



EnergyConnect (NSW – Western Section)

Technical paper 3

Agricultural land impact assessment



Tremain Ivey Advisory

Agricultural Consultants

Agricultural Land Impact Assessment

EnergyConnect (NSW – Western Section)

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Executive summary

Background

TransGrid and ElectraNet are currently investigating the proposed construction and operation of a new high voltage electrical interconnector and network support options between New South Wales (NSW) and South Australia (SA), with an added connection to north-west Victoria, which is known as EnergyConnect.

This report assesses the agricultural impacts of the EnergyConnect (NSW – Western Section), which would extend from the SA/NSW border (near Chowilla in SA) to Buronga substation and from Buronga substation to the NSW/Victoria border at Monak (near Red Cliffs) ('the proposal').

The report addresses portions of the Secretary's environmental assessment requirements ("SEARs"), as described in section 1.3.1.

Methodology

The methodology for the agricultural impact assessment included the following:

- review of the legislation and policy context for assessing agricultural impacts
- landowner consultations and property inspections
- analysis and description of the existing environment based on statistics, spatial data, satellite images, property inspections and consultations
- assessment of impacts on agriculture (including biosecurity impacts) based on satellite images, property inspections, consultations and professional knowledge of agricultural industries and the proposal study area
- provision of mitigation and management measures, based on property inspections, consultations, design information and professional knowledge.

Existing environment

General

Much of the proposal study area is relatively flat dune fields and sand plains between approximately 35 and 80 metres above Australian Height Datum (mAHD).

Rainfall in the proposal study area has low to moderate variability and an average annual total of approximately 260 to 290 millimetres with a slight winter and spring dominance.

Most soils of the proposal study area have low to moderately low inherent fertility. The area is largely covered by native vegetation, with relatively few crops or introduced pasture species.

Land and Soil Capability (LSC) class 5 is prevalent in the eastern and central sections of the proposal study area near the Darling Anabranch, Wentworth and Buronga, while most of the remainder consists of classes 6 and 7.

Land use and agricultural productivity

Agricultural land uses dominate the proposal study area. Livestock, cropping and horticultural enterprises together comprise 98 per cent of the proposal study area, with the vast majority being used for grazing livestock. Sheep and cattle account for almost all grazing livestock.

The total gross value of agricultural production across the Wentworth LGA in 2015-16 was equivalent to \$80 per hectare. However, this varies from approximately \$16,000 per hectare for horticulture production and \$320 per hectare for broadacre cropping to \$17 per hectare for grazing production. This is indicative of the productivity in the proposal study area.

Impact assessment

The construction and operation phases of the proposal would have similar agricultural impacts. However, in most cases the potential and expected impacts are greater in the construction phase due to greater activity and a larger impact footprint.

Land use and capability impacts

The potential impact of any disruption to agricultural enterprises caused by the proposal would be small due to the relatively low productivity of the land, the relatively small area permanently and directly affected, the continuation of agricultural enterprises over most of the proposal study area, and the planned mitigation measures.

The proposal study area would cover a small fraction of the agricultural land in the Wentworth LGA, and the impacts of the proposal on existing agricultural enterprises would be minimal. Therefore, the proposal would be consistent with the objects of the Wentworth Local Environmental Plan 2011.

Biosecurity

The potential spread of weeds by vehicles, machinery, personnel, soil movements or water movements is the highest priority biosecurity risk. The introduction of plant disease or pests is also a relevant biosecurity risk.

Other potential impacts

Other potential impacts include the temporarily restricted movements, disruptions to cropping aerial agriculture and irrigation operations, effect of noise on livestock, radiocommunication interference and fire risks. However, the impacts, if any, are expected to be relatively small and would have minor effect on productivity.

Mitigation and management measures

The mitigation measures for the construction and operation phases of the proposal are summarised in in Chapter 8.

Acronyms and abbreviations

ABS	Australian Bureau of Statistics
AIA	Agricultural Impact Assessment for the proposal – this report
ALC	Agricultural Land Classification system (see Hulme et al, 2002)
BOM	Bureau of Meteorology
BSAL	Biophysical Strategic Agricultural Land
CEMP	Construction Environmental Management Plan
Commonwealth	Reference to Commonwealth such as Commonwealth, Commonwealth land or Commonwealth legislation
CTF	Controlled Traffic Farming
disturbance area	Refers to the area that would be directly impacted by both construction and operation (including the areas that would be impacted by maintenance activities) of the proposal including all proposal infrastructure elements (including the proposed transmission line alignment, substation site works and other ancillary works i.e. the operational footprint) as well as locations for currently proposed construction elements such as construction compounds, access tracks and site access points, laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps.
DPE	former (NSW) Department of Planning and Environment
DPI	(NSW) Department of Primary Industries
DPIE	(NSW) Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EnergyConnect	EnergyConnect is a proposed new electricity interconnector between Wagga Wagga in New South Wales and Robertstown in South Australia, with an added connection into north-west Victoria. EnergyConnect is a joint project between TransGrid and ElectraNet, who operate the transmission networks in New South Wales (NSW) and South Australia (SA), respectively.
EP&A Act	(NSW) <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	(Commonwealth) <i>Environment Protection and Biodiversity Conservation Act 1999</i>
HV	high voltage

IAL		important agricultural land.
LEP		Local Environmental Plan
LGA		Local government area
LLS		Local Land Services – A NSW Government agency.
LSC		Land and Soil Capability assessment scheme (see OEH, 2012)
NEM		National Electricity Market
NSW		New South Wales
OEH		former (NSW) Office of Environment and Heritage.
OJD		ovine Johne's disease
permanent footprint	works	Refers to the area that would be directly impacted by permanent components of the proposal, including all proposed infrastructure elements on the ground such as the proposed transmission line structures, any new substation infrastructure or permanent access tracks.
(the) proponent		The proposal would be undertaken by NSW Electricity Networks Operations Pty Ltd as a trustee for NSW Electricity Operations Trust (referred to as TransGrid). TransGrid is the operator and manager of the main high voltage (HV) transmission network in NSW and the Australian Capital Territory (ACT), and is the Authorised Network Operator (ANO) for the purpose of an electricity transmission or distribution network under the provisions of the Electricity Network Assets (Authorised Transactions) Act 2015.

(the) proposal	<p>The proposal is known as ‘EnergyConnect (NSW – Western Section)’.</p> <p>The proposal would involve the following key features:</p> <ul style="list-style-type: none"> • construction of new high voltage transmission lines and associated infrastructure between the SA/NSW border near Chowilla and the existing Buronga substation • an upgrade to the existing transmission line between the Buronga substation and the NSW/Victoria border at Monak, near Red Cliffs, and the decommissioning of the 220kV single circuit transmission line (known as Line 0X1) • a significant upgrade and of the existing Buronga substation to a combined operating voltage of 220kV/330kV • new and/or upgrade of access tracks as required • a minor realignment of the existing X2 220kV transmission line, in proximity to the Darling River • ancillary works required to facilitate the construction of the proposal (e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps). <p>The description of the proposal as presented in the EIS is indicative and based on the current level of design. The proposal would continue to be refined during detailed design.</p>
proposal study area	<p>The study area for this EIS, which comprises a one kilometre wide corridor between the SA/NSW border near Chowilla and Buronga and a 200 metre wide corridor between Buronga and the NSW/Victoria border at Monak, near Red Cliffs.</p> <p>The proposal would be located within the proposal study area, however the full area would not be subject to direct impacts.</p>
RIT-T	Regulatory Investment Test for Transmission
Rural SEPP	<i>State Environmental Planning Policy (Primary Production and Rural Development) 2019</i>
SA	South Australia
SEARs	Secretary’s Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSI	State Significant Infrastructure
stock units	In this assessment, one sheep or goat is equated to one stock unit and cattle are equated to ten stock units each
TIA	Tremain Ivey Advisory

transmission line corridor	A 200 metre corridor in which the final transmission line easement and transmission line infrastructure would be contained within. Construction activities associated with the transmission line would be expected to be contained within this area.
transmission line easement	<p>An area surrounding and including the transmission lines, which would be a legal 'right of way' and allows for ongoing access and maintenance of the lines and would be acquired from landholders.</p> <p>The easement width would be up to 80 metres wide for the 330kV line and 50 metres wide for the 220kV line.</p>
WHS	work health and safety
WSP	WSP Australia Pty Ltd (principal EIS consultant for the proposal)

1 Introduction

1.1 Overview of EnergyConnect

TransGrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north-west Victoria. Collectively, the proposed interconnector is known as EnergyConnect.

EnergyConnect comprises several components or ‘sections’ (shown on Figure 1.1). The Western Section (referred to as ‘the proposal’) is the subject of this technical paper.

EnergyConnect aims to secure increased electricity transmission between SA, NSW and Victoria, while facilitating the longer-term transition of the energy sector across the National Electricity Market (NEM) to low emission energy sources.

EnergyConnect has been identified as a priority transmission project in the NSW Transmission Infrastructure Strategy (Department of Planning and Environment, 2018), linking the SA and NSW energy markets and would assist in transporting energy from the South-West Renewable Energy Zone to major demand centres.

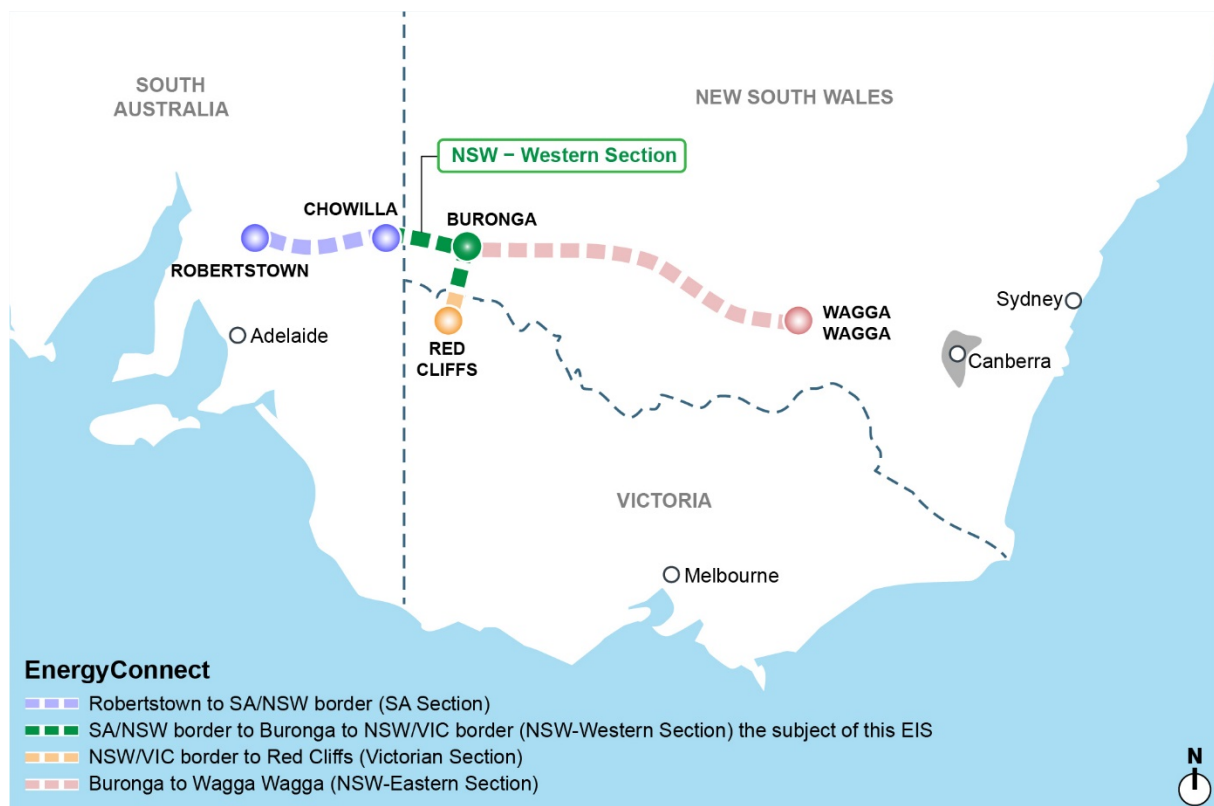


Figure 1.1: Overview of EnergyConnect

1.2 The proposal

TransGrid is seeking approval under Division 5.2, Part 5 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act) to construct and operate the proposal. The proposal has been declared as Critical State Significant Infrastructure under Section 5.13 of the EP&A Act.

The proposal was also declared a controlled action on 26 June 2020 and requires a separate approval under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*. The proposal is subject to the bilateral assessment process that has been established between the Australian and NSW governments.

The proposal is located in western NSW within the Wentworth local government area (LGA), approximately 800 kilometres west of Sydney at its nearest extent. The proposal spans between the SA/NSW border near Chowilla and Buronga and the NSW/Victoria border at Monak, near Red Cliffs. It traverses around 160 kilometres in total.

1.2.1 Key proposal features

The key components of the proposal include:

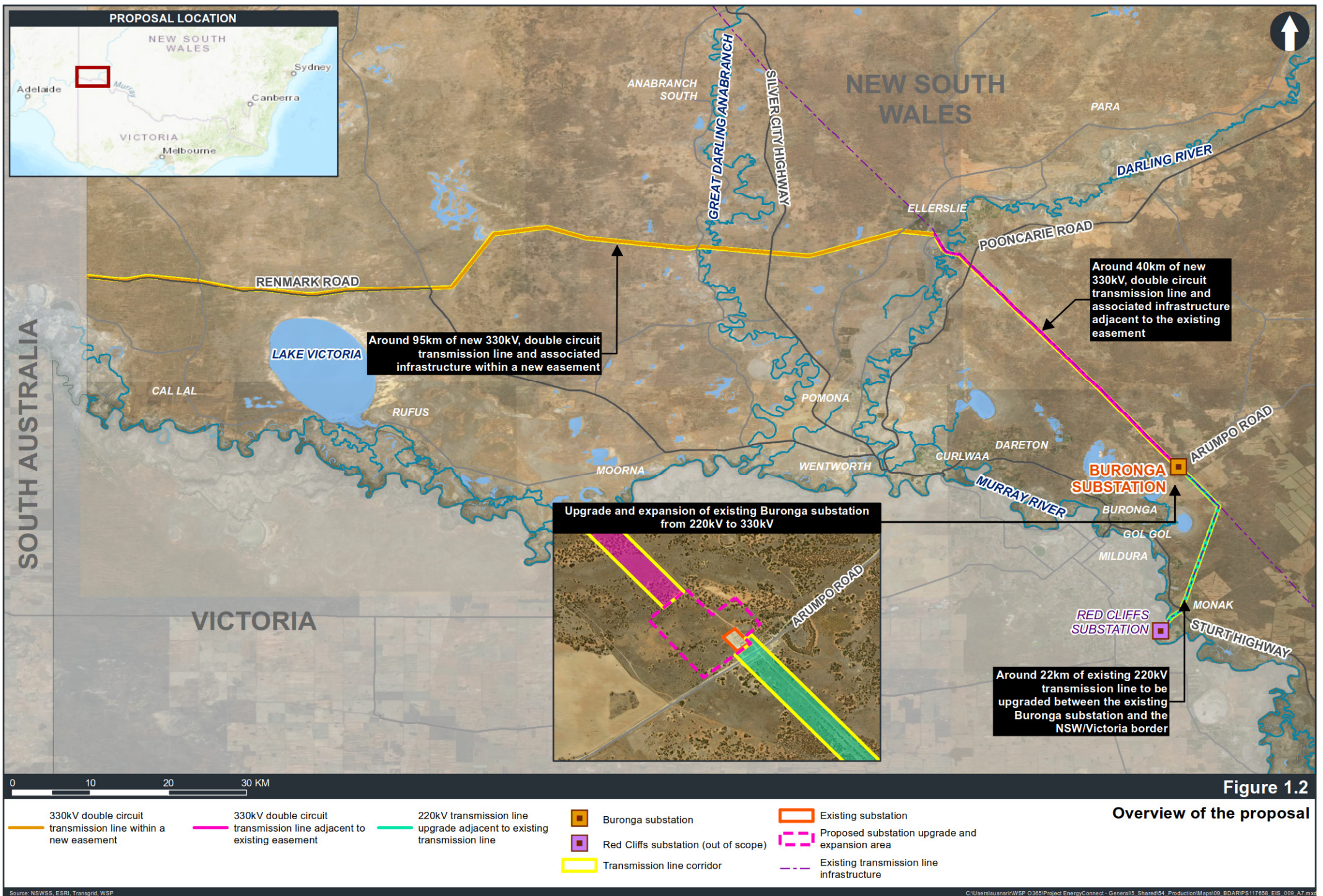
- a new 330 kilovolt (kV) double circuit transmission line and associated infrastructure, extending around 135 kilometres between the SA/NSW border near Chowilla and the existing Buronga substation
- an upgrade of the existing 24 kilometre long 220kV single circuit transmission line between the Buronga substation and the NSW/Victoria border at Monak (near Red Cliffs, Victoria) to a 220kV double circuit transmission line, and the decommissioning of the 220kV single circuit transmission line (known as Line 0X1)
- a significant upgrade and of the existing Buronga substation to a combined operating voltage of 220kV/330kV
- new and/or upgrade of access tracks as required
- a minor realignment of the existing X2 220kV transmission line, in proximity to the Darling River
- ancillary works required to facilitate the construction of the proposal (e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps).

