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HumeLink

Agricultural Impact Assessment
EIS Technical Report 4

Prepared by:	**Tremain Ivey Advisory**
Author:	**Peter Tremain**
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Wellington Office
26 Swift St
(PO Box 445)
WELLINGTON NSW 2820

Contact
Tel 02 6845 4545
Email TIA@TIAdvisory.com.au
Web www.TIAdvisory.com.au

Sydney Office
Level 14, 52 Phillip St
(GPO Box 3486)
SYDNEY NSW 2000

ABN 99 559 318 656

Executive summary

Background

Transgrid proposes to increase the energy network capacity in southern New South Wales (NSW) through the development of around 360 kilometres of new high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle. This project is collectively referred to as HumeLink.

HumeLink would connect to existing substations near Wagga Wagga and Bannaby. In addition, HumeLink would connect to a future substation at Maragle in the Snowy Mountains (referred to as the future Maragle 500 kV substation), which is subject to a separate major project assessment and approval (reference SSI-9717, EPBC, 2018/836).

The project would support the transfer of energy from existing renewable generation as well as facilitate development of new renewable generation in the Wagga Wagga and Tumut Renewable Energy Zones (REZs). The project would provide the required support for the network in southern NSW, allowing for the increase in transfer capacity between new renewable generation sources and the State's demand centres of Sydney, Newcastle and Wollongong. The project would also improve the efficiency and reliability of the current energy transfer in this part of the network.

Furthermore, HumeLink would form a key part of the transmission line infrastructure that supports the transfer of energy within the National Electricity Market (NEM) by connecting with other major interconnectors. The NEM incorporates around 40,000 kilometres of transmission lines across Queensland, NSW, Australian Capital Territory, Victoria, South Australia and Tasmania.

Construction of the project is targeted to commence in 2024, subject to the required planning and regulatory approvals. Once construction has commenced, the project is estimated to take approximately 2.5 years to construct and become operational in 2026.

This report assesses the agricultural impacts of HumeLink. It addresses portions of the Planning Secretary's Environmental Assessment Requirements ('SEARs'), as described in Section 1.4.

Methodology

The agricultural impact assessment assesses the impacts of the project on property access; agricultural operations; livestock and machinery movements; crop production activities; irrigation and biosecurity risks. The impact on agricultural productivity is quantified and mitigation strategies to minimise resource loss, biosecurity risks and other impacts are addressed.

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 agricultural study area
- provision of mitigation and management measures, based on property inspections, consultations, design information and professional knowledge.

Project description

The project includes the following main components:

- construction and operation of around 360 kilometres of new double circuit 500 kilovolt (kV) transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle
- construction of a new 500/330 kV substation at Gregadoo (Gugaa 500 kV substation) approximately 11 kilometres south-east of the existing Wagga 330/132 kV substation (Wagga 330 kV substation)
- demolition and rebuild of a section of Line 51 (around two kilometres in length) as a double circuit 330 kV transmission line connecting into the Wagga 330 kV substation
- modification of the existing Wagga 330 kV substation and Bannaby 500/330 kV substation (Bannaby 500 kV substation) to accommodate the new transmission line connections
- connection of transmission lines to the future Maragle 500/330 kV substation (Maragle 500 kV substation) approved under the Snowy 2.0 Transmission Connection Project)
- provision of one optical repeater telecommunications hut and associated connections to existing local electrical infrastructure
- establishment of new and/or upgraded temporary and permanent access tracks
- ancillary works required for construction of the project such as construction compounds, worker accommodation facilities, utility connections and/or relocations, brake and winch sites, and helipad/helicopter support facilities.

Existing environment

General

The agricultural study area (refer to Figure 4-1), which comprises the project footprint with 1.5 kilometre buffer, varies from undulating land with low relief to escarpments, high hills, ridges and ranges with moderate to high relief.

Rainfall in the agricultural study area has low to moderate variability and ranges from an average annual total of approximately 570 millimetres in near Wagga Wagga to 970 millimetres in Tumbarumba.

Most soils have moderately low to moderate inherent fertility with smaller areas of higher or lower fertility.

Land and soil capability (LSC) class 4 to 6 (low to moderate capability) are the dominant land types with substantial areas of lower capability land but limited high capability class 3 land.

The area of biophysical strategic agricultural land (BSAL) within the project footprint would be 447 hectares, while the area of draft State significant agricultural land (SSAL) would be larger at 534 hectares. This is equivalent to 5.2 and 6.2 per cent of the total project footprint, respectively.

Land use and agricultural productivity

Agricultural land uses are predominant with livestock, cropping and horticultural enterprises together comprising around 84 per cent of the project footprint. The part of the agricultural study area west of the Hume Highway is dominated by cropping. There are substantial orchards around Batlow. Grazing dominates land use elsewhere. Sheep and cattle account for almost all grazing livestock.

The total gross value of agricultural production averaged $590 per hectare in 2020-21 across the five Local Government Areas (LGAs) of Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Yass Valley and Upper Lachlan Shire which include the agricultural study area. However, this varies from approximately $88,800 per hectare for horticulture production and $1,100 per hectare for broadacre cropping to $418 per hectare for grazing production.

Impact assessment

Construction and operation of the project would have similar types of agricultural impacts. However, in most cases the extent and intensity of potential and expected impacts are greater during construction due to higher activity and a larger area of land that would be used during construction. However, construction impacts would only be temporary in duration, while most operational impacts would be permanent.

Agriculture and land capability impacts

The potential physical disruption to agricultural enterprises and land capability would be limited by the small area that would be permanently and directly affected by the project. Impacts would also be reduced through the continuation of grazing and cropping enterprises over most of the agricultural study area and by implementing the proposed mitigation measures. Although overall impacts would be small, impacts at an individual property level may be proportionally greater due to variations in their size, level of impact and nature of their enterprises. For example, impacts on cropping enterprises would generally be greater than on grazing enterprises, and small properties may have a greater proportional impact than a large property.

Regional impacts

The agricultural study area covers a small fraction of the total existing agricultural land across the five impacted LGAs. Therefore, the impacts of the project at a regional scale would be minimal.

Biosecurity

The potential spread of weeds by vehicles, machinery, personnel and movement of soil and water is the highest biosecurity risk. The introduction of plant disease or pest species is also a relevant biosecurity risk. The risks would be managed by implementing the proposed mitigation measures (refer to Table 9-1).

Other potential impacts

Other potential impacts include:

- temporarily restricted livestock and vehicle movements
- disruptions to on-ground, aerial and irrigation operations
- disturbance of livestock by noise
- radio communication and global positioning system (GPS) interference
- fire risks.

However, the impacts are expected to be relatively small and would have a minor effect on productivity. Some of these impacts have been considered in more detail in other technical reports including *Technical Report 13 – Bushfire Risk Assessment*, *Technical Report 14 – Aviation Impact Statement* and *Technical Report 15 – Electric and Magnetic Field Study*.

Mitigation measures

The proposed mitigation measures during construction and operation of the project are provided in Chapter 9 of this assessment. This would include development and implementation of property management plans in consultation with landowners to minimise impacts and disruption to agricultural activities.

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Glossary, acronyms and abbreviations

ABS	Australian Bureau of Statistics
agricultural study area	The study area for this assessment, which comprises the project footprint with a 1.5 km buffer . It encompasses the area that may be directly and indirectly affected by the project.
AIA	Agricultural Impact Assessment for the project – this report
ALA	Aircraft landing area
ALC	Agricultural Land Classification system (see Hulme et al, 2002)
asl	above sea level
Aurecon	Aurecon Australasia Pty Ltd (principal EIS consultant for the project)
Bannaby 500 kV substation	The existing 500/330 kV substation located at Bannaby.
BJD	Bovine Johne's disease
BoM	Bureau of Meteorology
brake and winch site	A temporarily cleared area where plant and equipment are located to spool and winch conductors into place on transmission line structures. The locations of the brake and winch sites may or may not be within the nominated transmission line easement. These sites are only required for the construction phase of the project and do not need to be maintained during operation.
BSAL	Biophysical strategic agricultural land is land with high quality soil and water resources capable of sustaining high levels of productivity (refer to Section 5.4.2)
Commonwealth	Reference to the Commonwealth of Australia such as Commonwealth land or Commonwealth legislation
CTF	Controlled traffic farming. CTF is a farming system built on permanent confined wheel tracks where the crop zone and traffic lanes are separated.
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment (now DPE)

easement	A legal right attached to a parcel of land that enables the non-exclusive use of the land by a third party other than the owner. For transmission lines, an easement defines the corridor area where the lines are located and that allows access, construction and maintenance work to take place. The easements for the 500 kV transmission lines would typically be 70 metres wide. However, a few locations would require wider easements up to 110 metres wide at transposition locations and up to 130 metres wide where the new transmission line would parallel the relocated section of Line 51. The easement grants a right of access and for construction, maintenance and operation of the transmission line and other operational assets.
EIS	Environmental Impact Statement
Project EnergyConnect	An electrical interconnector project of around 900 kilometres between the electricity grids of South Australia and New South Wales, with an added connection to north-west Victoria.
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2021 which commenced on 1 March 2022 and replaced the 2000 Regulation.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
future Maragle 500 kV substation	The future Maragle 500/330 kV switching station that would be built under the Snowy 2.0 Transmission Connection Project, which is subject to separate planning approval (reference SS1-9717, EPBC 2018/836).
GPS	Global positioning system
ha	Hectare
impacted LGAs	The five local government areas (LGAs) of Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Yass Valley and Upper Lachlan Shire through which the project would pass. Gundagai Shire Council was recently amalgamated into the Cootamundra-Gundagai Regional Council. Some older data used is from the Gundagai LGA.
infrastructure elements	Structural components of the project including proposed transmission line structures, new substation infrastructure, telecommunication huts and permanent access tracks.
km	kilometres
kV	kilovolt
land capability	the ability of land to support agricultural activities on a sustainable and productive basis, as defined by the LSC scheme.
LGA	Local Government Area
LLS	Local Land Services

LSC	Land and soil capability assessment scheme (see OEH, 2012)
m	metres
mAHD	Metres above the Australian Height Datum
MW	megawatt
NEM	National Electricity Market
NRM	National Resource Management
NSW	New South Wales
OEH	Former (NSW) Office of Environment and Heritage
OJD	Ovine Johne's disease
Primary Production SEPP	State Environmental Planning Policy (Primary Production) 2021
prime agricultural land	A generic term in common usage for high quality agricultural land. The term is not accurately defined and classification of land under LSC, BSAL and SSAL is used in preference in this assessment.
project (the)	The CSSI project 'HumeLink', which is the subject of this Environmental Impact Statement.
project footprint	The area that has been assumed for the purpose of this EIS to be directly affected by the construction and operation of the project. It includes the indicative location of project infrastructure, the area that would be directly disturbed during construction and any easement required during operation.
proposed Gugaa 500 kV substation	The new 500/330 kV substation proposed near Wagga Wagga.
proponent	NSW Electricity Networks Operations Pty Ltd (referred to as Transgrid). Transgrid operates and manages the high voltage transmission network in NSW and the ACT and is the Authorised Network Operator for the purpose of an electricity transmission or distribution network under the provisions of the *Electricity Network Assets (Authorised Transactions) Act 2015*.
REZ	Renewable Energy Zone
SEARs	Planning Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSAL	State significant agricultural land is land that has been identified as important agricultural land by the NSW Department of Primary Industries (refer to Section 5.4.3)
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 route	The location of the transmission line structures along the middle of the transmission line easement.
transmission line structures	Proposed free standing structures to support the transmission lines.
TSR	Travelling stock reserve
VNI West	Victoria to NSW Interconnector West
Wagga 330 kV substation	The existing 330/132 kV substation located in Wagga Wagga.
WHS	Work health and safety

1 Introduction

1.1 Overview

The Australian energy landscape is transitioning to a greater mix of low-emission renewable energy sources, such as wind and solar. To support this transition, meet our future energy demands and connect Australian communities and businesses to these lower cost energy sources, the national electricity grid needs to evolve.

Transgrid proposes to increase the energy network capacity in southern New South Wales (NSW) through the development of around 360 kilometres of new 500 kilovolt (kV) high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle. This project is collectively referred to as HumeLink. The project would be located across five Local Government Areas (LGAs) including Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Upper Lachlan Shire and Yass Valley. The location of the project is shown on Figure 1-1.

HumeLink would involve construction of a new substation east of Wagga Wagga as well as connection to existing substations at Wagga Wagga and Bannaby and a future substation at Maragle in the Snowy Mountains (referred to as the future Maragle 500 kV substation). The future Maragle 500 kV substation is subject to a separate major project assessment and approval (reference SSI-9717, EPBC 2018/836).

The project would deliver a cheaper, more reliable and more sustainable grid by increasing the amount of renewable energy that can be delivered across the national electricity grid, helping to transition Australia to a low carbon future. It would achieve this by supporting the transfer of energy from existing renewable generation as well as facilitate development of new renewable generation in the Wagga Wagga and Tumut Renewable Energy Zones (REZs). The project would provide the required support for the network in southern NSW, allowing for the increase in transfer capacity between new renewable generation sources and the State's demand centres of Sydney, Newcastle and Wollongong. The project would also improve the efficiency and reliability of the current energy transfer in this part of the network.

Furthermore, HumeLink would form a key part of the transmission line infrastructure that supports the transfer of energy within the National Electricity Market (NEM) by connecting with other major interconnectors. The NEM incorporates around 40,000 kilometres of transmission lines across Queensland (QLD), NSW, Australian Capital Territory (ACT), Victoria (VIC), South Australia (SA) and Tasmania (TAS).

Construction of the project is targeted to commence in 2024, subject to the required planning and regulatory approvals. Once construction has commenced, the project is estimated to take approximately 2.5 years to build and would become operational by the end of 2026.

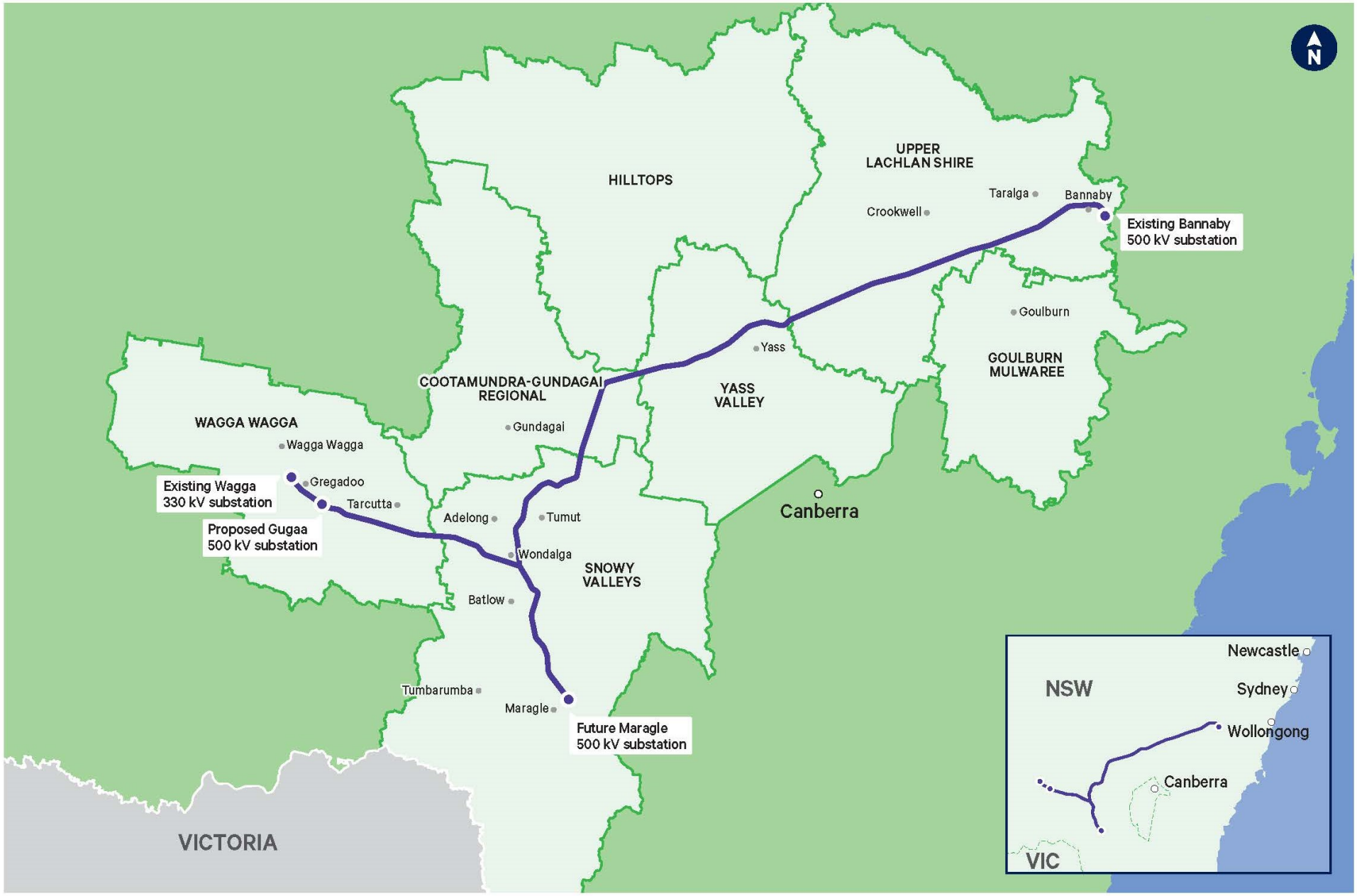
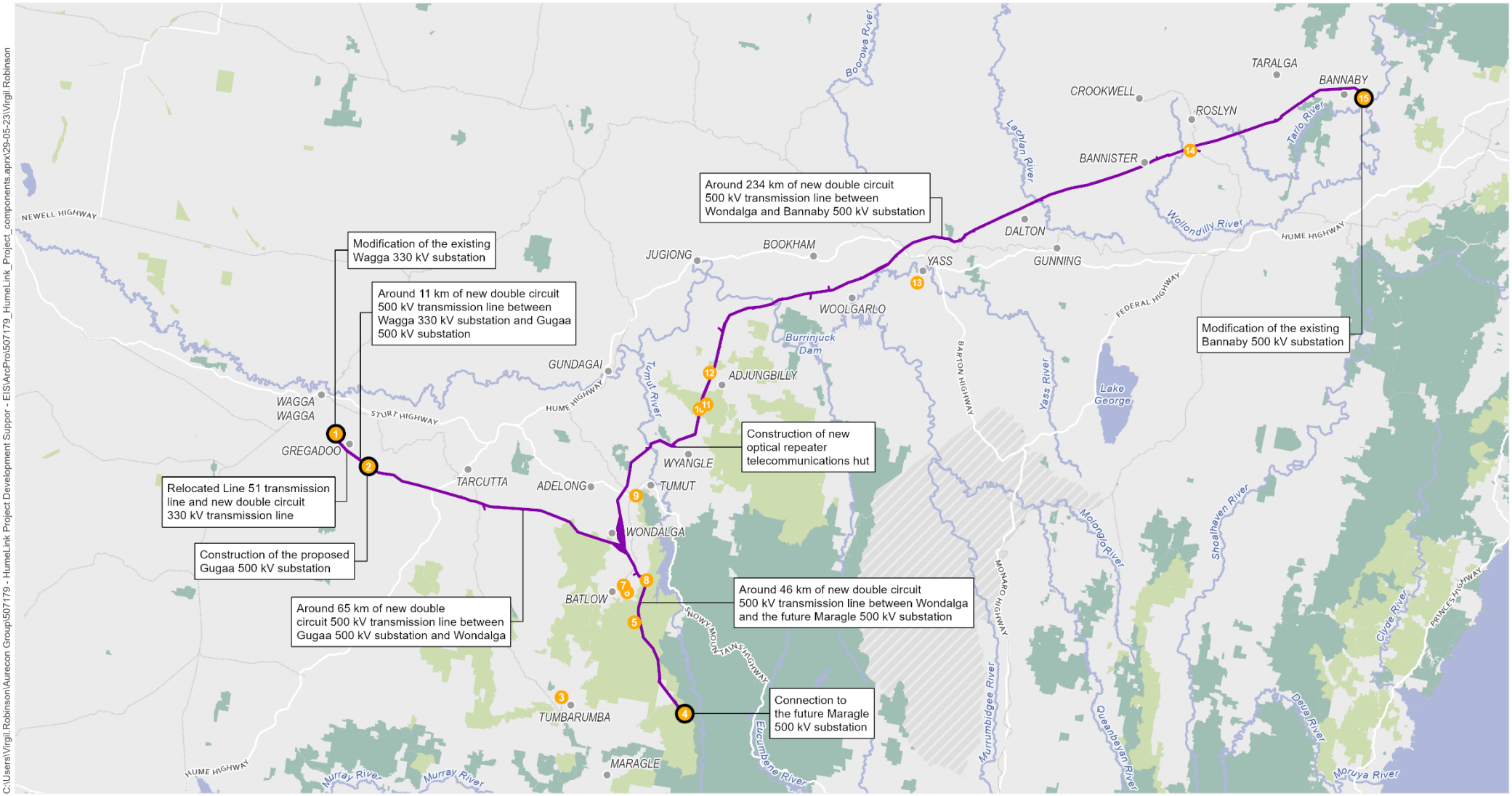


Figure 1-1: Overview of project location

The project includes the following key components (refer to Figure 1-2):

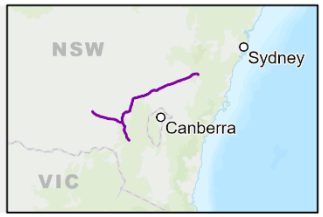
- construction and operation of around 360 kilometres of new double circuit 500 kV transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle
- construction of a new 500/330 kV substation at Gregadoo (Gugaa 500 kV substation) approximately 11 kilometres south-east of the existing Wagga 330/132 kV substation (Wagga 330 kV substation)
- demolition and rebuild of a section of Line 51 (around two kilometres in length) as a double circuit 330 kV transmission line connecting into the Wagga 330 kV substation
- modification of the existing Wagga 330 kV substation and Bannaby 500/330 kV substation (Bannaby 500 kV substation) to accommodate the new transmission line connections
- connection of transmission lines to the future Maragle 500/330 kV substation (Maragle 500 kV substation, approved under the Snowy 2.0 Transmission Connection Project)
- provision of one optical repeater telecommunications hut and associated connections to existing local electrical infrastructure
- establishment of new and/or upgraded temporary and permanent access tracks
- ancillary works required for construction of the project such as construction compound, worker accommodation facilities, utility connections and/or relocations, brake and winch sites and helipad/helicopter support facilities.



Project footprint
National park and reserve
State forest
Waterbody
Waterway
Major road
Railway
Substation location

Construction ancillary facilities

1. Wagga 330 kV substation compound (C01)
2. Gregadoo Road compound (C06)
3. Tumbarumba accommodation facility (AC1)
4. Maragle 500 kV substation compound (C05)
5. Snubba Road compound (C16)
6. Bowmans Lane compound (C15)
7. Memorial Avenue compound (C14)
8. Snubba Road compound (C03)
9. Snowy Mountains Highway compound (C02)
10. Honeysuckle Road compound (C07)
11. Red Hill Road compound (C08)
12. Adjungbilly Road compound (C09)
13. Yass substation compound (C10)
14. Woodhouselee Road compound (C11)
15. Bannaby 500 kV substation compound (C12)



Source: *Aurecon, Transgrid, Spatial Services (DCS), ESRI Basemap*

1:925,000
0 20 40 km

Projection: GDA 1994 MGA Zone 55

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1.2 Proponent

The proponent is NSW Electricity Networks Operations Pty Ltd (referred to as Transgrid). Transgrid operates and manages the high voltage transmission network in NSW and the Australian Capital Territory and is the Authorised Network Operator for the purpose of an electricity transmission or distribution network under the provisions of the *Electricity Network Assets (Authorised Transactions) Act 2015*.

Transgrid's network enables more than three million homes and businesses to access a safe, reliable and affordable supply of electricity. It is made up of more than 100 substations and more than 13,000 kilometres of high voltage transmission lines and underground cables. Current interconnections with Queensland and Victoria allow power to be transmitted between states. The network is instrumental to the electricity system and, therefore, the economy and facilitates energy trading across the NEM. Further information on Transgrid can be found at www.transgrid.com.au.

1.3 Purpose of this technical report

This technical report is one of several technical reports that form part of the Environmental Impact Statement (EIS) for the project.

The purpose of this technical report is to identify and assess the potential impacts of the project in relation to agriculture. It responds directly to the Planning Secretary's Environmental Assessment Requirements (SEARs) (refer to Section 1.4).

This report has the following objectives:

- describe the current socio-economic and environmental situation relevant to agricultural enterprises in the agricultural study area (refer to Figure 4-1)
- assess the impacts of the project on agriculture in the agricultural study area and in the surrounding region
- formulate mitigation and management measures to minimise the impacts on agriculture in the agricultural study area and in the surrounding region.

1.4 Secretary's Environmental Assessment Requirements

The NSW Department of Planning and Environment (DPE) has provided the SEARs for the EIS. The requirements specific to this assessment and where these aspects are addressed in this technical report are outlined in Table 1-1.

Table 1-1 Secretary's Environmental Assessment Requirements

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.	Sections 6.1 and 7.1 and Chapter 9.
	Assessment of impact of the project on agricultural land, land reserved under the *National Parks and Wildlife Act 1974*, Crown lands, travelling stock reserves, mineral resources and exploration licenses, rail reserves and pipeline corridors;	Impacts on agricultural land are discussed in sections 6.1, 7.1 and Chapter 9. Impacts on travelling stock reserves are discussed in Section 5.1.10 and Section 6.11.
Key Issue – Hazards:	Assess potential impacts on aviation safety, including *(amongst others)* — safe and efficient aerial application of agricultural fertilisers and pesticide; — identify aerodromes within 30 km of the transmission line and consider the impact to nearby aerodromes and aircraft landing areas.	Impacts on aerial agriculture are discussed in Section 6.6 and Section 7.6 Management of impacts is discussed in Chapter 9

The Agricultural Impact Assessment (AIA) addresses assessment requirements from the 'land' and 'hazards' key issues in relation to agricultural impacts.

The assessment requirements under the 'land' key issue relevant to agriculture is the assessment of existing land capability and the impact on agricultural land. Land reserved under the *National Parks and Wildlife Act 1974*, Crown lands, mineral resources, exploration licenses, rail reserves and pipeline corridors are not within the scope of this assessment and are addressed in *Technical Report 5 – Land Use and Property Impact Assessment*.

The relevant assessment requirement under the 'hazards' key issue is the assessment of aviation restrictions due to safety or access issues on agriculture activities, especially in relation to aerial application of agricultural fertilisers and pesticide. Other potential impacts on aviation safety are addressed in *Technical Report 14 – Aviation Impact Statement*.

The AIA assesses the impacts of the project on property access; agricultural operations; livestock and machinery movements; crop production activities; irrigation and biosecurity risks. The impact on agricultural productivity is quantified and mitigation strategies to minimise resource loss, biosecurity risks and other impacts are addressed.

1.5 Structure of this report

The structure and content of this report is as follows:

- Chapter 1 – Introduction*:* Outlines the background and need for the project, and the purpose of this report
- Chapter 2 –Project description summary: Provides the key components of the project
- Chapter 3 – Legislation and policy context: Provides an outline of the key legislative requirements and policy guidelines relating to the project.
- Chapter 4 – Methodology: Provides an outline of the methodology used for the preparation of this AIA.
- Chapter 5 – Existing environment: Describes the existing agricultural environment.
- Chapter 6 – Construction impacts: Describes the potential construction impacts associated with the project.
- Chapter 7 – Operational impacts: Describes the potential operational impacts associated with the project.
- Chapter 8 – Cumulative impacts*:* Outlines the potential cumulative impacts with respect to other known developments within the vicinity of the project.
- Chapter 9 – Management of impacts: Outlines the proposed mitigation measures for the project.
- Chapter 10 – Conclusion: Provides a conclusion on the potential impacts of the project on agriculture.
- Chapter 11 – References: Identifies the reports and documents used to generate this report.

Attachments to this report are:

- Attachment 1 Inherent soil fertility maps
- Attachment 2 Land use maps
- Attachment 3 Travelling stock reserves
- Attachment 4 Land and soil capability maps
- Attachment 5 Other regional weeds
- Attachment 6 Biosecurity Information System weed records.

1.6 Key terms used in this report

The key project terms used in this report relevant to the agricultural impacts of the project are:

- Project footprint: The area that has been assumed for the purpose of this EIS to be directly affected by the construction and operation of the project. It includes the indicative location of project infrastructure, the area that would be directly disturbed during construction and any easement required during operation.
- Agricultural study area: The agricultural study area comprises a 1.5 kilometre buffer around the project footprint. This encompasses the agricultural areas likely to be directly and indirectly affected by the project.
- Impacted LGAs: The five LGAs of Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Yass Valley and Upper Lachlan Shire through which the project would pass.

1.7 Limitations

The assessment has been based on information on the current project design supplied by Transgrid.

Not all land in the agricultural study area was inspected and not all landowners were interviewed. Inspections and interviews were limited to seven representative landowners across the agricultural study area as discussed further in Section 4.3.1.

2 Project description summary

The project description in this chapter is based on a concept design and indicative construction methodology for the project. The design and construction methodology would continue to be refined and confirmed during detailed design and construction planning by the construction contractors. Further details on the project are provided in Chapters 3 and 4 of the EIS.

2.1 Summary of key components of the project

Key components of the project are summarised in Table 2-1.

Table 2-1 Summary of key components of the project

Component	Description
Transmission lines and supporting infrastructure	
Transmission lines and structures	The project includes the construction of new 500 kV transmission line sections between: • Wagga 330 kV substation and Gugaa 500 kV substation (approximately 11 km) • Gugaa 500 kV substation and Wondalga (approximately 65 km) • Wondalga and Maragle 500 kV substation (approximately 46 km) • Wondalga and Bannaby 500 kV substation (approximately 234 km). The transmission line section between the Wagga 330 kV substation and proposed Gugaa 500 kV substation would operate at 330 kV under HumeLink. The project also includes the rebuild of approximately 2 km of Line 51 as a new 330 kV transmission line between the Wagga 330 kV substation and around Ivydale Road, Gregadoo. This would be adjacent to the new transmission line between the existing Wagga 330 kV and proposed Gugaa 500 kV substations. The 500 kV transmission lines would be supported on a series of free-standing steel lattice structures that would range between around 50 m up to a maximum of 76 m in height and generally spaced between 300 to 600 m apart. The typical transmission line structure height would be around 60 m. Earth wire and communications cables would be co-located on the transmission line structures. The 330 kV structures for the rebuild of Line 51 would range between 24 m and 50 m in height and have a typical height of 40 m. Indicative configurations of transmission line structures that may be used as part of the project are shown in Figure 2-1. The type and arrangement of the structures would be refined during detailed design. The footings of each structure would require an area of up to 300 m^2 to 450 m^2, depending on ground conditions and the proposed structure type. Additional disturbance at each structure site may be required to facilitate structure assembly and stringing.
Transmission line easements	The easements for the 500 kV transmission lines are typically 70 m wide. However, a number of locations may require wider easements of up to 110 m wide at transposition locations[1] and up to 130 m wide where the new transmission line would parallel the relocated section of Line 51. The easement provides a right of access to construct, maintain and operate the transmission line and other operational assets. The easement also generally identifies the zone of initial vegetation clearance and ongoing vegetation management to ensure safe electrical clearances during the operation of the lines. Vegetation management beyond the easement may also occur where nearby trees have the potential to fall and breach safety clearances.
Telecommunications hut	Telecommunications huts, which contain optical repeaters, would be required to boost the signal in the optical fibre ground wire (OPGW).

[1] Transposition is the periodic swapping of positions of the conductors of a transmission line in order to improve transmission reliability.

Component	Description
	One telecommunications hut would be required for the project. The telecommunications hut would be located adjacent to existing transmission line structures. Cables would be installed between the transmission line structure and the local power supply. The telecommunications hut would be surrounded by a security fence. A new easement would be established for the telecommunications hut power connection. The project also involves a telecommunications connection of OPGW between two proposed transmission line structures and the future Rye Park Wind Farm substation (SSD-6693). This removes the need for an additional telecommunications hut in this area of the project.
Substation activities	
Construction of the proposed Gugaa 500 kV substation	A new 500/330 kV substation would be constructed at Gregadoo, about 11 km south-east of the Wagga 330 kV substation. The substation would include seven new 500/330 kV transformers and three 500 kV reactors. The proposed Gugaa 500 kV substation is expected to occupy an area of approximately 22 hectares.
Modification of the existing Bannaby 500 kV substation	The existing Bannaby 500 kV substation on Hanworth Road, Bannaby would be expanded to accommodate connections for new 500 kV transmission line circuits. The modification would include changes to the busbars, line bays, bench and associated earthworks, steelwork, drainage, external fence, internal/external substation roads, secondary containment dams, sediment containment dams, cabling, and secondary systems. All of the works would be restricted to the existing substation property.
Modification of the existing Wagga 330 kV substation	The existing Wagga 330 kV substation on Ashfords Road, Gregadoo would be reconfigured to accommodate new bays for two new 500 kV transmission line circuits within the existing substation property. This would include modifications to the busbars, line bays, existing line connections, bench and associated earthworks, relocation of existing high voltage equipment, drainage, external fence, internal substation roads, steelwork, cabling, and secondary systems.
Connection to the future Maragle 500 kV substation	The project would connect to the future Maragle 500 kV substation approved under the Snowy 2.0 Transmission Connection Project (SS1-9717). Construction of the Maragle substation is proposed to be undertaken between 2023 and 2026. Further detail on the Snowy 2.0 Transmission Connection project is available at the Department of Planning and Environment's Major Projects website: www.planningportal.nsw.gov.au/major-projects/project/10591.
Ancillary facilities	
Access tracks	Access to the transmission line structures and the substations would be required during construction and operation. Wherever possible, existing roads, tracks and other existing disturbed areas would be used to minimise vegetation clearing or disturbance. Upgrades to existing access tracks may be required. In areas where there are no existing roads or tracks, suitable access would be constructed. This may include waterway crossings.
Construction compounds	Construction compounds would be required during construction to support staging and equipment laydown, concrete batching, temporary storage of materials, plant and equipment and worker parking required to construct the various elements of the project. Fourteen potential construction compound locations have been identified. The proposed use of the construction compounds and their proposed boundaries/layout would be refined as the project design develops in consultation with relevant stakeholders and the construction contractors.
Worker accommodation facility	Existing accommodation facilities within towns adjacent to the project would provide temporary accommodation for the majority of the construction workers. However, a potential shortage in accommodation has been identified close to the project footprint. A potential option to provide additional temporary worker accommodation during the construction period is the establishment of a temporary worker accommodation facility at the corner of Courabyra Road and Alfred Street, Tumbarumba to accommodate about 200 construction workers. The worker accommodation facility would consist of demountable cabins and would be connected to existing utilities. All required amenities for the accommodation facility would be provided including services and worker parking for light and heavy vehicles.

