Risk	Findings	Assessment		
		P	C	R
Temporary reduction of land used for agricultural purposes	The Modification will remove from service 28.2 ha currently used for agricultural activities during construction and operation.	A	5	Low
Permanent reduction of land used for agricultural purposes	An area of 26.2 ha of the PAA currently used for agricultural activities will be returned to agricultural activities following the life of the CVO. The remaining area of 2.0 ha will not be suitable for agricultural use following the life of the CVO.	A	4	Moderate
Temporary decreased productivity of agricultural land	The Modification will inhibit any agricultural productivity within the PAA during construction and operation.	A	5	Low
Permanent decreased productivity of agricultural land	An area of 26.2 ha of the PAA currently used for agricultural activities will be returned to an equivalent agricultural productivity following the life of the CVO. The remaining area of 2.0 ha will be subject to permanent decreased productivity as a result of the Modification.	A	4	Moderate
Discontinuing of existing agricultural enterprises in the PAA	There are no existing agricultural enterprises that will discontinue to due to lands being temporarily removed from agricultural service.	D	4	Low
Impacts to existing agricultural enterprises in the CVO locality	The Modification will not negatively impact any existing agricultural enterprise outside of the PAA.	E	5	Low
Changes to landform, slope and topography of the PAA	Due to the nature of the disturbance requiring no significant landform changes over an area of 26.2 ha of the PAA, there will be no changes to slope or topography that will result in decreased agricultural productivity for this area. The remaining area of 2.0 ha will be subject to changes in landform, slope and topography.	A	4	Moderate
Loss of soil resources within the PAA	Soil resources subject to disturbance by the Modification have been subject to extensive investigations. Soils will be salvaged prior to disturbance for re-use in localised rehabilitation. Additionally, specific soil dispersion risks will be managed to control erosion risk and prevent soil resource loss.	D	4	Low
Erosion and sedimentation of agricultural resources	Erosion control measures and a detailed site erosion and sediment control plan that addressed specific soil dispersion risks will be utilised to control erosion risk and prevent soil resource loss and sedimentation of streams.	C	4	Low
Permanent downgrading of LSC classes within the PAA	An area of 26.2 ha of the PAA will be returned to an equivalent LSC classes following the life of the CVO. The remaining area of 2.0 ha will be subject to a permanent downgrade of LSC class.	A	4	Moderate
Direct reduction of BSAL	The extent of verified BSAL within the PAA will be subject to direct reduction of approximately 0.8 ha due to landform modification.	A	4	Moderate



Risk	Findings	Assessment		
		P	C	R
Changes to availability of surface water used by local landholders	There will be no changes to availability of surface water used by local landholders	E	5	Low
Changes to availability of groundwater used by local landholders	The Modification is not expected to impact groundwater. As a result, there will be no to availability of groundwater used by local landholders	E	5	Low
Changes to site run-off water quality	Erosion control measures and a detailed site erosion and sediment control plan as well as a surface water management plan that includes monitoring will control impacts to surface water quality	E	5	Low
Impacts to agricultural resources outside the PAA	There will be no impact, permanent or temporary, direct or indirect, to agricultural resources outside the PAA as a result of the Modification.	E	5	Low
Impacts to agricultural support infrastructure in the Project locality and wider region	There will be no impact, permanent or temporary, direct or indirect, to agricultural infrastructure in the CVO locality or wider region as a result of the Modification.	E	5	Low
Changes to farm improvements within the PAA	Farm improvements such as fences will be replaced as part of site rehabilitation. Access tracks used for the activity will be improved for the CVO and will benefit agriculture land uses following the life of the CVO.	E	5	Low
Impacts on agricultural support services	Due to the limited scale of current agricultural enterprises within the PAA, impacts on agricultural support services are estimated to be negligible and will be outweighed by the economic benefits of the Modification.	E	5	Low
Impacts to the visual amenity of the CVO locality	Due to the present dominance of mining operations with areas of disturbance that are an established part of the existing view and character of the rural landscape changes in visual amenity will be suited to the local context.	C	5	Low
Reduction in landscape values of the CVO locality	Due to the present dominance of mining operations with areas of disturbance that are an established part of the existing view and character of the rural landscape impacts on landscape values will be negligible.	C	5	Low
Impacts on agriculture-based tourism	No tourism reliant on the PAA or immediate locality was identified.	E	5	Low
Effects on local and regional employment	The Modification's effect on employment will be negligible.	E	5	Low
Proliferation of pest species	Ongoing monitoring inspections will determine the requirement for weed or pest elimination as per a Pest Management Plan.	C	4	Low



Risk	Findings	Assessment		
		P	C	R
Introduction of biosecurity threat to agricultural enterprises	Standard procurement safeguards and quarantine procedures as per Australian requirements will control the potential impact on the biosecurity of agricultural resources and enterprises within the region.	E	4	Low
Changes to air quality and dust in CVO locality	Dust and air quality impacts are unlikely to be significant and standard dust suppression measures can be readily implemented.	E	5	Low
Increase in traffic volume in CVO locality	Increases in traffic volume are not expected to be an impact on agriculture within the CVO locality.	C	4	Low
Increase in noise levels in CVO locality	The predicted noise levels are considered negligible impact on agricultural activities. Nuisance noise will be effectively managed and minimised through the adoption of standard management practices.	C	4	Low
Effects on the critical mass threshold of the cattle industry	Due to the limited reduction in agricultural activity as a result of the Modification in the scale of cattle farming in the region, there will be no impact to critical mass thresholds	E	4	Low
Poor rehabilitation outcomes	The consequence of poor rehabilitation outcomes is significant. The risk assessment of many of the above factors is dependent on the sound rehabilitation of the PAA following the life of the CVO.  Rehabilitation planning and soil management recommendations form a foundation to control this risk. Rehabilitation methods and controls will be refined by a detailed site Rehabilitation Strategy.	D	2	Low

Note: P = Probability  
C = Consequence  
R = Risk

The risk assessment outcomes presented above indicate that the permanent risk of the Modification on agriculture ranges from low to moderate. The moderate risk items are summarised as the following:

- Permanent reduction of land used for agricultural purposes;
- Permanent decreased productivity of agricultural land;
- Changes to landform, slope and topography of the PAA;
- Permanent downgrading of LSC classes within the PAA; and
- Direct reduction of BSAL.

Despite the moderate risk status of these impacts, given the scale and nature of the activities in the PAA permanently impacting a limited area of 2.0 ha, the overall impact of the Modification on agriculture and agricultural resources is considered to be to be minor on a property scale and negligible at the scale of the locality. Viewed in context of the CVO, the Modification represents negligible additional impact.