An overview of the proposal is provided in Figure 1.2 (page 12). The final alignment and easement of the transmission line would be confirmed during detailed design and would be located within the proposal study area as shown in Figure 1.2.

Subject to approval, construction of the proposal would commence in mid-2021. The construction of the transmission lines would take approximately 18 months. The Buronga substation upgrade and expansion would be delivered in two components and would be initially operational by the end of 2022, with site decommissioning and rehabilitation to be completed by mid-2024.

The final construction program would be confirmed during detailed design.

The proposal is further described in Chapter 5 and Chapter 6 of the Environmental Impact Statement (EIS).



1.2.2 Proposal need

The proposal is required to complete the missing transmission link between SA and NSW transmission networks. The upgrade to the existing transmission line between Buronga and Red Cliffs would also enhance the capacity of the network to provide electricity between NSW and Victoria.

This connection would relieve system constraints and allow for NSW, SA and Victorian consumers to benefit from significant amounts of low-cost, large-scale solar generation in south-west NSW. The proposal is an essential component of EnergyConnect.

1.3 Purpose of this technical report

This technical paper is one of a number of technical papers that form part of the EIS for the proposal. The NSW Department of Planning, Industry and Environment (DPIE) has provided the Secretary's Environmental Assessment Requirements (SEARs) for the EIS.

The purpose of this technical paper is to identify and assess the potential impacts of the proposal in relation to agriculture. It responds directly to the SEARs (refer to section 1.3.1).

Further detail on the methodology applied in this assessment is detailed in Chapter 3 of this technical paper.

1.3.1 Secretary's environmental assessment requirements

The SEARs specific to this assessment and where these aspects are addressed in this technical report are outlined in Table 1.1.

Table 1.1
Summary of Secretary's Environmental Assessment Requirements – Land, and Social and Economic

Reference	Requirement	Where addressed in this document
Key Issue - Land:	An assessment of impacts of the project on soils and land capability of the site and surrounds.	Section 4.2.2, page 31 Section 5.1, page 40 Section 6.1, page 46 Chapter 8, page 53
	Assessment of impact of the project on any Crown lands and travelling stock reserves.	Section 5.3.7, page 45
Key Issue – Social & Economic:	Including an assessment of the social and economic impacts and benefits of the project (including the workers accommodation facility) for the region and the State as a whole, including consideration of any increase in demand for community infrastructure and services.	Chapters 5, 6 and 7, commencing page 40. Chapter 8, page 53 Socio-economic impacts are also addressed in Chapter 14 (Social and economic) of the EIS, and Technical paper 5.

This Agricultural Land Impact Assessment (AIA) partially addresses both the “land” and “social & economic” key issues. The part of “land” key issue relevant to agriculture is the impact on land capability and travelling stock reserves. Similarly, the economic impact associated with reduced agricultural production and increased operating costs arising from the proposal are the most relevant parts of the “social & economic” key issue. Social impacts and general economic impacts are not within the scope of this assessment and are detailed in Technical paper 5.

The AIA assesses the impacts of the proposal on access; agricultural operations; livestock & machinery movements; crop production activities; biosecurity risks; work, health and safety (WHS) risks; and bush fire management. The impact on agricultural productivity is quantified, and mitigation strategies to minimise resource loss, biosecurity risks, WHS risks and other impacts are addressed.

1.4 Structure of this report

The structure and content of this report is as follows:

- *Chapter 1 – Introduction:* Outlines the background and need for the proposal, and the purpose of this report
- *Chapter 2 – Legislation and policy context:* Provides an outline of the key legislative requirements and policy guidelines relating to the proposal
- *Chapter 3 – Methodology:* Provides an outline of the methodology used for the preparation of this AIA
- *Chapter 4 – Existing environment:* Describes the existing agricultural environment.
- *Chapter 5 – Assessment of construction impacts:* Describes the potential construction impacts associated with the proposal
- *Chapter 6 – Assessment of operational impacts:* Describes the potential operational impacts associated with the proposal
- *Chapter 7 – Assessment of cumulative impacts:* Outlines the potential cumulative impacts with respect to other known developments within the vicinity of the proposal
- *Chapter 8 – Mitigation measures:* Outlines the proposed mitigation measures for the proposal
- *Chapter 9 – Conclusion:* Provides a conclusion on the potential impacts of the proposal on agriculture
- *Chapter 10 – References:* Identifies the reports and documents used to generate this report.

Attachments to this report are:

- Attachment 1 Statistical Area Maps
- Attachment 2 Wentworth LGA Map

1.5 Report terminology

The following terms are discussed throughout the technical reports and are defined as:

- **proposal study area** – the proposal, including transmission line corridor, Buronga substation upgrade and expansion, access tracks, and the main construction compounds and accommodation camps at Buronga and Anabran South would be contained within the proposal study area. The proposal study area comprises a one kilometre wide corridor between the SA/NSW border near Chowilla and Buronga, and a 200 metre wide corridor between Buronga and the NSW/Victoria border at Monak, near Red Cliffs.
- **transmission line corridor** – the corridor in which the final easement and transmission line is expected to be contained. It would consist of a 200 metre corridor along the transmission line component of the proposal. Transmission line construction activities would be contained within this area, but some access tracks may extend beyond this corridor.

1.6 Limitations

We have relied on information about the proposal supplied by TransGrid. We have not verified the accuracy of this information.

Information in some instances was not obtained directly from landholders, but was supplied to us by personnel at Jones Lang LaSalle (JLL) who undertook extensive consultations with landowner.

We have not inspected all lands or interviewed all landholders in the proposal study area. Inspections and interviews were limited to three representative properties as discussed further in Section 3.1.1.

2 Legislation and policy context

2.1 Legislation

The proposal is subject to environmental assessment under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Other legislation specific to the agricultural impact assessment are the *Biosecurity Act 2015*, the *Soil Conservation Act 1938* and the *State Environmental Planning Policy (Primary Production and Rural Development) 2019* (Rural SEPP).

2.1.1 Biosecurity Act

The NSW *Biosecurity Act 2015* came into effect on 1 July 2017¹. The NSW Act complements the Federal *Biosecurity Act 2015*². The primary objective of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks. The Act is tenure neutral, that is it applies to all lands in NSW, both public and private tenure.

The Act defines key concepts such as biosecurity matter, carrier, biosecurity impact, biosecurity risk and pests and specifies a wide range of prohibited matter including pests and diseases of plants and animals.

Under the Act, the responsibility for biosecurity risk is shared among the government, industry and the community. Specifically, the Act established a general biosecurity duty:

‘General Biosecurity Duty: ‘Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.’

The NSW Department of Primary Industries (DPI) holds the primary responsibility for management of biosecurity under the Act, ensuring the legislative and policy settings support best practice management of biosecurity risks. In addition, DPI works with other jurisdictions to prevent, prepare for, respond to and recover from biosecurity incursions and incidents. DPI works with a range of partners in the management of biosecurity. Significant partners include; Local Land Services (LLS)³, local government, and industry groups (DPI 2013).

Regional biosecurity strategies developed by DPI and LLS covering the proposal impact site include the following:

- NSW Invasive Species Plan 2018-2021 (DPI, 2018a)
- Western Regional Strategic Weed Management Plan 2017-2022 (Western LLS, 2017)
- Western Regional Strategic Pest Animal Management Plan 2018-2023 (Western LLS, 2018).

The above strategies are considered in sections 5.2, 6.2 and 8 of this report.

¹ legislation.nsw.gov.au/#/view/act/2015/24

² legislation.gov.au/Series/C2015A00061

³ lls.nsw.gov.au/

2.1.2 Soil Conservation Act 1938

The *Soil Conservation Act 1938* makes provisions for the conservation of soil resources and farm water resources, and for the mitigation of erosion.

The Act enables the Soil Conservation Commissioner to issue notices to owners or occupiers aimed at preventing soil erosion or land degradation. The notices may require the owners or occupiers to refrain actions such as the clearing of land, or may require the adoption of measures to prevent erosion.

It also enables areas to be designated as "areas of erosion hazard". Landholders in these areas are urged to reach agreements for the completion of prescribed soil conservation measures. Failure to enter into an agreement can result in a notice being issued, similar to above.

2.1.3 SEPP (Primary Production and Rural Development) 2019

The *State Environmental Planning Policy (Primary Production and Rural Development) 2019* (Rural SEPP) include the following relevant aims of the policy:

- (a) to facilitate the orderly economic use and development of lands for primary production,
- (b) to reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources,
- (c) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations,
- (e) to encourage sustainable agriculture, including sustainable aquaculture,

Part 2 deals with State significant agricultural land within which clause 10 states that "the objects of this Part are as follows—

- (a) to identify State significant agricultural land and to provide for the carrying out of development on that land,
- (b) to provide for the protection of agricultural land—
 - (i) that is of State or regional agricultural significance, and
 - (ii) that may be subject to demand for uses that are not compatible with agriculture, and
 - (iii) if the protection will result in a public benefit."

Clause 11 states that land is State significant agricultural land if it is listed in schedule 1 of the Rural SEPP. However, schedule 1 does not list any State significant agricultural land at present.

2.2 Guidelines

The SEARs refers to lists of policies and guidelines that may be relevant to the assessment of the proposal at:

- planningportal.nsw.gov.au/major-projects/assessments/policies-andguidelines; and
- environment.gov.au/epbc/publications#assessments:

Documents of relevance at these locations are:

- Far West Regional Plan 2036 (DPE, 2017)
- State Environmental Planning Policy (Rural Lands) 2008 (repealed with effect from 28 February 2019 by State Environmental Planning Policy (Primary Production and Rural Development). 2019)
- The Land and Soil Capability Scheme (OEH, 2012)
- Agricultural Land Use Mapping Resources in NSW (Squires, 2017)
- Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land (OEH, 2013b).

The DPI document “A guideline to identifying important agricultural lands in NSW” (DPI, 2017) was also referred to in preparing this report.

Some guidelines provided specific guidance in relation to the assessment of agricultural impacts (for example, use of the weed and pest animal management plans in the biosecurity assessment). Where appropriate, these guidelines have been referenced in the relevant sections.

3 Methodology

The methodology for this agricultural impact assessment has been designed to meet the requirements of the SEARs (section 1.3.1).

3.1 Agricultural impact assessment

3.1.1 Landowner consultation and site inspections

Landowner consultations and property inspections occurred on 22 and 23 July 2020. These were undertaken by Peter Tremain of Tremain Ivey Advisory, accompanied by Ben Vincent of Jones Lang LaSalle.

Of the 21 agricultural properties directly affected by the proposal study area (Figure 3.1), consultations were undertaken with the owners of three properties. The properties were chosen to give a range of geographical locations, proposal impacts, and types of agricultural enterprises within the proposal study area.

Two properties were primarily rangeland grazing properties with opportunity dryland winter cropping. One of these was located approximately 33 kilometres north west of Wentworth on the Darling Anabranch where the new 330kV double circuit transmission line would be constructed on a greenfield site. The other was located approximately nine kilometres north of Gol Gol adjacent to the Buronga substation. It would be affected by a section of the new 330kV double circuit transmission line built alongside an existing transmission line, and by a section of the upgraded 220kV single circuit transmission line between the Buronga substation and the NSW/Victoria border.

The third property was an irrigated citrus enterprise located at Trentham Cliffs. It would be affected by the upgraded 220kV single circuit transmission line between the Buronga substation and the NSW/Victoria border, mainly with respect to land which is intended to be developed as a citrus orchard.

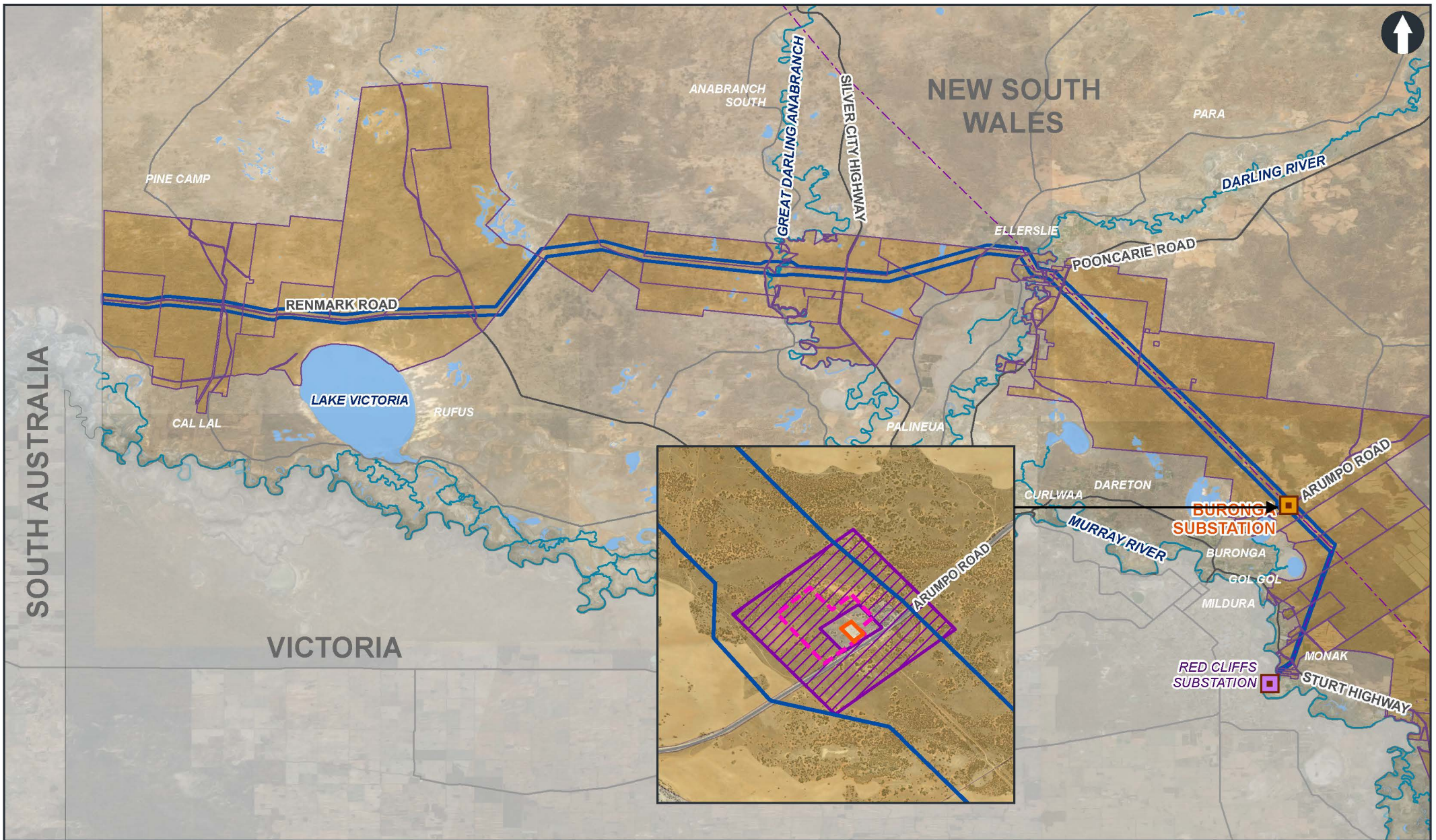
Where properties were not inspected, information was drawn from other sources as discussed below. This information, when combined with information gained from inspections of neighbouring properties and consultations with neighbouring landowners, was adequate to prepare this report.