Component	Description
	However, the ultimate delivery of the project may include multiple temporary worker accommodation facilities in various forms, which would be outlined in the Worker Accommodation Strategy for the project. The strategy would be developed in consultation with councils, and other relevant stakeholders. Any new or changed worker accommodation facility would be subject to additional environmental assessment or consistency review, as relevant.
Helipad/helicopter facilities	To facilitate construction of the project, helicopters may be used to deliver materials/equipment and transfer personnel to construction areas particularly within high alpine regions. To enable helicopters to operate safely and allow easy access to the site, a helicopter landing pad would be required. The helipad is expected to occupy an area of around 30 m by 30 m, and would be remediated after construction. These areas would typically be located on existing disturbed land not subject to inundation and a reasonable distance from waterways, sensitive receivers and drainage lines. Eight locations have been identified and assessed as potential helipad locations. The exact locations to be used would be confirmed during detailed design by the construction contractors. In addition to this, the existing facilities at the Wagga Wagga Airport and Tumut Airport may be used.
Utility connections, adjustments and protection	The project would require utility connections, adjustments and protection. Such works include interfaces with other transmission lines and connections to existing services for temporary facilities . Potential impacts to existing services and utilities would be confirmed during detailed design and any proposed relocation and/or protection works would be determined in consultation with the relevant asset owners.

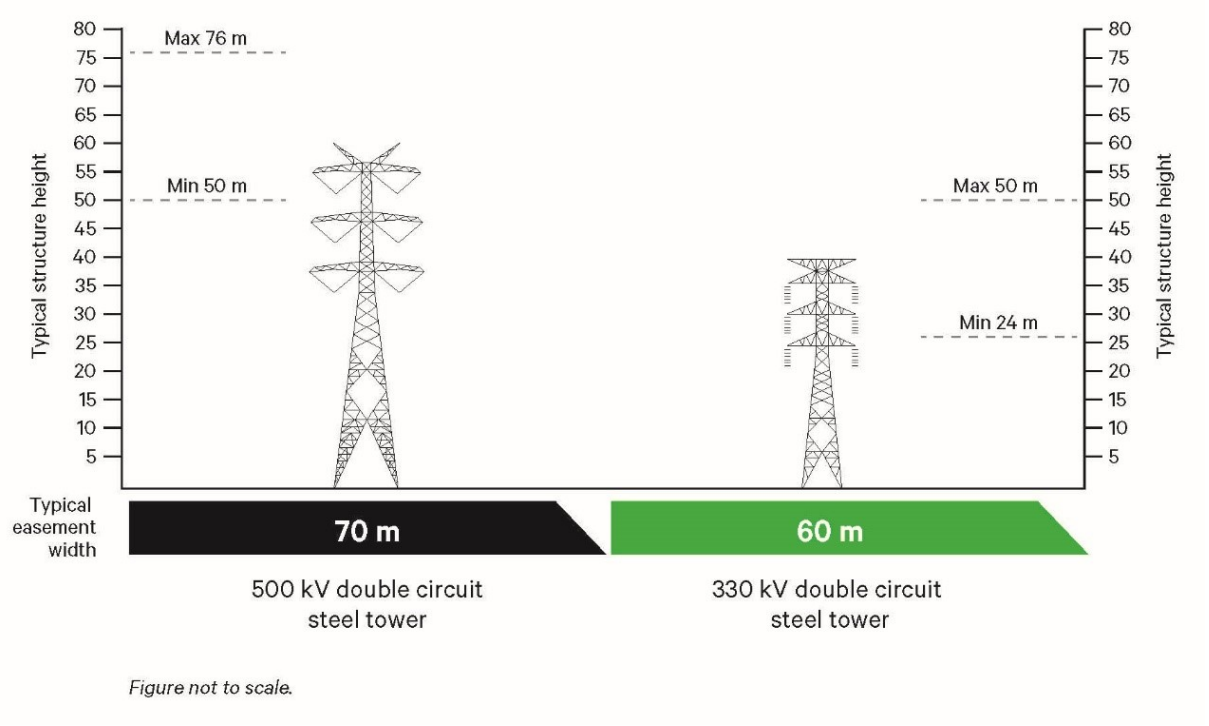


Figure 2-1: Indicative transmission line structures

2.2 Construction of the project

2.2.1 Construction activities

Key construction activities would generally include (but are not limited to):

- site establishment work, such as:
  - clearing of vegetation and topsoil
  - establishment of construction compounds and helipad/helicopter facilities
  - utility relocations and/or adjustments
  - construction of new access tracks and waterway crossings and/or upgrade of existing access tracks to transmission line structures
  - road improvement work
  - establishment of environmental management measures and security fencing
  - construction of temporary worker accommodation
- construction of the transmission lines, including:
  - earthworks and establishment of construction benches and brake and winch sites for each transmission line structure
  - construction of footings and foundation work for the new transmission line structures including boring and/or excavation, steel fabrication works and concrete pours
  - erection of the new transmission line structures
  - stringing of conductors, overhead earth wires and OPGW
  - installation of associated transmission line structure fittings inclusive of all earthing below ground level
- relocation of a section of Line 51, including:
  - demolition of the existing section of Line 51
  - erection of new transmission line structures for the rebuild of Line 51 in a new location
  - stringing of conductors, overhead earth wires and OPGW
  - installation of associated transmission line structure fittings inclusive of all earthing below ground level
- construction of the proposed Gugaa 500 kV substation, including:
  - bulk earthworks to form the substation bench, access roads, drainage and oil containment structures
  - installation of concrete foundations, bund walls, fire walls, noise walls and kerbs including excavation
  - installation of reinforced concrete and piled foundations for the electrical equipment and associated steel support structures
  - installation of electrical conduits, electrical trenches, site stormwater drainage, oil containment work and associated concrete pits, pipes and tanks including excavation
  - installation of new ancillary and equipment control buildings
  - erection of galvanised steel structures to support electrical equipment
  - installation of electrical equipment on foundations and/or steel support structures
  - installation of conductors, cabling, wiring, electrical panels and electrical equipment
  - erection of the substation site boundary security fencing, including site access gates
  - connection of the proposed transmission lines to the substation

- modification of the existing Wagga 330 kV substation to enable the proposed connection and operation of the new transmission lines, including:
  - demolition and removal of redundant electrical equipment, fencing and cabling
  - bulk earthworks to form the extended substation bench and modified drainage structures
  - installation of concrete foundations and kerbs including excavation
  - installation of reinforced concrete and piled foundations for the electrical equipment and associated steel support structures
  - erection of galvanised steel structures to support electrical equipment
  - installation of electrical equipment on foundations and/or steel support structures
  - installation of electrical conduits, electrical trenches, and modified site stormwater drainage including excavation
  - installation of conductors, cabling, wiring, electrical panels and electrical equipment
  - installation of fencing, lighting and other security features
  - testing and commissioning
  - connection of the proposed transmission lines to the substation
- modification of the existing Bannaby 500 kV substation to enable the proposed connection and operation of the new transmission lines, including:
  - bulk earthworks to form the extended substation bench, new access road, modified stormwater drainage, modified oil containment and modified sediment control structures
  - installation of concrete foundations, retaining walls, bund walls, fire walls and kerbs including excavation
  - installation of reinforced concrete and piled foundations for the electrical equipment and associated steel support structures
  - erection of galvanised steel structures to support electrical equipment
  - installation of electrical equipment on foundations and/or steel support structures
  - installation of electrical conduits, electrical trenches, site stormwater drainage, oil containment works and associated concrete pits, pipes and tanks including excavation
  - installation of conductors, cabling, wiring, electrical panels and electrical equipment
  - installation of fencing, lighting and other security features
  - demolish redundant fencing including footings and kerbs
  - testing and commissioning
  - connection of the proposed transmission lines to the substation
- connection of the proposed transmission lines to the future Maragle 500 kV substation, including:
  - stringing conductors between transmission line structures and the future Maragle 500 kV substation gantry (including overhead earth wire (OHEW) and OPGW)
  - installing droppers from the future substation gantry to the switchgear
- construction of the telecommunications hut, including:
  - bulk earthworks to form the pad for the hut
  - excavation and preparation for concrete foundations
  - installation of reinforced concrete and piled foundations
  - excavation and installation of electrical equipment conduits, trenches and general site drainage work
  - installation of the building, site wiring and electrical equipment
  - installation of security fencing and site access gates

- installation of buried cabling from the 500 kV transmission line structures to Rye Park Wind Farm substation
- testing and commissioning of new electrical infrastructure
- demobilisation and rehabilitation of areas disturbed by construction activities.

A number of activities are expected to commence in accordance with the project conditions of approval before the key construction activities outlined above. These activities are considered pre-construction minor work and would comprise low impact activities that would begin after planning approval but prior to approval of the Construction Environmental Management Plan.

2.2.2 Construction program

Construction of the project is targeted to commence in 2024, and is estimated to take about 2.5 years to complete. The project is expected to be fully operational by the end of 2026 (refer to Figure 2-2).

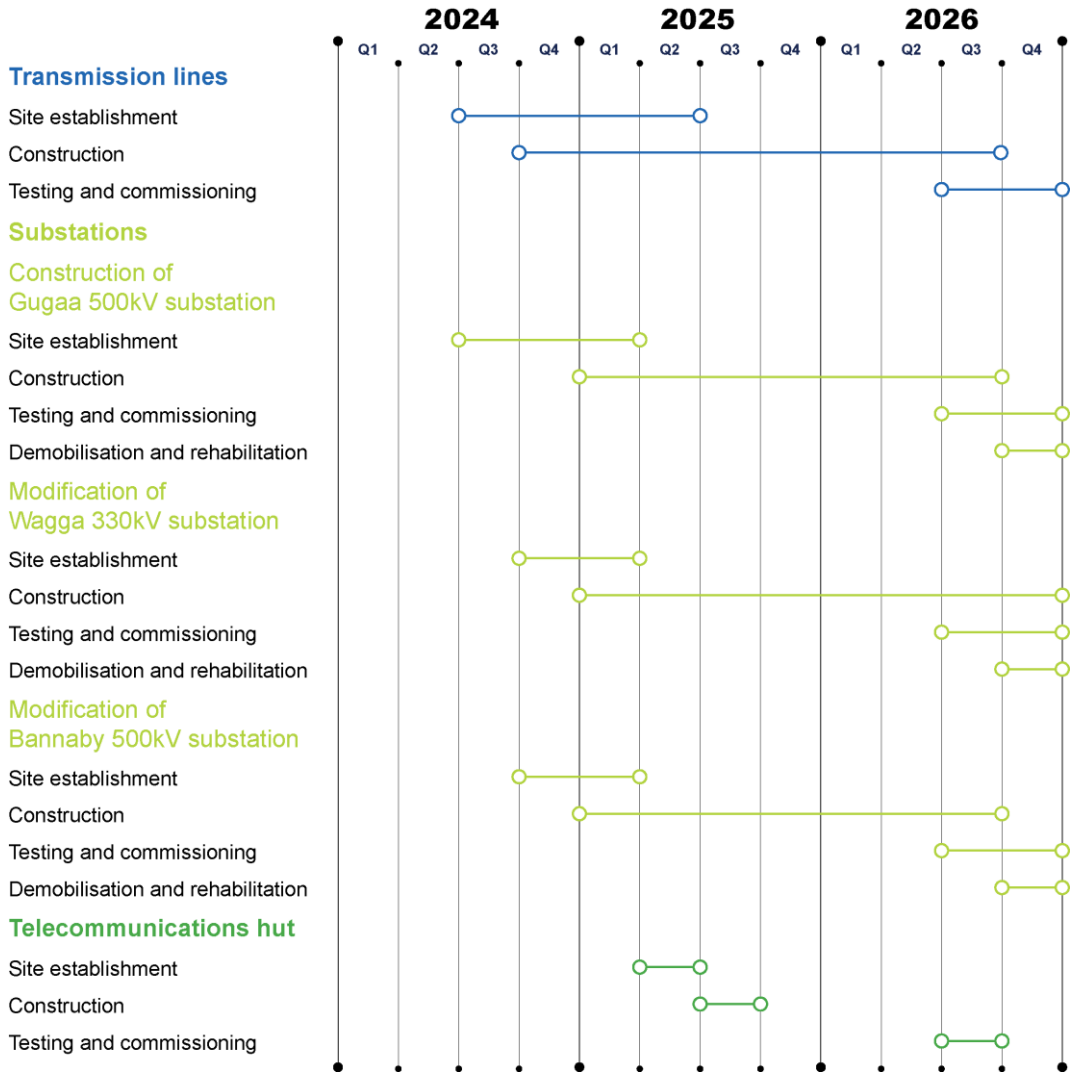


Figure 2-2: HumeLink indicative construction program

Indicative duration of construction activities

Construction at each transmission line structure would be intermittent and construction activities would not occur for the full duration at any one location. Durations of any particular construction activity, and inactive/respite periods, may vary for a number of reasons including (but not limited to):

- multiple work fronts
- resource and engineering constraints
- work sequencing and location.

Figure 2-3 presents an indicative duration of construction activities associated with an individual transmission line structure.

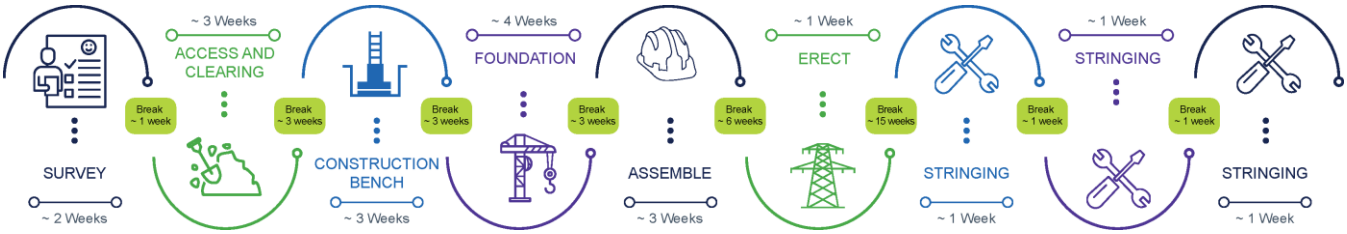


Figure 2-3: Indicative duration and sequence of construction activities for transmission line structures

Construction of the proposed Gugaa 500 kV substation could take up to 2.5 years.

2.2.3 Construction hours

It is expected that construction activities would largely be undertaken during standard construction hours. However, there would be times when working outside of standard construction hours would be required (as defined by the *Interim Construction Noise Guideline* (DECC, 2009)), subject to approval. As the details of construction methodology and project needs are developed, these hours will be refined for certain activities.

Where extended hours are proposed for activities in proximity to sensitive receivers, additional measures would be implemented and the work would be managed through an out-of-hours work protocol.

A series of work outside the standard construction hours is anticipated to include (but is not limited to) the following:

- transmission line construction at crossings of a main road or railway as these locations are expected to have restricted construction hours requiring some night work for activities such as conductor stringing over the crossing(s)
- work where a road occupancy licence (or similar) is required, depending on licence conditions
- transmission line cutover and commissioning
- the delivery of equipment or materials outside standard hours requested by police or other authorities for safety reasons (such as the delivery of transformer units)
- limited substation assembly work (eg oil filling of the transformers)
- connection of the new assets to existing assets under outage conditions (eg modification and/or connection work at Bannaby 500 kV substation, Wagga 330 kV substation and Maragle 500 kV substation), which is likely to require longer working hours

- emergency work to avoid the loss of lives and/or property and/or to prevent environmental harm
- work timed to correlate with system planning outages
- situations where agreement is reached with affected sensitive receivers
- activities that do not generate noise in excess of the applicable noise management level at any sensitive receiver.

2.2.4 Construction plant and equipment

An indicative list of construction plant and equipment likely to be required during construction is provided below.

- air compressor
- backhoe
- bobcat
- bulldozers
- concrete agitator
- concrete pump
- cranes (various sizes up to 400 tonnes)
- crawler crane with grab attachments
- drill and blast units and associated support plant/equipment
- drones
- dumper trucks
- elevated working platforms
- excavators (various sizes)
- flatbed hiab trucks
- fuel trucks
- generators
- graders
- helicopters and associated support plant/equipment
- mulchers
- piling rig
- pneumatic jackhammers
- rigid tippers
- rollers (10 to 15 and 12-15 tonnes)
- semi-trailers
- tilt tray trucks
- trenchers
- transport trucks
- watercarts
- winches.

2.2.5 Construction traffic

Construction vehicle movements would comprise vehicles transporting equipment, waste, materials and spoil, as well as workers' vehicles. A larger number of heavy vehicles would be required during the main civil construction work associated with the substations. Non-standard or oversized loads would also be required for the substation work (e.g. for transformer transport) and transportation of transmission line structure materials and conductors.

Hume Highway, Sturt Highway, Snowy Mountains Highway, Batlow Road and Gocup Road are the main national and state roads proposed to provide access to the project footprint. These roads would be supported by regional and local roads throughout the Local Government Areas (LGAs) of Wagga Wagga City, Snowy Valleys, Yass Valley, Cootamundra-Gundagai Regional and Upper Lachlan Shire that connect to the project footprint.

2.2.6 Construction workers

The construction worker numbers would vary depending on the stage of construction and associated activities. During peak construction activities, the project could employ up to 1,200 full time equivalent construction workers across multiple work fronts. It is expected that the maximum number of construction workers at any one location would not exceed 200.

2.2.7 Testing and commissioning

Prior to energisation of the infrastructure, a series of pre-commissioning activities would be conducted. This would include testing the new transmission lines and substation earthing, primary and secondary equipment.

2.2.8 Demobilisation and rehabilitation

Demobilisation and site rehabilitation would be undertaken progressively throughout the project footprint and would include the following typical activities:

- demobilisation of construction compounds and worker accommodation facility
- removal of materials, waste and redundant structures not required during operation of the project
- removal of temporary fencing and environmental controls.

2.3 Operation and maintenance of the project

The design life of the project is 50 years, which can be extended to more than 70 years for some assets.

The substations and transmission lines would be inspected by field staff and contractors on a regular basis, with other operational activities occurring in the event of an emergency (as required). The project would require about five workers (in addition to Transgrid's existing workers) during operation for ongoing maintenance activities. Likely maintenance activities would include:

- regular inspection (ground and aerial) and maintenance of electrical equipment
- general building, asset protection zone and access road/track
- vegetation clearing/trimming within the easement
- fire detection system inspection and maintenance
- stormwater drainage systems maintenance.

It is expected that these activities would only require light vehicles and/or small to medium plant (depending on the work required).

3 Legislation and policy context

3.1 Legislation

The project is subject to environmental assessment under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Other legislation specific to the AIA includes the *Biosecurity Act 2015, Local Land Services Act 2013* and State Environmental Planning Policy (Primary Production) 2021 (Primary Production SEPP). A summary of the relevance of key legislation specific to assessment of agricultural impacts is provided in the following sections.

3.1.1 Biosecurity Act 2015

The NSW *Biosecurity Act 2015* came into effect on 1 July 2017[1] and complements the Commonwealth *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 between the NSW Government, industry and the community. Specifically, the Act establishes a general biosecurity duty, as follows:

'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, 2013a).

Regional biosecurity strategies developed by DPI and LLS covering the agricultural study area include:

- NSW Invasive Species Plan 2018-2021 (DPI, 2018)
- *Regional Strategic Weed Management Plans 2017-2022* for the Murray LLS, Riverina LLS and South East LLS (Murray LLS, 2017, Riverina LLS, 2017, South East LLS, 2017)
- *Regional Strategic Pest Animal Management Plans 2018-2023* for the Murray LLS, Riverina LLS and South East LLS (Murray LLS, 2018, Riverina LLS, 2018, South East LLS, 2018).

The above listed strategies are considered in Sections 6.2 and 7.2 of this report.

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

[2] legislation.gov.au/Series/C2015A00061

[3] lls.nsw.gov.au/ The project mainly traverses the Riverina LLS and South East LLS, with a small section in the Murray LLS.

As shown in Figure 3-1, the project mainly traverses the Riverina LLS and South East LLS regions, with a small section in the Murray LLS region. The Murray LLS region (covers approximately 15 kilometres of the project footprint, and this part of the footprint is mostly comprised of non-agricultural land uses. Therefore, where relevant, discussion in this report concentrates on the Riverina LLS and South East LLS regions.

3.1.2 Local Land Services Act 2013

The *Local Land Services Act 2013* establishes a statutory corporation (known as LLS) which has the responsibility for the management and delivery of LLS in the social, economic and environmental interests of the State in accordance with any State priorities. Objectives of the Act include ensuring the proper management of natural resources in the social, economic and environmental interests of the State, and providing a framework for financial assistance and incentives to landowners.

The Act deals with issues such as the management of native vegetation, private native forestry, the management and regulation of travelling stock reserves (TSRs), and the regulation of the use of public roads by travelling stock and persons (impacts on TSRs are discussed in Section 6.11).

3.1.3 Primary Production SEPP

The Primary Production SEPP consolidates the previous Primary Production and Rural Development SEPP 2019 and the Sydney Regional Environmental Plan No 8 (Central Coast Plateau Areas). The SEPP contains planning provisions to manage primary production and rural development, including supporting sustainable agriculture.

The relevant part of the Primary Production SEPP is 'Chapter 2 – Primary production and rural development'. This chapter includes the following relevant aims:

(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 2.2 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,

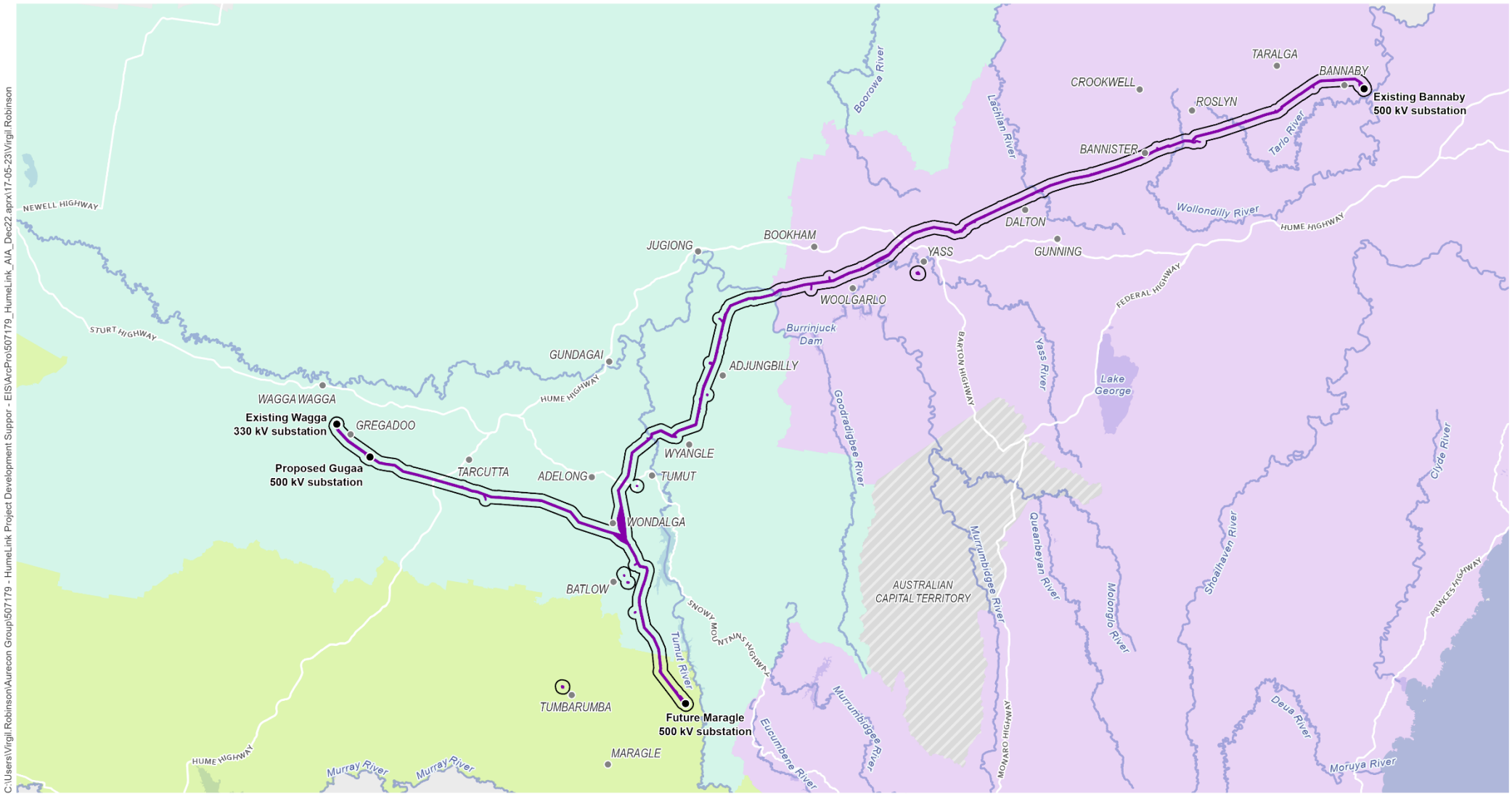
(b) to provide for the protection of agricultural land—

(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 1 of section 2.8 states that land is State significant agricultural land if it is listed in Schedule 1 of the Primary Production SEPP. Schedule 1 does not list any State significant agricultural land at present. However, a draft map of State significant agricultural land (SSAL) has been recently released (DPI, 2021a). Areas of draft SSAL within the project footprint are identified in Figure 5-4.



Source: *Aurecon, Transgrid, Spatial Services (DCS), ESRI Basemap*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Agricultural Impact Assessment**

FIGURE 3-1: Local Land Services Boundaries

3.2 Guidelines

Policies and guidelines relevant to the AIA include:

- *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE, 2022)
- *State Environmental Planning Policy* (Primary Production and Rural Development 2019), now consolidated into the Primary Production SEPP
- *The Land and Soil Capability Assessment Scheme* (OEH, 2012)
- *Agricultural Land Use Mapping Resources in NSW* (Squires, 2017)
- *Infrastructure Proposals on Rural Land* (DPI, 2013b)
- *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH, 2013).

Some guidelines provide 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 of this technical report.

4 Methodology

The methodology for this AIA has been designed to meet the requirements of the SEARs (refer to Section 1.4).

4.1 Overview of approach

The key aspects of the methodology were as follows:

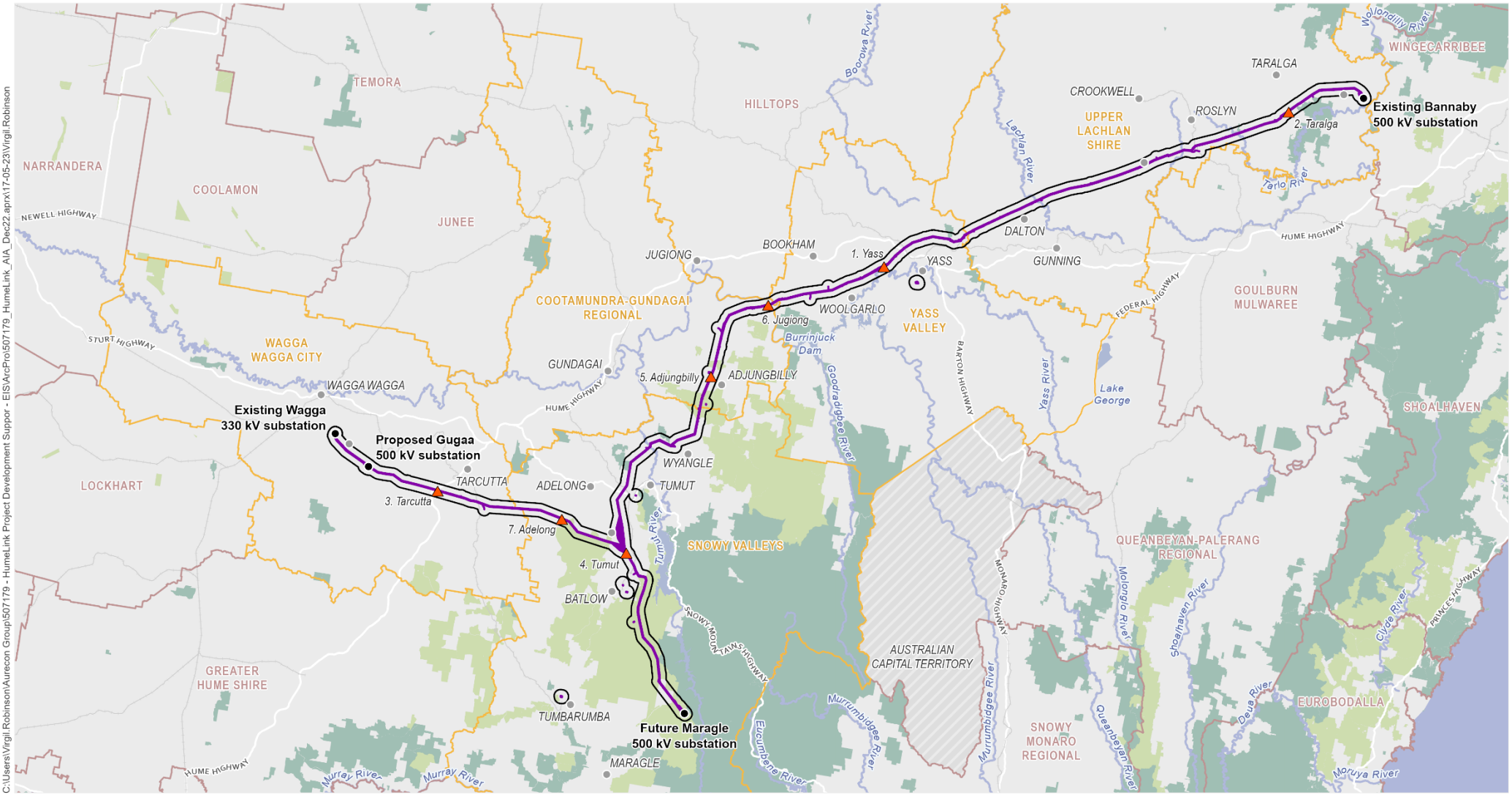
- Landowner consultation and property inspections occurred on 23 and 24 November 2021 and 11 May 2022 to obtain information on the agricultural enterprises conducted on their property and their perceived impacts of the project.
- Other consultation with stakeholders to identify the main biosecurity risks associated with the project and recommended mitigation measures was undertaken by telephone with various weeds officers.
- The existing environment was identified and described primarily using a desktop study based on data from various sources referenced in Chapter 4, including satellite imagery, reference material and public GIS datasets.
- The assessment of the impacts on agriculture was based on the desktop study, consultation with landowners and other stakeholders, property inspections and professional knowledge.
- Cumulative impacts with other major developments in the region were assessed, based on the type, degree and proximity of the impacts of each development.
- The identification 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 4.

4.2 Relevant study areas

The agricultural impacts of the project have been assessed with reference to the following study areas (refer to Section 1.6 and Figure 4-1):

- project footprint, which would generally be the area of direct project impacts on agriculture. However, this is conservative as not all areas of the project footprint would be used during construction and operation and therefore would not entirely impact on agriculture. For example, grazing enterprises would be largely unaffected by the final transmission line easement.
- agricultural study area, which comprises the project footprint with a 1.5 kilometre buffer and encompasses the agricultural areas likely to be directly and indirectly affected by the project
- impacted LGAs, which provides context for the understanding of agricultural land uses in the LGAs surrounding the project.

These different study areas have been identified because some impacts, such as noise disturbance on livestock and restrictions on aerial agriculture, may occur beyond the project footprint.



Source: *Aurecon, Transgrid, Spatial Services (DCS), ESRI Basemap*

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Projection: GDA 1994 MGA Zone 55

HumeLink **Agricultural Impact Assessment**

FIGURE 4-1: Assessment approach

4.3 Agricultural impact assessment

4.3.1 Landowner consultation and property inspections

Landowner consultation and property inspections occurred on 23 and 24 November 2021 and 11 May 2022. The consultation was undertaken by Peter Tremain of Tremain Ivey Advisory who was accompanied by Transgrid land access officers.

Seven representative properties were chosen to cover a range of geographical locations, project impacts, and types of agricultural enterprises within the agricultural study area (refer to Figure 4-1). Meetings were undertaken with the seven landowners affected by the project. The properties are briefly described in Table 4-1.

Table 4-1
Summary of property inspections

Property Number	Location	Pastures and Cropping	Enterprises	Existing Line
1	Yass	Mostly native pastures	Sheep	None
2	Taralga	Mostly modified pastures	Sheep and cattle	Present
3	Tarcutta	Mostly sown pastures, some cropping	Sheep and cattle	Present
4	Tumut	Mostly sown pastures, some cropping	Sheep and cattle	Present
5	Adjungbilly	Mostly sown pastures, some cropping	Sheep and cattle	None
6	Jugiong	Sown and native pastures	Sheep and cattle	None
7	Adelong	Mostly sown pastures, some cropping	Stud cattle	Present

The properties chosen had a wide geographical location from Taralga in the north west part of the project footprint to Tarcutta in the west and Tumut in the south. The properties were also representative of the land use across the agricultural study area with native and modified (sown) pastures and cropping strongly represented. These make up 99.7% of the agricultural land use in the agricultural study area (refer Table 5-5).

Table 4-1 above denotes 'present' where there is an existing high voltage transmission line on the property, or 'none' where there is no existing high voltage transmission line.

Consultation with landowners included general discussions on the agricultural enterprises conducted on each property, usual crops grown, normal livestock numbers, types of livestock, property areas and specific discussions on the perceived impacts of the project.

Other properties were viewed to some extent from public roadways and adjacent private property to determine aspects of general consistency or difference with the properties on which consultation was undertaken.

Additional consultation with landowners has been undertaken (and is ongoing) by Transgrid as part of the project development process. Outcomes of this extensive consultation has identified issues raised by landowners that have been considered in this report. Key issues raised by landowners included:

- biosecurity
- impacts to agricultural practices (including aerial operations)

- impacts to agricultural land capability and productivity
- restrictions to access and movement.

Further information on the inspected properties and other properties (such as information on vegetation cover, soil type, land capability, land use, type and locations of horticultural crops, extent of cleared areas and type of cropping) was gained through examination of satellite imagery, reference material and public GIS datasets. This information, when combined with information gained from inspections and consultation undertaken to date, is considered adequate to prepare this report.

4.3.2 Stakeholder consultation

Discussions to identify the main biosecurity risks associated with the project and recommended mitigation measures were undertaken by telephone with biosecurity officers from Riverina LLS, South East LLS, Wagga Wagga City Council, Snowy Valleys Council, Yass Valley Council, Cootamundra-Gundagai Regional Council and Upper Lachlan Shire Council. LLS is the government authority which delivers biosecurity services to landowners in partnership with DPI. Local government has a legal responsibility for implementing and enforcing compliance with the NSW *Biosecurity Act 2015* on all lands within their areas of operation.

4.3.3 Agricultural impact assessment

The description of the existing environment was primarily a desktop study based on data from various sources referenced in Chapter 5. However, this information was also evaluated with reference to the information gathered during the property inspections and landowner consultations described above. 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 agricultural study area
- measures which best appraise the nature and productivity of agricultural enterprises in the agricultural study area (such as land and soil capability, land use and value of production).

The assessment of the impacts on agriculture was based on information from the existing environment assessment and consultation undertaken with landowners and other stakeholders.

Mitigation measures are defined as actions, processes or structures, which minimise or eliminate the impacts of the project. The identification 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 5.

4.4 Consideration of biosecurity issues

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

1. landowner consultation (refer to Section 4.3.1)
2. observations during the property inspections (refer to Section 4.3.1)
3. consultation with various LLS and local government weed officers (refer to Section 4.3.2)
4. reference to the NSW *Biosecurity Act 2015*
5. reference to the relevant regional strategic weed management plans
6. review of other documents set out in Section 6.2.

Existing biosecurity issues and potential biosecurity risks were primarily based on a desktop study including pest, disease and weed distribution data, and various legislation, regional plans and surveys referenced in Section 6.2. However, information gathered from property inspections, landowner and stakeholder consultation was also considered. The biosecurity assessment concentrated on the main risks associated with the project as identified by the desktop study and consultation undertaken with landowners and stakeholders.

The identification 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, and Transgrid documents referenced in Chapter 11.

5 Existing environment

5.1 General description

5.1.1 Location

The agricultural study area (refer to Figure 4-1) is located across the Wagga Wagga City, Snowy Valleys, Yass Valley, Cootamundra-Gundagai Regional and Upper Lachlan Shire LGAs (the impacted LGAs).

Small parts of the agricultural study area are also located in the Goulburn-Mulwaree and the Hilltops LGAs, however the project footprint is not located in these LGAs.

5.1.2 Topography

The agricultural study area mainly traverses a landscape of low hills and ridges of low to moderate relief (30 to 100 metres) in the areas around Wagga Wagga, Tarcutta, Tumut, Yass and Gunning. There are escarpments, high hills, ridges and ranges with moderate to high relief (100 to 380 metres) in the vicinity of Batlow, Tumbarumba and Bannaby. Areas of undulating land with low relief (zero to 30 metres) are found around Jugiong and Crookwell (Central Mapping Authority, 1987).

The project ranges from an elevation of approximately 230 metres Australian Height Datum (mAHD) at the Wagga 330 kV substation to over 1,200 mAHD around Maragle. Much of the agricultural study area, apart from the mountainous areas around Batlow and Maragle, is between 230 and 700 mAHD. However, the area around Crookwell and Taralga ranges in elevation between 700 and 900 mAHD.

5.1.3 Climate

Climate, especially rainfall and temperature, has a large impact on the productivity of dryland agricultural properties such as those found throughout the agricultural study area. Rainfall and temperature vary considerably over the agricultural study area. Four Bureau of Meteorology (BoM) recording stations have been chosen to illustrate the range of climatic conditions (refer to Figure 5-1 and Table 5-1).

Table 5-1
Summary of BoM recording stations

Station name and number	Data Available	Elevation
072150 Wagga Wagga AMO	80 years	212 m
073007 Burrinjuck Dam	113 years	390 m
072043 Tumbarumba Post Office	136 years	645 m
070080 Taralga Post Office	139 years	845 m

The average rainfall is generally lower in the western end of the agricultural study area with substantially higher rainfall being recorded at the higher elevation stations further east (refer to Table 5-2). Rainfall at Taralga is relatively evenly spread throughout the year. However, Burrinjuck Dam and Tumbarumba are strongly winter dominant, receiving 60 per cent more rainfall in winter than in summer. Wagga Wagga has a moderate winter dominance.

Records indicate that one in 10 years has rainfall of approximately 65 to 73 per cent of the long-term mean. The rainfall has moderately low variability according to rainfall records (BoM, 2021). Variability is generally much greater in late summer and early autumn than at other times of the year

and declines as average annual rainfall increases. Most parts of the project footprint experienced extended drought conditions around the period 2018 to 2020, followed by wetter than average seasons in subsequent years.

Table 5-2
Summary of rainfall records

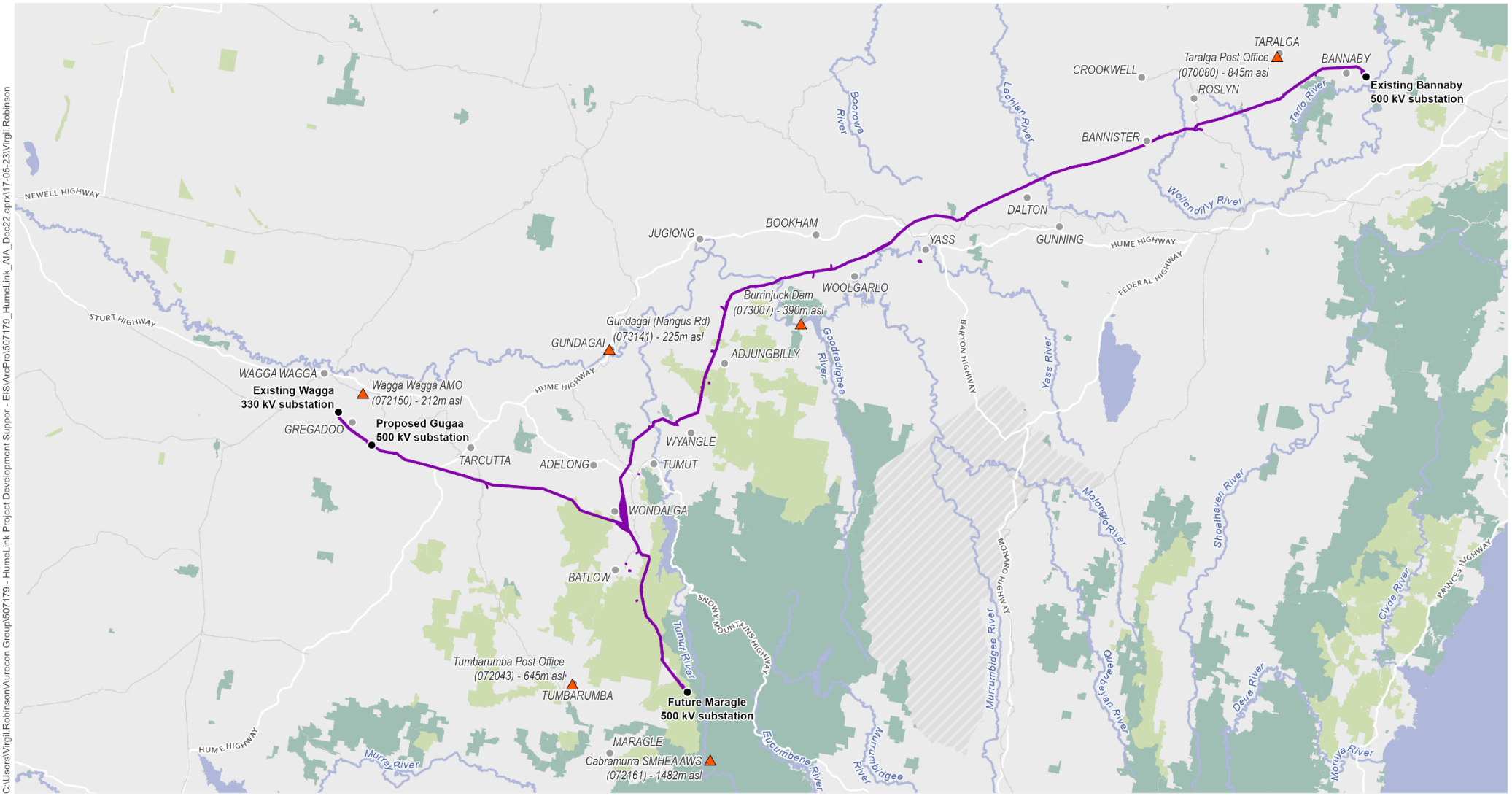
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean													
Burrinjuck Dam	62.0	57.0	62.5	63.8	79.8	96.2	101.1	97.6	83.6	84.6	72.9	63.3	922.8
Taralga	72.3	72.5	68.5	57.8	58.8	75.6	66.4	67.9	61.2	69.4	67.7	66.2	804.0
Tumbarumba	62.9	54.6	66.2	65.8	82.4	102.0	104.6	105.9	90.1	94.8	74.9	70.8	974.2
Wagga Wagga	40.1	40.2	45.9	39.9	50.4	50.8	53.7	51.0	49.0	55.8	46.7	46.1	571.4
10th percentile													
Burrinjuck Dam	9.0	5.6	9.0	8.6	16.1	31.3	33.5	38.9	29.4	27.8	17.9	10.8	600.3
Taralga	14.7	6.4	12.4	10.3	12.6	21.3	22.2	25.9	26.8	21.6	18.2	13.2	569.6
Tumbarumba	13.2	4.8	10.8	16.4	20.0	36.7	44.7	42.3	38.7	25.3	21.8	14.3	707.1
Wagga Wagga	7.0	4.1	1.8	7.8	8.1	19.0	22.0	10.1	16.9	14.4	12.0	4.8	401.8

Maximum temperature records for the selected stations are set out in Table 5-3. The mean maximum monthly temperatures reach a peak of approximately 32°C in January at Wagga Wagga but are approximately 3°C to 6°C lower at the other stations. The mean maximum monthly temperature ranges from 10.4°C to 12.8°C in July. The temperature differences are largely determined by the elevation of the stations.

The average number of days per annum over 35°C ranges from 3.6 days at Taralga to 20.6 days at Wagga Wagga.

Table 5-3
Summary of maximum temperatures

Statistic element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (°C)													
Burrinjuck Dam	29.8	29.0	26.0	21.1	16.2	12.5	11.7	13.4	16.9	20.5	24.1	27.7	20.7
Taralga	26.3	25.0	22.5	18.8	14.5	11.2	10.4	11.9	15.1	18.6	21.6	24.6	18.4
Tumbarumba	29.0	28.4	25.1	20.1	15.2	11.9	10.8	12.2	15.5	19.7	22.9	26.2	19.7
Wagga Wagga	31.9	30.9	27.7	22.6	17.4	13.9	12.8	14.5	17.7	21.7	26.0	29.6	22.2
Mean number of days >= 35°C													
Burrinjuck Dam	6.1	3.4	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.5	13.5
Taralga	2.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	3.6
Tumbarumba	2.7	1.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	4.9
Wagga Wagga	8.2	4.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.7	4.4	20.6



Source: *Aurecon, Transgrid, BoM, Spatial Services (DCS), ESRI Basemap*

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Projection: GDA 1994 MGA Zone 55

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FIGURE 5-1: BoM weather stations

Minimum temperature records are set out in Table 5-4. The mean minimum temperatures fall to lows of approximately 3°C in July at Wagga Wagga and Burrinjuck Dam, but are considerably colder at Taralga (0.6°C) and Tumbarumba (-0.1°C). The highest mean minimum temperatures occur in January and February and range from approximately 16°C at Wagga Wagga and Burrinjuck Dam and 12°C at Taralga and Tumbarumba.

A minimum temperature under 2°C is generally regarded as the approximate temperature at which frost will occur. Wagga Wagga records an average of 50 such days per annum, but Taralga and Tumbarumba experience almost twice as many days below 2°C. The average number of days below 2°C is much lower at Burrinjuck Dam.

Mean daily evaporation averages 5.1 millimetres at Wagga Wagga, with a peak of 10.1 millimetres in January. Mean daily evaporation is more than 40 per cent lower in at Burrinjuck Dam on an annual basis, but the percentage difference is much higher in winter compared to summer (refer to Table 5-4).

Due to high temperatures, high evaporation and low rainfall, the growing season in the western part of the agricultural study area is generally shorter and less reliable than other areas further east.

Table 5-4
Summary of minimum temperatures and evaporation

Statistic element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean minimum temperature (°C)													
Burrinjuck Dam	15.6	15.8	13.4	9.6	6.4	4.2	3.0	3.7	5.7	8.4	11.1	13.7	9.2
Taralga	12.1	12.1	9.9	6.2	3.2	1.7	0.6	1.2	3.1	5.4	7.7	9.9	6.1
Tumbarumba	12.3	12.0	8.9	5.1	2.3	0.2	-0.1	0.9	3.0	5.3	7.8	9.8	5.6
Wagga Wagga	16.4	16.5	13.5	9.2	5.9	3.7	2.8	3.5	5.1	7.8	11.0	14.0	9.1
Mean number of days <= 2°C													
Burrinjuck Dam	0.0	0.0	0.0	0.1	1.5	6.8	11.2	8.2	2.4	0.3	0.0	0.0	30.5
Taralga	0.1	0.0	0.7	4.1	12.3	14.9	19.2	17.6	11.8	6.1	2.1	0.5	89.4
Tumbarumba	0.0	0.0	0.9	6.1	14.4	17.4	19.1	16.7	12.2	6.7	2.1	0.3	95.9
Wagga Wagga	0.0	0.0	0.0	0.9	5.6	10.4	13.5	11.0	6.8	2.0	0.2	0.0	50.4
Mean daily evaporation (mm)													
Burrinjuck Dam	5.9	5.3	3.8	2.2	1.3	0.9	0.9	1.3	2.0	3.1	4.3	5.4	3.0
Wagga Wagga	10.1	9.0	6.8	4.0	2.1	1.3	1.2	1.9	3.0	5.0	7.2	9.4	5.1

5.1.4 Climate change

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

Climate projections for the Murray Basin cluster of National Resource Management (NRM) regions[1] are set out in Timbal, et al. (2015) and CSIRO (2016a).

[1] The Murray Basin cluster of NRM regions includes the Riverina LLS and the South East LLS, and encompasses the entire agricultural study area.

The projections indicate that in the near future (2030) natural rainfall variability is projected to predominate over trends due to greenhouse gas emissions. Late in the century (2090) cool season (April to October) rainfall is projected to decline under both an intermediate and high emission scenario. In the warm season (November to March), little change, increased rainfall and decreased rainfall are variously projected by different models. The magnitude of projected changes for late in the century (2090) span approximately -40 to five per cent in winter and -15 to +25 per cent in summer for a high emissions case.

Heavy rainfall intensity is projected to increase with high confidence. Time spent in drought is projected, with medium confidence, to increase over the course of the century.

There is very high confidence in continued substantial increases in projected mean, maximum and minimum temperatures. For 2030, the annually averaged warming across all emission scenarios is projected to be around 0.6 to 1.3°C above the climate of 1986-2005. By 2090, the projected range of warming is 2.7 to 4.5°C for a high emission scenario and 1.3 to 2.4°C under an intermediate scenario.

More hot days and warm spells are projected with very high confidence. Fewer frosts are projected with high confidence and could halve by late in the century. Snowfall and maximum snow depth have declined substantially since 1960 and are projected to continue to decline with high confidence.

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 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 carbon dioxide levels and warmer average temperatures during autumn and winter. Frost damage risk may decline.

5.1.5 Soils

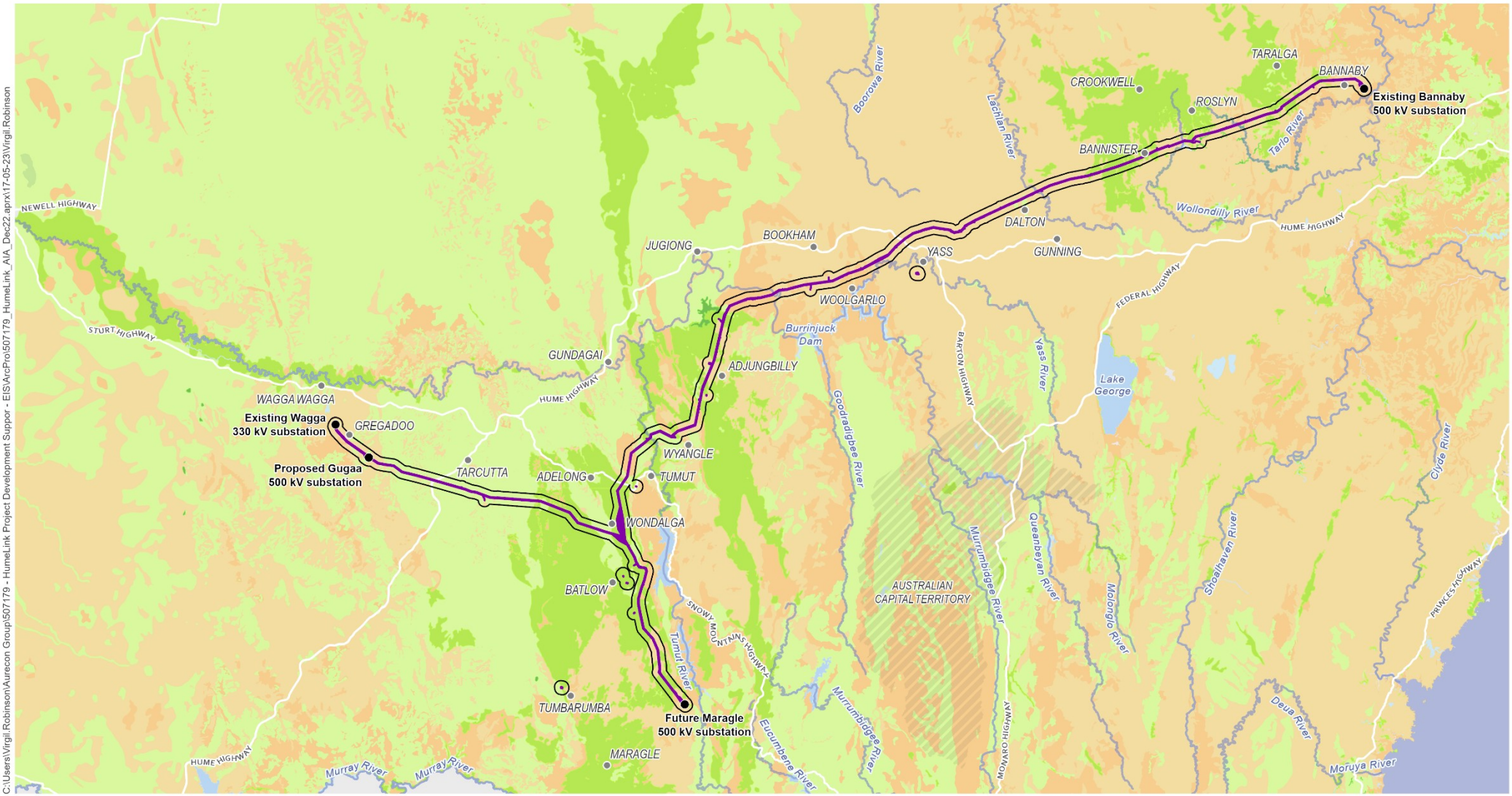
Most soils in the Wagga Wagga and Tarcutta area are either moderate or moderately low fertility (OEH, 2017). The area around Jugiong, Tumut, Batlow and Maragle has a relatively high percentage of moderately high fertility soils in addition to a variety of lower fertility soils. Further east, the area between Adjungbilly and Bannaby is dominated by moderately low fertility soils with large areas of low and moderately high fertility soils. A map of inherent soil fertility across the agricultural study area is provided in Figure 5-2 and further detail is shown in Attachment 1.

The dominant soils in the western part of the agricultural study area around Wagga Wagga and Tarcutta are kurosols and kandosols, with smaller areas of various soils, including sodosols and rudosols according to Australian Soil Classification (CSIRO, 2016b). Vertosols are found along Tarcutta Creek.

Kurosols are moderately fertile with a distinct texture contrast between the topsoil (A horizons) and a strongly acid subsoil (B horizons) with higher clay content. Some have sodic topsoils. Kandosols have a small or gradual increase in clay content with depth, weakly structured to non-structured subsoils and are well drained. Sodosols are similar to kurosols but have sodic sub soil which is not strongly acidic. Rudosols have low inherent fertility and a sandy, weakly developed profile. Vertosols have clay texture throughout the profile, display strong cracking when dry, and shrink and swell considerably during wetting and drying phases (Agriculture Victoria, 2021).

Higher fertility dermosols and ferrosols are found in the central and southern area around Jugiong, Tumut, Batlow and Maragle. Kurosols, kandosols, sodosols and rudosols are also relatively common in this area.

Dermosols have a small or gradual increase in clay content with depth but have a moderately deep and well-structured subsoil. They are usually strongly acid and well drained. Ferrosols are deep, well-structured and friable soils that have formed on basalt. They are high in free iron oxide and clay and are generally strongly acid (Agriculture Victoria, 2021).



Project footprint
Agricultural study area
Major road
Waterway
Substation

Inherent soil fertility

1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high
5 - High
Water

Source: *Aurecon, Transgrid, DPE, Spatial Services (DCS), ESRI Basemap*

1:925,000
0 20 40km

Projection: GDA 1994 MGA Zone 55

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FIGURE 5-2: Inherent soil fertility

Kurosols and kandosols are the most common soils in the north of the agricultural study area around Gundagai, Yass and Gunning. However, there are also substantial areas of sodosols and rudosols.

The area around Crookwell and Taralga is characterised by a mixture of kurosols, ferrosols, dermosols, with relatively small areas of other soils.

Further detail on soils within the project footprint is provided in *Technical Report 10 – Phase 1 Contamination Assessment*.

5.1.6 Surface water

Surface water for agriculture is mainly supplied by the major waterways (such as the Kyeamba Creek, Tarcutta Creek, Yaven Yaven Creek, Adelong Creek, Gilmore Creek, Murrumbidgee River, Tumut River, Yass River, Lachlan River, Wollondilly River and Tarlo River), smaller waterways and earthen farm dams. Water is used for stock and domestic use, and for some irrigation on and around the agricultural study area.

Earthen farm dams capture and store local runoff and are mainly used for livestock purposes. Surface water is reticulated on many grazing properties using a system of pumps, pipes, tanks and livestock troughs.

Further detail on the surface water catchments relevant to the agricultural study area is provided in *Technical Report 12 – Surface Water and Groundwater Impact Assessment*.

5.1.7 Groundwater

Groundwater across most of the agricultural study area is part of the Lachlan Fold Belt fractured rock groundwater resource. Water quality within the Lachlan Fold Belt varies greatly based on rock type, fracture density, aquifer depth, and climate. Water is used for livestock and domestic purposes, but not usually for irrigation (DPIE, 2019). Salinity is generally marginal to moderate at 500 to 3,000 milligrams of total dissolved solids per litre (Green, et al, 2011).

Groundwater bores are located throughout the agricultural study area. However, high concentrations of bores are located around Gregadoo in the west, and in the Tumut and Yass River valleys. Relatively few bores are found in sections of the agricultural study area from Tarcutta to Adelong, Wyangle (near Gundagai) to Woolgarlo (near Bookham), and Dalton to Bannister.

Further detail on the existing hydrogeology relevant to the agricultural study area is provided in *Technical Report 12 – Surface Water and Groundwater Impact Assessment*.

5.1.8 Land use

Maps of land use across the agricultural study area have been included as Attachment 2. Relevant areas of land use are summarised in Table 5-5.

The part of the agricultural study area west of Tarcutta is dominated by cropping (DPIE, 2020). However, in any particular year the 'cropping' area includes a substantial portion which is in a pasture phase of the cropping rotation. Smaller areas of grazing of both modified pastures and native vegetation were also identified. Between Tarcutta and Batlow, grazing of modified pastures becomes dominant with some cropping and grazing of native pastures. Substantial irrigated perennial horticulture (orchards) is located around Batlow, while plantation and production native forests are located between Batlow and Maragle.

The dominant land use across the remainder of the agricultural study area between Batlow and Bannaby is grazing of modified pastures, with some grazing of native pastures but little cropping. There are some plantation and production native forests in the south-west of this section, and

cropping becomes more common around Crookwell and Bannister. Grazing of native pastures prevails around Dalton and Bannaby.

Grazing of cattle and sheep (for wool and meat) is common throughout the agricultural study area.

Table 5-5
Summary of land use

Land Use (DPIE, 2020)	Agricultural study area (ha)	Proportion	Project footprint area (ha)	Proportion
Agricultural land uses				
2.1.0 Grazing native vegetation	30,764	25.0%	2,172	25.4%
3.2.0 Grazing modified pastures	55,002	44.7%	4,200	49.0%
3.3.0 Cropping	11,881	9.6%	802	9.4%
3.4.0 Perennial horticulture	5	0.0%	0	0.0%
4.3.0 Irrigated cropping	68	0.1%	0	0.0%
4.4.0 Irrigated perennial horticulture	181	0.1%	4	0.0%
5.1.0 and 5.2.0 Intensive agriculture	39	0.0%	0	0.0%
Sub-total - Agriculture	97,940	79.5%	7,178	83.9%
Conservation and natural environments	2,616	2.1%	33	0.4%
Production native and plantation forestry	16,897	13.7%	1,089	12.7%
Residential and farm infrastructure	2,119	1.7%	14	0.2%
Other intensive uses (mining, transport, etc)	716	0.6%	79	0.9%
Water (lakes, rivers, etc)	2,767	2.2%	154	1.8%
Other	76	0.1%	3	0.0%
Total	123,130	100.0%	8,551	100.00%

*Note on Table 5-5: Individual amounts are approximate and may not sum to the amount of the totals due to rounding.

5.1.9 Farm size

Australian Bureau of Statistics (ABS) statistics indicate an average agricultural establishment size of approximately 788 hectares across the agricultural study area (ABS, 2022a).

The average agricultural establishment size is somewhat higher than average in the Wagga Wagga City (961 hectares) and Cootamundra-Gundagai Regional (1,189 hectares) LGAs, and lower than average in Snowy Valleys (562 hectares) and Upper Lachlan Shire (661 hectares) LGAs.

5.1.10 Travelling stock reserves and livestock routes

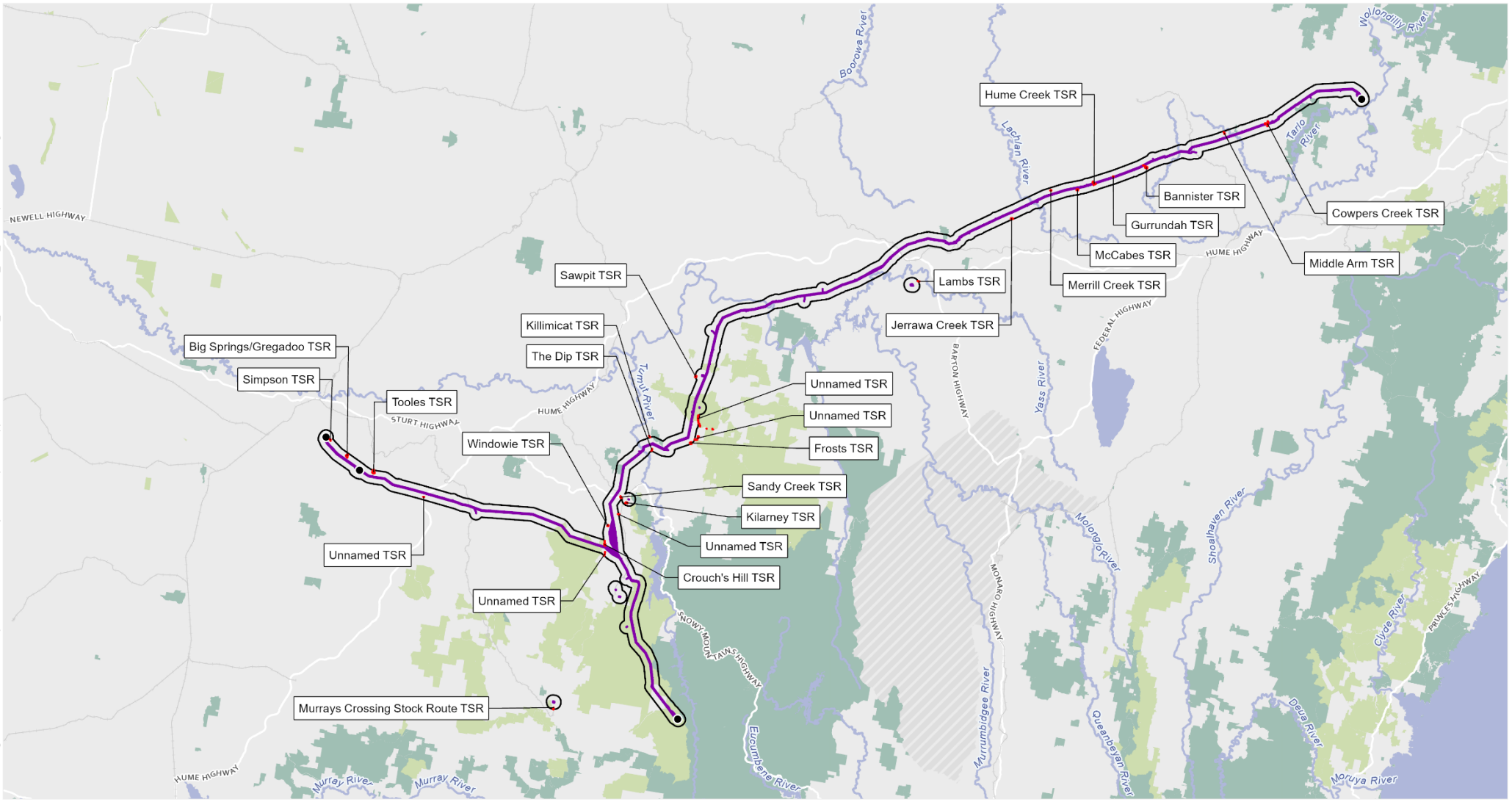
The grazing industry uses a network of Crown reserves called travelling stock reserves (TSRs) for moving or grazing stock on foot around NSW. Some of these reserves are linear, providing a route for livestock to move from place to place. Other reserves are blocks of varying sizes providing a place for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

As shown in Figure 5-3, the project footprint intersects with four TSR blocks (LLS, 2021) at the following locations listed below:

- Hume Creek, Gurrundah Road
- Gurrundah, Bannister Lane
- Bannister, Range Road
- Cowpers Creek, Taralga Road.

These TSR blocks and other adjacent blocks within the agricultural study area, are shown in Figure 5-3 and Attachment 3.

There are no roads which intersect with the agricultural study area that have been identified by the NSW Government as 'livestock highways'. The NSW Department of Industry defined livestock highways as a key network of livestock routes connecting key agricultural regions within NSW, and with Queensland and Victoria (Department of Industry, 2017).



Source: *Aurecon, Transgrid, Department of Regional New South Wales, Spatial Services (DCS), ESRI Basemap*

1:925,000

0 20 40 km

Projection: GDA 1994 MGA Zone 55

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FIGURE 5-3: Travelling Stock Reserves within the Agricultural study area

5.2 Biosecurity issues

Agriculture in the study area is relatively intensive and this is associated with comparatively high biosecurity risks.

5.2.1 Weeds

The most common weed recorded by authorised officers during property inspections under the *Biosecurity Act 2015* (DPI, 2021b) was blackberry (*Rubus fruticosus*), which was found in relatively high numbers across the agricultural study area. Landowners also highlighted the high prevalence and importance of blackberries during consultation for the project.

Other common weeds with more restricted geographical spread are set out in Table 5-6.

Table 5-6
Common weeds in the agricultural study area

Between Wagga Wagga and Tarcutta	
Chilean needle grass (*Nassella neesiana*)	Coolatai grass (*Hyparrhenia hirta*)
silverleaf nightshade (*Solanum elaeagnifolium*)	African boxthorn (*Lycium ferocissimum*)
Between Tarcutta and Tumut	
Chilean needle grass (*Nassella neesiana*)	Bathurst burr (*Xanthium spinosum*)
St. John's wort (*Hypericum perforatum*)	sweet briar (*Rosa rubiginosa*)
Between Tumut and Maragle	
St John's wort (*Hypericum perforatum*)	
Between Tumut and Bookham	
St. Barnaby's thistle (*Centaurea solstitialis*)	sweet briar (*Rosa rubiginosa*)
serrated tussock (*Nassella trichotoma*)	
Between Bookham and Dalton	
African lovegrass (*Eragrostis curvula*)	sweet briar (*Rosa rubiginosa*)
St John's wort (*Hypericum perforatum*)	
Between Dalton and Bannaby	
serrated tussock (*Nassella trichotoma*)	

A full list of weeds recorded by authorised officers during property inspections in each section and recorded in the Biosecurity Information System is set out in Attachment 6.

State priority weeds which may occur in the Riverina or South East LLS regions include:

- African boxthorn (*Lycium ferocissimum*)
- asparagus weeds *(Asparagus* species)
- athel pine (*Tamarix aphylla*)
- bitou bush (*Chrysanthemoides monilifera* ssp. *rotundata*)
- blackberry (*Rubus fruticosus*)

- boneseed (*Chrysanthemoides monilifera* ssp. *monilifera*)
- cane cactus (*Austrocylindropuntia cylindrica*)
- lantana (*Lantana camara*)
- prickly pears *(Opuntia* and *Cylindropuntia* species)
- silverleaf nightshade (*Solanum elaeagnifolium*)
- tropical soda apple (*Solanum viarum*)
- water hyacinth (*Eichhornia crassipes*)
- willows (some *Salix* species).