Consultations took the form of general discussions on the nature of the agricultural enterprises and specific discussions on perceived impacts of the proposal with one or more landowners of each property. The consultations also involved an inspection of the affected parts of the landowners' properties.

Other properties were viewed to some extent from adjacent public roadways and adjacent private property. Further information on these properties such as vegetation cover, type and locations of horticultural crops, extent of cleared areas and type of cropping was gained through examination of satellite imagery and public GIS datasets. Jones Lang LaSalle provided details of the nature of the impacts of the proposal perceived by other landowners not consulted by Tremain Ivey Advisory.

3.1.2 Stakeholder consultation

Discussions were undertaken by telephone with biosecurity officers employed by both Western LLS (Wentworth) and Wentworth Shire Council to obtain their opinions on the main biosecurity risks associated with the proposal and the type of mitigation measures that should be implemented.



0 10 20 30 KM

- | | | |
|--------------------------------------|--|--|
| Buronga substation | Existing transmission line infrastructure | Property holding |
| Red Cliffs substation (out of scope) | Existing substation | Freehold land acquisition (substation) |
| Proposal study area | Proposed substation upgrade and expansion area | |

Figure 3.1

The proposal study area with respect to property holdings

3.1.3 Agricultural impact assessment

The description of the existing environment was primarily a desktop study based on data from various sources as referenced in Chapter 4. However, this information was evaluated by reference to information gathered during property inspections and landowner consultations. The assessment of the existing environment concentrated on:

- geographical factors (such as climate, topography and soils) that have the greatest influence on agriculture in the proposal study area
- measures (such as land and soil capability, land use and value of production) which best appraise the nature and productivity of agricultural enterprises in the proposal study area.

The assessment of the impacts on agriculture was based on information from the existing environment assessment, consultations with landowners and other stakeholders, property inspections and professional knowledge.

Mitigation measures are defined as actions, processes or structures which minimise or eliminate the impacts of the proposal. The assessment of mitigation and management measures was based on information from the existing environment and impact assessments, consultations with landowners and other stakeholders, property inspections, professional knowledge, and various information sources as referenced in Chapter 8.

3.2 Biosecurity

Relevant information on biosecurity issues for the proposal site were identified from the following sources:

1. landowner consultations (section 3.1.1)
2. observations during the property inspections (section 3.1.1)
3. consultation with Western Local Land Services and Wentworth Shire Council biosecurity officers (section 3.1.2)
4. reference to the NSW Biosecurity Act 2015
5. reference to the Western Regional Strategic Weed Management Plan 2017-2022
6. review of various other documents set out section 5.2.

The methodology for the biosecurity assessment was similar to the agricultural impact assessment set out in preceding sections, as follows. The description of existing biosecurity issues was primarily a desktop study, but information gathered during property inspections and landowner consultations was also considered. The assessment of the existing biosecurity issues concentrated on those which were identified as the main risks associated with the proposal.

The assessment of the potential biosecurity risks was based on information from the existing environment assessments of this report, consultations with landowners and other stakeholders, property inspections, pest, disease and weed distribution data, professional knowledge, and various legislation and surveys referenced in section 5.2.

The assessment of mitigation and management measures was based on information from the existing environment and impact assessments of this report, consultations with landowners and other stakeholders, property inspections, professional knowledge, and TransGrid documents referenced in section 10.

4 Existing environment

4.1 General description

4.1.1 Location

The proposal impact site is entirely located in the LGA of Wentworth Shire Council (Attachment 2).

The proposal study area intersects with approximately 21 rural properties under private ownership (Figure 3.1).

4.1.2 Topography

The proposal study area mainly traverses a landscape of relatively flat dune fields and sand plains. There are areas of alluvial plains where the proposal crosses the flood plains of the Darling River, the Murray River and the Darling Anabranch.

The proposal ranges from an elevation of approximately 35 metres to 80 metres above Australian Height Datum (mAHD) at with no significant or consistent fall along the alignment.

4.1.3 Climate

Climate, especially rainfall and temperature, have a large impact on the productivity of dryland agricultural properties such as those found in the proposal study area. The most relevant Bureau of Meteorology (BOM) rainfall recording station near the proposal study area with the largest number of records over an extended period is Wentworth Post Office (station number 47053). The most relevant BOM temperature recording station is Lake Victoria Storage (470160).

The average rainfall at the Wentworth Post Office between 1868 and 2020 has been 286 millimetres per annum (refer to Table 4.1). There is a slight seasonal dominance from late autumn to late spring, with summer and early autumn being the driest period, on average.

The rainfall has low to moderate variability according to BOM (2020). Records indicate that one in 20 years records an annual rainfall of less than 127 millimetres (44 per cent of the long-term average). One in 10 years records rainfall of less than 176 millimetres (62 per cent). Variability is much greater in summer and early autumn than at other times of the year.

Mean rainfall does not vary greatly across the proposal study area. The average annual rainfall at other recording stations near the proposal study area include 260 millimetres at Wentworth (Wamberra Station – 47040), 269 millimetres at Wentworth (Toora – 47099) and 259 millimetres at Lake Victoria Storage.

A summary of temperature records for Lake Victoria Storage for the period 1922 to 2020 is set out in Table 4.2. The mean maximum monthly temperature reaches a high of 32.3°C in January and a low of 15.4°C in July. There has been an average of 31.6 days per annum over 35°C and 6.4 days over 40°C. The mean minimum monthly temperature falls to a low of 5.3°C in July, but is around 16.5°C in January and February.

Mean daily evaporation averages 5.6 millimetres with a peak of 10.0 millimetres in January falling to 1.8 millimetres in June and 1.9 millimetres in July. Due to high temperatures, high evaporation and low rainfall the growing season is variable, but typically short in duration.

There has been a relatively low average of 12.3 days per annum with a minimum temperature under 2°C, which is generally regarded as the approximate temperature at which a frost will occur. Nights with a minimum temperature of less than 2°C can be generally expected between May and September in a typical year. An average of only 2.8 nights per year fall to a temperature of less than or equal to 0°C.

Table 4.1
Summary of rainfall records

Wentworth Post Office

Station Number: 047053 · Opened: 1868 · Status: Open · Latitude: 34.11°S · Longitude: 141.92°E · Elevation: 37 m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	21.3	21.7	19.6	18.4	27.7	26.3	23.9	25.7	26.6	27.0	24.8	22.2	285.7
Lowest	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	70.8
5th percentile	0.0	0.0	0.0	0.0	1.1	2.2	2.7	3.6	3.3	1.5	0.5	0.2	127.2
10th percentile	0.3	0.0	0.0	0.3	3.0	3.6	7.0	4.5	5.1	3.1	2.0	1.1	176.2
Median	11.7	8.9	10.2	12.2	23.4	22.3	20.8	23.1	21.7	18.9	17.0	13.2	272.0
90th percentile	59.8	58.9	51.6	42.9	62.5	58.2	43.6	49.3	55.9	59.8	56.7	54.2	397.0
Highest	140.9	137.9	117.7	163.0	108.5	90.3	71.5	87.2	106.3	107.2	123.4	140.1	603.6

Table 4.2
Summary of temperature and other records

Lake Victoria Storage

Station Number: 047016 · Opened: 1922 · Status: Open · Latitude: 34.04°S · Longitude: 141.27°E · Elevation: 26 m

Statistic Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (°C)	32.3	31.7	28.6	23.6	19.1	15.7	15.4	17.2	20.5	23.9	27.4	30.5	23.8
Highest temperature (°C)	47.5	46.4	41.7	39.2	32.2	26.5	26.5	32.3	37.5	41.9	45.1	47.8	47.8
Decile 1 maximum temperature (°C)	26.0	25.6	22.7	19.0	15.2	13.1	12.8	14.0	15.8	18.8	21.7	24.3	
Decile 9 maximum temperature (°C)	39.4	38.4	35.0	29.2	23.7	18.8	18.5	21.2	25.9	30.8	34.5	37.5	
Mean number of days >= 30°C	20.0	18.1	11.3	2.5	0.0	0.0	0.0	0.0	0.9	3.7	9.0	15.0	80.5
Mean number of days >= 35°C	9.8	8.3	3.3	0.2	0.0	0.0	0.0	0.0	0.1	0.7	2.7	6.5	31.6
Mean number of days >= 40°C	2.8	1.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.3	6.4
Mean minimum temperature (°C)	16.6	16.5	14.1	10.5	7.8	5.7	5.3	6.1	8.1	10.6	13.2	15.3	10.8
Lowest temperature (°C)	8.0	8.5	5.0	0.5	-0.8	-3.9	-3.5	-2.6	0.5	2.2	4.1	7.0	-3.9
Decile 1 minimum temperature (°C)	12.2	12.1	9.8	6.5	4.0	1.8	1.5	2.2	4.2	6.4	8.8	10.8	
Decile 9 minimum temperature (°C)	23.0	22.6	19.9	15.8	12.6	10.0	9.0	10.0	12.8	16.0	19.2	21.5	
Mean number of days <= 2°C	0.0	0.0	0.0	0.1	1.0	3.7	4.2	2.8	0.5	0.0	0.0	0.0	12.3
Mean number of days <= 0°C	0.0	0.0	0.0	0.0	0.2	0.9	1.3	0.4	0.0	0.0	0.0	0.0	2.8
Mean daily evaporation (mm)	10.0	9.0	7.0	4.3	2.5	1.8	1.9	2.7	4.2	6.0	7.9	9.4	5.6

4.1.4 Climate change

The effect of climate change on the proposal study area is somewhat uncertain, but is likely to be multi-faceted and include several impacts.

OEH (2014) reported that the Far West Region is projected to continue to warm during the near future (2020–2039) and far future (2060–2079), compared to recent years (1990–2009). The warming in the vicinity of the proposal is projected to be on average about 0.5°C to 1.0°C in the near future, increasing to 1.5°C to 2.0°C in the far future. The number of high temperature days is projected to increase, with fewer potential frost risk nights anticipated.

Increased temperature is likely to result in higher evapotranspiration, shorter growing seasons, and a greater potential for heat and moisture stress on crops, pasture and animals. The risk of extreme heatwaves, flooding, higher fire frequencies and a longer fire season in the Riverina Murray Region is also anticipated.

The average crop and pasture growth is likely to be reduced in spring and summer by higher temperatures, and constrained by lower soil moisture levels. Conversely, plant growth rates may benefit from higher CO₂ levels and warmer average temperatures during autumn and winter. Frost damage risk may reduce.

The Far West is projected to experience an increase in average and severe fire weather in the near future and the far future (OEH, 2014). However, fire danger in the Far West is moderated by a sparsity of woodland and forest fuel loads, low grass fuel loads in most seasons, low population density and a reduced chance of extreme fire weather compared to the south-east corner of Australia (Taylor & Freeman, 2010).

OEH (2014) reported that most of the models studied predict that spring and winter rainfall will decrease, while summer and autumn rainfall will increase in the near future and far future. The changes in spring and autumn rainfall are predicted to be greater than for winter and summer. This may change the relative growth of different rangeland species.

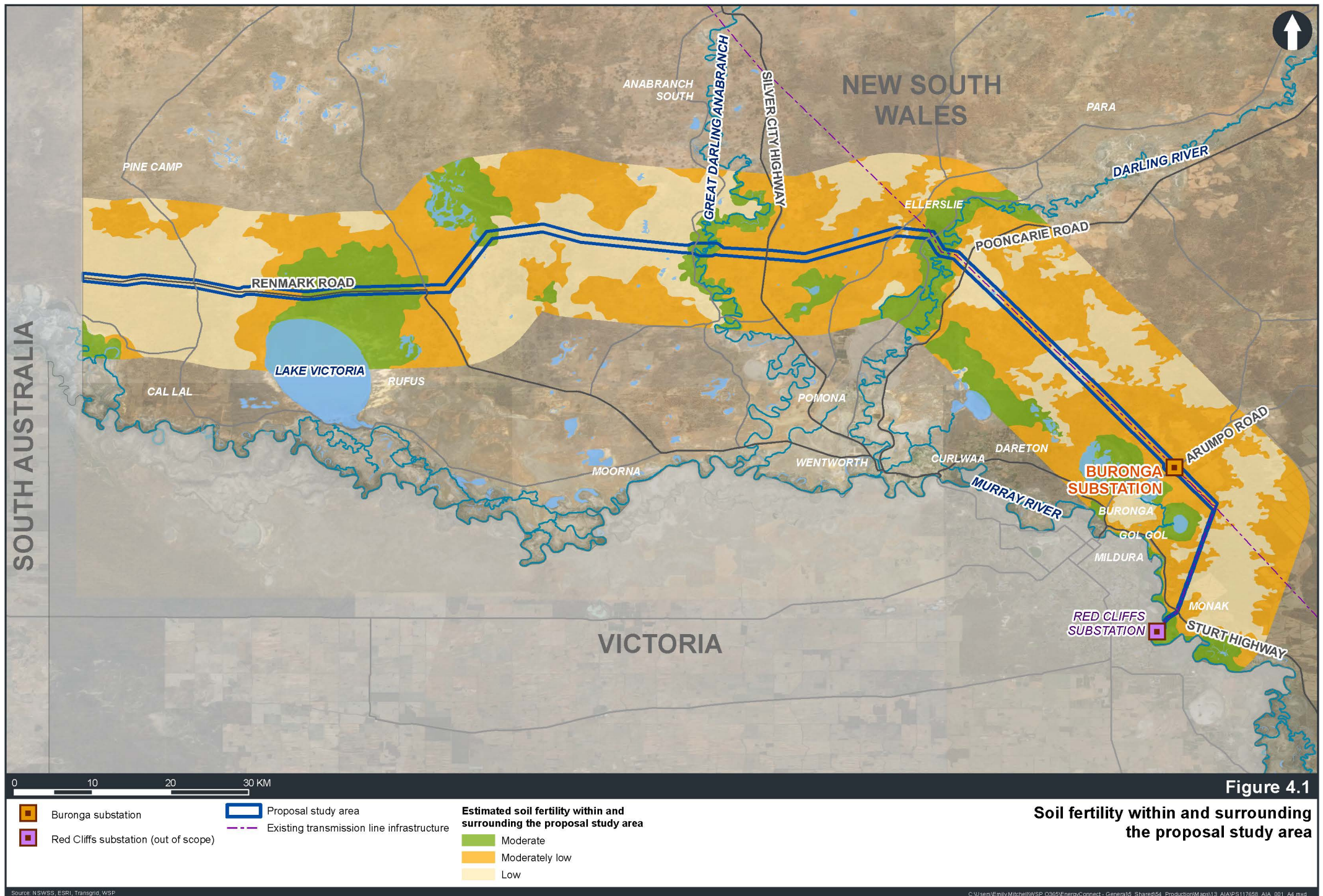
4.1.5 Soils

Most soils of the proposal study area have low to moderately low inherent fertility (OEH, 2017) and low plant available water holding capacity. The main exceptions are areas adjacent to the Murray River, the Darling River and the Darling Anabranh, and an area to the north of Lake Victoria which have moderate inherent soil fertility. A map of inherent soil fertility across the proposal study area has been included as Figure 4.1.

The dominant soil in the proposal study area are calcarosols according to Australian Soil Classification (CSIRO, 2016). These have moderately low inherent fertility and are formed on calcareous aeolian sediments of variable texture. They generally have a small, gradual increase in clay content with depth. The soil profile is alkaline throughout, and sodicity and salt levels are often high in the deeper subsoils (Agriculture Victoria, 2020).

Rudosols are also quite common, having low inherent fertility and a sandy, weakly developed profile. Other soils of low to moderately low inherent fertility found in the proposal study area include tenosols and kandosols.

The main soil of moderate inherent fertility are vertisols found along the main watercourses. They have a clay texture throughout the profile, display strong cracking when dry, and shrink and swell considerably during wetting and drying phases (Agriculture Victoria, 2020). Other soils of moderate inherent fertility include kurosols and chromosols north of Lake Victoria.



4.1.6 Surface water

Surface water for agriculture is mainly supplied by the major water courses; the Murray River, the Darling River and the Darling Anabranh. Water is used for stock and domestic use, and for some irrigation on and around the proposal study area from the Darling and Murray Rivers. A pipeline for the delivery of stock and domestic water supplies along the Darling Anabranh was completed in 2007 (Green, et al, 2012). Flows in the Murray and Darling Rivers are regulated. The Lower Darling River¹ has been regulated by the Menindee Lakes Scheme since 1960. Despite this, flows in the Darling River are very variable.