The regional strategic weed management plans (Riverina LLS, 2017 and South East LLS, 2017) identify regional priority weeds, some of which are, or may be, present in the vicinity of the agricultural study area according to weed distribution data (DPI, 2021b and DPI, 2021c), as follows:

- African lovegrass (*Eragrostis curvula*)
- black willow (*Salix nigra*)
- bitou bush (*Chrysanthemoides monilifera* ssp. *rotundata*)
- cane needle grass (*Nassella hyalina*)
- cat's claw creeper (*Dolichandra unguis-cati*)
- Chilean needle grass (*Nassella neesiana*)
- Coolatai grass (*Hyparrhenia hirta*)
- fireweed (*Senecio madagascariensis*)
- gorse (*Ulex europaeus*)
- grey sallow (*Salix cinerea*)
- groundsel bush (*Baccharis halimifolia*)
- lantana (*Lantana camara*)
- Montpellier broom (*Genista monspessulana*)
- mother of millions (*Bryophyllum* spp.)
- ox-eye daisy (*Leucanthemum vulgare*)
- perennial ground cherry (*Physalis longifolia*)
- pink pampas grass (*Cortaderia jubata*)
- prairie ground cherry (*Physalis hederifolia*)
- Scotch broom (*Cytisus scoparius*)
- serrated tussock (*Nassella trichotoma*)
- Spanish broom (*Spartium junceum*)
- Spanish heath (*Erica lusitanica*)
- tropical soda apple (*Solanum viarum*)
- water hyacinth (*Eichhornia crassipes*).

Some of the weeds listed above as state or regional priority weeds or weeds recorded by authorised officers are also 'weeds of national significance' (Weeds Australia, 2022), including athel pine (*Tamarix aphylla),* bitou bush (*Chrysanthemoides monilifera),* blackberry (*Rubus fruticosus*), bridal creeper (*Asparagus asparagoides*), Chilean needle grass (*Nassella neesiana*), gorse *(Ulex europaeus*), lantana *(Lantana camara*), serrated tussock (*Nassella trichotoma*) and willows (some *Salix* species).

Other important weeds in the Riverina and South East LLS regions are listed in the respective regional strategic weed management plans. The description of these weeds varies between the two relevant LLS regions, but they are described in South East LLS (2017) as species that pose a potential biosecurity risk within the region, but there is insufficient information on them to complete a regional risk assessment and inform an appropriate regional response. These weeds are listed in Attachment 5.

Other weeds in the vicinity of the agricultural study area include khaki weed (*Alternanthera pungens*) and caltrops (*Tribulus terrestris*). Both are found in disturbed and high traffic areas such as roadways and are easily spread by vehicles and humans.

Problematic weeds present in the district with the potential to become more widespread that were mentioned by landowners during consultations included Illyrian thistle (*Onopordum Illyricum),* Chilean needle grass, Bathurst burr, St. John's wort*,* khaki weed, serrated tussock, blackberries and African lovegrass*.*

5.2.2 Pest animals

Foxes, wild rabbits and kangaroos have a widespread distribution across the agricultural study area (Riverina LLS, 2018 and South East LLS, 2018). Feral goats have scattered distribution with a low to medium presence near Tarcutta, low concentrations near Wagga Wagga and Burrinjuck Dam, and a higher abundance near Bannaby. Wild pigs are mainly found in low densities in the south near Tarcutta, Tumut, Maragle and Bookham, and around Dalton and Bannaby (DPI, 2021d).

The part of the agricultural study area between Tumut and Maragle has a medium to high abundance of feral horses and deer, and a medium level of wild dogs. Wild dogs and deer are also found at the eastern end of the agricultural study area around Bannaby. The distribution of feral horses, feral pigs and deer has expanded in recent years in parts of the agricultural study area (DPI, 2021d).

Plague locusts and mice can also cause problems in favourable seasons. Some species (such as goats and pigs) pose important biosecurity, economic and social threats as they can harbour and transmit both endemic and exotic diseases.

5.2.3 Animal and plant diseases

The occurrence of sheep footrot in the vicinity of the agricultural study area has been low in recent years. DPI reported a total of 32 quarantined flocks in December 2021 across the Riverina and South East LLS regions (DPI, 2022). The total number of flocks across the Riverina and South East LLS regions was 5,440. Therefore, the infection rate was around 0.6 per cent.

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, or by exposure to contaminated land under favourable conditions.

Little recent data is available on the prevalence of ovine Johne's disease (OJD) in NSW. However, most of the agricultural study area was in a high prevalence area with more than 12.5 per cent of flocks estimated to be infected (DPI, 2011). OJD is an incurable infectious disease caused by the bacterium *Mycobacterium paratuberculosis*.

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

The landowners consulted confirmed that OJD is not a substantial problem as it is currently well managed. There have been problems with footrot in recent years, but these cases are relatively rare.

Horticultural enterprises are particularly susceptible to plant diseases and pests. All of the agricultural study area is within the Phylloxera Exclusion Zone. The entire state of NSW is a Potato Biosecurity Zone.

5.3 Land and soil capability

There are a number of measures of land capability relevant to agriculture. Some of these seek to identify and protect the highest quality land. However, none use the term 'prime agricultural land' as this is a generic term which is not defined or described by any NSW datasets (Squires, 2017).

This report describes the land and soil capability based on the Office of Environment and Heritage's (OEH) Land and Soil Capability (LSC) Assessment Scheme (OEH, 2012). However, other measures are also examined in the following sections.

5.3.1 Background

The 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 would 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 updated 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).

5.3.2 LSC classes

Class 1 land is described as “extremely high capability land: Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices".

Class 2 land is described as “very high capability land: Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation".

Class 3 land is described as “high capability land: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation".

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 land use apart from nature conservation. There should be no disturbance of native vegetation”.

5.3.3 LSC in the agricultural study area

A map of LSC across the agricultural study area is included in Attachment 4. The area of each LSC class is summarised in Table 5-7. There are no class 1 or class 2 lands within the agricultural study area or project footprint.

Very low to moderate capability classes 4 to 7 are the dominant land types across the study area, comprising 93-94 per cent of the agricultural study area and the project footprint. Higher capability class 3 land comprises six per cent of both areas. However, there are large differences in the distribution of each land class, as summarised below.

Table 5-7
Summary of land and soil capability

	Agricultural study area		Project footprint	
LSC class	**Area (ha)**	**Proportion**	**Area (ha)**	**Proportion**
3 - High capability	7,346	6.0%	496	5.8%
4 - Moderate capability	30,669	24.9%	1,809	21.2%
5 - Moderate–low capability	20,435	16.6%	1,292	15.1%
6 - Low capability	37,642	30.6%	2,529	29.6%
7 - Very low capability	26,074	21.2%	2,418	28.3%
8 - Extremely low capability	1,005	0.8%	2	0.0%
Sub Total	123,171	100.00%	8,546	100.00%
Unclassified	146		4	
Total	123,317		8,551	

Between the Wagga 330 kV substation and the Tarcutta area, the LSC is dominated by moderate capability class 4 and class 5 land.

Lower capability land becomes more common further east towards Batlow, where classes 6 and 7 are the main land types associated with smaller areas of classes 4, 5 and 8. Small areas of high capability class 3 land can be found in some valleys, including those associated with Yaven Yaven Creek, Darlows Creek, Right Arm Creek and Nacki Nacki Creek.

The land south of Batlow to Maragle is a mixture of very low to moderate capability classes 4 to 7. Around Tumut there is a complex assortment of mostly classes 5, 6 and 7 land with a large amount of high capability class 3 land in the Gilmore Creek and Tumut River valley, and some class 8 land.

Lower capability land (classes 6 and 7) predominates further north between Wyangle and Bookham. The remainder of the agricultural study area through to Bannaby is characterised by low to moderate capability land (classes 4 to 6) with some areas of higher capability class 3 land (mainly near Bannister and Taralga) and some lower capability class 7 land near the eastern end.

5.4 Other measures of land capability

5.4.1 Agricultural land classification

The Agricultural Land Classification (ALC) system is similar to the LSC assessment scheme. The current 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".*

5.4.2 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 (OEH, 2013). BSAL has the best quality intrinsic landforms, soil and water resources which are naturally capable of sustaining high levels of productivity and require minimal management to maintain the high quality (DPE, 2013).

Mapping of BSAL was undertaken by the then NSW Department of Planning and Environment. This mapping indicates that there is some BSAL in the agricultural study area (refer to Figure 5-4), as follows:

- small areas south-west of Adelong
- east, south and north of Tumut along the Tumut and Goobarragandra Rivers
- around Bannister
- south of Roslyn
- south of Taralga
- small areas east of Taralga.

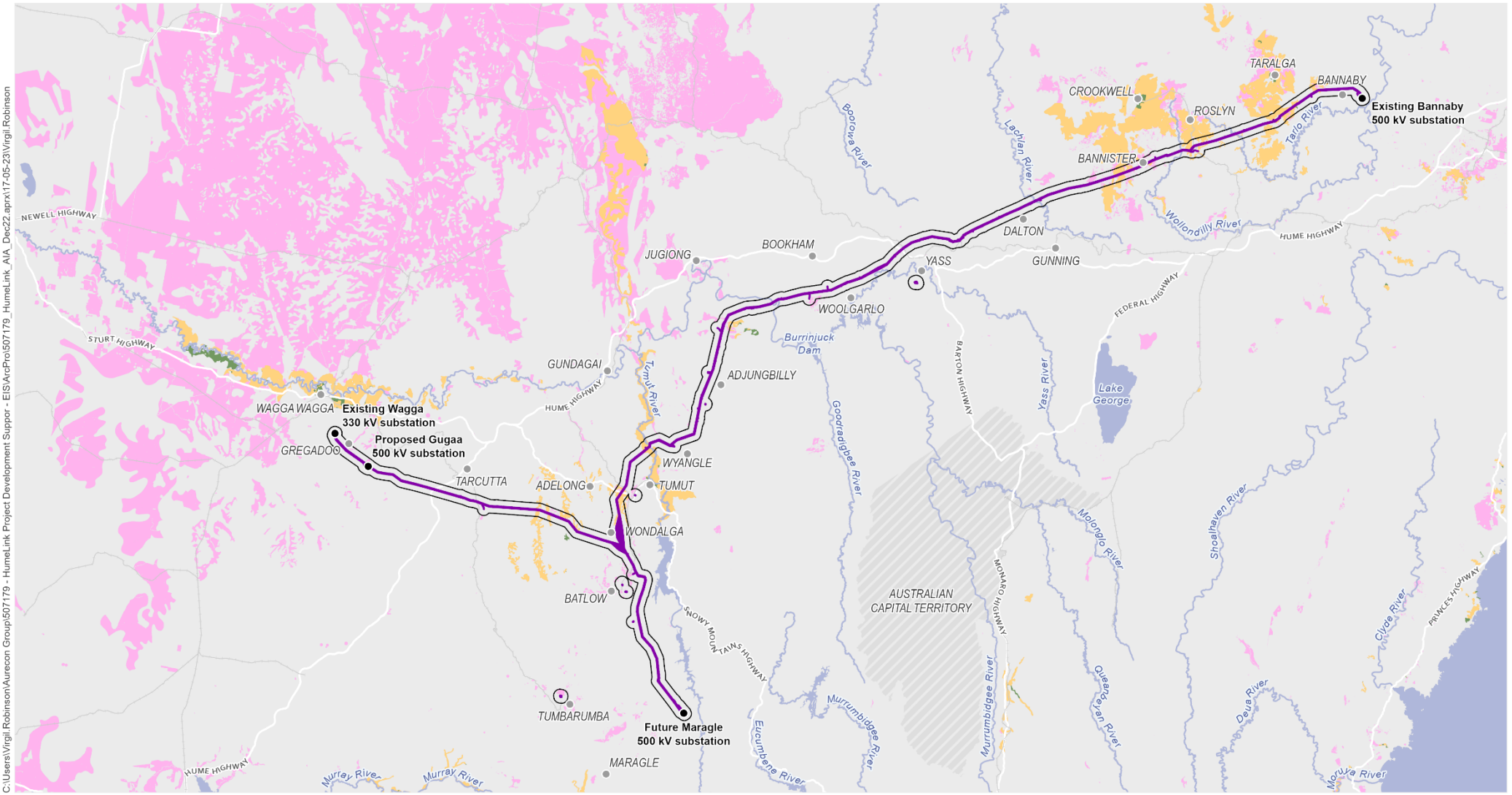
Areas of BSAL within the project footprint total 447 hectares. This is equivalent to 5.2 per cent of the project footprint.

5.4.3 Draft State significant agricultural land

SSAL has certain biophysical characteristics, which results in the land being inherently fertile and generally lacks significant biophysical constraints. It can be used sustainably for intensive agricultural production such as cultivation with minimal management practices to maintain this high quality. These biophysical attributes relate to the biological and physical characteristics of land and climate and include water availability, land and soil capability, inherent soil fertility, and soil pH.

A draft map of SSAL has been recently released (DPI, 2021a). The distribution of draft SSAL across the agricultural study area is similar to BSAL, as the assessment of both is based on similar parameters. In general, there are slightly greater areas of draft SSAL than BSAL across the agricultural study area, especially south of Jugiong and around Bannister (refer to Figure 5-4).

The area of draft SSAL within the project footprint is 534 hectares. This is equivalent to 6.2 per cent of the total project footprint.



Source: *Aurecon, Transgrid, DPE, Spatial Services (DCS), ESRI Basemap*

1:925,000

0 20 40 km

Projection: GDA 1994 MGA Zone 55

FIGURE 5-4: BSAL and SSAL

5.5 Agricultural productivity

5.5.1 Employment

Agriculture forestry and fishing is the largest industry (by number of persons employed) in three of the five impacted LGAs. In 2016, employment in 'agriculture, forestry and fishing' was between 15 per cent and 26 per cent of employed persons in the Snowy Valleys, Cootamundra-Gundagai Regional and Upper Lachlan Shire LGAs. This compares to the national average of around three to four per cent. The rate was lower in Wagga Wagga City (four per cent) and Yass Valley (eight per cent) due to the larger urban populations (ABS, 2021).

Total employment in 'agriculture, forestry and fishing' is estimated at approximately 4,500 persons across the five LGAs. This is approximately nine per cent of all employed persons.

In 2020, there were 3,448 'agriculture, forestry and fishing' businesses in the five impacted LGAs (ABS, 2021). This is approximately 29 per cent of all businesses, but the proportion was 36-62 per cent in the Snowy Valleys, Cootamundra-Gundagai Regional and Upper Lachlan Shire LGAs.

5.5.2 Agricultural land use

The total area of agricultural holdings across the five impacted LGAs located within the project footprint in 2020-21 (ABS, 2022a)[1] is summarised in Table 5-8.

Table 5-8
Total area of agricultural holdings 2020-21

LGA	Area of holdings (ha)	Number of businesses	Average size (ha)
Wagga Wagga City	444,995	463	961
Snowy Valleys	236,493	421	562
Cootamundra-Gundagai Regional	338,839	285	1,189
Yass Valley	242,441	340	713
Upper Lachlan Shire	387,447	586	661
Total	**1,650,215**	**2,095**	**788**

The same ABS statistics show the following broad land uses on agricultural holdings across the five LGAs located within the project footprint.

[1] Detailed agricultural statistics are only produced by the ABS to an LGA level every five years. The most recent LGA data are from 2020-21.

Table 5-9
Land use on farms 2020-21

Land use	Area (ha)
Wheat for grain	116,768
Other broadacre crops	150,307
Hay and Silage	40,568
Grapes	576
Fruit and nuts	713
Other horticulture	260
Other – Mostly grazing	1,341,024
Total area of holdings	**1,650,215**

Statistics that detail the use of 'other' land not used for cropping or horticulture are not available for 2020-21. However, most of the 'other' land is expected to be native vegetation or improved pastures used for grazing. There would also be land used for agroforestry, environmental purposes, infrastructure or intensive agriculture (such as poultry and feedlots), unused, or having minimal use land. Overall, 'other' land comprises 81 per cent of the total area of holdings, but this percentage varies from 54 per cent in the Wagga Wagga City LGA where a high percentage of land is used for cropping, to 95 per cent or more in the Snowy Valleys, Yass Valley and Upper Lachlan Shire LGAs.

5.5.3 Livestock carried

Table 5-10 sets out total livestock numbers across the five impacted LGAs located within the project footprint in 2021. Poultry and bees which are usually associated with intensive production are excluded.

Table 5-10
Total livestock numbers in all impacted LGAs

Livestock type	Number
Sheep and lambs	2,998,648
Meat cattle	380,255
Dairy cattle	11,278
Pigs	754
Goats and other livestock	6,584
Total – stock units	**6,920,565**
per hectare[1]	5.80

Source: ABS, 2022a

'Stock units' are calculated as one unit for sheep, lambs, goats and 'other', and 10 units each for meat cattle and dairy cattle. Pigs are disregarded for this calculation as they are generally intensively raised rather than grazed on pasture. The 'stock units per hectare' amount calculated in Table 5-10 indicate the average stocking rate of pastures across the agricultural study area.

[1] Excluding cropping and horticultural areas (Table 5-9).

The average stocking rate of 5.80 stock units per hectare in 2020-21 is relatively high across the five impacted LGAs. The average stocking rate across all of NSW in 2020-21 was 1.53 stock units per grazing hectare (ABS, 2022a). However, this includes large areas of semi-arid rangeland in the west of the State.

5.5.4 Value of agricultural production

The total gross value of agricultural production across the five impacted LGAs in 2020-21 (ABS, 2022b) is shown in Table 5-11 at $973 million.

The disposal of cattle and calves (mostly for meat) was the most valuable agricultural commodity produced in 2020-21 at over $250 million. It was followed by wool, sheep and lambs, wheat and other broadacre crops. Each of these commodities was valued at over $100 million.

Horticulture is relatively important in the Snowy Valleys LGA, due largely to the fruit industry around Batlow. Horticulture contributed 25 per cent of the total gross value of agricultural production in the Snowy Valleys LGA, but only eight per cent across all five impacted LGAs.

Cropping is dominant in the Wagga Wagga City LGA, contributing 68 per cent of the total gross value of agricultural production in 2020-21. It is also relatively important in the Cootamundra-Gundagai Regional LGA (39 per cent of total value) but cropping contributes only five per cent to twelve per cent of the total value in the other LGAs.

Table 5-11
Total gross value of agricultural production

LGA	Cootamundra-Gundagai Regional	Snowy Valleys	Upper Lachlan	Wagga Wagga City	Yass Valley	Total
Broadacre crops						
Wheat	$34,486,331	$400,618	$1,987,844	$102,825,948	$2,581,267	$142,282,007
Other	$32,641,848	$1,019,676	$4,320,802	$107,147,735	$3,897,634	$149,027,695
Hay	$9,619,015	$7,960,315	$8,294,139	$17,056,059	$3,983,754	$46,913,283
Total – Broadacre Crops	**$76,747,193**	**$9,380,609**	**$14,602,785**	**$227,029,743**	**$10,462,654**	**$338,222,984**
Horticulture						
Grapes	$770,910	$322,996	$86,359	$98,204	$259,224	$1,537,693
Fruit and nuts	$0	$49,248,000	$154,280	$94,549	$819,432	$50,316,261
Other horticulture	$0	$959,263	$3,371,225	$12,397,664	$5,595,454	$22,323,606
Total – Horticultural crops	**$770,910**	**$50,530,258**	**$3,611,863**	**$12,590,418**	**$6,674,111**	**$74,177,560**
Livestock products						
Wool	$24,146,030	$7,230,485	$32,882,737	$21,435,705	$22,709,188	$108,404,144
Sheep and lambs	$40,575,744	$11,077,319	$49,388,031	$30,141,104	$33,568,576	$164,750,774
Cattle and calves	$56,085,042	$103,258,416	$42,655,693	$33,480,191	$16,001,788	$251,481,130
Milk	$49,590	$16,708,813	$987,696	$4,841,438	$207,579	$22,795,115
Pigs	$77,719	$19,293	$173,118	$3,219,703	$2,704	$3,492,537
Poultry and eggs	$469,807	$54,399	$8,910,445	$1,586	$46,294	$9,482,532
Goats and other livestock	$193,121	$18,452	$20,862	$132,409	$11,836	$376,680
Total – Livestock products	**$121,597,054**	**$138,367,176**	**$135,018,582**	**$93,252,136**	**$72,547,964**	**$560,782,912**
Total – Agriculture	**$199,115,157**	**$198,278,044**	**$153,233,230**	**$332,872,296**	**$89,684,729**	**$973,183,456**

The total gross value of agricultural production in 2020-21 was equivalent to $590 per hectare over the total area of agricultural holdings (1,650,215 hectares, refer to Table 5-8). However, there were differences between the LGAs which reflect the nature of the agricultural enterprises present. Snowy Valleys LGA had the highest overall average gross value ($838 per hectare) due to the large average gross value of the horticulture industry. The average gross value of production in the Wagga Wagga City LGA ($748 per hectare) was enhanced by its extensive cropping enterprises.

There was also a large difference between the average value of broadacre cropping production ($1,100 per hectare), horticulture production (approximately $88,800 per hectare) and grazing production ($418 per hectare).

The value of agricultural production is greatly influenced by seasonal and market conditions and can fluctuate widely from year to year.

6 Construction impacts

6.1 Loss of land use

6.1.1 General comments

The project would not affect the intrinsic capability or physical characteristics of the soil and land in or adjacent to the agricultural study area. Rather, the main impact of the project on soil and land capability would be through the temporary or permanent removal of areas from agricultural production to accommodate the project.

The exact land uses within these areas cannot be accurately determined because land use data is not accurate to the required fine scale. Table 5-5 indicates that approximately 74 per cent of the project footprint is used for grazing. Therefore, a similar percentage of the land use lost due to construction is expected to be grazing land. Cropping (nine per cent of the project footprint) makes up almost all of the remaining agricultural land, while non-agricultural uses (including forestry) comprise 16 per cent of the project footprint.

The main enterprises found in the agricultural study area are relatively productive with extensive high value cropping and grazing, and smaller areas of very high value horticulture.

The impact on agricultural land use would be limited by the relatively small area permanently and directly affected, the continuation of some agricultural enterprises over most of the agricultural study area, and the proposed mitigation measures (refer to Chapter 9).

6.1.2 Area directly affected

The project footprint would include areas required for permanent work such as transmission line structures, access tracks and substations as well as temporary areas required for construction (such as temporary construction compounds, brake and winch sites, and a worker accommodation facility). The project footprint covers an area of 8,551 hectares. Of this, approximately 7,178 hectares (84 per cent) is used for agriculture (refer to Table 5-5).

Although the project footprint is relatively large, the agricultural land directly impacted by permanent and temporary works would be relatively small in the context of the agricultural study area and the regional agricultural industry. The part of the project footprint on agricultural land (7,178 hectares) is equivalent to approximately 0.4 per cent of the total area of agricultural holdings in the five impacted LGAs (1,650,215 hectares).

In addition, the project footprint is conservative and not all of the land is likely to be used for construction of the project. Based on a concept design and construction methodology, the area of land within the project footprint that is likely to be used for construction of the project is approximately 2,712.82 hectares. Of this, approximately 82 per cent is within land mapped as agricultural land uses (refer to Table 6-1).

Table 6-1
Summary of land affected by construction of the project

Element	Indicative area (ha)	Area within agricultural land uses (ha)	Proportion within agricultural land uses
Transmission line structures, easement and access tracks	2,573.49	2,157.58	84%
Construction compounds	98.34	27.69	28%
Worker accommodation facility	10.96	10.41	95%
Proposed Gugaa 500 kV substation	23.17	22.23	96%
New area at the modified Bannaby 500 kV substation	6.73	0.15	2%
New area at the modified Wagga 330 kV substation	0.09	0.00	0%
Telecommunications hut	0.04	0.04	100%
Total direct impact	**2,712.82**	**2,218.10**	**82%**

The land occupied by construction of the transmission line structures would be approximately 406.62 hectares in total across approximately 860 transmission line structures. Approximately 82 per cent of this area is expected to be agricultural land, which is predominantly grazing land and a smaller proportion of cropping land (refer to Table 5-5).

Construction compounds total approximately 98.34 hectares. However, land use data and satellite imagery indicates that some of this land is currently being used for urban or forestry land uses with agricultural land only making up 28 per cent of this land. Approximately 16 hectares of this is cropping land, with the remainder being grazing land. It is likely that the construction contractors may also not use all of the construction compounds and their boundaries will be refined during detailed design.

The identified worker accommodation facility encompasses approximately 11 hectares, the majority of which is currently agricultural land (refer to Table 6-1).

The proposed Gugaa 500 kV substation would occupy approximately 22.23 hectares of cropping land. The substation work at the existing Bannaby 500 kV substation and existing Wagga 330 kV substation would not occupy a substantial area of agricultural land.

Based on indicative access tracks, the new and upgraded access tracks would occupy approximately 190.26 hectares. Approximately 92 per cent of this area (174.65 hectares) is expected to be agricultural land, the vast majority of which would be grazing land.

Construction is estimated to take about 2.5 years to complete. However, construction at each transmission line structure would be intermittent and construction activities would not occur for the full duration at any one location, with a total of up to 21 weeks of intermittent construction activity expected at each transmission line structure. However, impacts at other sites such as construction compounds, substations and access tracks are likely to extend for longer periods. Therefore, impacts would not be experienced on the total area of agricultural land directly impacted by construction work for the full 2.5 years.

Areas not required for operational purposes would be rehabilitated (if required) and returned to their former land uses (or as agreed with landowners) after construction has been completed. The soil and land capability (refer to Table 5-7), and agricultural production, would only be lost on those areas not subject to permanent work during construction and for a limited time afterwards.
The direct impact of the project on agricultural production would be relatively low during construction and would have a minor effect on agricultural productivity. Table 6-1 indicates that 2,218.1 hectares of agricultural land would be impacted by construction. However, agricultural land use across the transmission line easement (1,649.3 hectares) would largely continue during construction. Therefore, 568.8 hectares of agricultural land use would be lost during construction.

The transmission line easement and parts of the agricultural study area outside the project footprint could be affected by other impacts, which may extend over a much greater area than those calculated above. Other impacts are discussed in Sections 6.2 to 6.11.

The value of agricultural production loss is assessed at $590 per hectare (refer to Section 5.5.4 – 2020-21 values). Across the 568 hectares of agricultural land directly impacted by construction, this equates to a total agricultural production loss of $335,120 per annum. Allowing for an average 2.5-year period of disruption across all work sites, the total loss of agricultural production is estimated at approximately $837,800.

6.2 Biosecurity

The following sections address the potential biosecurity impacts during construction of the project.

6.2.1 General biosecurity risks

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

Increased costs could include expenses associated with monitoring pests, weeds or diseases and implementing control measures; while reduced income could include reduced livestock, crop or pasture production, plus lower quality of produce.

Potential carriers of weed seeds, plant material and diseases include vehicles (especially tyres), machinery and personnel (clothing and footwear). These can transport biosecurity matter over relatively long distances (Animal Health Australia, 2018).

Biosecurity matter also has the potential to be spread by soil and water movements associated with construction work. These latter movements generally occur over relatively short distances.

The biosecurity risks would generally be highest during construction due to earthworks, and the greater frequency of vehicle and worker movements.

6.2.2 Weed biosecurity risks

Weeds which present a high biosecurity risk of the project are those:

- which may be spread readily by activities associated with the project
- that are adapted to the environmental conditions of the region
- that would have a substantial economic impact if they were to spread.

Weeds that are present in the region and present a potential biosecurity threat are discussed in Section 5.1.10.

Weeds such as some cactuses, spiny burrgrass, caltrops, 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. For example, silver-leaf nightshade is difficult to control in pastures and irrigation areas, while spiny burrgrass containment presents a challenge in pastures and crops. Noogoora burr and Bathurst burr are important contaminants which decrease wool quality and prices.

There are numerous other weeds which could potentially have a large impact on the agricultural enterprises, however the risk is moderated by:

- most weeds not being readily spread by activities associated with the project
- limited adaptability of some weeds to the environmental conditions of the region.

The risk of weed spread associated with the project would be high, and the maximum potential impact would occur during construction due to earthworks, the frequency of vehicle and personnel movements, and increased weed growth due to disturbance of ground cover and soil.

Mitigation measures to limit and manage the weed biosecurity risk are provided Chapter 9.

6.2.3 Livestock pests and diseases biosecurity risks

Sheep lice, OJD and ovine footrot are likely to be the most important livestock pest and disease risks associated with the project. These sheep diseases are present in the region and can have large productivity impacts on sheep enterprises.

Footrot is the greatest risk despite its low current prevalence (refer to Section 5.1.10), due to the relative ease of its spread and its high potential economic impact. Virulent footrot is a severe, debilitating disease that causes considerable 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 substantial costs associated with the control of the disease.

OJD is a wasting disease of sheep that can result in sizeable 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 considerable 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 low probability of spread being caused by project activities and the low prevalence of disease in the area (refer to Section 5.1.10).

There are many other important diseases of domestic livestock. Some diseases, such as bovine Johne's disease (BJD), leptospirosis, pestivirus and those caused by internal parasites, have the potential to be spread by uncontrolled livestock movements or carried by humans. However, the chance of this arising from activities associated with the project would be low.

Other diseases, such as anthrax, bovine respiratory disease, cheesy gland, clostridial diseases, ovine brucellosis, pinkeye, three-day sickness, trichomoniasis and vibriosis, are very unlikely to be spread by proposed construction activities.

Foot and mouth disease is an emerging issue in Indonesia, and appropriate measures would be implemented if there is any risk of introduction via construction of the project.

6.2.4 Vertebrate pest biosecurity risks

The most important vertebrate pests in the vicinity of the agricultural study area are likely to be pigs, foxes, rabbits and kangaroos. Other pest species such as deer, goats, horses and wild dogs have a more restricted distribution, and lower overall economic impact. All these pests have economic impacts on agricultural enterprises arising from lamb predation, fence damage or consumption of pasture and crops.

The project is unlikely to change the number or movement patterns of vertebrate pests and therefore the impacts from vertebrate pest spreading is considered to be very low. Agricultural land is generally subject to existing land clearing, cropping and intensive grazing. Therefore, pest animals can move relatively freely through agricultural land, except where fences provide a barrier to movement. The project would not be expected to increase pest animal movement across agricultural land because relatively little additional clearing would be undertaken, and existing fences would be largely unchanged and not provide a lesser barrier to pest movement.

It is unlikely that pest movement would materially increase from other land types, such as national parks, onto agricultural land because of the project. Pest species can already move relatively freely in national parks, and the barrier provided by existing fences would not decline because of the project.

6.2.5 Plant disease and pest biosecurity risks

There are biosecurity risks associated with plant diseases and pests in the horticultural industries on and around the agricultural study area. In particular, there is a ban on taking grapevines, cuttings, budwood, or soil that has been in contact with grapevine material into the Phylloxera Exclusion Zone. This zone covers most of NSW including the agricultural study area.

The agricultural study area is also in the Potato Biosecurity Zone which covers all of NSW. The movement of plants belonging to the family Solanaceae and associated matter is banned from entering the zone.

There are a wide range of exotic and endemic pests and diseases of the apple and other fruit industries. People moving between orchards, nurseries and other horticultural regions can spread pests on vehicles, equipment, boots and clothing. The most obvious risks are pests carried in soil and plant material. Many pests and diseases can be spread by infected plant material (Plant Health Australia, 2010).

Biosecurity risks to beehives pollinating horticultural crops are also a concern. There are a number of exotic pests which that have the potential to severely impact on the honeybee and pollination-dependant industries if they were to become established. In addition, the spread of pests already established in Australia, such as the small hive beetle, American foulbrood and European foulbrood pose a biosecurity risk (Plant Health Australia, 2010).

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

Plant diseases or pests are not a substantial issue for most grazing enterprises in the region. However, there are several important crop diseases in the region and pathogens such as rusts can be spread on vehicles, footwear and clothing (Plant Health Australia, 2017). Activity associated with the project has the potential to result in the spread of crop or pasture diseases or pests, but the risk appears to be lower than for the horticultural industry due to the extensive and annual nature of production.

6.2.6 Biosecurity risks to organic producers

Organic producers face the same pest, weed and disease biosecurity risks as non-organic producers. However, there is an additional risk associated with the introduction of non-organic plants or materials to an organic property. These could include genetically modified plants, mineral fertilisers and synthetic pesticides. Construction activities are not expected to use or introduce genetically modified plants, and there are alternatives to the use of mineral fertilisers and synthetic pesticides. Therefore, the risk to organic produces would be very small with appropriate mitigation measures (refer to Chapter 9).

6.3 Restricted movement

It is unlikely that construction activities would substantially restrict movements of landowners, agricultural workers, their livestock or equipment within the agricultural study area. It is possible that some movement would be affected temporarily due to restricted access to the work sites within the project footprint. However, these restrictions would be generally short in duration, in a limited location and would be undertaken in consultation with relevant landowners. Therefore, construction activities are unlikely to markedly affect movements across landowners' properties for agricultural purposes.

Such restrictions are more likely to occur in cropping and horticultural areas than grazing areas due to the higher intensity land use. In addition, there are generally greater restrictions in movement of livestock and vehicles across cropped areas than pasture areas. Further restrictions caused by construction activities could exacerbate existing restricted access in cropping and horticultural areas.

6.4 Impacts on ground agricultural operations

Construction activities on pasture, cropping or horticultural land would have the potential to disrupt normal on-ground husbandry operations. Critical times include crop sowing (approximately April to June) and harvesting periods (typically October to December). Delays to these activities can result in large income losses due to sub-optimal sowing times and weather damage. Some direct damage to crops and pastures may also occur due to vehicle and plant movement and the construction of transmission line structures, access tracks and ancillary work.

Airborne dust from vehicle movements and construction activities can reduce the yield and quality of crops and pastures. Dust can block stomata, hinder transpiration, reduce photosynthesis, foster pathogens and make pasture less palatable to livestock. The impact of dust generated by construction activities is likely to be minor due to the limited earthworks and amount and duration of traffic flow on each access track.

Usual cultivation, crop establishment and spray travel patterns would also need to be adjusted to avoid transmission line structures and other infrastructure elements during the construction process, and care would need to be taken to avoid collisions when using wide farming equipment. The impacts of the infrastructure elements such as electricity transmission line structures and lines on controlled traffic farming (CTF), steering guidance, weed control and cropping under transmission lines would commence during construction and continue into the operational phase. These impacts are discussed further in Section 7.4.

The impact on crop, pasture and horticultural operations in the agricultural study area during construction would be relatively minor due to the small areas directly affected (refer to Section 6.1.2), the relatively short construction period at each location, and the ability to continue cropping across most of the project footprint during construction.

6.5 Impacts on irrigation activities

In addition to the impacts outlined above, irrigated cropping or horticulture enterprises may be subject to other impacts during construction. Construction activities and erection of new transmission line structures may require some irrigation infrastructure to be modified or moved, in agreement with the landowner, where they impact on the operation of irrigation blocks areas. These impacts would commence during construction and continue into the operational phase and are discussed in Section 7.5.

The 2017 land use records (DPIE, 2020) indicate that there are approximately 58 hectares of irrigated cropping and 181 hectares of irrigated perennial horticulture within the agricultural study area. Only four hectares of irrigated perennial horticulture are located in the project footprint. No irrigated cropping is located in the project footprint (refer to Table 5-5). There is also some irrigated land near the agricultural study area in the Batlow and Tumut areas. Satellite imagery from January 2019 indicates that most or all of this area was no longer used for tree crops. Therefore, the impact on irrigation activities is expected to be minor.

6.6 Impacts on aerial agriculture operations

Impacts on aerial agriculture operations (such as aerial spreading of fertilisers and aerial spraying) and drones have the potential to arise from the construction of transmission line structures in cropping or horticultural areas. However, the impacts would be limited to a relatively small areas around transmission lines and transmission line structures where continued aerial applications would be unsafe or ineffective.

The construction of the transmission line may restrict the use of nearby airstrips for aerial agriculture in some cases where safe landing and take-off is compromised. Safety issues may also prevent the aerial application of fertiliser and pesticides while construction personnel are present on site. However, the risk would generally not be long-lasting and would be minimised through consultation with landowners.

Other activities such as the construction of compounds, tracks and substations are likely to have minimal impact.

The impacts on aerial agriculture operations would commence during construction and continue into the operational phase, and are discussed in Section 7.6.

6.7 Impacts on livestock enterprises

The main potential impact on livestock enterprises would be disturbance of sheep and cattle caused by noise and vehicle movements. Although livestock habituate to disturbances, the noise and movement of construction vehicles and other construction activities may have an impact on livestock in specific circumstances, especially during calving and lambing periods. Livestock can be panicked, particularly if they are new to the area near the project (such as relocated, agisted or newly purchased animals) or if they are not accustomed to human contact.

Although there is potential for some disturbance, the effect on productivity is expected to be relatively minor.

The removal of vegetation from the easement may have a major impact on the available shade or shelter in a few areas. In most cases, there would be sufficient shade and shelter remaining to meet livestock requirements. In affected areas, grazing management may need to be modified (for example, undertaking lambing in alternative more sheltered paddocks) and replacement shade and shelter vegetation may need to be established. The overall impact on livestock productivity is expected to be small.

Considerable disruption to livestock enterprises (such livestock deaths, illness and stress; disease spread; mixing of animals and uncontrolled breeding) is possible if stock water pipelines or fences are damaged and not promptly repaired during construction, or if gates are left open.

Grazing management would also be disrupted if construction activities result in paddocks being temporarily unavailable for grazing, or cause a disruption to the grazing pattern of livestock.

6.8 Biophysical strategic agricultural land

The area of BSAL within the project footprint would be 447 hectares. This is equivalent to 5.2 per cent of the total project footprint.

The impact on BSAL would be minor due to the small area involved and because agricultural production would only be temporarily lost on most of this area during construction and for a limited time afterwards. Most of the area would be rehabilitated (if required) and returned to its former land use after construction is completed or as agreed with the landowner. There would be small areas with long term impacts due to permanent structures.

6.9 Draft State significant agricultural land

The area of draft SSAL within the project footprint would be 534 hectares. This is equivalent to 6.2 per cent of the total project footprint. This is 19.5 per cent higher than the amount of BSAL.

As for BSAL, the impact on SSAL would be minor due to the small area involved and the temporary impact on most of this area during construction. Most of the area would be rehabilitated (if required) but there would be small areas with permanent impacts due to the location of permanent structures.

6.10 Fire risk

Fires have the potential to cause great damage to livestock, agricultural infrastructure (such as residences, 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 in some areas.

A Bush Fire Emergency Management and Evacuation Plan (BFEMEP) would be prepared for the project and would include mitigation measures applicable to construction activities undertaken during the bushfire danger period, including mitigation measures on Total Fire Ban days and days of elevated fire danger (High Fire Danger Rating forecast or greater). The implementation of this plan is expected to adequately manage the bushfire risk during construction. Fire risk is discussed in greater detail in *Technical Report 13 – Bushfire Risk Assessment*.

6.11 Travelling stock reserves and livestock routes

It is possible that some movement of livestock along TSRs or public roads would be affected temporarily by restricted access to construction areas. However, these restrictions would be of a short duration during construction and stringing procedures and the project is not expected to majorly prevent or hinder livestock movements, or impact the use of TSRs. Only four TSRs intersect with the project footprint (refer to Section 5.1.10).

7 Operational impacts

7.1 Loss of land use

Operation of the project would result in permanent change in land use, from the existing agricultural land use to electrical infrastructure, where permanent infrastructure would be established (eg transmission line structures, telecommunications hut, permanent access tracks and at the proposed Gugaa 500 kV substation). The soil and land capability, and agricultural production, in these areas would be lost during the operational life of the project.

Grazing and cropping operations would be able to continue on other areas of the project footprint, such as the land under the conductors between transmission line structures.

7.1.1 Impacts

Easements (typically 70 metres wide with a few locations that would be wider) would be established along the transmission line to ensure Transgrid can access its infrastructure for maintenance purposes. These easements would reduce the area available for certain land uses such as fruit tree orchards and agroforestry due to height limitations of vegetation that would be permitted within the easement. However, the land within an easement, and immediately next to proposed infrastructure could continue to be used for grazing and other agricultural activities such as cropping, subject to some height restrictions (refer to Section 7.4).

Some of the project footprint (such as bases of the transmission line structures) would not be permanently removed from agricultural production. For example, grazing may continue under the transmission line and around the transmission line structures. However, in cropping areas, the transmission line structure and a safe buffer around the structure would result in some areas being permanently unable to be cropped in the future.

Other parts of the project footprint, such as permanent access tracks, are likely to affect soil characteristics to the extent that these locations would no longer be productive cropping or pasture areas. This would greatly reduce land and soil capability in these locations, but they comprise only a small percentage of the agricultural study area.

The potential impact of a new transmission line on irrigated horticultural land is relatively high due to its high productivity (refer to Section 5.5.4). However, it is not expected that any irrigated horticultural land would be taken out of production by the operation of the project. Although the land use data shows 4 hectares of 'irrigated perennial horticulture' (refer Table 5-5), satellite imagery shows that this area (located near Wondalga, north of Batlow) has been abandoned or is disused.

7.1.2 Area affected

The direct impact of the project on agricultural production would be minimal during operation due to the small area affected (refer to Table 7-1) relative to total size of agricultural enterprises within the five impacted LGAs. Although overall impact is small, the impact on individual properties may be proportionally greater, especially for small properties with a relatively large easement compared to the total property size.

Table 7-1
Summary of land affected by operation of the project

Element	Indicative total area (ha)	Area within agricultural land uses (ha)	Proportion within agricultural land uses
Transmission line structures	38.61	31.74	82%
Transmission line easement and access tracks	2,521.62	2,116.95	84%
Proposed Gugaa 500 kV substation	23.17	22.23	96%
New area at the modified Bannaby 500 kV substation	6.73	0.15	2%
New area at the modified Wagga 330 kV substation	0.09	0	0%
Telecommunications hut	0.04	0.04	100%
Total	**2,590.26**	**2,171.11**	**84%**

The permanent area of agricultural land used for the transmission line structures would amount to approximately 31.74 hectares, spread across the length of the project footprint. Approximately 84 per cent of this area is expected to be agricultural land, which is predominantly expected to be grazing land with a small portion being cropping land (refer to Table 5-5).

There would also be approximately 22.23 hectares of permanent disturbance of cropping land at the proposed Gugaa 500 kV substation and 0.15 hectares of permanent disturbance of grazing land at Bannaby 500 kV substation. The area of permanent disturbance at the telecommunications hut is less than 0.4 hectares.

It is assumed for the purposes of these calculations that all indicative access tracks could be permanent. However, in reality there is potential that not all access tracks would be used for operation.

The total area of agricultural land affected is assessed at approximately 2,171.11 hectares (refer Table 7-1). However, the vast majority of this area consists of the transmission line easement (1,912.34 hectares). While the easement would be subject to the impacts outlined in Sections 7.2 to 7.11, agricultural land uses would essentially continue in this area during operation.

Therefore, the area of agricultural land use that would be lost during operation is estimated at 258.77 hectares. This is equivalent to 0.02 per cent of the total area of agricultural holdings in the five impacted LGAs or 3.03 per cent of the project footprint on agricultural land. Cropping in this area would be precluded, but grazing could continue in parts of this area, such as underneath the transmission line and around transmission line structures.

The exact location of infrastructure elements would influence the amount of land permanently affected. If infrastructure elements are located close to other objects, the land between the two objects has the potential to become inaccessible to cropping equipment. For example, a transmission line structure located 10 metres from a fence may prevent cultivation, seeding, spraying and/or

harvesting in that gap if cropping equipment used is wider than 10 metres. Further consideration of this issue to minimise potential impacts would be carried out during detailed design.

The width of cropping equipment varies from property to property, but sprayers can exceed 40 metres in width, especially on larger cropping properties near Wagga Wagga and Tarcutta. This may increase the distance that is required from transmission line structures to avoid impacts on existing spraying activities for some properties. However, some sprayers have the capacity to fold and operate at narrower widths.

7.2 Biosecurity

Any activity during operation (such as inspections, maintenance and repairs) that requires access of personnel, vehicles or machinery to the transmission line easement poses a potential biosecurity risk to agricultural operations in the vicinity of the project.

The biosecurity risks and potential impacts outlined in Section 6.2.2 in relation to construction are also applicable to the operational phase. The major difference is that vehicle, machinery and personnel activity would be less intense and frequent during operation, and therefore the risk of weed, pest or disease spread would be much lower.

7.3 Restricted movement

It is unlikely that the operation of the project would majorly restrict the movements of landowners, workers, livestock or equipment.

7.4 Impacts on on-ground agricultural operations

The presence of transmission line structures or other facilities on arable crop and pasture land would disrupt, to some extent, normal on-ground husbandry operations around the structure or facility. Usual cultivation, sowing 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. As discussed in Section 7.1.2, the degree of disruption would depend on the location of transmission line structures relative to fences and other objects in some instances. However, the overall impact of the project on production would be minor due to the small areas directly affected, and the ability to continue cropping across most of the transmission line easement and the agricultural study area during operation.

Infrastructure elements such as electricity transmission line structures are particularly problematic for CTF as the permanent cultivation lines would have to be realigned, and would not be straight. In areas where CTF is not currently used, the project may have an impact if the system was implemented in the future. The permanent wheel tracks would need to be adjusted to avoid any infrastructure elements. In some instances, where straight parallel tracks are currently used, the adjusted tracks would not be straight or parallel in parts, leading to inefficiencies in cropping operations.

Many landowners in the agricultural study area, including those employing CTF, use GPS guidance for their cropping equipment. GPS systems use receivers in the equipment, and sometimes in a fixed base station. Concerns have been expressed that the project's transmission lines would have the potential to interfere with the GPS reception by base stations and cropping equipment, or with signals sent by base stations to equipment.

The extent to which interference may occur is assessed in the HumeLink *Audible Noise and Radio Interference Report* (Aurecon, 2022). However, should interference with GPS guidance occur, this would cause a substantial impact on cropping operations. The HumeLink *Audible Noise and Radio Interference Report* (Aurecon, 2022) recommends that where the project causes nuisance interference, signal boosting equipment or antenna enhancement would be offered.

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

Transmission lines above cropping areas can be hazardous due to the considerable height of agricultural plant and equipment such as harvesters and standalone grain augers. 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 and augers are generally the tallest cropping machinery. The working height of standalone augers can vary widely. However, large harvesters have an operating height of around four metres and a total height of approximately five metres with its in-built auger extended while unloading grain.

Transgrid's guidelines indicate that machinery cannot extend more than 4.3 metres above ground level within transmission line easements (Transgrid, 2022a). Consequently, areas within the transmission line easement would not be suitable for grain loading and unloading activities.

7.5 Impacts on irrigation activities

In addition to the impacts outlined in Section 7.4, irrigated crop, pasture or horticulture enterprises may be subject to other impacts.

The use of hand-move irrigation pipes in irrigation areas around overhead power lines can be an additional hazard due to their considerable length. It is unlikely that hand-move irrigation pipes are used much in the agricultural study area. The main irrigated crop in the vicinity of the agricultural study area is fruit trees. Fruit trees are generally not irrigated with hand-move pipes.

Transmission line structures and other associated facilities would have the potential to interfere with moving irrigation equipment, particularly mechanised centre pivot or linear move systems. However, there does not appear to be any centre pivot or linear move systems within the agricultural study area. There are some centre pivot or linear move systems close to the agricultural study area near Tumut.

7.6 Impacts on aerial agriculture operations

Large, localised impacts on aerial agriculture operations (such as aerial spreading of fertilisers and aerial spraying with fixed wing aircraft or helicopters) and drones use have the potential to arise from the presence of transmission lines in agricultural areas.

The efficiency and effectiveness of aerial agriculture operations can decline as application procedures must be amended to compensate for the presence of infrastructure elements. Transmission line structures and transmission lines are a potential hazard for low level aviation activities, and these must be considered in planning a safe aerial application program. The direction of flight, release heights and run lengths may have to be adjusted to maintain safe operations. This can lead to parts of paddocks near infrastructure elements being less effectively treated due to increased release

heights, or some areas may not be able to be treated safely at all. Efficiency of the aerial agricultural operations may decrease and become more time consuming.

Aerial agriculture is extensively used in the mixed dryland farming areas near Wagga Wagga and Tarcutta. Aerial agriculture is less intensive in the eastern part of the agricultural study area, as aerial applications are less frequent in horticultural and grazing situations. Despite this, landowners indicated that some weed control and fertiliser applications are undertaken by air.

The location of the transmission line in the proximity of existing airstrips employed for aerial agriculture may restrict the use of these airstrips in some cases. Nearby transmission lines can compromise safety during take-off and landing. In these cases, use of the airstrips may not be possible in certain conditions, or the airstrip may need to be relocated.

Technical Report 14 - Aviation Impact Assessment identified the project as having a 'major' or 'moderate to major' impact on four aircraft landing areas (ALAs) so that the use of the ALAs would be compromised by the nearby location of transmission lines. A further five ALAs with 'moderate' or 'minor to moderate' impacts were identified, which would result in some flight paths not being available or requiring a moderate adjustment to avoid the transmission line for most types of flight operations.

Eight ALAs and one helicopter landing site would have 'minor' or 'minor to no' impact, requiring a minor adjustment to avoid the transmission line.

The Aviation Impact Assessment concludes that aerial application flights would need to consider transmission lines and structures in planning and conducting their flights and the landowners would need to consider how they are going to treat the area that the aircraft cannot cover. There may be additional costs to be considered by aerial application operators when planning flight paths to be clear of the transmission line.

Proximal sensing using drones is competitive with remote sensing by satellites for crop and horticultural monitoring purposes. Crop sensing by drones can be cheaper, more targeted, more timely, less affected by cloud cover, and provides higher quality images, which would probably result in increased future use. Drones can also be used for mustering and livestock monitoring.

Transmission line structures and transmission lines 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 to 45 metres of power lines, electrical substations and other electrical equipment (Indiana Electric Cooperatives, 2020). Transgrid guidelines indicate that unmanned aerial vehicles (such as drones) cannot be flown within 60 metres of any transmission line structure, guy wire or conductor (Transgrid, 2022a).

7.7 Impacts on livestock enterprises

The main potential impact on livestock enterprises would be movement disturbance of sheep and cattle as discussed in Section 6.7. These impacts would be lower during operation due to a lower intensity of personnel and vehicle movements required for maintenance activities. The potential for damage to fences and other livestock infrastructure and gates being left open, are also lower. Operational impacts related to noise are unlikely to be an issue for livestock enterprises.

There may be some impact on livestock movement and husbandry activities if stockyards and loading facilities are located close to the close to the transmission structures. In these cases, facilities may have to be relocated.

Overhead transmission lines also impact on the operation of electric fencing. Electric fencing must be located at least 30 metres from transmission line structures or supporting guy wires, and have a height of no greater than 2.5 metres (Transgrid, 2022a). 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 and may require the realignment of some fences, but are unlikely to result in major impacts on the operation of grazing enterprises or the movement of livestock.

All metallic fences (electric and non-electric) in the vicinity of transmission lines have specific construction requirements involving earthing and isolation panels (Transgrid, 2022b), which would add some extra construction costs.

7.8 Biophysical strategic agricultural land

The area of BSAL within the project footprint would be 447 hectares, equivalent to approximately 5.2 per cent of the total project footprint.

The impact on BSAL would be minor during operation due to:

- the small area of BSAL impacted compared to the total project footprint
- the loss of agricultural production would be limited to the area occupied by permanent infrastructure elements, however cropping and grazing could continue on BSAL within most of the transmission line easement.

7.9 Draft State significant agricultural land

The area of draft SSAL within the project footprint would be approximately 534 hectares. This is equivalent to approximately 6.2 per cent of the total project footprint (refer to Section 5.4.3).

As for BSAL, the impact on SSAL would be minor during operation due to the small area of draft SSAL impacted by permanent infrastructure elements and the continuation of existing agricultural operations across most of the transmission line easement.

7.10 Fire risk

Fires have the potential to be started by human activities, equipment and vehicles during operation. This risk would be lower than during construction but are dependent on seasonal and weather conditions.

Fires have the potential to 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 hot work, storage and use of dangerous materials, high heat, wind impacts and contact with vegetation.

Transmission lines constructed for this project are planned in some areas near or adjacent to existing transmission lines and more broadly in a landscape where firefighting operations must consider transmission lines in control strategies. The risk of contact with 500 kV transmission lines by aircraft

or water-bucket and cable is lower than the risk posed by other less visible hazards such as trees, lower voltage transmission lines or distribution lines. These risks would be managed with procedural controls, community briefings, and incident briefings as part of a bushfire incident action plan. Bushfire awareness measures, including those relating to potential transmission link risks, would be included in the project specific Bush Fire Emergency Management Evacuation Plan. Fire risk is assessed in greater detail in *Technical Report 13 – Bushfire Risk Assessment*.

7.11 Radio communication interference

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

Radio communications are used by agricultural businesses in many ways, including:

- reception of radio broadcasting
- reception of television broadcasting
- aviation communications and radar
- emergency services radio (including bush fire brigades)
- private UHF radio communications
- mobile phones
- wireless internet
- satellite television and internet
- GPS and auto-steer applications (Section 7.4)
- radio frequency identification (for example, identification of livestock)
- radio frequency control systems (for example, control of irrigation)
- radio frequency telemetry (for example, soil monitoring).

The HumeLink *Audible Noise and Radio Interference Report* (Aurecon, 2022) recommends that where the project causes nuisance interference, signal boosting equipment or antenna enhancement would be offered.

8 Cumulative impacts

The cumulative impact assessment considers other nearby development projects along with the Humelink project, and assesses the scale and nature of the cumulative impacts the projects on key matters.

8.1 Developments

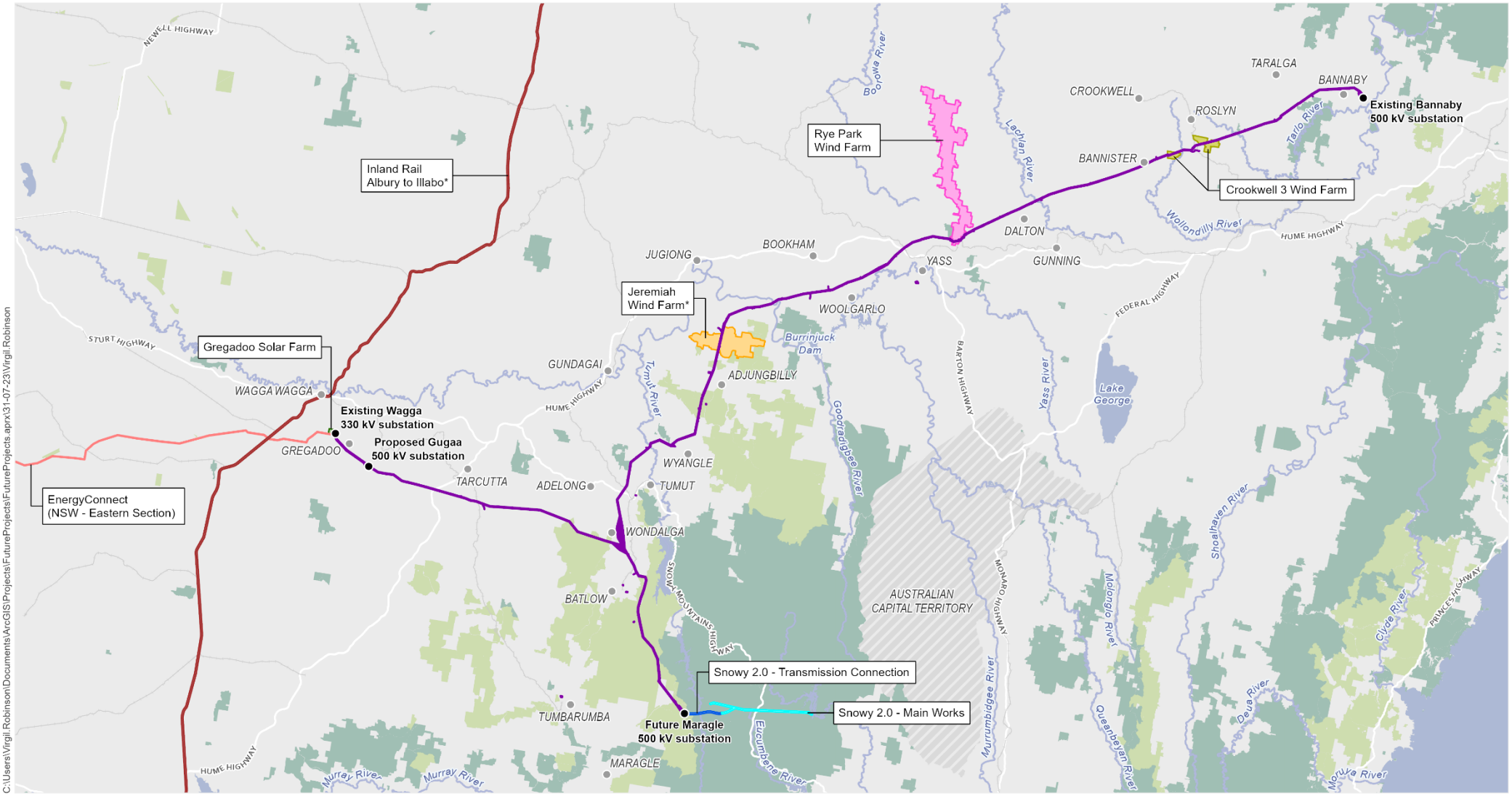
The cumulative impact assessment was prepared in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE, 2022). Projects with the potential for cumulative impacts with the project were identified, and shown in Figure 8-1, through a review of publicly available information and environmental assessments from the following data sources in March 2023:

- DPE's Major Projects register
- DPE's Southern Regional Planning Panel project register
- NSW Independent Planning Commission project register
- EPBC Act Public Ports
- Transport for NSW Projects Map.

A number of proposed developments have been identified as follows.

- EnergyConnect – Eastern Section
- Gregadoo Solar Farm
- Jeremiah Wind Farm
- Rye Park Wind Farm (under construction)
- Victoria to NSW Interconnector West (VNI West)
- Snowy 2.0 - Transmission Connection Project
- Snowy 2.0 - Main Work (under construction)
- Inland Rail – Albury to Illabo
- Crookwell 3 Wind Farm.

Each of these projects is examined in Table 8-1 below.



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Project footprint
National park and reserve
State forest
Waterbody
Waterway
Major road
Railway
Substation

Relevant future projects

Crookwell 3 Wind Farm
EnergyConnect (NSW - Eastern Section)
Gregadoo Solar Farm
Inland Rail Albury to Illabo*
Jeremiah Wind Farm*
Rye Park Wind Farm
Snowy 2.0 - Main Works
Snowy 2.0 - Transmission Connection

*Note: Subject to approval

Source: *Aurecon, Transgrid, Spatial Services (DCS), ESRI Basemap*

1:925,000
0 20 40 km

Projection: GDA 1994 MGA Zone 55

HumeLink **Agricultural Impact Assessment**

FIGURE 8-1: Relevant future projects

Table 8-1
Summary of cumulative impacts identified

Project	Details	Status	Distance and Interface	Cumulative Impacts
EnergyConnect (NSW – Eastern Section)	The EnergyConnect (NSW – Eastern Section) project would comprise 375 km of new 330 kV double circuit transmission line and associated infrastructure between the Buronga substation and the proposed Dinawan 330 kV substation, construction of a new 330 kV substation around 30 km south of Coleambally (the proposed Dinawan substation) and about 162 km of new 500 kV double circuit transmission line (operated at 330 kV) and associated infrastructure between the proposed Dinawan substation and the existing Wagga 330 kV substation. Construction of the project began in early 2023. The construction of the transmission lines and substation facilities would take around 18 months to complete. The upgraded Wagga 330 kV substation and new Dinawan 330 kV substation are expected to be operational by late-2024. Site decommissioning and remediation would extend around six months beyond the commissioning (operational) phase, with estimated completion in mid-2025.	EIS approved 2022	Interface at existing Wagga 330 kV substation	The magnitude of the impacts of this project on agriculture is limited by: — the minor amount of land removed from agriculture — the continuation of agriculture activity despite the construction and operation of the project — the low biosecurity risks. Although the nature of the impacts of EnergyConnect would be very similar to HumeLink, there would be little impact of the project on agricultural productivity at a regional scale. The EnergyConnect project would interface with HumeLink at the Wagga 330 kV substation, and there would be cumulative impacts on agricultural activities in the surrounding area. However, the impacts of both projects are minor compared to the large scale of regional agricultural activity and the cumulative impacts would also be minor. Most of EnergyConnect is distant from HumeLink and would impact different parts of NSW.
Gregadoo Solar Farm	The Gregadoo Solar Farm proposed by Gregadoo Solar Farm Pty Ltd, would be located about 13 km south-east of Wagga Wagga, adjacent to the Wagga 330 kV substation. The project is proposed to comprise construction, operation and decommissioning of a maximum 47 MW solar farm and associated infrastructure. The project was approved on 11 December 2018 and construction is expected to commence mid-2023 and expected to take about 9 months. The EIS for the Gregadoo Solar Farm (NGH Environmental, 2018) indicates that the project land would continue to be grazed with sheep during operation and, upon decommissioning, would be returned to its previous	EIS approved 2018 Modification 2 approved 2021	Adjacent to the Wagga 330 kV substation	The Gregadoo Solar Farm would have little impact on regional agricultural production due to its small size and the continued sheep grazing. Therefore, the cumulative impacts would also be minor.

Project	Details	Status	Distance and Interface	Cumulative Impacts
	agricultural capacity. The solar farm occupies around 96 hectares of a 150 ha property.			
Jeremiah Wind Farm	The proposed Jeremiah Wind Farm by CWP Renewables would be located approximately 29 km east of Gundagai in the Adjungbilly area. The project proposes a 65 turbine wind farm with a maximum tip height of 300 m, battery energy storage system and associated ancillary infrastructure. An EIS is in preparation. Project approval anticipated in 2023 and construction is expected to take 24-30 months. The scale of the impacts would also be reduced by the existing grazing land use of the site, little or no existing cropping, and the relatively low land and soil capability of most of the site. Therefore, the cumulative impacts on a regional and local scale would be small.	EIS in preparation	HumeLink transmission lines would pass through the Jeremiah Wind Farm development area but are not expected to interfere with any of the proposed wind turbines. The expected construction periods of HumeLink and Jeremiah Wind Farm may overlap by up to 18 months between mid-2024 and 2025.	Local impacts would be increased if construction on both projects occurred in the same location at the same time. The construction impacts of both projects are generally restricted to a small area around construction sites, the physical overlap of the projects is a small proportion of the total project areas and construction at each location is of relatively short duration compared to the total construction period. Therefore, any cumulative impacts at a local scale would be managed and minimised. The Jeremiah Wind Farm is unlikely to have a large impact on agricultural production or biosecurity issues in the region. Existing agricultural activities would be able to continue. Therefore, its contribution to any cumulative impacts is expected to be small. Conversely, the wind farm is likely to have a large potential impact on aerial agriculture operations in addition to the impacts of this project, depending on the reliance of landowners in the area on aerial applications of fertiliser and chemical. The cumulative impacts on aerial agriculture operations in the vicinity of the Jeremiah Wind Farm may be substantial, but would be limited to a localised area. Alternative methods of fertiliser and chemical application would ensure that the overall impact on agricultural productivity is low.
Rye Park Wind Farm	The Rye Park Wind Farm is located to the west of Rye Park, to the north-west of Yass and south-east of Boorowa. The modified project includes a maximum of 80 wind turbines with a maximum tip height of 200 m. The project also includes construction of associated infrastructure (substations, operation and maintenance facilities) and upgrades to local	EIS approved 2017 Modification 1 approved 2021	HumeLink transmission lines would pass through the southern end of the wind farm project boundary at Bango (near Bango Nature Reserve).	The Rye Park Wind Farm is unlikely to have a large impact on agricultural production or biosecurity issues in the region. Existing agricultural activities would be able to continue. Therefore, its contribution to any cumulative impacts with HumeLink is expected to be minor.

Project	Details	Status	Distance and Interface	Cumulative Impacts
	roads. The EIS was approved in 2017, and a modification was approved in 2021. Construction commenced in December 2021, with expected completion in June 2023.	Modification 2 preparation 2022		However, the wind farm would have a large impact on aerial agriculture operations with a 500 m no fly zone being implemented around the turbines, according to the Rye Park Wind Farm Environmental Assessment (Epuron, 2014). The cumulative impacts on aerial agriculture operations in the vicinity of the Rye Park Wind Farm may be substantial but would be limited to a localised area. Alternative methods of fertiliser and chemical application would ensure that the overall impact on agricultural productivity is low. The scale of the impacts would also be reduced by the existing grazing land use of the site, little or no existing cropping, and the relatively low productivity of parts of the site. Therefore, the cumulative impacts on a regional and local scale would be small.
Victoria to NSW Interconnector West (VNI West)	The Victoria to NSW Interconnector West (VNI West) project involves targeted interconnector expansion between Victoria and NSW to address transmission network limitations and improve supply reliability. VNI West is still in scoping and market modelling phase to assess the technical and economic viability of expanding transmission interconnector capacity between Victoria and NSW. Construction is proposed to start in 2026 with completion in 2028.	Scoping/market modelling phase Underwriting agreement with Commonwealth Government April 2022	Mostly distant from the HumeLink project.	Specific impacts on agriculture are not known as the corridors have not been determined. The impacts of transmission lines on agriculture at a regional scale are usually small. Some of the corridor options have interconnections with HumeLink, but the preferred option would be distant from the HumeLink project. Therefore, any potential cumulative impacts on agriculture are likely to be low.
Snowy 2.0 – Transmission Connection	The Snowy 2.0 – Transmission Connection project involves a new transmission connection between the proposed Snowy 2.0 pumped hydro and generation project to the existing high voltage transmission network. This includes construction of a new substation in Bago State Forest (future Maragle 500 kV substation), new access tracks and upgrade of existing access tracks and ancillary work to support construction. An EIS has been exhibited. Construction expected to begin in late 2023 with expected completion by end of 2025.	EIS approved 2022	HumeLink would connect to the future Maragle 500 kV substation being constructed as part of the Snowy 2.0 - Transmission Connection project.	The Snowy 2.0 - Transmission Connection Project would be located on non-agricultural land, and therefore negligible impacts on agriculture are expected.

Project	Details	Status	Distance and Interface	Cumulative Impacts
Snowy 2.0 – Main Works	The Snowy 2.0 – Main Works project includes an underground pumped hydro power station and ancillary infrastructure. The main works at Talbingo Reservoir site include excavated rock placement, portal construction and tunnelling, access roads and ancillary facilities for emplacement activities and tunnelling support. Construction is underway and is expected to be completed by 2026.	EIS approved 2020 Modification 1 approved 2022	Main works at Talbingo Reservoir	The main works at Talbingo Reservoir would be located on non-agricultural land, and therefore negligible impacts on agriculture are expected.
Inland Rail – Albury to Illabo	Upgrade 185 km of rail track from Albury to Illabo which passes through Wagga Wagga. Construction is proposed to begin in early 2024 and is expected to take about 16 months.	EIS exhibited between 17/08/22 and 28/09/22 Responding to submissions	Roughly 9 km north-west of existing Wagga 330 kV substation	This upgrade section of the Inland Rail would be constructed on an existing rail corridor and only a relatively small area of agricultural land would be affected.
Crookwell 3 Wind Farm	16 wind turbines up to 157 m in height, connected to the grid via the 330 kV transmission line. Detailed design and pre-construction activities are being carried out with main construction work expected to take about 18 months once commenced	Addendum EIS approved 2019	Project site is within the project footprint	The wind farm would enable agricultural activities to continue on all but 1% of the project site, and therefore its impact on agricultural production would be small.

8.2 Summary

Cumulative impacts on agriculture in the region arising from the project being constructed and operated close to other major projects would not be substantial.

The individual impact on regional agriculture of each project is expected to be relatively small. The total agricultural area affected by the projects is minor, relative to total extent of agriculture in the impacted LGAs through which the project passes. All projects would allow most of the existing agricultural activities to continue on the project land. Biosecurity risks are expected to be low once mitigation measures are implemented. Consequently, the cumulative impact of construction and operation of HumeLink and the other identified projects is expected to be low.

9 Management of impacts

The mitigation measures that would be implemented to avoid or minimise potential agricultural impacts are listed in Table 9-1.