River water as a local water source is augmented by earthen farm dams which capture and store local runoff, and are mainly used for livestock purposes. Surface water is reticulated on some grazing properties using a system of pumps, pipes, tanks and livestock troughs.

Lake Victoria is located approximately three kilometres south of the proposal study area at its closest point.

4.1.7 Groundwater

Groundwater in the Lower Darling catchment generally has high salinity levels making the water suitable only for stock use. Groundwater under the proposal study area exists mostly in porous rock aquifers (Green, et al, 2012).

The floodplain of the Darling River is underlain by a shallow alluvial aquifer which gains water from the river. This dilutes the saline groundwater with salinity values ranging from 400–4,000 milligrams per litre near the river compared to around 20,000 milligrams per litre away from the river. A shallow fluvial aquifer also occurs along the channel of the Darling Anabranh. The salinity in this aquifer progressively increases downstream from less than 1,500 milligrams per litre to over 5,000 milligrams per litre (Green, et al, 2012).

Some groundwater from alluvial aquifers is used for irrigation in addition to stock and domestic purposes.

4.1.8 Vegetation

The Lower Murray-Darling region of NSW retains over 90 per cent of its native vegetation cover (Green, et al, 2012). Consequently, the proposal study area is dominated by native vegetation, with relatively little clearing and establishment of introduced species. The main exceptions are some irrigated agriculture near the Darling River, and some other modified vegetation types, including dryland cropping around Buronga and the Murray River.

The WSP ecology team have field validated the NSW vegetation classes in the proposal study area. The dominant vegetation classes, which together comprise approximately 83 per cent of the native vegetation, are as follows. Descriptions are derived from the Central Resource for Sharing and Enabling Environmental Data in NSW (NSW Government, 2018):

- Aeolian chenopod shrublands – Open shrubland dominated by chenopods
- Semi-arid sand plain woodlands – Open Casuarina woodland with chenopod understorey
- Sand plain mallee woodlands – Mallee eucalypt woodland with a prominent stratum of shrubs and variable groundcover of chenopods
- Dune mallee woodlands – Mallee eucalypt woodland with an open stratum of shrubs and prominent stratum of hummock grasses.

¹ That portion of the Darling River below the Menindee Lakes Scheme.

Substantial areas of the following vegetation classes, which together comprise approximately 14 per cent of the native vegetation, were also verified in the proposal study area:

- Inland floodplain woodlands – Woodland up to 25 metres tall with a variable shrub stratum of saltbushes and semi-continuous groundcover of grasses and forbs
- Riverine sandhill woodlands – Open woodland with an open shrub layer and sparse ground layer.

Limited areas of the following vegetation classes are also present:

- Inland saline lakes - Saline open water or dry salt pans surrounded by open succulent herbfield less than 0.3 metres tall
- Inland riverine forests – Open forest up to 40 metres tall with a dense to patchy, species rich, herbaceous groundcover interspersed with bare ground and scattered shrubs
- Sand plain mulga shrublands – Tall open shrubland with an open understorey of smaller shrubs and perennial tussock grasses
- Riverine chenopod shrublands – Open chenopod shrubland with groundcover of forbs and grasses.

4.1.9 Biosecurity issues

In contrast to much of NSW, the Far West has the potential to effectively manage biosecurity risks due to its separation from major populations and intensive agricultural industries, and the semi-arid climate which is challenging for exotic animals and plants to survive (DPE, 2017).

Weeds

The density of some species of native shrubs and trees (e.g. hop bush, turpentine bush and punty bush) has increased in some parts of the Western LLS region, thought to have largely resulted from high grazing pressure and changed fire regimes. However, the region is fortunate to have relatively few examples of widespread introduced species of weeds, due in part to its relatively intact native vegetation and low rainfall (LLS, 2017). Some landowners use prescribed burning to control woody weeds.

Weeds recorded by authorised officers during property inspections under the Biosecurity Act 2015 (DPI, 2020b) in the vicinity of proposal study area include horehound (*Marrubium vulgare*), common pear (*Opuntia stricta*), burr ragweed (*Ambrosia confertiflora*), boneseed (*Chrysanthemoides monilifera*), Hudson pear (*Cylindropuntia rosea*), and African boxthorn (*Lycium ferocissimum*).

Under the former *Noxious Weeds Act 1993*, the following weeds were declared noxious in Wentworth LGA, and are likely to be found in the vicinity of the proposal study area as per the NSW WeedWise website (DPI, 2000c):

- | | |
|---|--|
| <p>Class 4</p> <ul style="list-style-type: none"> • Rope pear (<i>Cylindropuntia imbricata</i>) • Hudson pear • Prickly pear (<i>Opuntia</i> spp.) | <p>Class 5</p> <ul style="list-style-type: none"> • Athel pine (<i>Tamarix</i> spp.) • Bridal creeper (<i>Asparagus asparagoides</i>) • Willows (<i>Salix</i> spp.) |
|---|--|

The Department of Environment, Climate Change and Water NSW (2010) reported that the distribution and abundance of the following weeds was increasing in the Lower Murray Darling region, but not in the immediate vicinity of the proposal study area.

- | | |
|---|---|
| <ul style="list-style-type: none"> • Bridal creeper • Fountain grass (<i>Pennisetum setaceum</i>) • Silver-leaf nightshade (<i>Solanum elaeagnifolium</i>) | <ul style="list-style-type: none"> • Boneseed • Mesquite (<i>Prosopis</i> spp.) • Athel Pine |
|---|---|

The Western Regional Strategic Weed Management Plan 2017 – 2022 (LLS, 2017) identifies regional priority weeds, some of which may be present in the vicinity of the proposal study area (DPI, 2000c), as follows:

- Boxing glove/coral cactus (*Cylindropuntia fulgida*)
- Burr ragweed
- Clock weed (*Oenothera curtiflora*)
- Willow rhus (*Searsia lancea*)
- Giant reed (*Arundo donax*)
- Silver-leaf nightshade
- African boxthorn
- Bridal creeper
- Rope pear
- Prickly pear
- Spiny burrgrass (*Cenchrus* spp.)

The only state priority weed which may be present in the vicinity of the proposal study area is Bitou bush (*Chrysanthemoides monilifera*) (DPI, 2000c).

Other important weeds in the vicinity of the proposal study area include khaki weed (*Alternanthera pungens*), Noogoora burr (*Xanthium occidentale*), and Bathurst burr (*Xanthium spinosa*). Khaki weed is often found in irrigation and high traffic areas such as roadways. The burrs can also be a significant problem in irrigation fields and are an important wool contaminant.

Khaki weed, caltrops (*Tribulus terrestris*), thornapple (*Datura* spp.), onion weed (*Asphodelus fistulosus*) and horehound were mentioned by landowners and the Wentworth Shire Council biosecurity officer during consultations as problematic weeds present in the district with the potential to become more widespread.

Pest Animals

Wild dogs, feral pigs, unmanaged rangeland goats, wild rabbits, foxes, kangaroos and feral cats are currently considered to be the most important pest animals in the Western region, causing damage to primary production, natural environments and cultural assets. Several other pest animals (deer species, feral camels, feral donkeys and wild horses) are considered to be emerging issues, but none are presently found in close proximity to the proposal study area. Common carp is also present throughout all major river systems in the Western LLS region (LLS, 2018). Plague locusts can cause problems in favourable seasons.

Consultations with landowners and the Western LLS biosecurity officer identified rabbits, foxes kangaroos, goats, wild dogs and pigs as the main vertebrate pests in the vicinity of the proposal study area.

Some species (such as goats and pigs) pose significant biosecurity, economic and social threats to the Western region as they can harbour and transmit both endemic and exotic diseases (LLS, 2017).

The Department of Environment, Climate Change and Water NSW (2010) reported that the distribution and abundance of feral donkeys and deer was increasing in the Lower Murray Darling region to the north of the proposal study area, but densities were still at low levels.

Other

The occurrence of sheep footrot in the vicinity of the proposal study area has been low in recent years. DPI (2016) reported no flocks were quarantined for footrot in either March 2014 or December 2015 across the Western LLS region, out of a total of 861 flocks. One flock had been quarantined for part of the 2015 calendar year.

Footrot is a contagious bacterial disease of sheep and goats, caused by the organism *Dichelobacter nodosus* (*D. nodosus*) in association with several other bacteria. The bacterium *D. nodosus* may persist for many years in the feet of infected sheep and may pass from infected sheep into the soil. Footrot is introduced into a clean flock by the inclusion of infected sheep in the flock, or by exposure to contaminated land under favourable conditions.

Little recent data is available on the prevalence of ovine Johnes disease (OJD) in NSW. However, the proposal study area was in a “low prevalence area” in 2011 with an estimated infected flock proportion of less than 0.8 per cent (DPI, 2011). No known OJD infections were reported during landowner consultations. OJD is an incurable infectious disease caused by the bacterium *Mycobacterium paratuberculosis*.

No specific data is available on sheep lice infestations near the proposal study area.

The landowners consulted confirmed that footrot and OJD has not been a significant problem in the past and is unlikely to readily spread in the proposal study area. Although the prevalence of the major livestock diseases has been low in the past, stock movements associated with the recent drought and subsequent restocking may increase their incidence.

Horticultural enterprises are particularly susceptible to plant diseases and pests. Parts of the proposal study area are located in plant quarantine zones known as the Greater Sunraysia Pest Free Area and the Phylloxera Exclusion Zone.

4.1.10 Land tenure

Nearly all the land in the Western LLS region (which includes the proposal study area) is held under Western Lands Leases, granted under the *Crown Land Management Act 2016* (formerly the *Western Lands Act 1901*), with only a small area under freehold. Most Western Lands Leases are perpetual and can only be used for a designated purpose. The majority of more than 6,600 Western Lands Leases are for grazing (4,300). A further 573 are for “agriculture” (DPIE 2020). Leases held for grazing or pastoral purposes cannot be converted to freehold (LLS, 2017).

4.1.11 Farm size

The LLS (2017) indicates that the size of pastoral properties varies considerably with properties around Wentworth usually around 5,000 to 6,000 hectares. ABS statistics (ABS, 2017a) indicate an average agricultural establishment size of approximately 8,100 hectares for the Wentworth LGA, although this includes smaller horticultural and cropping holdings, especially near the Murray River.

ABS statistics (ABS, 2017a) indicate a larger average agricultural establishment size of approximately 16,200 hectares for the Wentworth-Balranald statistical area (Attachment 1) which may be representative of the parts of the proposal study area in rangeland areas.

The Wentworth-Buronga statistical area which encompasses a strip of land along the Murray River (Attachment 1) covering irrigated horticultural areas, has a much smaller average agricultural establishment size of approximately 1,960 hectares (ABS, 2017a).

4.2 Land use and zoning

4.2.1 Land use

The vast majority of the proposal study area and surrounding areas is used for grazing native vegetation and is classified as such in mapping of the former NSW Office of Environment and Heritage (OEH, 2013a). Grazing of goats, cattle and sheep (for wool and meat) is common.

Much smaller proportions are classified as cropping or grazing modified pastures by OEH (2013a). There are some relatively small areas with a recent history of dryland cropping and improved pastures at the south eastern end of the proposal study area around Buronga, however, satellite imagery indicates some other areas in the central part of the proposal study area do not appear to have been cropped or been developed with improved pastures in recent years.

There are some irrigated grape vines on and adjacent to the proposal study area near the Darling River, and adjacent to the proposal study area near the Murray River.

A map of land use across the proposal study area has been included as Figure 4.2. Relevant areas are summarised in Table 4.3.

Table 4.3
Summary of land use in the proposal study area

Land Use	Area	Proportion
	ha	%
2.1.0 Grazing native vegetation	13,000	89%
3.2.0 Grazing modified pastures	498	3%
3.3.0 Cropping	648	4%
4.4.0 & 4.6.0 Irrigated land	132	1%
5.4.0 Residential and farm infrastructure	39	0%
5.7.0 Transport and communication	84	1%
6.1.0 Lake	17	0%
6.3.0 River	85	1%
6.5.0 Marsh/wetland	35	0%
Other*	12	0%
Total	14,550	100%

Notes on Table 4.3:

Source: OEH (2013a)

Individual amounts are approximate and may not sum to the amount of the totals due to rounding.

* - "Other" includes 5.6.0 utilities, 5.8.0 mining, 5.9.0 waste treatment and disposal and 6.2.0 reservoir/dam.

4.2.2 Zoning

The entire proposal study area is zoned RU1 Primary Production under the Wentworth Local Environmental Plan 2011 (Wentworth LEP, 2011), apart from two small areas totalling approximately 40 hectares near the Darling River, and another small area of 0.2 hectares near the Murray River zoned E2 Environmental Conservation.

The objects of the RU1 zone are as follows:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To ensure the protection of both mixed dryland and irrigation agricultural land uses that together form the distinctive rural character of Wentworth.
- To ensure land is available for intensive plant agricultural activities.
- To encourage diversity and promote employment opportunities related to primary industry enterprises, including those that require smaller holdings or are more intensive in nature.

4.3 Land and soil capability

There are a number of measures of land capability relevant to agriculture. This report concentrates on the Land and Soil Capability assessment scheme (OEH, 2012). However, other measures are also examined in the following sections.

4.3.1 Background

The Land and Soil Capability (LSC) assessment scheme was published in 2012 by the former Office of Environment & Heritage (OEH, 2012), representing a revision of an earlier scheme that was first published by the former Soil Conservation Service of NSW in 1986 (Emery 1986). The LSC system builds on the earlier scheme, but with more emphasis on a broader range of soil and landscape properties.

LSC is based on an assessment of the biophysical characteristics of the land, the extent to which this will limit a particular type of land use, and the current technology that is available for the management of the land. It indicates the broad agricultural land uses most physically suited to an area. That is, it determines the best match between the physical requirements of the use and the physical qualities of the land, and the potential hazards and limitations associated with specific uses over a site. The LSC system can provide guidance on the inputs and management requirements associated with different intensities of agricultural land use (Woodward, 1988).

The LSC assessment is based on the premise that using land beyond its capability may have serious consequences for the land and soil resources of the State as well as broader environmental impacts on water, air and biodiversity (Woodward, 1988).