Table 9-1
Mitigation measures – agriculture

Impact	Environmental safeguard	Timing	Relevant location(s)
Direct land use impacts	The location of infrastructure, work sites and access tracks (temporary and permanent) will be confirmed in consultation with landowners . Where permanent tracks are required, a single access track will be designed to serve both temporary and permanent purposes, where possible.	Detailed design and construction	All locations
Property impacts	A property management plan will be developed for directly impacted properties in consultation with landowners and stakeholders. The property management plans will outline the protocols that will be implemented to address landowner concerns during construction. This may include: — the process for rectification of any damage to property infrastructure caused by construction — the process for rehabilitation and stabilisation of disturbed areas following the completion of construction — measures to minimise disruption to agricultural practices during construction — any fencing and gate requirements — specific biosecurity protocols.	Detailed design and construction	All locations
Agricultural impacts	Alternative technologies which could enable weed control close to the transmission lines will be considered.	Detailed design and construction	All locations
Biosecurity	Biosecurity controls will be implemented to minimise the risk of off-site transport or spread of disease, pests or weeds. Controls will be in accordance with Transgrid's *Biosecurity Procedure and Biosecurity Environmental Guidance Note* and include development of specific controls if high biosecurity risks are identified. Appropriate measures will be implemented with respect to foot and mouth disease to control any risk of introduction via the project. The specific controls applicable to a property will be identified in consultation with the affected landowner. The effectiveness of these controls will be monitored in a manner and time interval consistent with the level of risk on each property. In the event of new infestations of notifiable weeds as a result of construction activities, the relevant control authority will be notified as per *Biosecurity Act 2015* (NSW) and Biosecurity Regulation 2017.	Construction and operation	All locations
Access impacts	Management of access on private landowner properties required for access to infrastructure for maintenance, including opening and closing of gates, will be done in accordance with landowner requirements.	Operation	Transmission line

Impact	Environmental safeguard	Timing	Relevant location(s)
GPS impacts	If adverse effects on agricultural precision farming (using GPS) is reported within 12 months of operation, practical rectification measures (including signal boosting equipment or antenna enhancement) will be considered. This will be carried out in consultation with the relevant landowners.	Operation	Transmission line

10 Conclusion

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

- the relatively small amount of land temporarily affected by construction activities and permanently removed from agriculture compared to regional agricultural activity
- the general continuation of agriculture activity across the project footprint and the agricultural study area during construction and operation
- relatively low biosecurity risks after mitigation measures are implemented
- effective mitigation measures would be implemented to reduce the impacts of the project on the agricultural industry.

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

Although overall impacts would be small, impacts at an individual property level may be proportionally greater due to variations in their size, level of impact and nature of their enterprises. For example, impacts on cropping enterprises would generally be greater than on grazing enterprises, and small properties may have a greater proportional impact than a large property.

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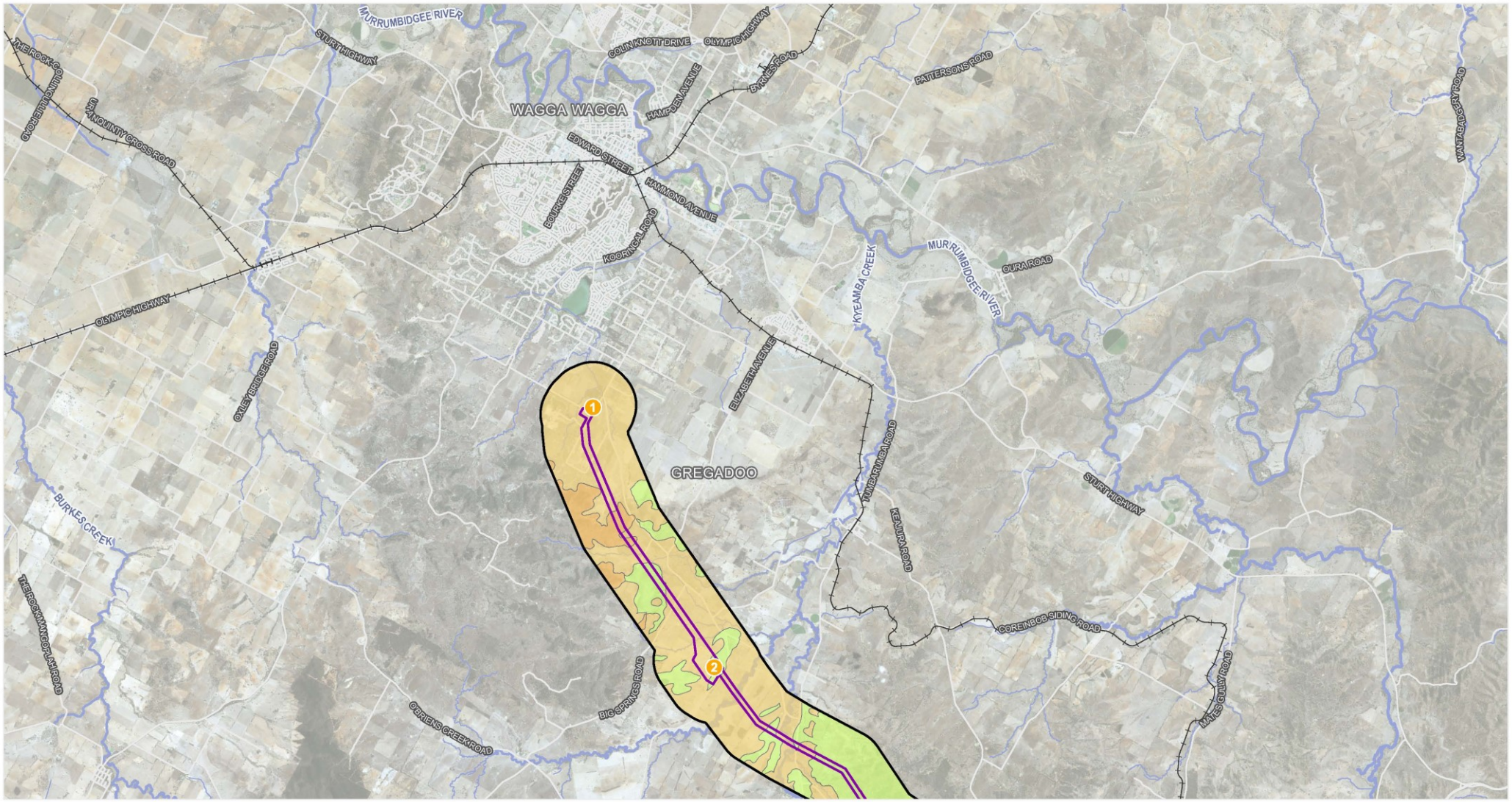
Attachment 1 Inherent soil fertility maps



Project footprint

Agricultural study area

Waterway

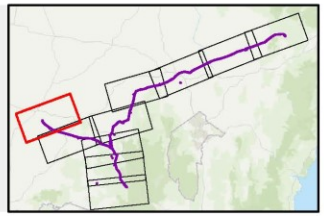
Railway

Construction ancillary facilities

1. Wagga 330 kV substation compound (C01)
2. Gregadoo Road compound (C06)

Inherent Soil Fertility

- 1 - Low
- 2 - Moderately low
- 3 - Moderate



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

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Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 1 of 10**

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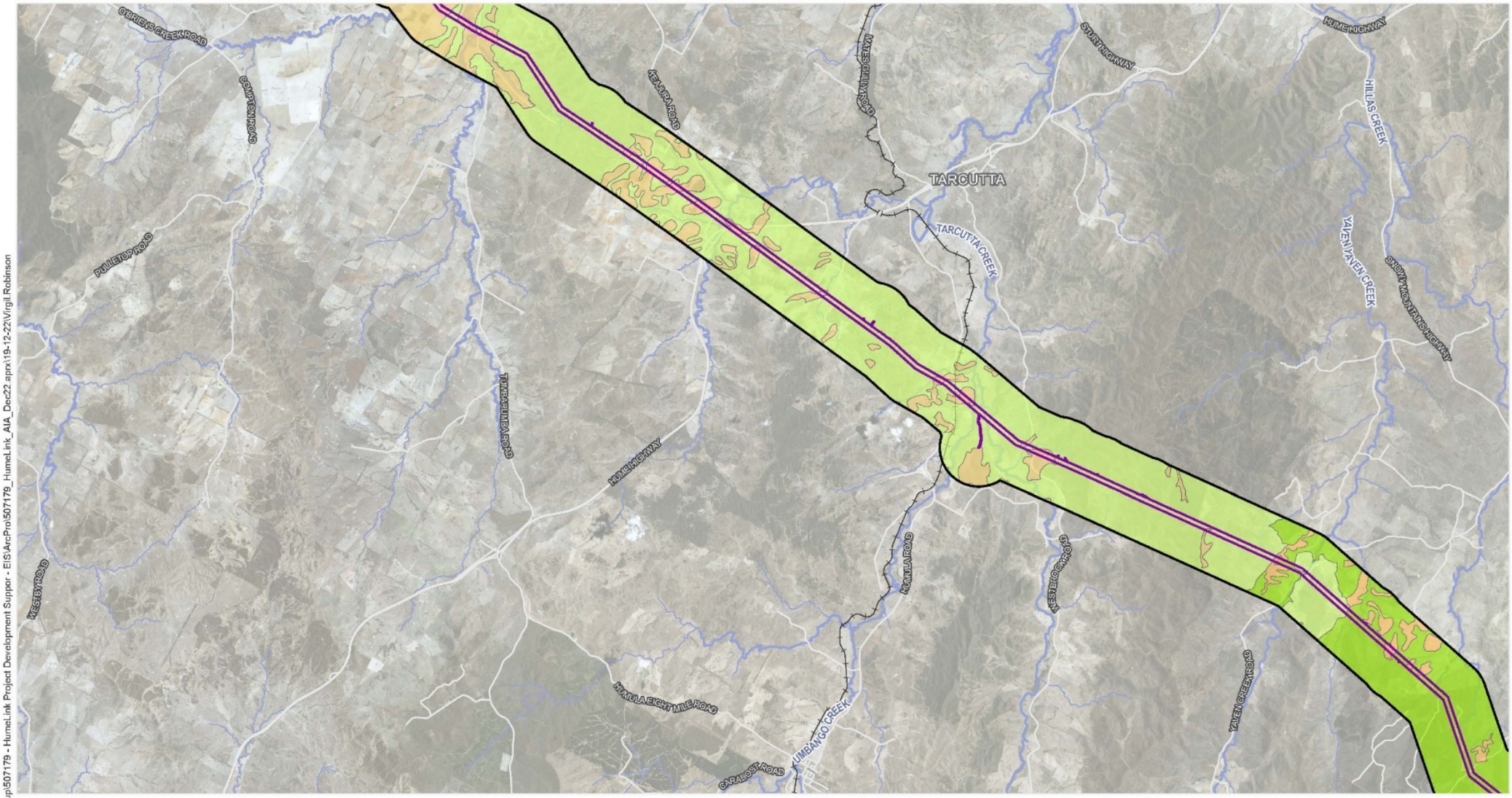
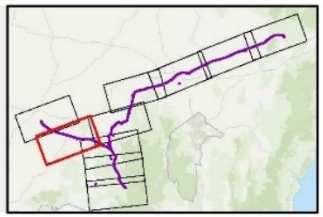


Project footprint
Agricultural study area
Waterway
Railway

Inherent Soil Fertility

1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high



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Projection: GDA 1994 MGA Zone 55

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Attachment 1: Inherent Soil Fertility **Attachment 2 of 10**

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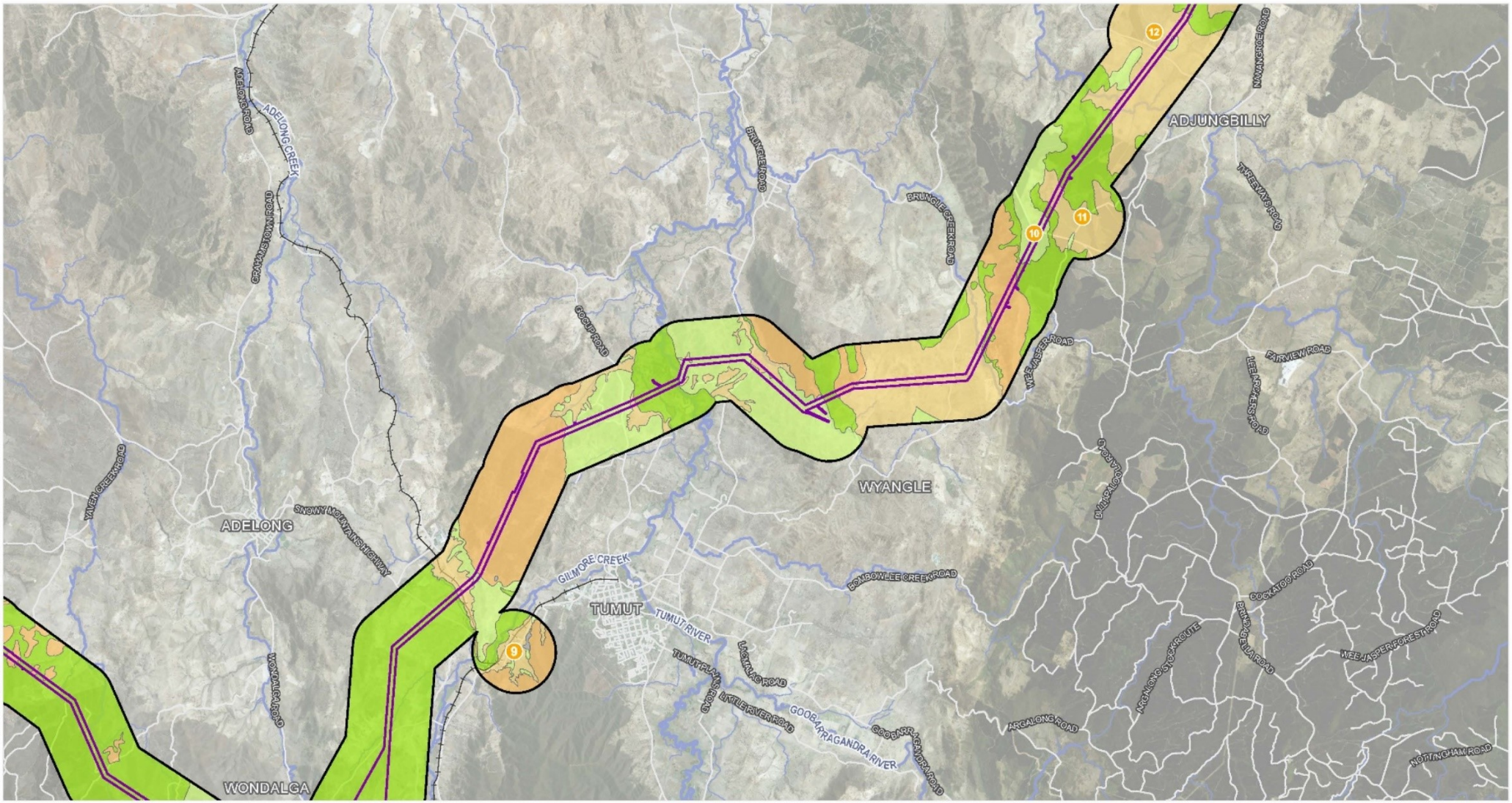

Project footprint

Agricultural study area

Waterway

Railway

Construction ancillary facilities

9 Snowy Mountains Highway compound (C02)

10 Honeysuckle Road compound (C07)

11 Red Hill Road compound (C08)

12 Adjungbilly Road compound (C09)

Inherent Soil Fertility

1 - Low

2 - Moderately low

3 - Moderate

4 - Moderately high

Not assessed

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

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Projection: GDA 1994 MGA Zone 55

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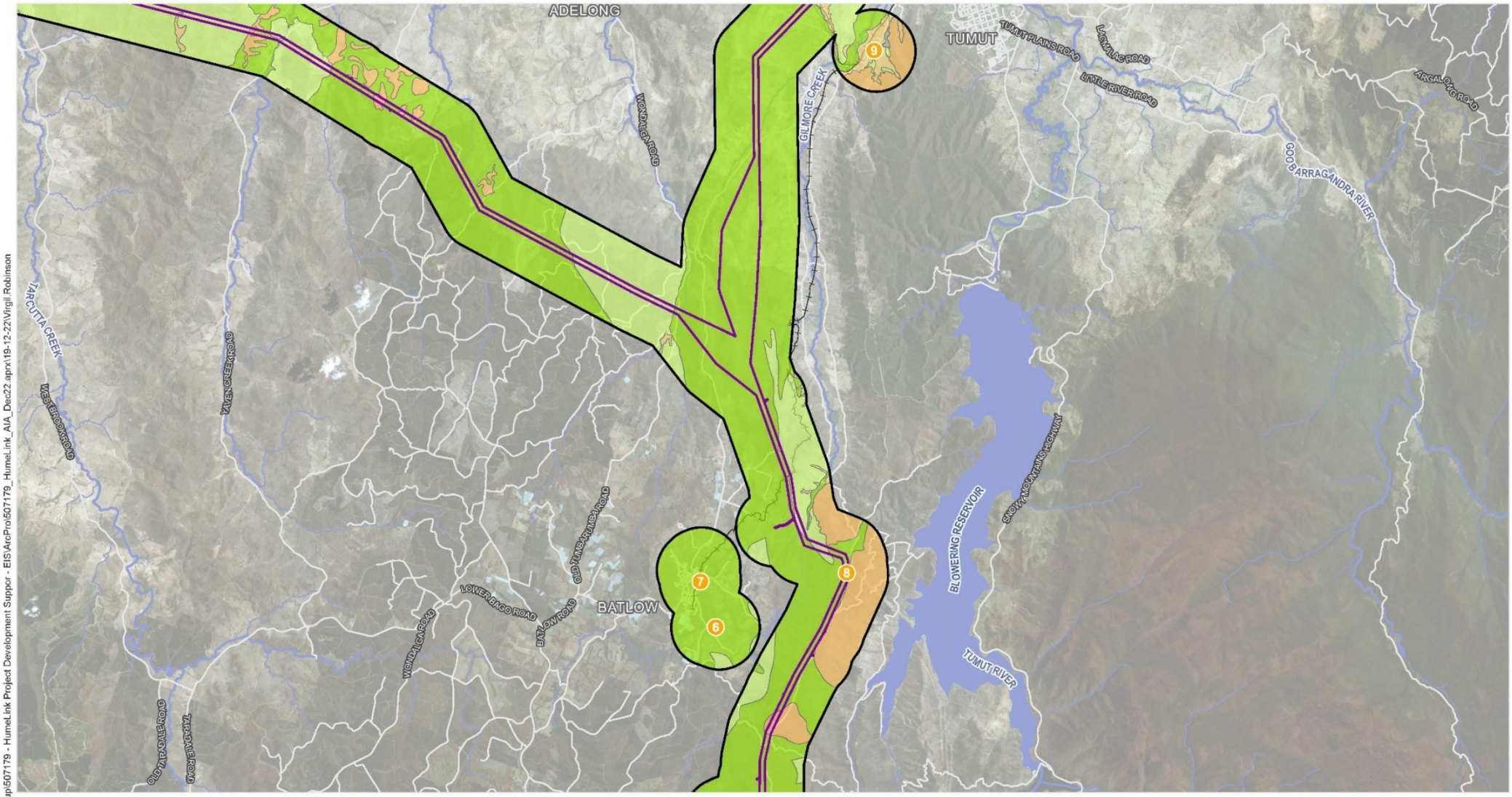
HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 3 of 10**



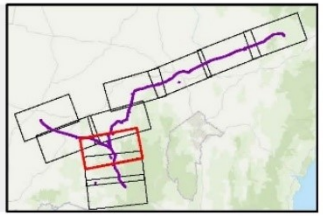
Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities

6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)
9 Snowy Mountains Highway compound (C02)

Inherent Soil Fertility

1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high
Not assessed



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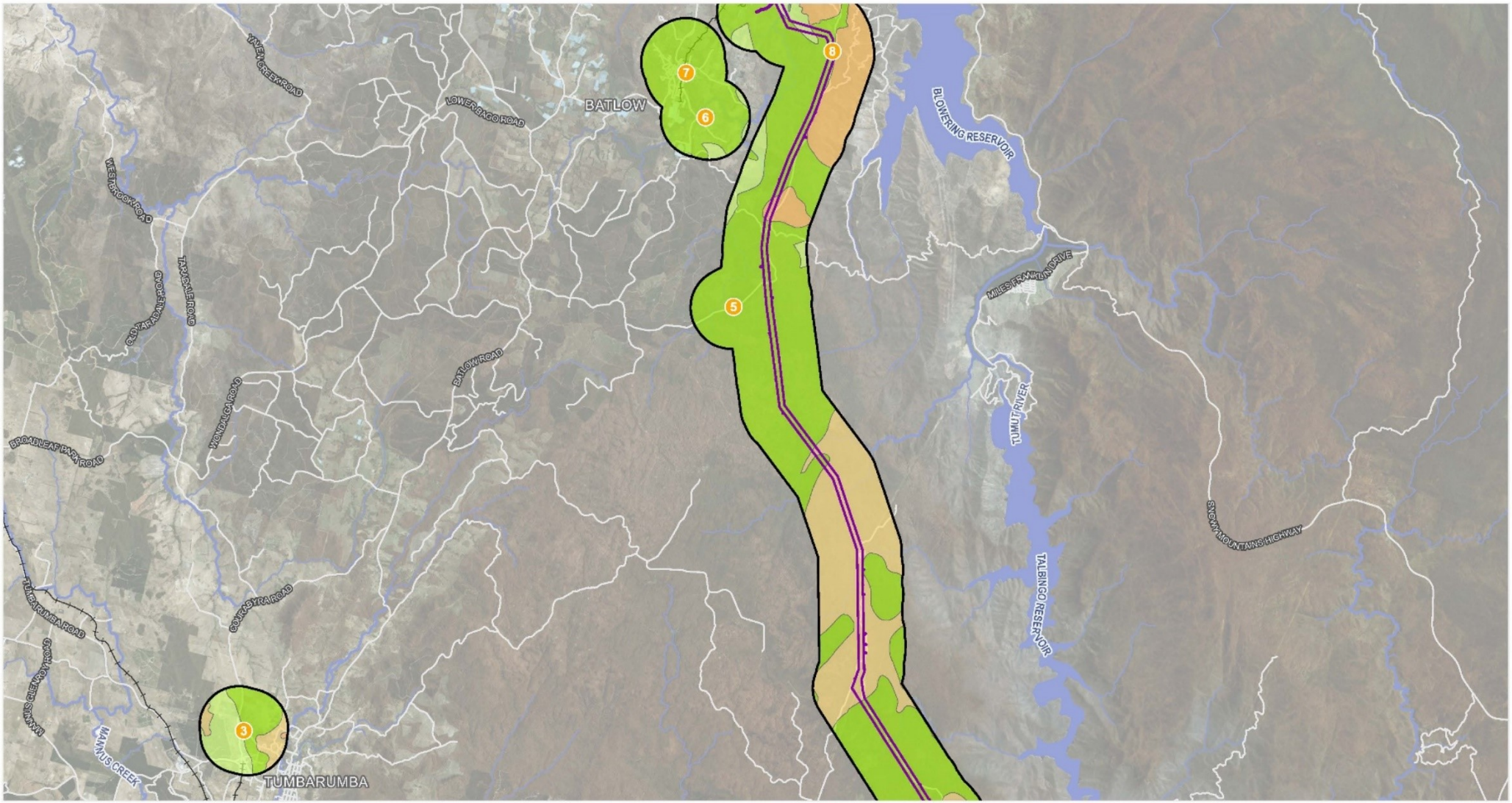
HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 4 of 10**



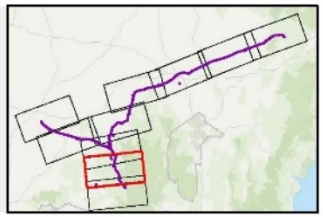
Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)
5 Snubba Road compound (C16)
6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)

Inherent Soil Fertility

1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high



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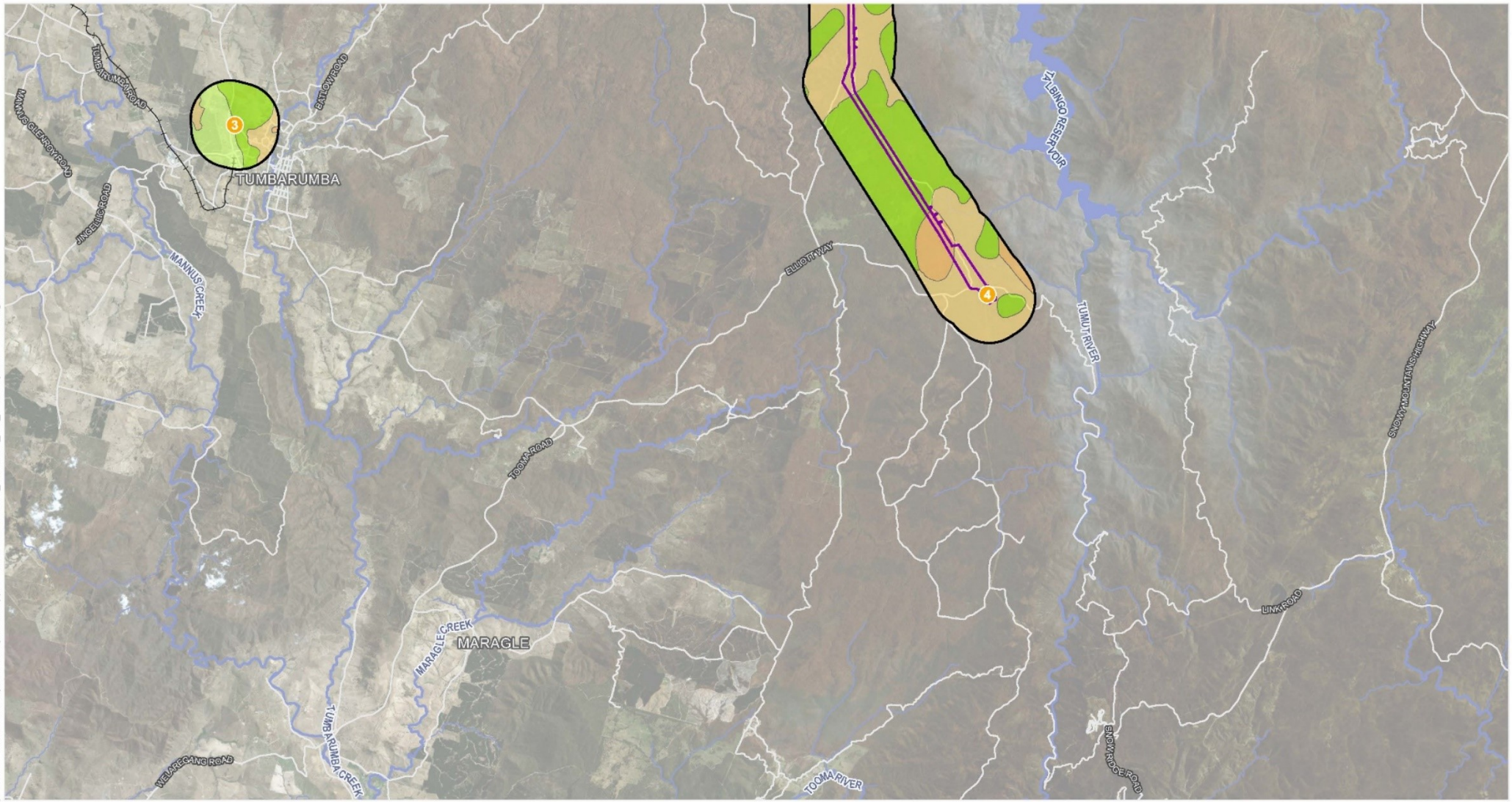
HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 5 of 10**



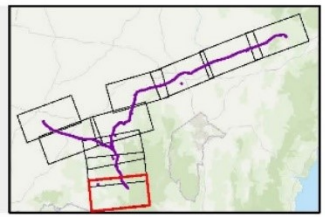
Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)
4 Maragle 500 kV substation compound (C05)

Inherent Soil Fertility

1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high



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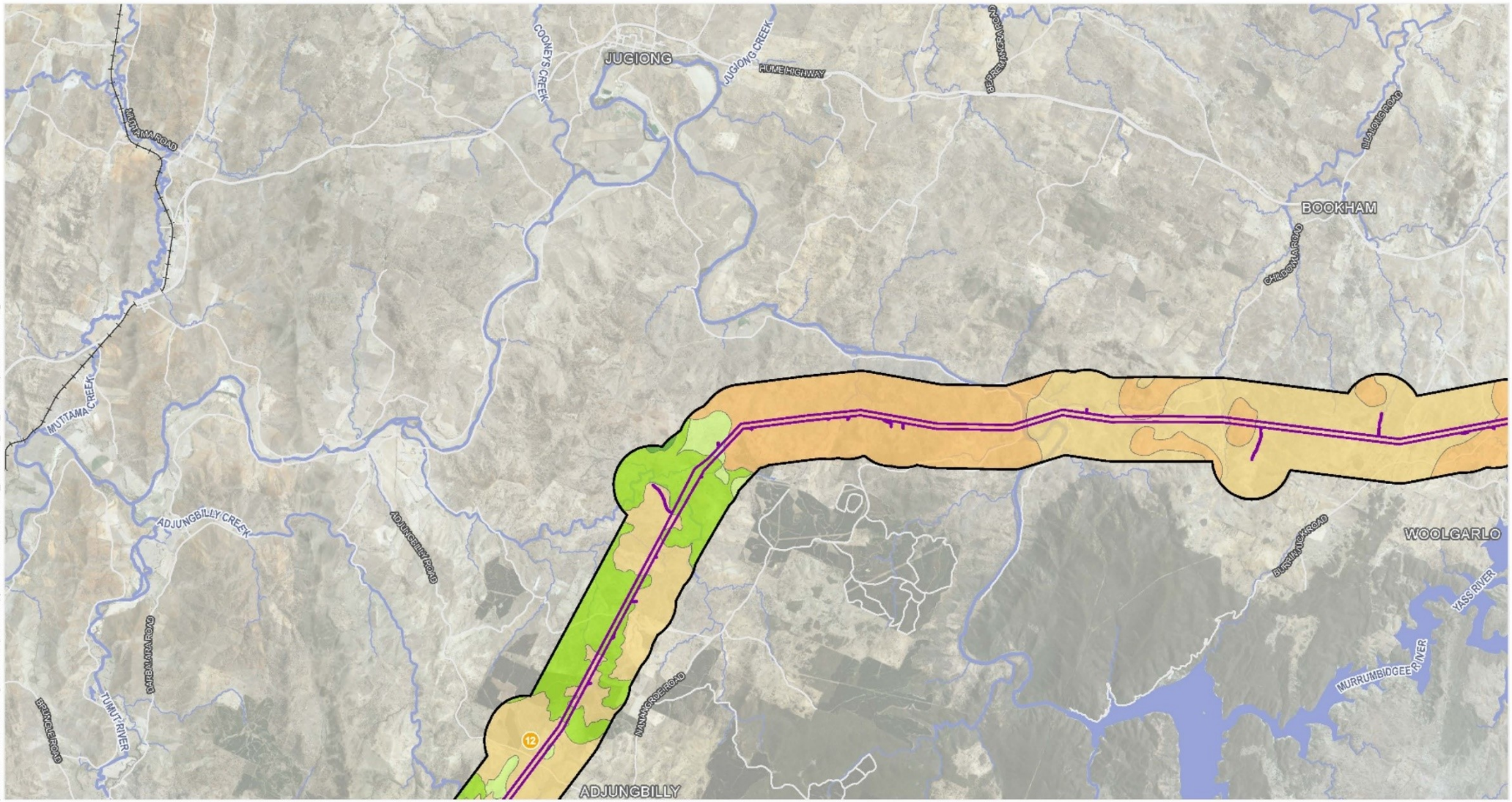
Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 6 of 10**



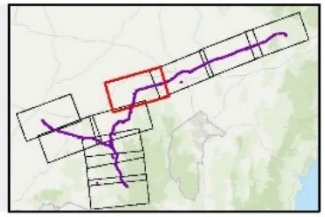
Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities

12 Adjungbilly Road compound (C09)

Inherent Soil Fertility

1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high
5 - High



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Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 7 of 10**

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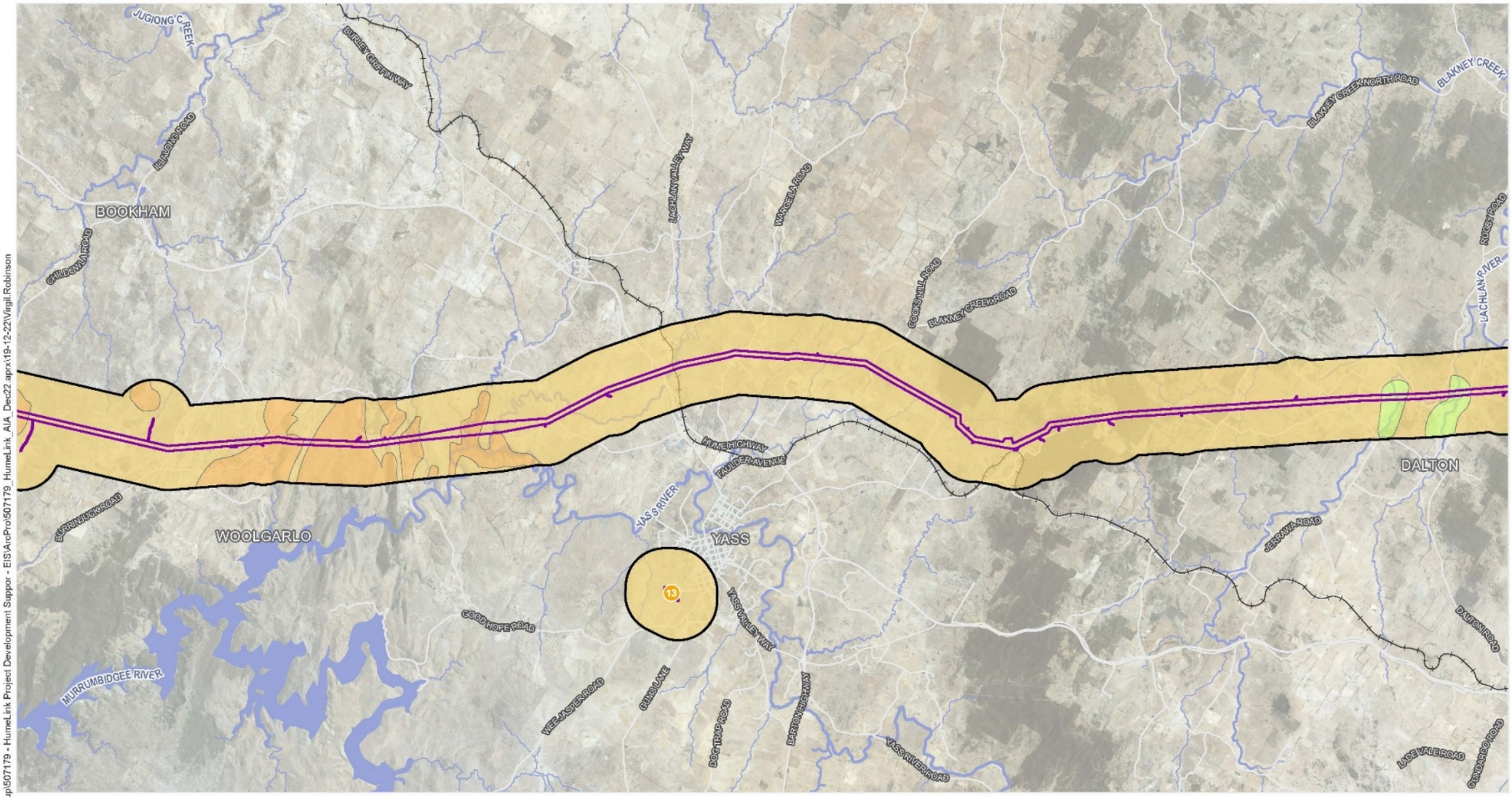
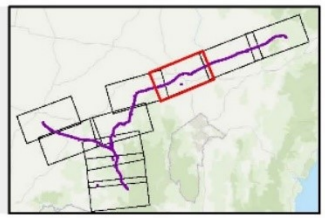


Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities
13 Yass substation compound (C10)

Inherent Soil Fertility
1 - Low
2 - Moderately low
3 - Moderate



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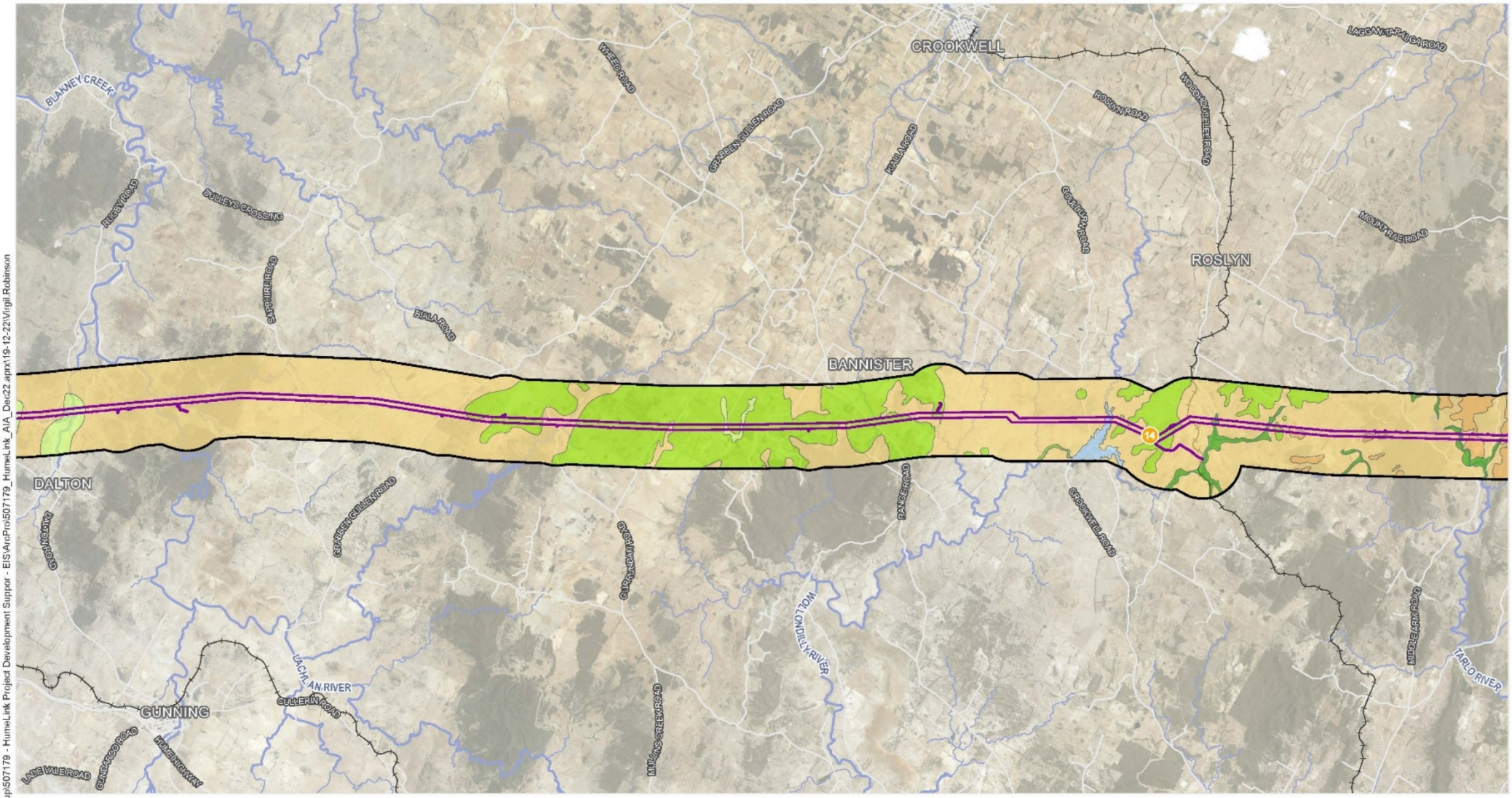
1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

C:\Users\Virgil.Robinson\Aurecon Group\507179 - HumeLink Project Development Suppor - EIS\ArcPro\507179_HumeLink_AIA_Dec22 aprx\19-12-22\Virgil.Robinson

HumeLink

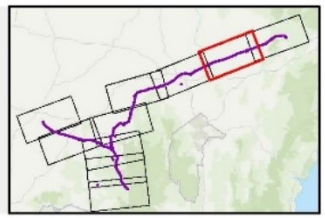
Attachment 1: Inherent Soil Fertility **Attachment 8 of 10**



Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities
14 Woodhouselee Road compound (C11)

Inherent Soil Fertility
1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high
5 - High
Water



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 9 of 10**

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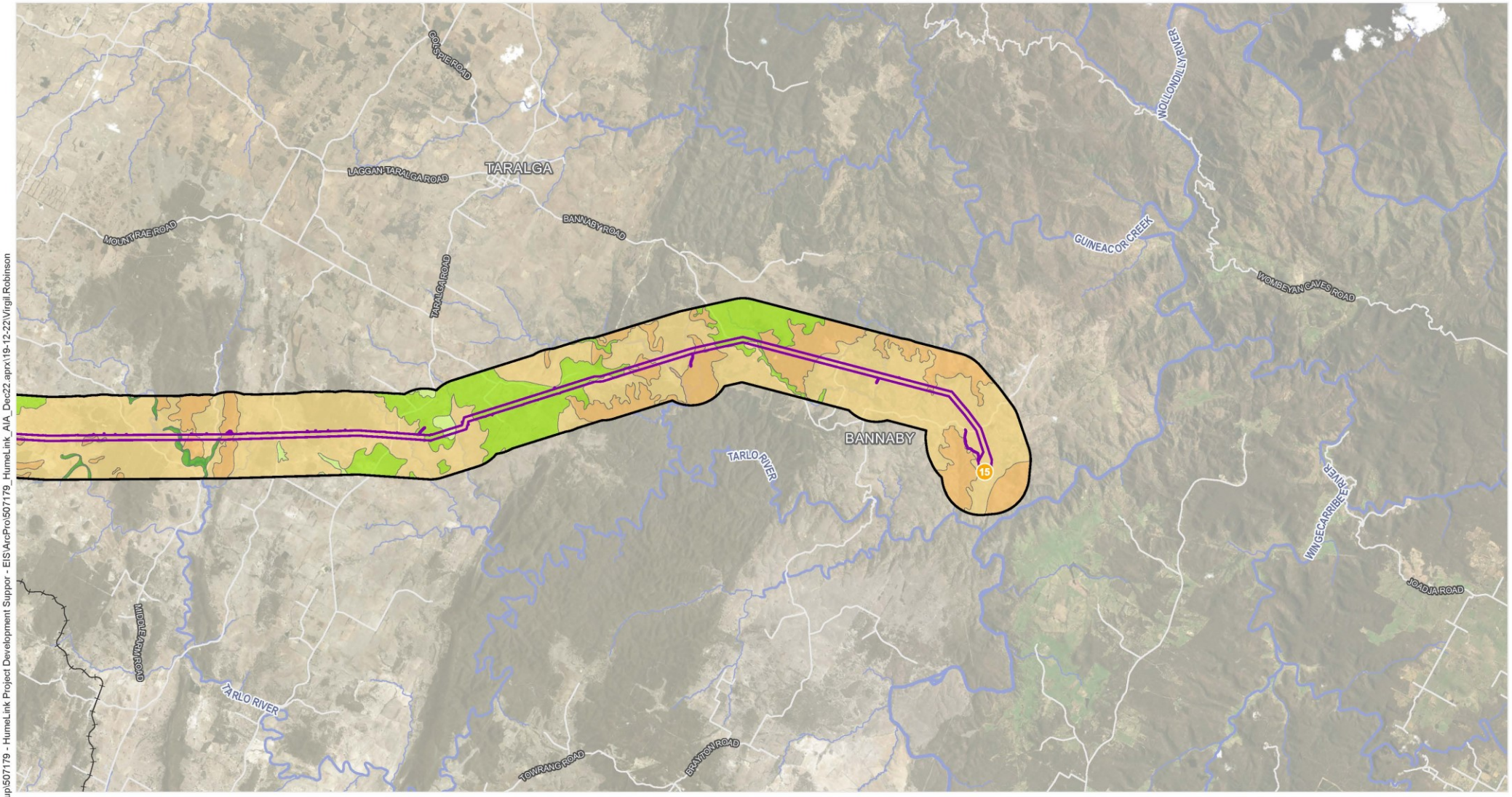


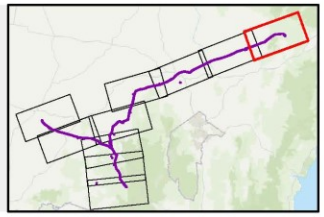
Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

15 Bannaby 500 kV substation compound (C12)

Inherent Soil Fertility

1 - Low
2 - Moderately low
3 - Moderate
4 - Moderately high
5 - High



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

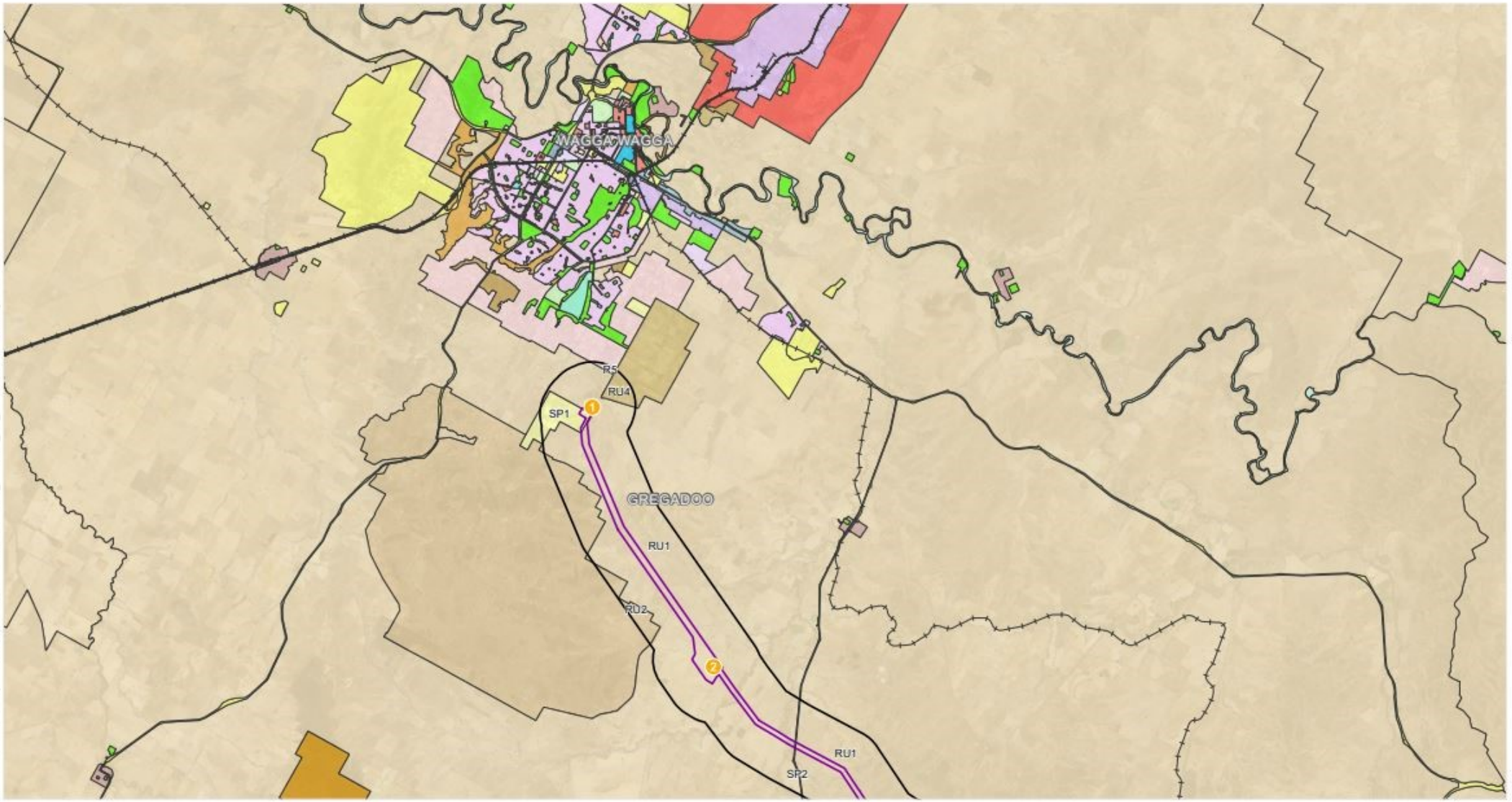
Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 1: Inherent Soil Fertility **Attachment 10 of 10**

C:\Users\VirgilRobinson\Aurecon Group\507179 - HumeLink Project Development Suppor - EIS\ArcPro\507179_HumeLink_AIA_Dec22.aprx\19-12-22\VirgilRobinson

Attachment 2 Land use maps



Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

1 Wagga 330 kV substation compound (C01)

2 Gregadoo Road compound (C06)

Land Zoning

B1 Neighbourhood Centre
B2 Local Centre
B3 Commercial Core
B4 Mixed Use
B5 Business Development
B6 Enterprise Corridor
C1 National Parks and Nature Reserves
C2 Environmental Conservation
C4 Environmental Living
IN1 General Industrial
IN2 Light Industrial
R1 General Residential
R3 Medium Density Residential
R5 Large Lot Residential
RAZ Rural Activity Zone
RE1 Public Recreation
RE2 Private Recreation
REZ Regional Enterprise Zone
RU1 Primary Production
RU2 Rural Landscape
RU4 Primary Production Small Lots
RU5 Village
RU6 Transition
SP1 Special Activities
SP2 Infrastructure
W1 Natural Waterways
W2 Recreational Waterways

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

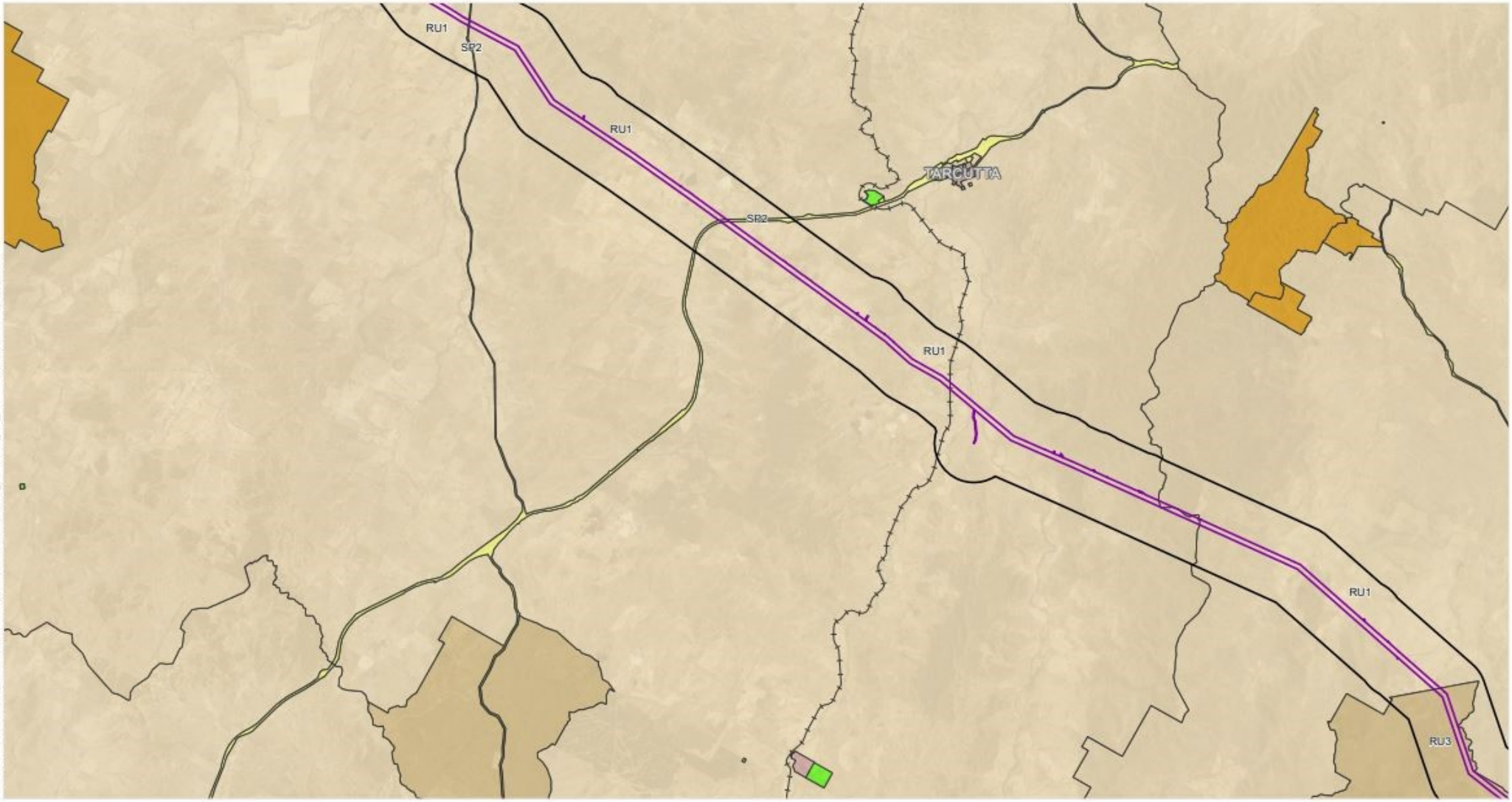
1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 1 of 10**

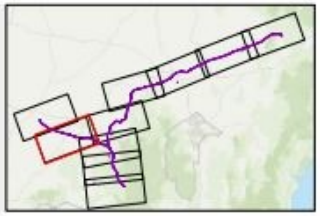
C:\Users\Virgil.Robinson\Aurecon Group\507179 - HumeLink Project Development Suppor - EIS\ArcPro\507179_HumeLink_A4A_Dec22.aprx\16-02-23\Virgil.Robinson



Project footprint
Agricultural study area
Waterway
Railway

Land Zoning

C1 National Parks and Nature Reserves
RE1 Public Recreation
RU1 Primary Production
RU3 Forestry
RU5 Village
SP1 Special Activities
SP2 Infrastructure



Source: *Base data (aerial imagery, transport, water, and cadastral themes): NSW Foundation Spatial Data Framework; Transgrid*

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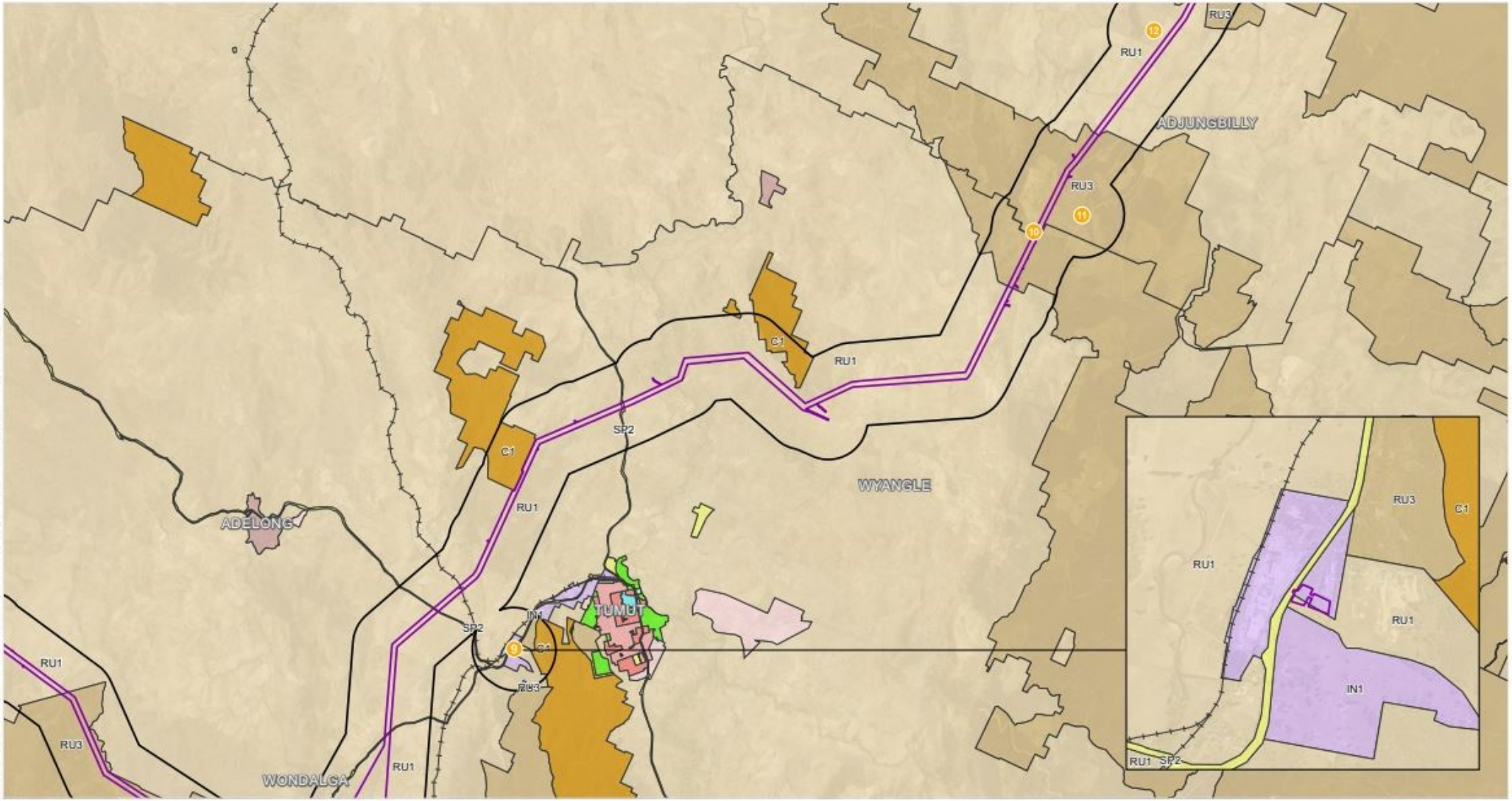
1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 2 of 10**



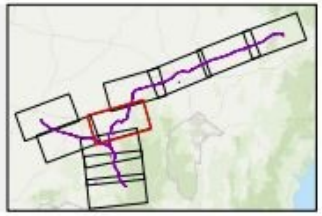
Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

9 Snowy Mountains Highway compound (C02)
10 Honeysuckle Road compound (C07)
11 Red Hill Road compound (C08)
12 Adjungbilly Road compound (C09)

Land Zoning

B1 Neighbourhood Centre
B2 Local Centre
C1 National Parks and Nature Reserves
IN1 General Industrial
IN2 Light Industrial
R2 Low Density Residential
R3 Medium Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RE2 Private Recreation
RU1 Primary Production
RU3 Forestry
RU5 Village
SP1 Special Activities
SP2 Infrastructure



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

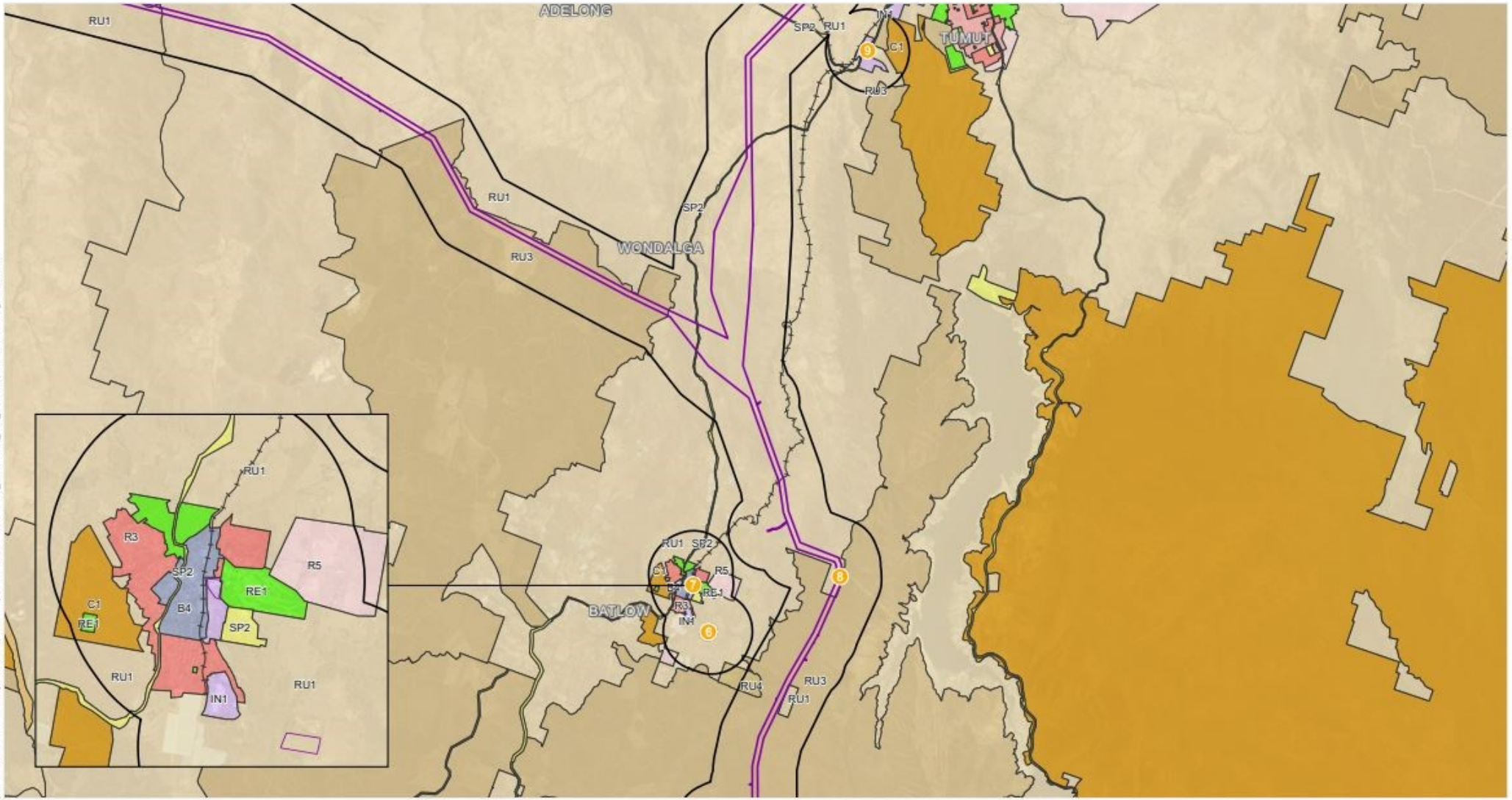
1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 3 of 10**

C:\Users\Virgil Robinson\Aurecon Group\507179 - HumeLink Project Development Suppor - EIS\ArcPro\507179_HumeLink_AIA_Dec22.aprx\16-02-23\Virgil Robinson



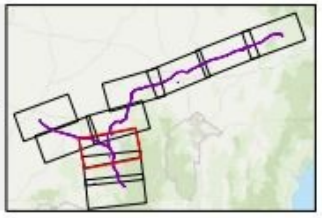
Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)
9 Snowy Mountains Highway compound (C02)

Land Zoning

B1 Neighbourhood Centre
B4 Mixed Use
C1 National Parks and Nature Reserves
C3 Environmental Management
IN1 General Industrial
R2 Low Density Residential
R3 Medium Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RU1 Primary Production
RU3 Forestry
RU4 Primary Production Small Lots
SP2 Infrastructure



Source: Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

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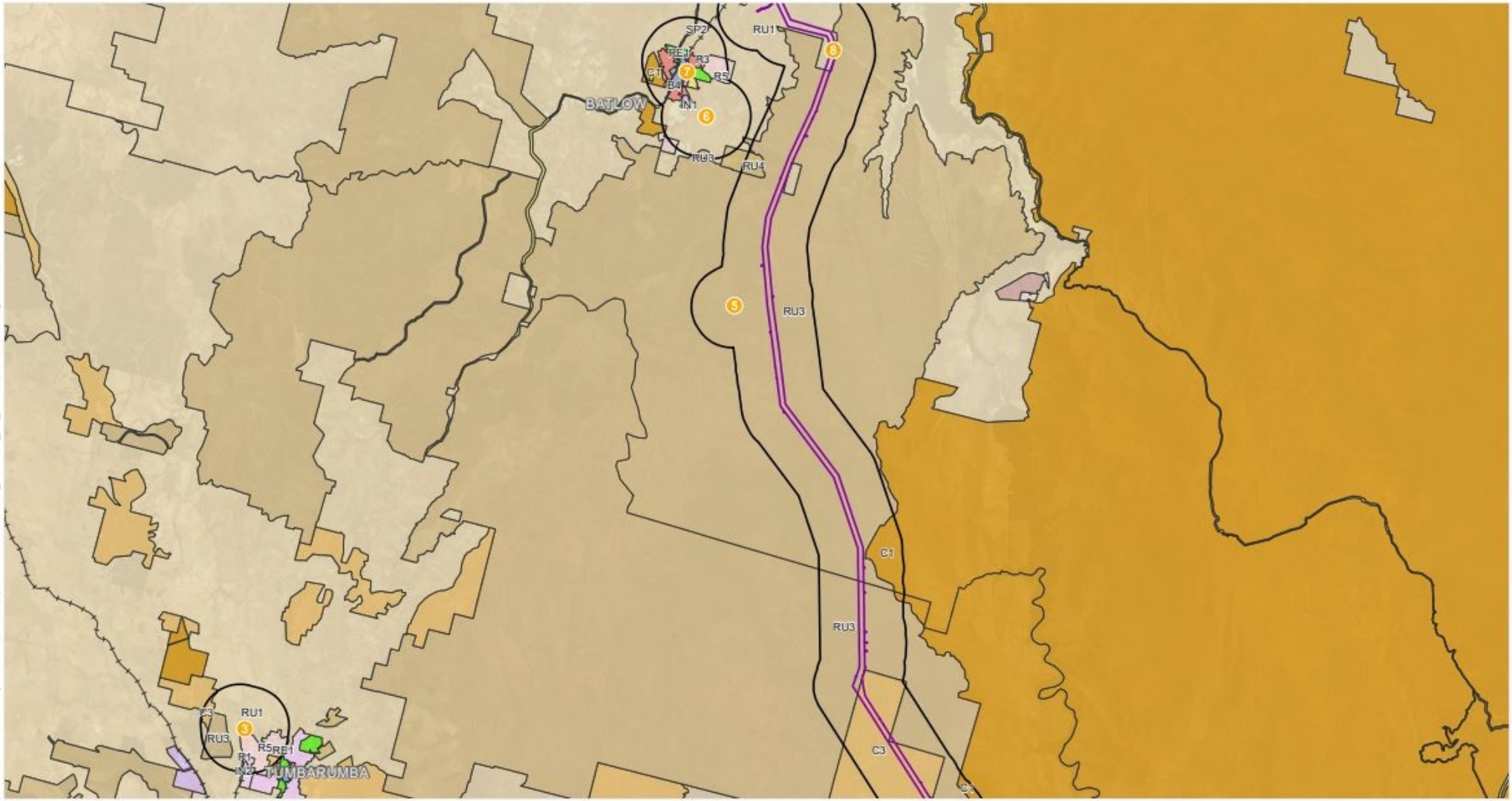
HumeLink

Attachment 2: Land use zoning **Attachment 4 of 10**



Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)

5 Snubba Road compound (C16)
6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)

Land Zoning

B2 Local Centre
B4 Mixed Use
C1 National Parks and Nature Reserves
C3 Environmental Management
IN1 General Industrial
IN2 Light Industrial
R1 General Residential
R3 Medium Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RU1 Primary Production
RU3 Forestry
RU4 Primary Production Small Lots
RU5 Village
SP2 Infrastructure