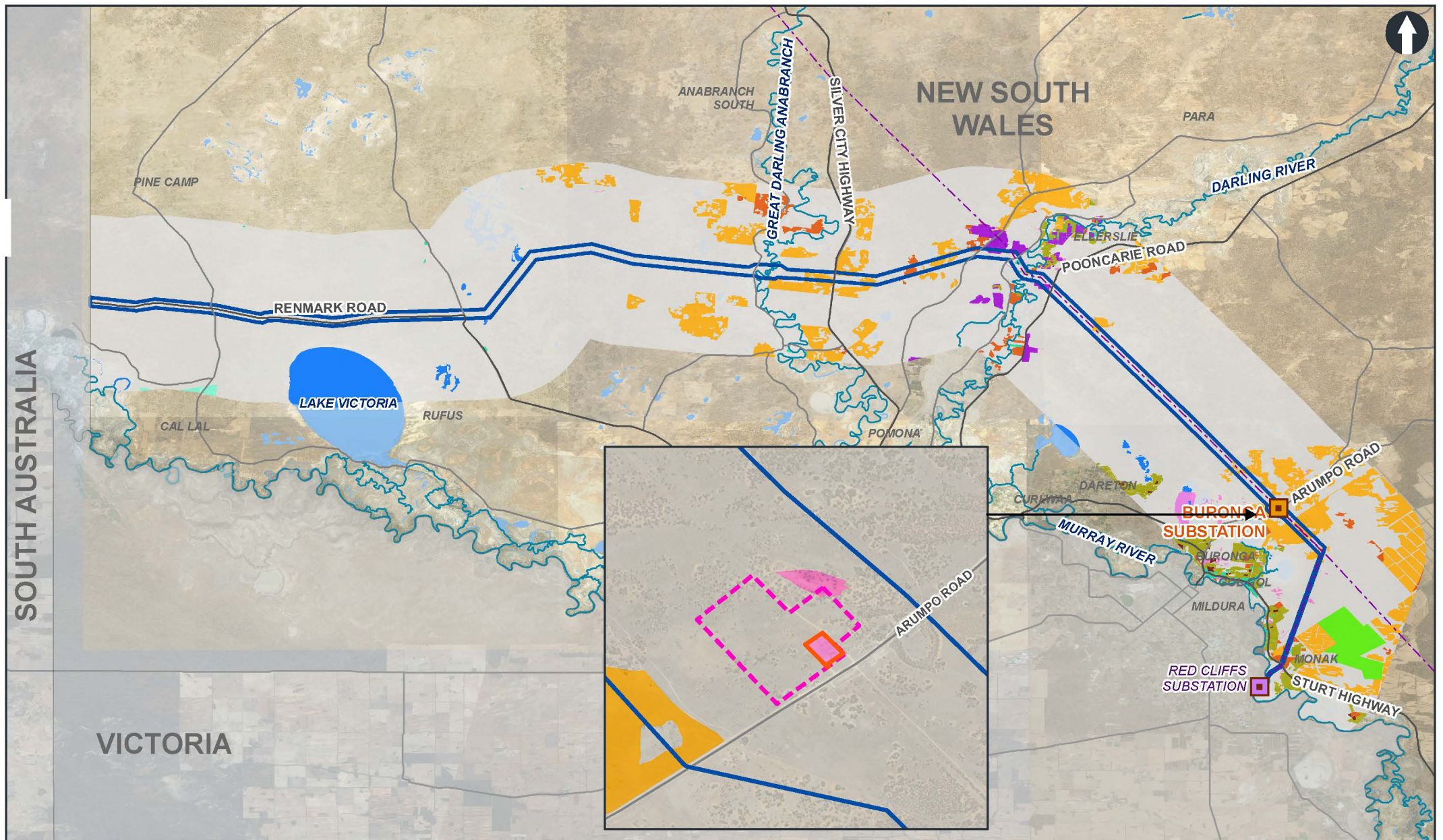
The LSC assessment scheme comprises eight land capability classes (1 to 8) with values representing a decreasing capability of the land to sustain intensive agricultural land use. Class 1 represents land capable of sustaining most intensive land uses including those that are often associated with regular soil cultivation, whereas class 8 represents land that can only sustain very low intensity land uses.

The current LSC scheme was initially developed for the NSW property vegetation planning program under the former *Native Vegetation Act* 2003 and further upgraded for the NSW Natural Resources Monitoring, Evaluation and Reporting program.

The LSC assessment scheme uses the biophysical features of the land and soil including landform position, slope gradient, drainage, climate, soil type and soil characteristics to derive detailed rating tables for a range of land and soil hazards. These hazards include water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and mass movement. Each hazard is given a rating between 1 (best, highest capability land) and 8 (worst, lowest capability land). The final LSC class of the land is based on the most limiting hazard.

The LSC class gives an indication of the land management practices that can be applied to a parcel of land without causing degradation to the land and soil at the site and to the off-site environment. As land capability decreases, the management of hazards requires an increase in knowledge, expertise and investment. In lands with lower capability, the hazards cannot be managed effectively for some land uses.

The LSC assessment scheme is most suitable for broad-scale assessment of land capability, particularly for assessment of lower intensity, dryland agricultural land use. It is less applicable for high intensity land use, or for irrigation (Woodward 1988).



0 10 20 30 KM

- Proposal study area
- Buronga substation
- Red Cliffs substation (out of scope)

- Existing transmission line infrastructure
- Existing substation
- Proposed substation upgrade and expansion area

- Land use classes**
- Cropping
 - Grazing modified pastures
 - Grazing native vegetation

- Intensive farming and industry
- Irrigated forestry and horticulture
- Managed resource protection

- Nature conservation
- Other minimal use
- Perennial horticulture
- Production forestry

- Seasonal horticulture
- Services and utilities
- Water use

Figure 4.2
Land use within and surrounding the proposal study area (based on NSW Land Use Categories 2013)

4.3.2 The proposal study area

A map of LSC across the proposal study area has been included as Figure 4.3 (page 36). The area of each LSC class in the proposal study area is summarised in Table 4.4 (page 34).

The majority of the proposal study area comprises classes 5, 6 and 7 land. Class 5 is prevalent at the eastern and central sections near the Darling Anabranch, Wentworth and Buronga, while there is a higher proportion of classes 6 and 7 at the western end, closer to the SA border. There is some class 8 land north east of Dareton, and approximately 40 kilometres east of the SA border.

Higher capability land (class 4) is located around the Darling and Murray Rivers, associated with alluvial soils supporting cropping and horticultural land uses.

Class 4 land is described as “moderate capability land: 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”.

Class 5 land is described as “moderate–low capability land: 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.

Class 6 land is described as “low capability land: 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”.

Class 7 land is described as “Very low capability land: 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”.

Class 8 land is described as “extremely low capability land: 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” (OEH, 2012).

Table 4.4
Summary of land and soil capability

LSC Class	Proposal Study Area	
	Area	Proportion
	ha	%
4 - Moderate capability	796	5%
5 - Moderate–low capability land	5,025	35%
6 - Low capability	4,985	34%
7 - Very low capability	2,892	20%
8 - Extremely low capability	852	6%
Total	14,549	100%

The LSC mapping set out in Figure 4.3 broadly concurs with observations made during the property inspections.

4.4 Other measures of land capability

4.4.1 Agricultural land classification

The Agricultural Land Classification (ALC) system is similar to the LSC assessment scheme. The current Agricultural Land Classification (ALC) system (Hulme, et al 2002) was developed by the former NSW Agriculture (now DPI).

Under the ALC system land is classified by evaluating biophysical, social and economic factors that may constrain the use of land for agriculture. In general terms, the fewer the constraints on the land, the greater its value for agriculture. Each type of agricultural enterprise has a particular set of constraints affecting production.

The ALC system is not considered in detail in this assessment due to its similarity to the LSC assessment scheme, and its limitations. Squires (2017) states that the ALC system has limitations with “poor quality control of product, limited availability and suitability for digital conversion (available as paper maps only in some areas), does not identify specific industry needs and excludes non-soil based agricultural needs”.

4.4.2 Biophysical strategic agricultural land

Biophysical strategic agricultural land (BSAL) is land with high quality soil and water resources capable of sustaining high levels of productivity. The protocol for determining BSAL is set out in OEH (2013b). BSAL have the best quality intrinsic landforms, soil and water resources which are naturally capable of sustaining high levels of productivity and require minimal management practices to maintain this high quality (DPE, 2013).

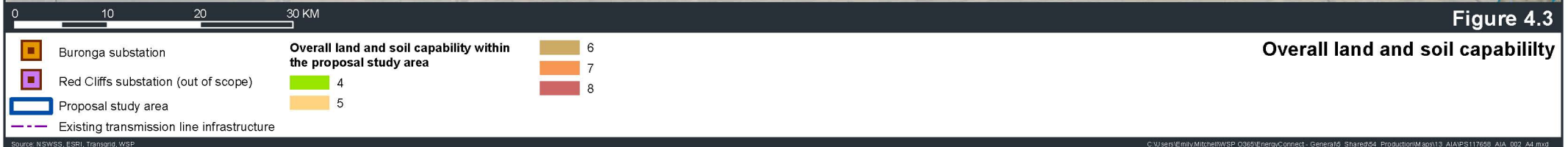
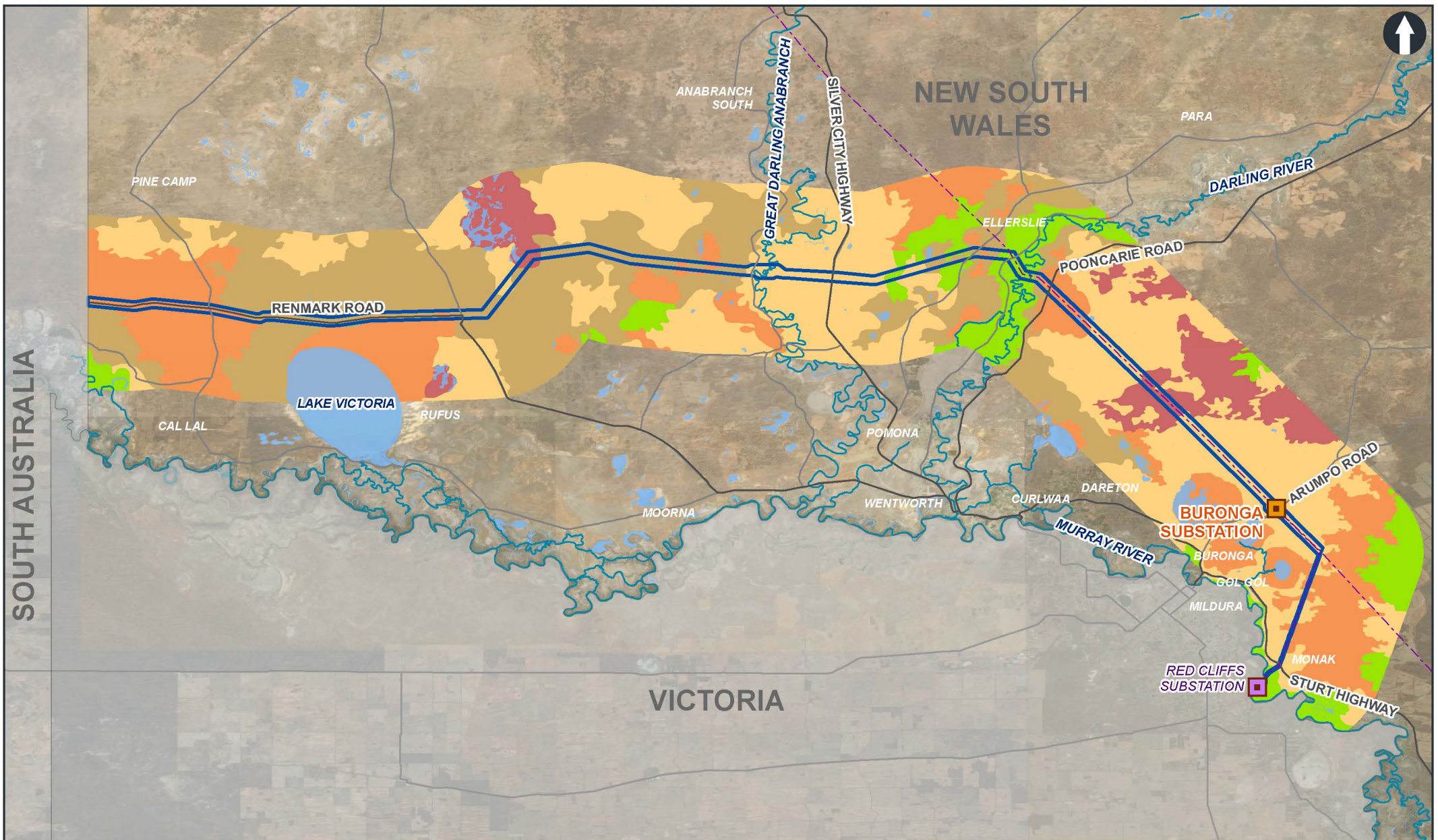
Mapping of BSAL was undertaken by the then NSW Department of Planning and Infrastructure. This mapping indicates that there is no BSAL in the vicinity of the proposal study area.

4.4.3 Important agricultural land

The DPI is undertaking important agricultural land (“IAL”) mapping across nine regions in NSW. The IAL mapping program contributes to the DPIE’s regional planning actions that identify the need to map important agricultural lands in NSW. Knowing where important agricultural land is situated and understanding its requirements, value and contribution will assist state and local government, organisations and industries with making decisions about current and future agricultural land uses. (DPI, 2020a).

Important agricultural land (“IAL”) is not precisely defined by DPI. The key document on important agricultural land “A guideline to identifying important agricultural lands in NSW” (DPI, 2017) states that IAL is defined as “existing or future location of local or regionally important agricultural industries or resources as mapped”.

A pilot project in the Central West and Upper Hunter of NSW defined important agricultural industry land as “land that is highly suitable for specific agricultural industries in accordance with the typical biophysical, marketing and climatic conditions for the locality or region”.



DPI (2017) sets out the criteria and thresholds used in the mapping of IAL during a study of the Central West and Orana regions of NSW. However, the criteria and thresholds for agricultural industries in a particular study area may vary considerably from those in a different geographic area, and some criteria may not be directly transferable from one region to another.

DPI advise that the IAL Project has recently been updated in response to feedback. The IAL project remains a key part of the Government's commitment to implementing Right to Farm Policy and is proposed to be completed in 2020. The revised project will ensure a product is developed which is suitable for inclusion in the planning framework.

The intent of the revised IAL Mapping Project is to identify areas in a region which are key contributors to that region's agricultural economy; and have the inherent capability of being productive with minimal inputs. These areas will be identified on a basis that they are suitable for consideration when consent authorities are undertaking strategic and statutory planning (DPI 2020d).

It is understood that no IAL mapping has yet been undertaken for the Wentworth LGA.

4.5 Agricultural productivity

4.5.1 Employment

Agriculture is the largest industry (by number of persons employed) in the Wentworth-Balranald and Wentworth-Buronga statistical areas. In 2016, 38.3 per cent of employed persons in the Wentworth-Balranald area and 14.1 per cent of employed persons in the Wentworth-Buronga statistical area were employed in "agriculture, forestry and fishing". This was equivalent to a total of approximately 952 persons (ABS, 2019).

In 2018, there were 542 "agriculture, forestry and fishing" businesses in the two statistical areas.

4.5.2 Agricultural land use

The area of agricultural holdings in the Wentworth LGA, Wentworth-Balranald statistical area and Wentworth-Buronga statistical area (Attachments 1 and 2) in 2015-16 (ABS 2017a)¹ is shown in Table 4.5.

Table 4.5
Area of agricultural holdings 2015-16

Area	Area of Holdings (ha)	Number of Holdings (ha)	Average Area (ha)
Wentworth LGA	2,345,737	288.4	8,134
Wentworth-Balranald statistical area	4,443,034	275	16,172
Wentworth-Buronga statistical area	28,406	145	195

¹ Detail agricultural statistics are only produced by the ABS to an LGA level every five years. The most recent LGA data is from 2010-11 and 2015-16.

The same ABS statistics (Table 4.6) shows the broad land use on agricultural holdings in the Wentworth LGA.

Table 4.6
Land use on farms 2015-16

	Area (ha)
Wheat for grain	64,240
Other broadacre crops	17,233
Hay and Silage	1,476
Grapes	5,087
Other horticulture	2,614
Other - Mostly grazing	2,255,087
Total area of holdings	2,345,737

Statistics that detail the use of land not used for cropping or horticulture are not available for Wentworth LGA or for 2015-16. However, earlier statistics (2010-11) show that approximately 94 per cent of the remaining area (apart from cropping and horticulture) in the Wentworth-Balranald statistical area was used for grazing, with the remained being for non-agricultural uses. Of the grazing area, only 17.3 per cent was improved pasture (ABS, 2012a).

The land use in the Wentworth-Buronga statistical area was similar with approximately 98 per cent used for grazing and 16.5 per cent of that being improved pasture (ABS, 2012a).

4.5.3 Livestock carried

Table 4.7 sets out livestock numbers across the Wentworth LGA in 2011 and 2016. Livestock such as poultry and pigs, which are usually associated with intensive production are excluded.

“Stock units” are calculated based on one unit for sheep, lambs, goats and “other” and 10 units each for meat cattle and dairy cattle.

Table 4.7
Livestock numbers

Number	Wentworth LGA
Sheep and lambs	434,465
Meat cattle	18,280
Goats	2,436
Pigs & dairy cattle	150
Total - Stock Units	619,853
per hectare ¹	0.27

Source: ABS 2017a

¹ Excluding cropping and horticultural areas (Table 4.6).

The average stocking rate of 0.27 stock units per hectare in 2016 (Table 4.7) is relatively low. The average stocking rate across all of NSW in 2011 was 1.78 stock units per grazing hectare, but this includes a large area of higher rainfall pasture area in the east of the state (ABS, 2012a).

4.5.4 Value of agricultural production

The gross value of agricultural production in the Wentworth LGA in 2015-16 (ABS 2017b) is shown in Table 4.8 at \$189 million.

Based on Table 4.8, grapes and other horticultural crops (including citrus, stone fruits, avocados, almonds and other nuts) are the most valuable agricultural commodities produced in the Wentworth LGA, followed by wheat, wool, the disposal of cattle and sheep (mostly for meat) and other broadacre crops.

Agriculture in the Wentworth LGA is dominated by irrigated horticulture and livestock grazing, with a significant contribution from broadacre cropping, but little dairy or intensive livestock industry.

The total gross value of agricultural production in 2015-16 was equivalent to \$80 per hectare over the total area of agricultural holdings in the Wentworth local government area (2,345,737 hectares - Table 4.5). However, there is a large difference between the average value of broadacre cropping production (approximately \$320 per hectare), irrigated horticulture production (approximately \$16,000 per hectare) and grazing production (approximately \$17 per hectare).

The value of agricultural production is greatly influenced by seasonal and market conditions and can fluctuate widely from year to year. The gross value of agricultural production over the Wentworth LGA in 2010-11 was \$124.8 million (ABS 2012b). This was 34 per cent lower than in 2015-16.

Table 4.8
Gross value of agricultural production

	2015-16
<u>Broadacre Crops</u>	
Wheat	\$20,498,294
Other	\$5,667,743
Hay	\$521,165
Total - Broadacre Crops	\$26,687,201
<u>Horticulture</u>	
Grapes	\$68,402,011
Other horticulture	\$54,846,943
Total - Horticultural crops	\$123,248,954
<u>Livestock Products</u>	
Wool	\$15,828,808
Sheep and lambs	\$13,328,542
Cattle and calves	\$9,385,882
Goats	\$73,039
Other livestock	\$65,326
Total - Livestock Products	\$38,681,596
Total – Agriculture	\$188,617,751

5 Assessment of construction impacts

5.1 Loss of land use

5.1.1 General comments

The impact of the proposal on soil and land capability would be through the removal of areas from agricultural production. The areas to be removed as a result of the proposal would be small and generally limited to relatively low-productivity land, as discussed below.

The agricultural productivity of the proposal study area is generally relatively low compared to other areas in NSW due to low rainfall, high temperatures (section 4.1.3) and low to moderate fertility soils (section 4.1.5).

The generally low productivity is reflected in relatively small proportions of the proposal study area being used for cropping and improved pastures (section 4.5.2), low high stocking rates (section 4.5.3) and low value of agricultural production on a per hectare basis (section 4.5.4).

The main exception is some relatively small, but highly productive irrigated horticulture enterprises on and adjacent to the proposal study area near the Darling and Murray Rivers. There are also some dryland cropping areas with moderate levels of productivity in the proposal study area.

Due to the relatively low average productivity, the potential impact of any disruption to agricultural enterprises caused by the proposal is also relatively low. In addition, the impact on agricultural land use in the proposal study area would be further limited by the relatively small area permanently and directly affected, the continuation of agricultural enterprises over most of the proposal study area, and the planned mitigation measures (Chapter 8).

5.1.2 Area directly affected

The disturbance area for permanent works would include transmission line tower structure bases, permanent access tracks and the expanded Buronga substation. The disturbance area for construction would include access tracks, and other ancillary works required to facilitate the construction of the proposal (such as laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps). Rehabilitation of the areas not required for operational purposes would occur once the construction phase is completed.

Consequently, the disturbance area directly affected by the proposal would be relatively small in the context of the proposal study area and the regional agricultural industry. For example, the bases of the transmission line tower structures are expected to occupy approximately three hectares or 0.02 per cent of the total area of the proposal study area (totalling 14,549 hectares). The extent of the new Buronga substation would be approximately 30 hectares (Figure 1.2, page 12), approximately 0.2 percent of the total area of the proposal study area. An additional area for temporary works would be required for tracks and other ancillary construction activities, however the final extent of these works is unknown at this stage.

The remainder of the proposal study area would not be directly affected by on-ground works. However, it would be affected by other impacts which may extend over a much greater area than calculated above. These other impacts are discussed below in sections 5.2 and 5.3.

Areas not required for operational purposes (some roads, tracks and other ancillary works) would be rehabilitated and returned to its former land use after construction has been completed. Agricultural production would only be lost on this area during construction and for a limited time afterwards.

The direct impact of the disturbance area on agricultural production would be relatively low during both the construction phase and the operating phase, and would have minor effect on agricultural productivity.

5.1.3 Zoning

The proposal study area would cover a small fraction (0.6 percent) of the agricultural land in the Wentworth LGA, and the impacts of the proposal on existing agricultural enterprises would be minimal. In addition, the proposal does not cause significant fragmentation or alienation of agricultural land, or result in significant disruption to agricultural operations. Therefore, the proposal would be consistent with the objects of the RU1 zone (refer to Section 4.2.2).

5.2 Biosecurity

The following sub sections address the potential biosecurity impacts of the construction stage of the proposal.

5.2.1 General biosecurity risks

There are risks that animal diseases, plant diseases, feral pests and (especially) weeds could be introduced or spread during the construction phase of the proposal. A biosecurity breach of this nature is likely to increase costs and decrease income of agricultural properties in the vicinity of the proposal. Depending on the biosecurity matter, impacts on both costs and income could be short term to longer term (more than five years).

Potential carriers of weed seeds, plant material and diseases include vehicles (especially tyres), machinery and personnel (clothing and footwear). Biosecurity matter could also be spread by soil and water movements associated with construction works. These movements generally occur over relatively short distances. However, the extensive nature of agriculture in the vicinity of the proposal study area means that the potential of significant biosecurity impacts by movement over short distances is relatively low.

The biosecurity risks are generally highest during the construction phase due to earthworks, and the frequency of vehicle and personnel movements.

Potential impacts of a biosecurity incident on agricultural businesses include increased costs associated with monitoring pests, weeds or diseases and implementing control measures; and reduced income caused by reduced livestock, crop or pasture production and lower produce quality. The extent and severity of the impact of a biosecurity incident would depend on the nature of the incident. However, it is unlikely that a biosecurity incident would have a major economic impact on agriculture in the region. The mitigation measures that would be implemented should prevent any biosecurity incident and reduce the impact if an incident should occur.

5.2.2 Weed biosecurity risks

Weeds which present a potential biosecurity risk of the proposal are those:

- which may be spread relatively easily by activities associated with the proposal
- that are adapted to the environmental conditions of the region
- that would have a relatively severe economic impact if they were to spread.

Weeds that are present in the region and present a potential biosecurity threat are listed in section 4.1.9.

Weeds such as some cactuses, spiny burgrass, khaki weed, Noogoora burr and Bathurst burr are readily spread by vehicle, machinery and human activity. Some also have a potential high impact on the income and costs of agricultural enterprises. Silver-leaf nightshade is difficult to control in pastures and irrigation areas, while the spiny burgrass grass presents a challenge in pastures and crops. Noogoora burr and Bathurst burr are important wool contaminants.

There are numerous other weeds which could potentially have a significant impact on the agricultural enterprises. Some of these are listed by Grice (2006) in relation to western rangelands, including mesquite, onion weed, boxthorn, lippia (*Phyla canescens*), Noogoora burr, Ward's weed (*Carrichtera annua*) and billy buttons (*Ixiolaena brevicompta*). However, the risk is moderated by:

- the weeds not being readily spread by activities associated with the proposal (for example, mesquite)
- limited adaptability to the environmental conditions of the region (for example, serrated tussock (*Nassella trichotoma*)) the limited cropping areas where cropland weeds may become established (for example, wild radish (*Raphanus raphanistrum*)).

The risk of weed spread is at its highest during the construction phase due to earthworks, the frequency of vehicle movements, and increased weed growth due to disturbance of ground cover and soil. The Wentworth Shire Council biosecurity officer advised that weeds had been introduced into the shire during previous construction projects.

In addition, the proposal study area lies within the biosecurity zones for alligator weed, bitou bush and water hyacinth (Biosecurity Regulation 2017). These zones cover most of NSW, and require land owners and occupiers to notify the local control authority of a new infestation of the weeds, and eradicate, destroy or suppress the weeds.

There is a medium risk of weed spread due to construction activities. Mitigation measures to limit and manage the weed biosecurity risk are provided in Chapter 8.

5.2.3 Livestock pests and diseases biosecurity risks

Sheep lice, ovine Johne's disease (OJD) and ovine footrot are the highest livestock pest and disease risks associated with the proposal. They are all diseases of sheep, are present in the region, and have significant productivity impacts on sheep enterprises.

Footrot is the most important risk despite its low current prevalence (section 4.1.9), due to the relative ease of its spread and its high potential economic impact. Virulent footrot is a severe, debilitating disease with significant economic loss from reduced wool growth, lower wool quality, poor ewe fertility, slow growth rates, losses from blowfly strike, and reduced value of sale sheep. In infected flocks, there are also significant costs associated with the control of the disease.

OJD is a wasting disease of sheep that can result in significant economic losses on infected farms due to sheep deaths, lost meat production, fewer lambs and less wool. Under the *Biosecurity Act 2015*, sheep footrot and OJD are notifiable diseases.

Sheep lice cause significant losses in sheep enterprises due to treatment costs, reduced wool growth and lower meat production.

The risks associated with these diseases are low due to the extensive nature of agriculture in the vicinity of the proposal study area, the low probability of spread being caused by proposal activities, the low prevalence of disease in the area (section 4.1.9), the low density of livestock and unfavourable conditions for disease spread.

Other possible biosecurity risks include bovine Johne's disease (BJD) and internal parasites. However, the biosecurity risks associated with these diseases are very low.

Due to the low risk associated with animal diseases, no specific mitigation measures are required. General mitigation measures relating to management and repair of property infrastructure will further reduce the risk.

5.2.4 Vertebrate pest biosecurity risks

The most significant vertebrate pests in the vicinity of the proposal study area are likely to be pigs, foxes, rabbits and kangaroos. All these pests have economic impacts on livestock and/or crop enterprises arising from lamb predation, fence damage or consumption of pasture and crops. However, the impact of the proposal, if any, would be very low as it is unlikely to significantly change the number or movement patterns of vertebrate pests. Consequently, no specific mitigation measures are required.

Other vertebrate pests such as wild dogs and unmanaged goats have potential economic impacts, but are less prevalent in the proposal study area. Consequently, no specific mitigation measures are required.

5.2.5 Plant disease and pest biosecurity risks

There are substantial biosecurity risks associated with plant diseases and pests in the horticultural industries on and around the proposal study area. In particular, part of the proposal study area is located within the Greater Sunraysia Pest Free Area of NSW and Victoria. The main aim of this quarantine area is the prevention of the entry of Queensland fruit fly. Most fruit and fruiting vegetables are banned from entering the Greater Sunraysia Pest Free Area.

In addition, there is a ban on taking grapevines, cuttings or budwood into the Phylloxera Exclusion Zone. This zone covers most of NSW including the proposal study area. Soil that has been in contact with any grapevine material cannot be brought into this zone.

The proposal study area is also in the Potato Biosecurity Zone which covers all of NSW, and this bans the movement of plants belonging to the family Solanaceae and associated matter into the zone.

The NSW Rice Pest and Disease Exclusion Zone lies just to the east of the proposal study area. This zone bans the entry of rice plants or grain such as paddy rice or brown rice.

There are substantial avocado orchards near the proposal study area which are susceptible to phytophthora root rot. This disease can be spread by soil attached to footwear or vehicle tyres, and by water movements. Snails are a significant pest of citrus trees and may be introduced to new areas by vehicle and personnel movements.

Consequently, there are substantial biosecurity risks to horticultural enterprises if activities associated with the proposal were to result in inappropriate plant material or soil being brought into the proposal study area. Biosecurity risks would be highest during the construction phase due to the larger number of personnel and vehicle movements to and within the proposal study area.

Given the nature of the dominant rangeland grazing land use, plant diseases or pests are not a substantial issue for grazing enterprises in the region. It is unlikely any activity associated with the proposal would result in spread of pasture diseases or pests. Therefore, no significant biosecurity risk to grazing enterprises is expected.

Mitigation measures to limit and manage the risk of plant pests and diseases are provided in Chapter 8.

5.3 Other potential impacts

5.3.1 Restricted movement

It is unlikely that the construction of the proposal would substantially restrict movements of landholders, and their livestock and equipment, within the proposal study area. It is possible that some movement would be affected temporarily due to restricted access to construction areas. However, these restrictions would be of a short duration and in a limited location, and therefore unlikely to markedly affect movements for agricultural purposes.

Such restrictions are more likely in cropping and horticultural areas than rangeland grazing areas due to the higher intensity land use and greater movement restrictions imposed by cropped areas. However, cropping and horticultural areas represent only a small percentage of the proposal study area (section 4.2). Mitigation measures to limit disruption are provided in Chapter 8.

5.3.2 Impacts on cropping and horticultural operations

The construction of a transmission tower or other facilities on cropping or horticultural land disrupts, to some extent, normal husbandry operations on land surrounding the structure or facility. Usual cultivation, crop establishment and spraying travel patterns must be adjusted to avoid the structure or facility, and care needs to be taken to avoid collisions when using wide farming equipment.

The impacts of the proposal structures such as electricity transmission towers and lines on controlled traffic farming (CTF), weed control and cropping under powerlines would commence during the construction phase and continue into the operational phase. These impacts are discussed in section 6.3.2.

The impact on cropping and horticultural operations in the proposal study area during the construction phase would be relatively small due to the same factors listed in section 6.3.2. Mitigation measures to limit disruption are provided in Chapter 8.

5.3.3 Impacts on irrigation activities

In addition to the cropping impacts outlined above, irrigated cropping or horticulture enterprises may be subject to other impacts during the construction phase. These impacts would commence during the construction phase and continue into the operational phase and are discussed in section 6.3.3. These impacts would be low, and mitigation measures to limit disruption are provided in Chapter 8.

5.3.4 Impacts on aerial agriculture operations

Significant impacts on aerial agriculture operations (such as aerial spreading of fertilisers and aerial spraying) and drones can potentially arise from the construction of transmission lines in cropping or horticultural areas. These impacts would commence during the construction phase and continue into the operational phase and are discussed in section 6.3.4. These impacts would be low, and mitigation measures to limit disruption are provided in Chapter 8.

5.3.5 Impacts on livestock enterprises

The main potential impact on livestock enterprises would be noise disturbance of sheep and cattle. Noise created by the movement of construction vehicles and other construction activities may have an impact on livestock, especially during calving and lambing. Livestock can be easily panicked, particularly if they are new to the area near the proposal, such as occurs with relocated, agistment or newly purchased animals.

The impacts of noise on livestock would be diminished by the low density of livestock on the proposal study area. The effect on productivity is expected to be negligible.

Considerable disruption could occur to livestock enterprises if stock water pipelines or fences were damaged and not promptly repaired during construction, or if gates were left open.

Overhead transmission lines also impact on the operation of electric fencing and stock yards. This impact is discussed under the operation phase in section 6.3.5.

Apart from the potential impact associated with damage to infrastructure and mismanagement of gates, other impacts on livestock enterprises would be low. Mitigation measures to limit disruption, particularly in relation to management and repair of property infrastructure, are provided Chapter 8.

5.3.6 Fire risk

Fires could be started by human activities, equipment and vehicles during the construction phase.

Fires have the potential to cause significant damage to livestock, agricultural infrastructure (such as dwellings, stock yards, sheds and fences), pasture, shade and shelter trees, and agricultural equipment.

Conversely, clearing along the transmission line easement provides a potential firebreak and increases access for firefighting activities.

Fire risk is dealt with in more detail in a separate technical report of this EIS on bushfire risk management.

5.3.7 Travelling stock routes and reserves

The grazing industry uses a network of Crown reserves called travelling stock reserves (TSRs) for moving or grazing stock on foot around NSW. Some of these reserves are linear, providing a route for livestock to move from place to place. Other reserves are blocks of varying sizes providing a place for livestock to be temporarily grazed or held (e.g. for overnight yarding). Livestock can also be moved along public roads subject to permit from the LLS.

There are no TSRs directly affected by the proposal study area. The closest TSRs are:

- Gol Gol Well (0.24 hectares) located approximately 2.5 kilometres south west of the proposal study area on Arumpo Road
- Tapio (3.05 hectares) approximately 14 kilometres north east of the proposal study area on Arumpo Road.

No roads in the proposal study area have been identified by the NSW Government as part of a “livestock highway”. The NSW Department of Industry (2017) defined livestock highways as a key network of livestock routes connecting key agricultural regions within NSW, and with Queensland and Victoria.

The proposal would not have any significant impact on travelling stock reserves or the movement of livestock along public roads. Consequently, no specific mitigation measures are required.

6 Assessment of operational impacts

6.1 Loss of land use

The impact of the proposal on soil and land capability would be through the removal of areas from agricultural production. The areas required by the proposal however would be small and generally limited to relatively low-productivity land, as discussed below.

The general comments on the loss of land use included in section 5.1 are also relevant to the loss of land use during the operational phase.

Some of the permanent works footprint of the proposal (such as bases of the transmission line structures) would be not be permanently removed from agricultural production. For example, grazing may continue around and under the transmission line and structures.

Other parts of the permanent works footprint, such as hardstand areas and permanent tracks could affect soil characteristics so that these locations would no longer be productive cropping or pasture areas. This would affect cropping and horticultural land use to a greater degree than the transmission line structures, but these locations comprise only a small percentage of the proposal study area (section 4.2).

The potential impact of the proposal on irrigated horticultural land is relatively high due to its high productivity (section 4.5.4). However, it is not expected that any irrigated horticultural land would be taken out of production by the proposal.

The existing 220kV transmission line from Buronga to the Victorian border would be replaced and a new line constructed adjacent to the location of the existing line. Once the new line is constructed the existing line would be removed. The final transmission line easement width would be the same as the existing easement width but slightly shifted in location. Therefore, the change in land use in this section of the transmission line corridor, due to the slightly larger transmission line structure footprints, would be relatively small.

The direct impact of the proposal on agricultural production would be minimal during the operation phase, due to the small areas affected and the low productivity of the majority of the proposal study area.

6.2 Biosecurity

6.2.1 Weeds

The biosecurity risks and potential impacts outlined in section 5.2.2, in relation to the construction phase are also applicable to the operational phase. The major difference is that activity would be less intense and frequent in the operational phase, and therefore the risk of weed spread would be much lower.

There is a low risk of weed spread due to operational activities. Mitigation measures to limit and manage the weed biosecurity risk are provided in Chapter 8.

6.2.2 Livestock pests and diseases

As discussed in in section 5.2.3, the biosecurity risks associated with livestock pest and diseases from activities associated with the proposal are low. The risks in the operational phase would be lower than for the construction phase due to lesser vehicle, machinery and personnel activity. Consequently, no specific mitigation measures are required. General mitigation measures relating to management and repair of property infrastructure will further reduce the risk.

6.2.3 Vertebrate pests

As for the construction phase (section 5.2.4), the impact of the proposal on vertebrate pests during operation, if any, would be very low. Consequently, no specific mitigation measures are required.

6.2.4 Plant diseases and pests

As discussed in section 5.2.5, the biosecurity risks associated with plant pest and diseases from activities associated with the proposal are significant for horticultural industries but low for other agricultural enterprises. Lower personnel activity would lead to lesser risks in the operational phase than for the construction phase. Mitigation measures to limit and manage the risk of plant pests and diseases are provided in Chapter 8.

6.3 Other potential impacts

6.3.1 Restricted movement

It is unlikely that the operation of the proposal would restrict the movements of landholders. Consequently, no specific mitigation measures are required.

6.3.2 Impacts on cropping and horticultural operations

The presence of a transmission line structures or other facilities on cropping land disrupts, to some extent, normal crop husbandry operations on land surrounding the structure or facility. Usual cultivation, crop establishment and spraying travel patterns must be adjusted to avoid the structure or facility, and care needs to be taken to avoid collisions when using wide farming equipment.

Structures such as electricity transmission towers are particularly problematic for controlled traffic farming (CTF). CTF is a farming system built on permanent wheel tracks where the crop zone and traffic lanes are permanently separated. In areas where CTF is not currently used, the proposal may have an impact if the system was implemented in the future.

Effective weed control within cropping areas would also be impacted by the inability to apply herbicides to the area under or around structures such as transmission towers with normal spray operations. These areas may need separate applications of herbicides and extra attention to prevent a build-up of weeds and their spread onto adjacent cropping areas.

Overhead powerlines above cropping areas can be hazardous due to the considerable height of agricultural plant and equipment such as harvesters and grain augurs. The height above ground of transmission lines would be sufficient to enable the allowable approach distance of six metres (WorkCover, 2006) to be maintained for cropping machinery. Large grain harvesters are generally the tallest farm machinery, with an operating height of around four metres and a total height with auger extended while unloading grain of approximately five metres.

TransGrid's guidelines indicate that machinery cannot extend more than 4.3 metres above ground level within transmission line easements (TransGrid, 2020a). Consequently, the transmission easement would not be suitable for grain loading and unloading.

The impact on cropping operations in the operation phase would be relatively small due to the following factors:

- cropping and horticultural areas represent only a small percentage of the proposal study area (section 4.2)
- a substantial proportion of the dryland cropping areas in the transmission line corridor are between the existing Buronga substation and the NSW/Victoria border. These are areas which would have an upgraded line which would ultimately result in no increase in the transmission easement size. Therefore, additional impacts in this area are likely to be limited
- cropping impacts would be greater where a new transmission line is constructed, especially if it is not associated with an existing transmission line. However, no recent dryland cropping has been located on the western part of the transmission line corridor where the new greenfield section of 330kV transmission line would be constructed
- little or none of the existing dryland cropping appears to be based on CTF
- no transmission towers would be located on existing horticultural land
- if possible, towers and overhead wires would be located away from higher risk areas such as those used for set up and pack up of agricultural equipment, entry points into cropping paddocks and turning areas.

The location of the transmission line across existing or future orchards or vineyards would result in breaks in the rows, if the easement is not used for horticulture. Consequently, average row lengths would be shorter, resulting in increased costs due to:

- lower efficiency of horticultural operations
- increased cost of establishing or replacing irrigation across the easement
- increased cost of trellising, especially additional end strainers.

6.3.3 Impacts on irrigation activities

In addition to the cropping impacts outlined in section 6.3.2, irrigated cropping or horticulture enterprises may be subject other impacts.

The use of hand-move irrigation pipes in irrigation areas around overhead powerlines can be an additional hazard due to their considerable length. It is unlikely that hand-move irrigation pipes are used in the proposal study area due to the extensive and permanent nature of irrigation enterprises (such as grape growing).

Transmission line structures and other associated facilities can interfere with the operation of irrigation systems, particularly mechanised centre pivot or linear move systems. However, there does not appear to be any centre pivot or linear move systems on the transmission line corridor. There is some potential for these systems to be installed in the future, however they are not commonly used for horticulture which dominates irrigated agriculture in the vicinity of proposal study area.

No transmission line structures would be located on existing horticultural land.

6.3.4 Impacts on aerial agriculture operations

Significant impacts on aerial agriculture operations (such as aerial spreading of fertilisers and aerial spraying) and drones can potentially arise from the presence of transmission lines in cropping or horticultural areas.

The efficiency and effectiveness of aerial agriculture operations can decline as application procedures must be amended to compensate for the presence of transmission lines. Transmission lines are also a potential hazard for low level aviation activities and these must be considered in planning a safe aerial application program.

The impact on aerial agriculture operations and productivity in the transmission line corridor would be relatively small due to the following factors:

- cropping and horticultural areas represent only a small percentage of the proposal study area (section 4.2)
- few aerial agriculture operations are expected in the transmission line corridor for the following reasons:
 - most horticultural pesticides and fertilisers are applied by ground sprays or via irrigation water, and aerial applications are rarely used
 - the dry climate in the proposal study area means that dryland cropping production is not particularly high value, and high cost aerial applications are rarely used
 - aerial applications of pesticides and fertilisers are generally not used in rangeland grazing areas
- the section between the Buronga substation and the NSW/Victoria border, where significant existing or potential horticulture and dryland cropping land is located on or near the transmission line corridor, also corresponds to areas where the transmission line would be upgraded, resulting in larger transmission line structures rather than an additional line. Therefore, additional impacts to aerial agriculture operations would be limited
- no transmission line structures would be located on existing horticultural land. However, it is possible that horticultural land may expand into the proposal study area in the future.

Despite this, the use of drones for mustering and monitoring crops (including horticulture) is increasing. Proximal sensing using drones is competitive with remote sensing by satellites for crop monitoring purposes. Crop sensing by drones is cheaper, more targeted, more timely, less affected by cloud cover, and provides higher quality images, which will probably result in increased future use.

Transmission lines and structures would restrict drone flight and sensing in areas around these structures. Drones are subject to electric and magnetic interference from transmission lines, and it is recommended that they are not flown within approximately 30 metres of a power line (Drone U Flight School, 2020). Unmanned aerial vehicles (such as drones) cannot be flown within 60 metres of any transmission line structure, guy wire or conductor (TransGrid, 2020a).

6.3.5 Impacts on livestock enterprises

The main potential impact on livestock enterprises would be noise disturbance of sheep and cattle, as discussed in section 5.3.5. Noise impacts would lessen during the operation phase due to a lower intensity of personnel and vehicle movements as maintenance activities would be less frequent than construction activities. The potential for damage to fences and other livestock infrastructure, and gates being left open (section 5.3.5), are also lower.

Overhead transmission lines also impact on the operation of electric fencing. Electric fencing must be located at least 30 metres from transmission structures or supporting guy wires, and have a height of no greater than 2.5 metres (TransGrid, 2020a).

Australian Standard AS/NZS 3014:2003 states that electric fence crossings with overhead power lines must be avoided wherever possible. When a crossing cannot be avoided, it must be made underneath the transmission line and near as possible right angles to it. In addition, all electric fence connecting leads and wires are installed near an overhead power line above 33,000 volts must have a clearance of at least eight metres.

These requirements would potentially restrict the siting of electric fences, but is unlikely to have major impact on the operation of grazing enterprises.

All metallic fences (electric and non-electric) in the vicinity of transmission lines have specific construction requirements involving earthing and isolation panels (TransGrid, 2020b), adding some extra construction costs.

Any livestock yards or buildings situated under the transmission lines would need to be relocated.

6.3.6 Fire risk

Fires could be started by human activities, equipment and vehicles during the operational phase. This risk should be lower than during construction, but are dependent on seasonal and weather conditions.

Fires could also arise from the operation of transmission lines and substations. Mechanical failure of a transmission line (for example, a dropped conductor), or failure of a transmission line to operate correctly under fault conditions (for example, faulty earthing at times of lightning strike), can initiate fire under specific conditions (TransGrid, 2013). Other fire risks may involve high heat, wind impacts and contact with vegetation.

Fire risk is dealt with in more detail in a separate technical report of this EIS on bushfire risk management.

6.3.7 Radiocommunications interference

Overhead transmission lines and high voltage equipment can potentially cause interference with radiocommunications such as radio and television signals.

It is beyond the scope of this agricultural impact assessment to determine the degree of interference that may be caused by the proposal. However, radiocommunications are used by agricultural businesses in many ways, including:

1. reception of radio broadcasting
2. reception of television broadcasting
3. aviation communications and radar
4. emergency services radio (including bush fire brigades)
5. private UHF radio communications
6. mobile phones
7. wireless internet
8. satellite television and internet
9. GPS and auto-steer applications
10. radio frequency identification (for example, identification of livestock)
11. radio frequency control systems (for example, control of irrigation)
12. radio frequency telemetry (for example, soil monitoring).

6.3.8 Trespass

Some concerns were expressed during landowner consultations that improved access resulting from clearing of vegetation along the transmission line easement would encourage trespass onto agricultural properties. According to landowners consulted, trespass of this nature is an ongoing problem around the proposal study area, and there is potential that the cleared areas associated with the proposal could lead to an increase in unauthorised hunting, damage to infrastructure, injury to livestock, livestock theft and biosecurity risks.

Mitigation measures associated with maintaining fencing and gates to limit unauthorised access to properties would assist with limiting this risk.

7 Assessment of cumulative impacts

Cumulative impact assessment means the consideration of other nearby development projects along with the proposal. Projects with the potential for cumulative impacts with the proposal were identified through a review of publicly available information and environmental impact assessments from the following databases:

- NSW Major Projects website (NSW Government, searched June 2020)
- Wentworth Shire Council website (Wentworth Shire Council, searched June 2020)
- Australian Government – Department of Environment and Energy, EPBC Public notices list (Australian Government, searched June 2020).

Three proposed developments have been identified and these include:

- Copi Mineral Sands Mine
- Buronga Solar Farm
- Buronga – Gol Gol residential expansion.

7.1 Copi Mineral Sands Mine

Copi Mineral Sands Project is a development of an open cut mineral sands mine and associated infrastructure to extract and process up to 1.5 million tonnes per annum for up to six years, transporting the heavy mineral concentrate via road for off-site processing; and progressively rehabilitating the site. The mine is located approximately 25 kilometres north of the proposed alignment, and is currently at the “prepare EIS stage”.

The preliminary environmental assessment for the Copi Mineral Sands Project (R.W. Corkery & Co. Pty. Limited, 2018) indicates that the project would comprise two open cuts covering approximately 143 hectares and an infrastructure area covering approximately five hectares, plus a new 31 kilometres access road.

The bulk of the project site is comprised of LSC class 8 land of extremely low capability, with a small section of class 4 land of moderate capability, all of which is used for low-intensity grazing (R.W. Corkery & Co. Pty. Limited, 2018). The mine project is expected to require approximately 12 months for site establishment and construction, followed by mining for a period of approximately six years, and up to two years to complete final rehabilitation operations.

The relatively small area of disturbance of this project, the low agricultural productivity of the land (section 4.5.4) and the limited lifespan of the project indicate that the agricultural impacts on the region would be relatively small.

7.2 Buronga Solar Farm

Buronga Energy Station is a development of a 400 megawatt solar farm with energy storage and associated infrastructure located approximately five kilometres north east of Buronga, and essentially located adjacent to the Buronga substation. The development includes a transmission line to the Buronga substation, and the approval process is currently at the “prepare EIS stage”.

The preliminary environmental assessment for the Buronga Energy Station (Renew Estate, 2018) indicates the proposal site is approximately 1,200 hectares of which approximately 50 per cent has been cleared for cropping and grazing of volunteer pastures with the remainder being used for grazing of native pastures. The majority of the proposal site is LSC class 5 land of moderate–low capability, with a small portion of class 7 land of very low capability.

During operation, groundcover vegetation would be maintained under the arrays and is intended to be managed by sheep grazing where possible. Therefore, some grazing production will continue during the operational phase, but cropping will cease. The solar farm would be decommissioned and rehabilitated at the end of the project, making the site available for agriculture once again.

The preliminary environmental assessment concludes that the temporary (approximately 30 years) reduction of agricultural production at the proposal site is unlikely to have any significant impact on the agricultural productivity of the region.

7.3 Buronga – Gol Gol residential expansion

Buronga – Gol Gol residential expansion consists of new subdivisions set to provide approximately 500 new large residential housing allotments. Buronga – Gol Gol is considered to be the growth area of the Wentworth Shire. There is no timeframe on the proposed development which is limited to areas adjacent to existing residential areas.

The Buronga – Gol Gol residential expansion is approximately six kilometres west of proposal study area at its closest point. Maps which form part of the Wentworth LEP 2011 indicate that the total urban release area is approximately 240 hectares. Most of this area is currently used for irrigated horticulture. Consequently, the potential impact on regional agricultural production is significant if all this area was released for residential expansion, due the high value of irrigated horticulture production (section 4.5.4).

7.4 Conclusions

Cumulative impacts on agriculture in the region arising from the proposal and other projects would not be substantial.

The individual impacts on regional agriculture of the proposal, the Copi Mineral Sands Project and the Buronga Solar Farm are all expected to be relatively minor, and their cumulative impact is also expected to be low. The total area affected is small relative to total extent of agriculture in the in the Wentworth-Balranald and Wentworth-Buronga statistical areas (section 4.5.2), and is mostly limited to extensive grazing and dryland cropping land uses.

The potential impact on regional agricultural production of the Buronga – Gol Gol residential expansion is significant through its potential effect on irrigated horticulture production. However, the impact of the proposal on irrigated horticulture production is relatively small (sections 5 and 6). Therefore, the contribution of the proposal to the potential cumulative impacts on irrigated horticulture would be minor.

8 Mitigation measures

The mitigation measures that would be implemented to avoid or minimise potential agricultural impacts are listed in Table 8.1.

Table 8.1
Mitigation measures – agriculture

Reference	Mitigation measure	Timing	Applicable location(s)
AG1	During detailed design, access tracks (temporary and permanent) will be determined in consultation with landholders and to minimise impacts to agricultural activities to the greatest extent possible. Where permanent tracks are required, a single access track will be designed to serve both temporary and permanent purposes, where possible.	Detailed design	All locations
AG2	Transmission line structures (and associated permanent structures or construction compounds) will be located where possible to avoid or minimise impacts, or as agreed with the affected landholder, on: <ul style="list-style-type: none"> • cropping and irrigated horticultural land • areas used for set up and pack up of agricultural equipment, entry points and turning areas • radiocommunication sensitive areas • drainage catchments for farm dams • locations of high biosecurity risk. 	Detailed design	All locations
AG4	Final transmission line easement will be located parallel with existing transmission lines or road corridors or along property boundaries, where possible, to reduce potential fragmentation of properties and disturbance to existing land uses.	Detailed design	Transmission line

Reference	Mitigation measure	Timing	Applicable location(s)
AG3	<p>To minimise disruption to agricultural activities:</p> <ul style="list-style-type: none"> landholders will be consulted regarding any required adjustments to property infrastructure (fences, access tracks, etc) and the proposed timing and location of construction works, especially where some restriction on vehicular or stock movements will be necessary. Appropriate arrangements will be negotiated with the affected parties and put in place prior to any such disruption. property infrastructure (such as gates) will be managed in accordance with landholder requirements and any damage caused by construction will be repaired promptly use of existing roads, tracks and other existing disturbed areas will be prioritised. where access is required across open spaces, care will be exercised to ensure that minimum damage is caused to the surface by confining vehicular or plant movement, as far as possible, to one route. 	Pre-construction and construction	All locations
AG5	Disturbed areas will be stabilised and appropriately rehabilitated as soon as feasible and reasonable following the completion of construction. This will be carried out in consultation with the relevant landowner.	Construction	All locations
AG6	<p>Procedures will be implemented so that potential impacts or conflicts between livestock and construction activities are appropriately managed. Procedures will be developed in consultation with effected landholders and will include management of:</p> <ul style="list-style-type: none"> noise intensive activities during sensitive periods within the livestock production cycle (such as lambing and calving) vehicle movements and other activities within the vicinity of livestock movement of stock away from potential stressors created by construction activities. 	Construction	Transmission line

Reference	Mitigation measure	Timing	Applicable location(s)
AG7	<p>Biosecurity controls will be implemented during construction to minimise the risk of off-site transport or spread of disease, pests or weeds. Controls will include (but not limited to):</p> <ul style="list-style-type: none"> • inspections and cleaning of vehicles, machinery, and personnel equipment prior to movement on and off construction work areas or between properties • minimising movements across adjoining farmland including trip numbers and locations • additional measures where localised areas of high biosecurity risks have been identified. <p>The effectiveness of these controls will be regularly monitored.</p>	Construction	All locations
AG8	Where present, weeds will be managed in consultation with Western LLS, Wentworth Shire Council and NSW Department of Primary Industries.	Construction	All locations
AG9	In the event of new infestations of notifiable weeds as a result of construction activities, the relevant control authority will be notified as per <i>Biosecurity Act 2015</i> and Biosecurity Regulation 2017.	Construction	All locations
AG10	Fencing and access arrangements along the transmission line easement, such as locked gates, will be determined in consultation with landholders.	Operation	Transmission line
AG11	Biosecurity controls will be implemented during operation to minimise the risk of off-site transport or spread of disease, pests or weeds during maintenance activities.	Operation	All locations
AG12	Where present, weeds will be managed in accordance with the <i>Biosecurity Act 2015</i> .	Operation	All locations
AG13	Management of access including opening and closing of gates and monitoring of fencing will be done in accordance with landholder requirements. Any damage caused by maintenance activities will be repaired promptly.	Operation	All locations

9 Conclusion

There are several potential impacts of the proposal on the agricultural industry. However, the magnitude of these impacts is constrained by the following factors:

- the relatively low productivity of agriculture in proposal study area, due mainly to low rainfall and the predominance of rangeland grazing land use. Higher value enterprises such as irrigated horticulture and dryland cropping make up a small proportion of the proposal study area
- the low impact of the proposal in terms of the small amount of land removed from agriculture, and the general continuation of agriculture activity across the transmission line easement and the proposal study area
- low biosecurity risks in the dominant grazing and dryland cropping areas
- effective mitigation measures will be implemented to reduce the impacts of the proposal on the agricultural industry.

The impact of the proposal on agricultural productivity at a regional scale would be small due to the above factors.

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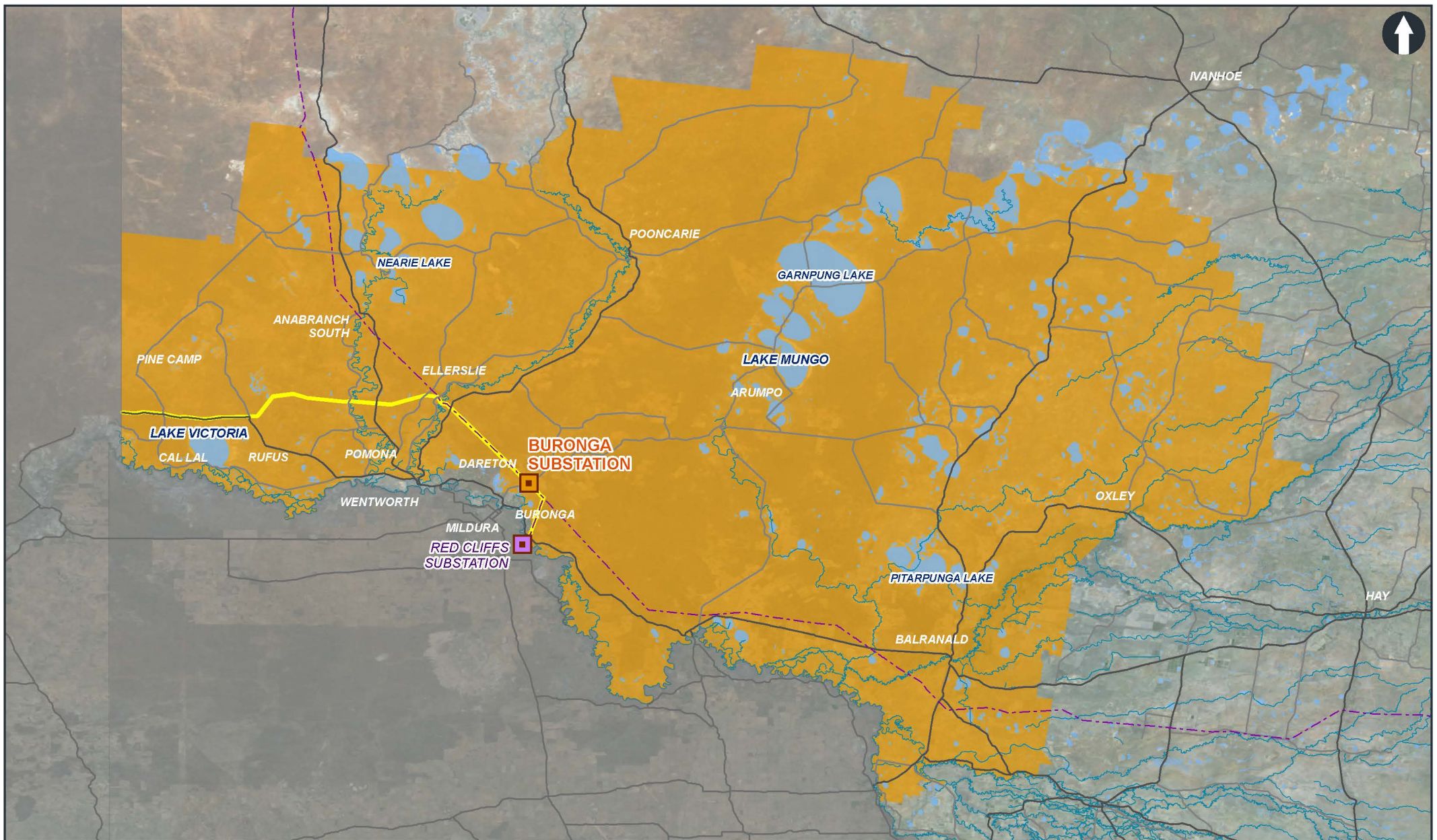
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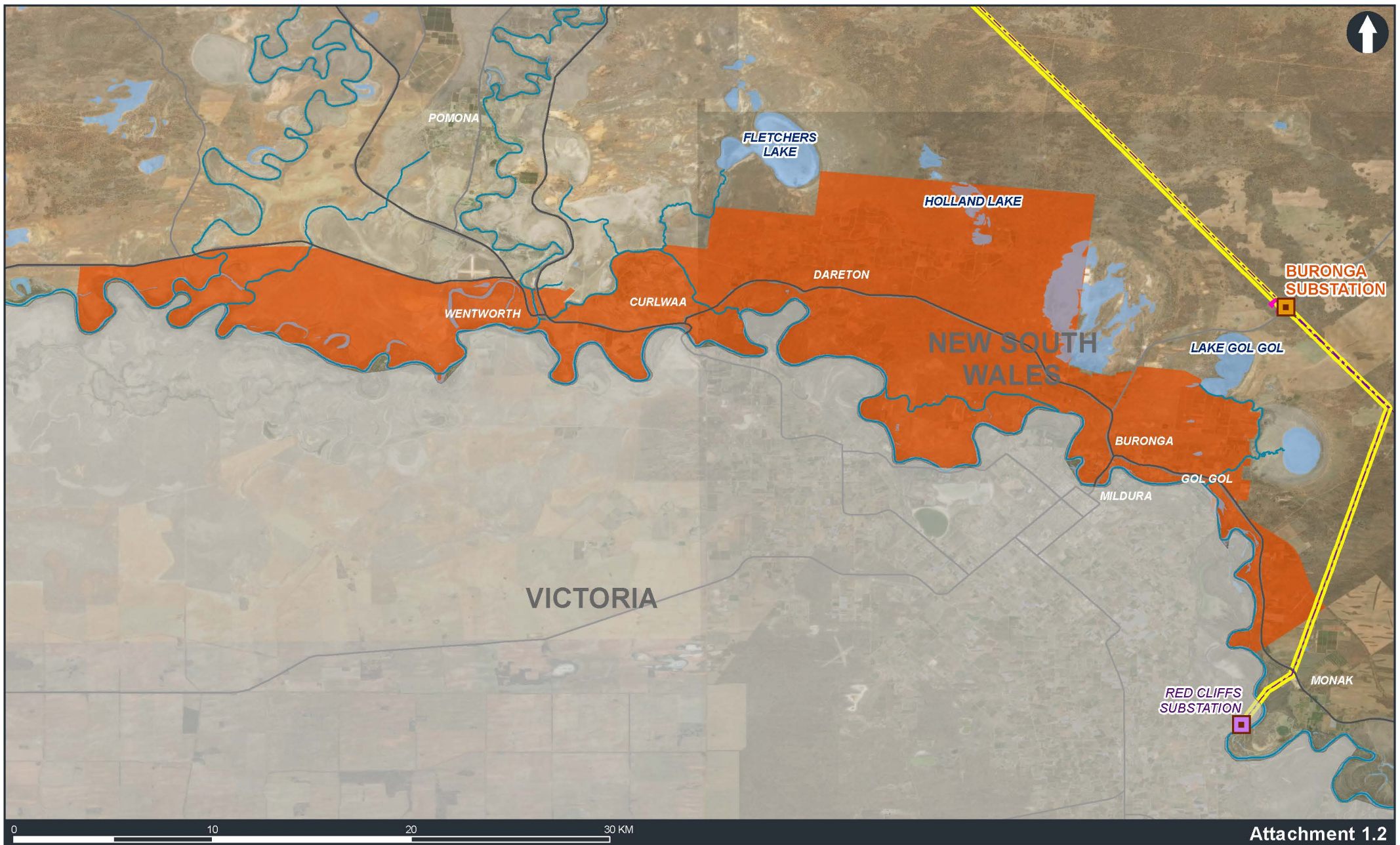


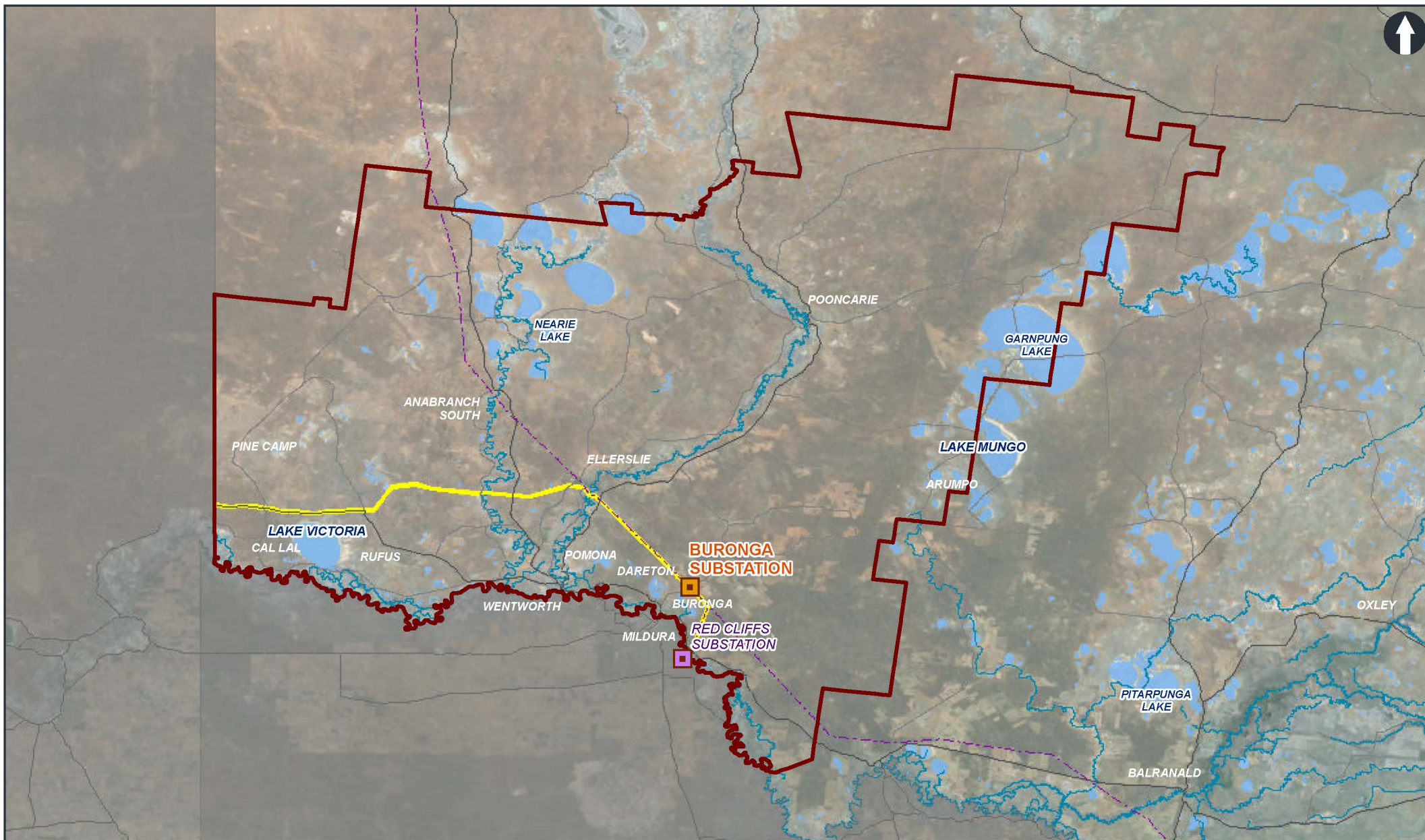
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Attachment 1.1

Wentworth-Balranald Statistical Area

- Buronga substation
- Red Cliffs substation (out of scope)
- Transmission line corridor
- Existing transmission line infrastructure
- Wentworth-Balranald Statistical Area (ABS 2020)





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Attachment 2.1

Wentworth LGA Map

- Buronga substation
- Red Cliffs substation (out of scope)
- Transmission line corridor
- Existing transmission line infrastructure
- Wentworth LGA boundary