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

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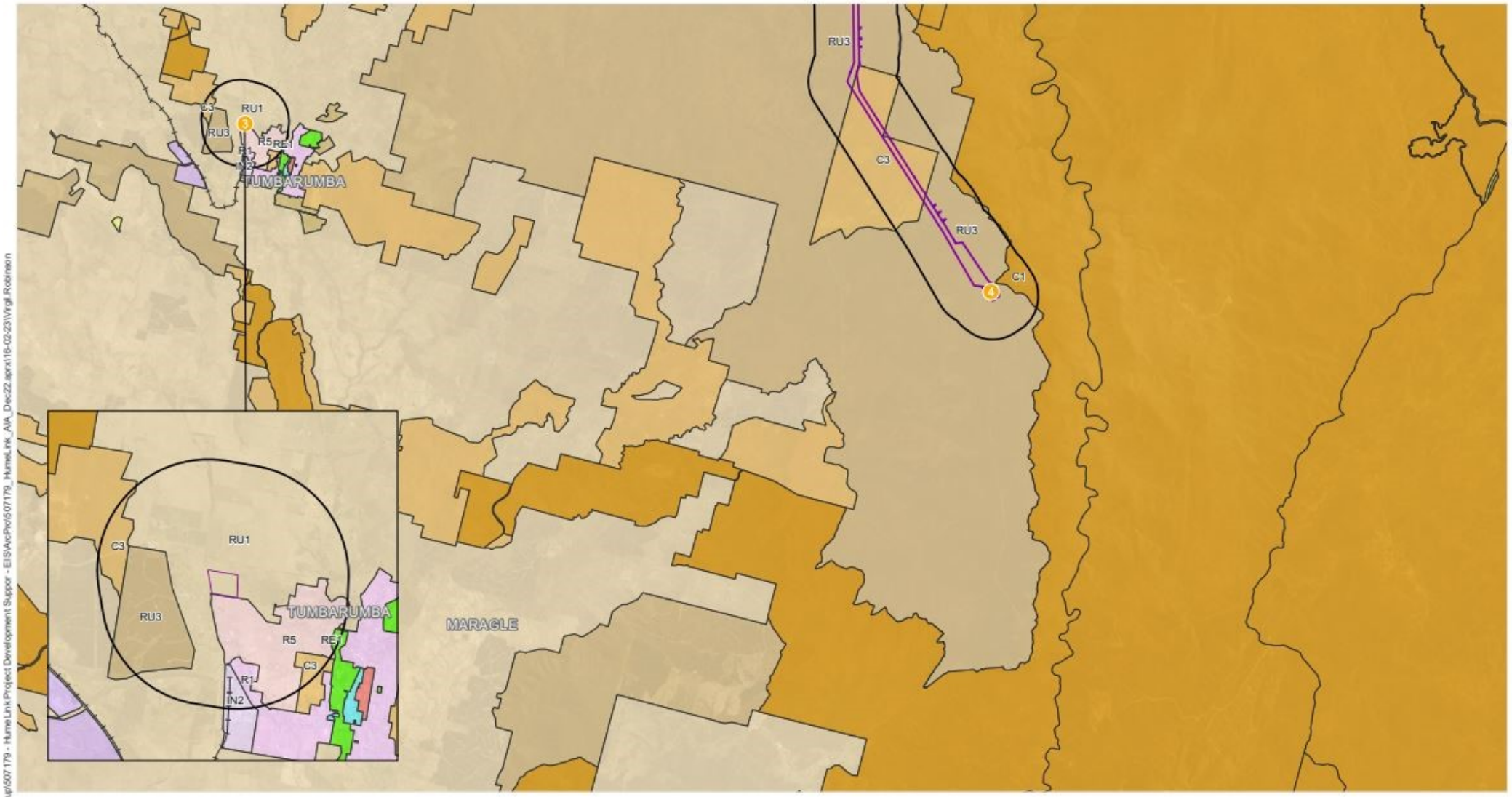
HumeLink

Attachment 2: Land use zoning **Attachment 5 of 10**



Project footprint
Agricultural study area
Waterway
Railway

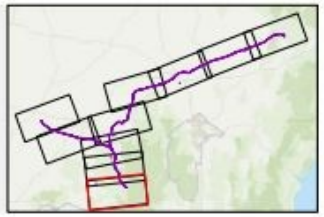
Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)

4 Maragle 500 kV substation compound (C05)

Land Zoning

B2 Local Centre
C1 National Parks and Nature Reserves
C3 Environmental Management
IN1 General Industrial
IN2 Light Industrial
R1 General Residential
R3 Medium Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RU1 Primary Production
RU3 Forestry
RU4 Primary Production Small Lots
SP2 Infrastructure



Source: *Base data (aerial imagery, transport, water, and cadastral themes): NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 6 of 10**

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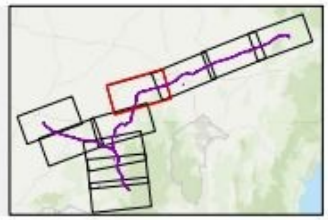
Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

12 Adjungbilly Road compound (C09)

Land Zoning

C1 National Parks and Nature Reserves
C3 Environmental Management
R5 Large Lot Residential
RE1 Public Recreation
RU1 Primary Production
RU3 Forestry
RU5 Village
SP1 Special Activities
SP2 Infrastructure
SP3 Tourist
W1 Natural Waterways



Source: *Base data (aerial imagery, transport, water, and cadastral themes): NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 7 of 10**

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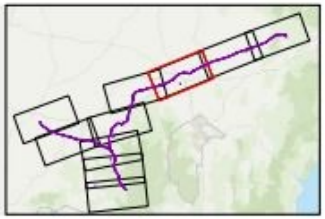
Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities
Yass substation compound (C10)

Land Zoning
B1 Neighbourhood Centre
B2 Local Centre
B5 Business Development
B6 Enterprise Corridor
C1 National Parks and Nature Reserves
C2 Environmental Conservation
C3 Environmental Management
C4 Environmental Living
IN1 General Industrial
IN2 Light Industrial
R1 General Residential
R2 Low Density Residential
R3 Medium Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RE2 Private Recreation
RU1 Primary Production
RU2 Rural Landscape
RU5 Village
SP1 Special Activities
SP2 Infrastructure
W1 Natural Waterways



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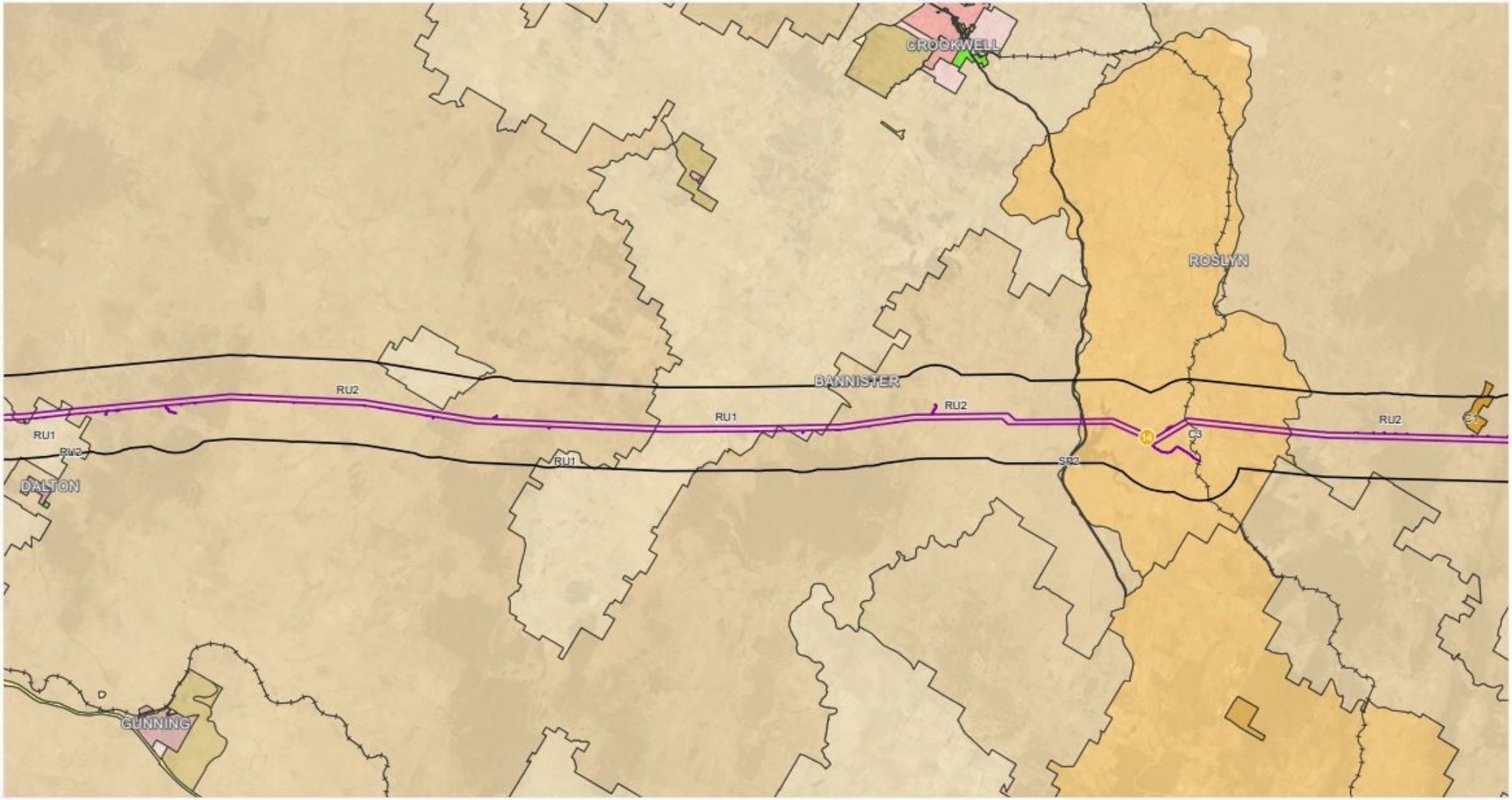
Source: *Base data (aerial imagery, transport, water, and cadastral themes): NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 8 of 10**



Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

14 Woodhouselee Road compound (C11)

Land Zoning

B2 Local Centre
B4 Mixed Use
C1 National Parks and Nature Reserves
C2 Environmental Conservation
C3 Environmental Management
IN2 Light Industrial
R2 Low Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RU1 Primary Production
RU2 Rural Landscape
RU4 Primary Production Small Lots
RU5 Village
SP1 Special Activities
SP2 Infrastructure

Source: *Base data (aerial imagery, transport, water, and cadastral themes): NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 9 of 10**

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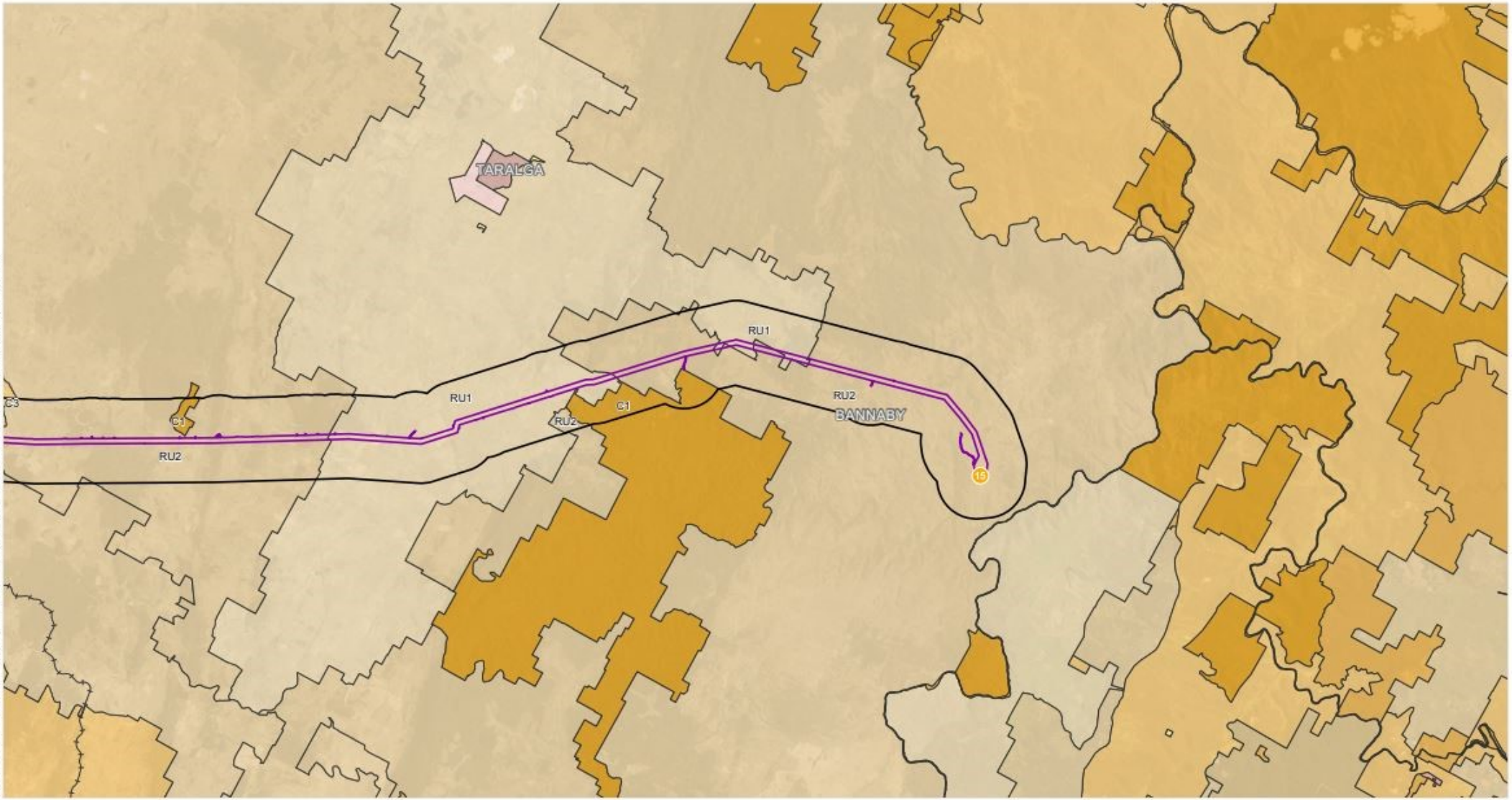

Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

15 Bannaby 500 kV substation compound (C12)

Land Zoning

C1 National Parks and Nature Reserves
C2 Environmental Conservation
C3 Environmental Management
R2 Low Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RU1 Primary Production
RU2 Rural Landscape
RU3 Forestry
RU5 Village
SP1 Special Activities
SP2 Infrastructure
SP3 Tourist

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 2: Land use zoning **Attachment 10 of 10**

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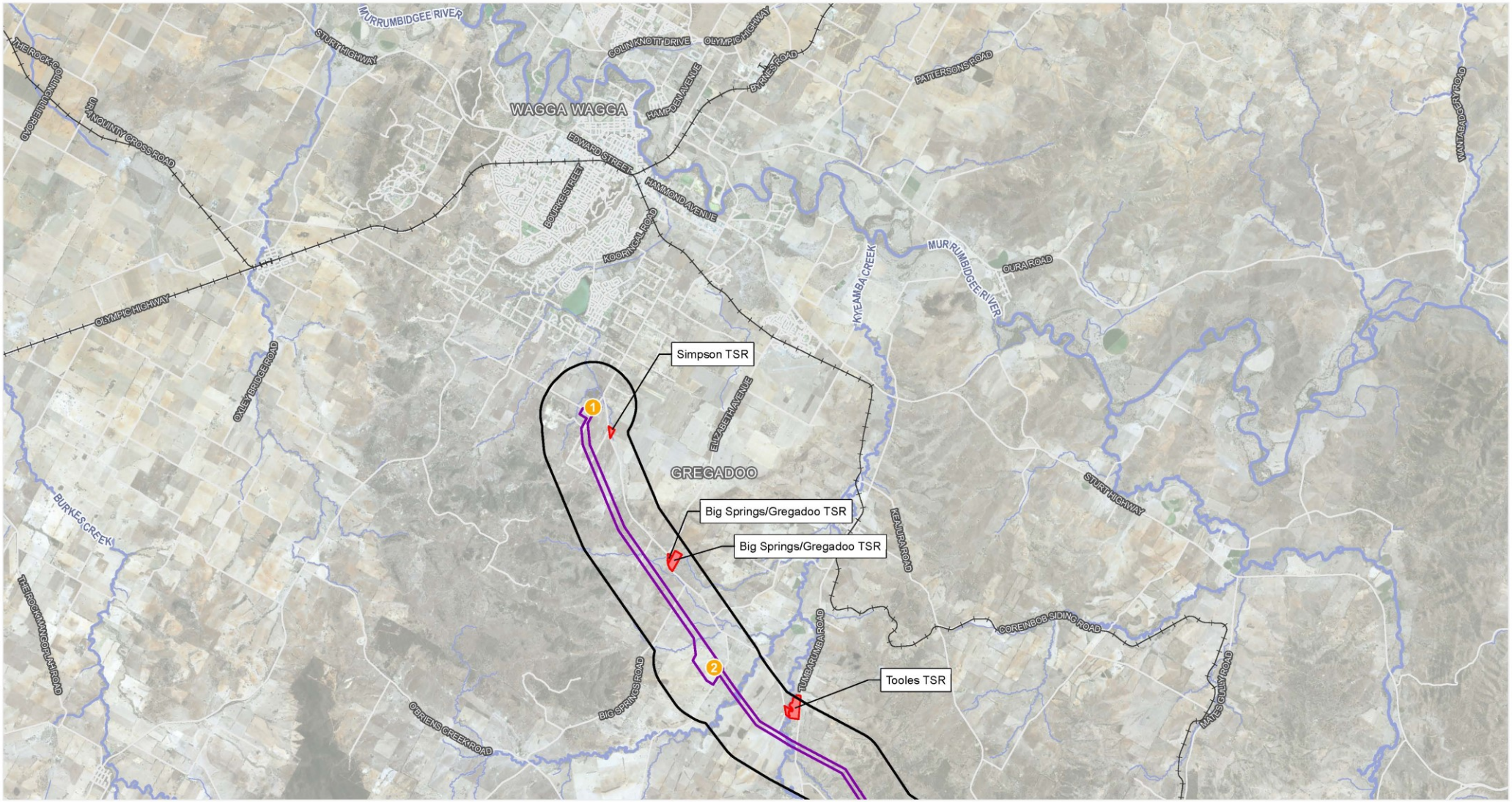
Attachment 3 Travelling stock reserves



Project footprint

Agricultural study area

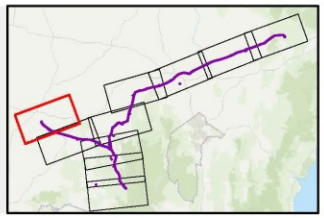
Travelling stock reserve

Waterway

Railway

Construction ancillary facilities

1. Wagga 330 kV substation compound (C01)
2. Gregadoo Road compound (C06)



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

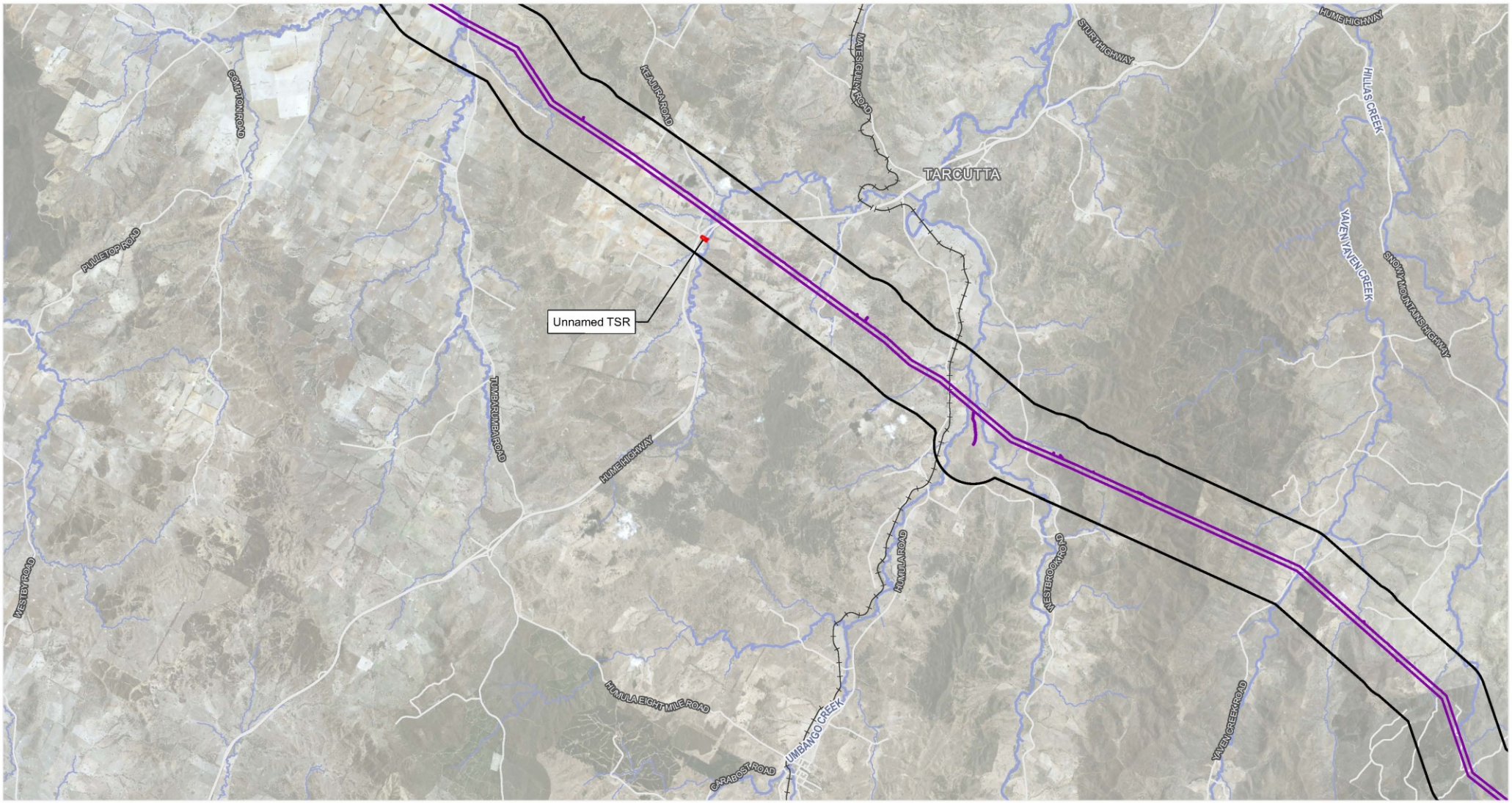
1:150,000

0 4 7km

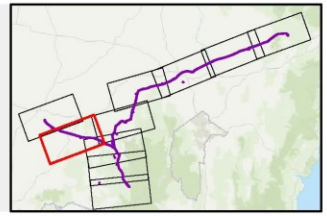
Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 1 of 10**



Project footprint
Agricultural study area
Travelling stock reserve
Waterway
Railway



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

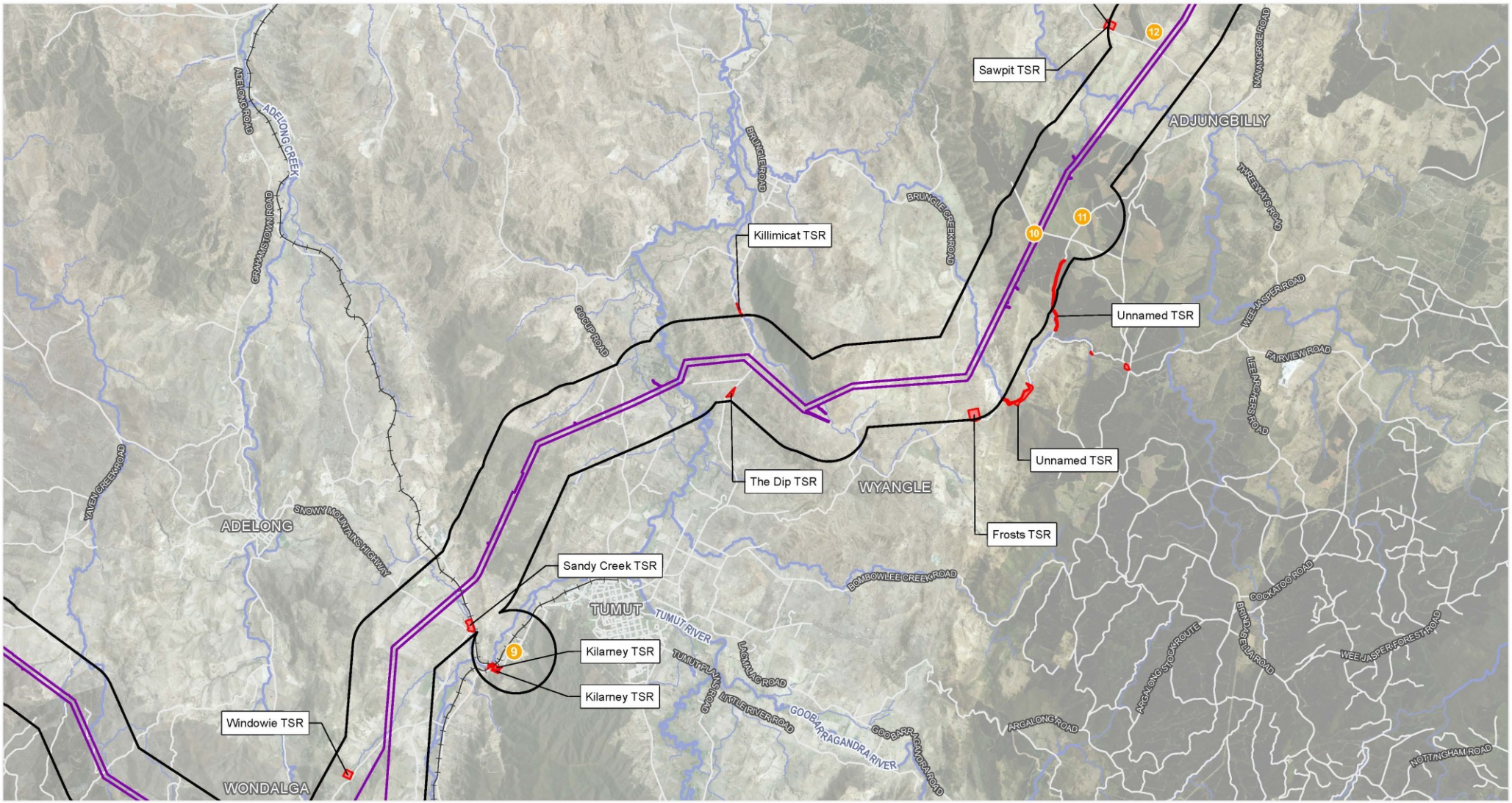
1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 2 of 10**

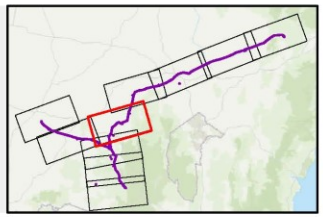
C:\Users\Virgil.Robinson\Aurecon Group\507179 - HumeLink Project Development Suppor - EIS\ArcPro\507179_HumeLink_AIA_Dec22.aprx\21-12-22\Virgil.Robinson



Project footprint
Agricultural study area
Travelling stock reserve
Waterway
Railway

Construction ancillary facilities

9 Snowy Mountains Highway compound (C02)
10 Honeysuckle Road compound (C07)
11 Red Hill Road compound (C08)
12 Adjungbilly Road compound (C09)



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 3 of 10**

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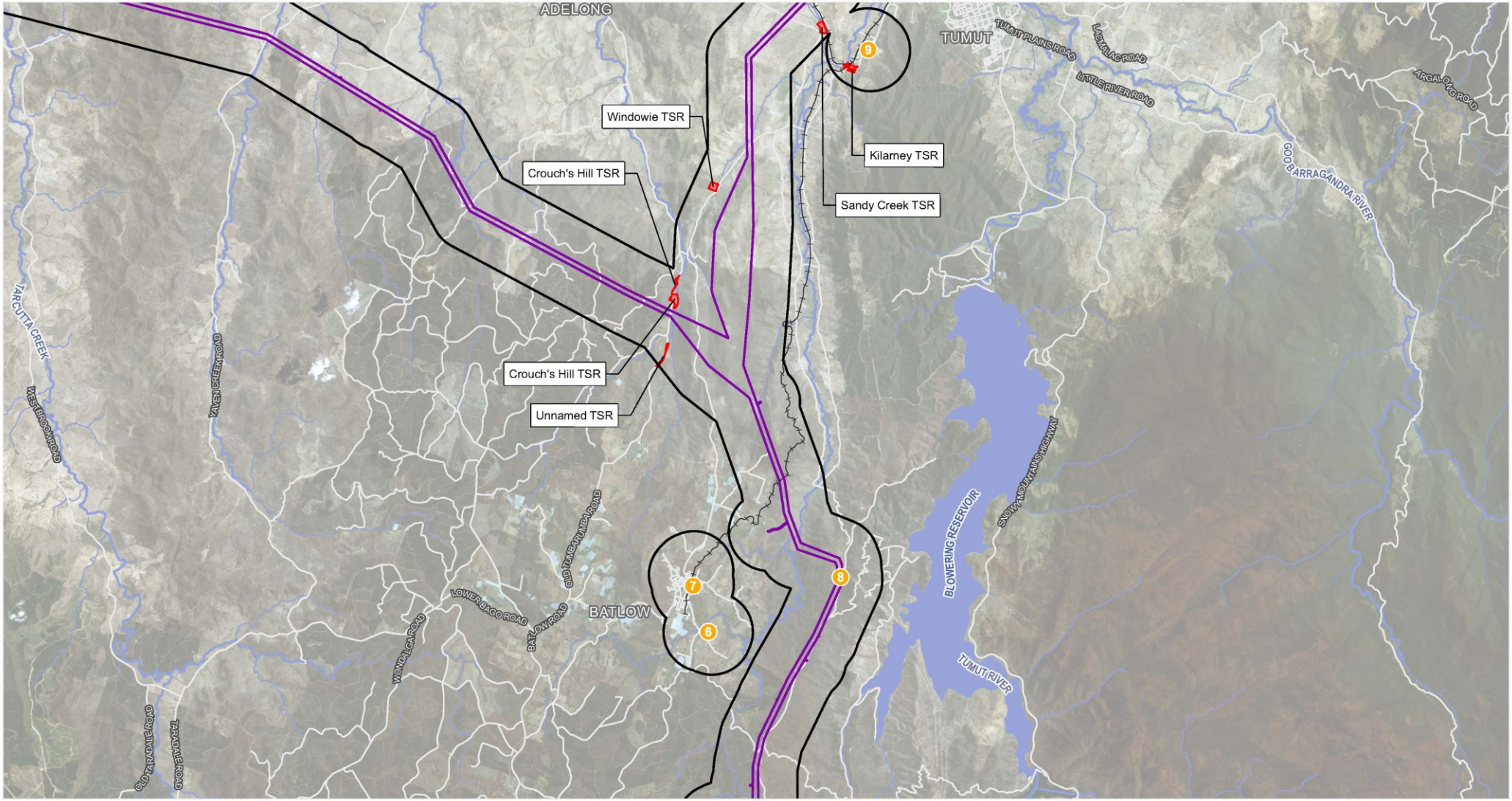
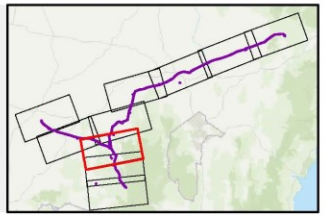


Project footprint
Agricultural study area
Travelling stock reserve
Waterbody
Waterway
Railway

Construction ancillary facilities

6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)
9 Snowy Mountains Highway compound (C02)



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

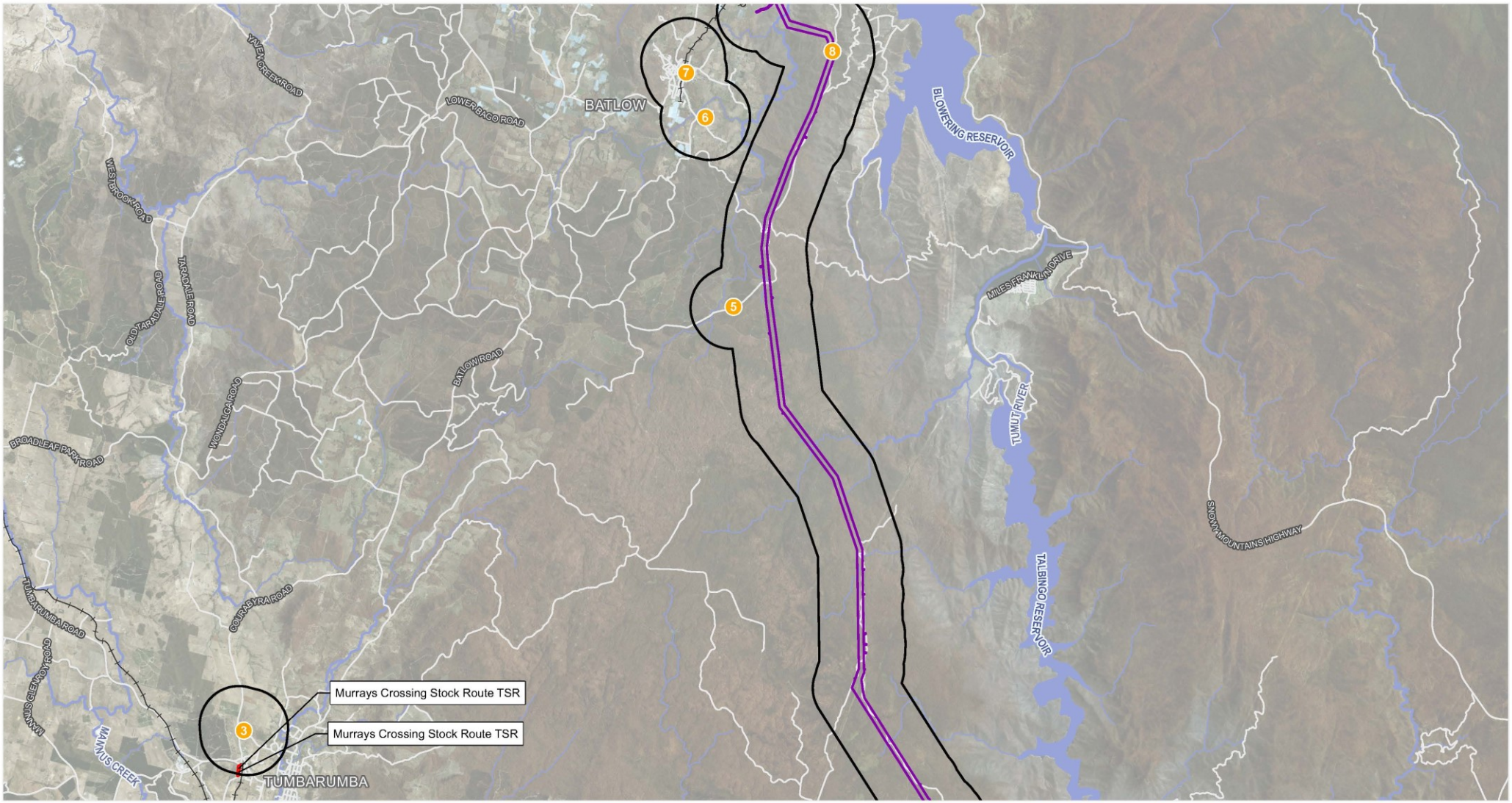
1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 4 of 10**

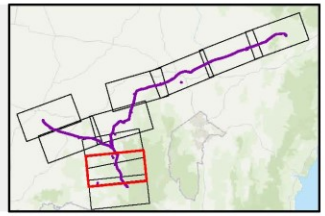
C:\Users\Virgil.Robinson\Aurecon Group\507179 - HumeLink Project Development Suppor - EIS\ArcPro\507179_HumeLink_AIA_Dec22.aprx\10-01-23\Virgil.Robinson



Project footprint
Agricultural study area
Travelling stock reserve
Waterbody
Waterway
Railway

Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)
5 Snubba Road compound (C16)
6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)



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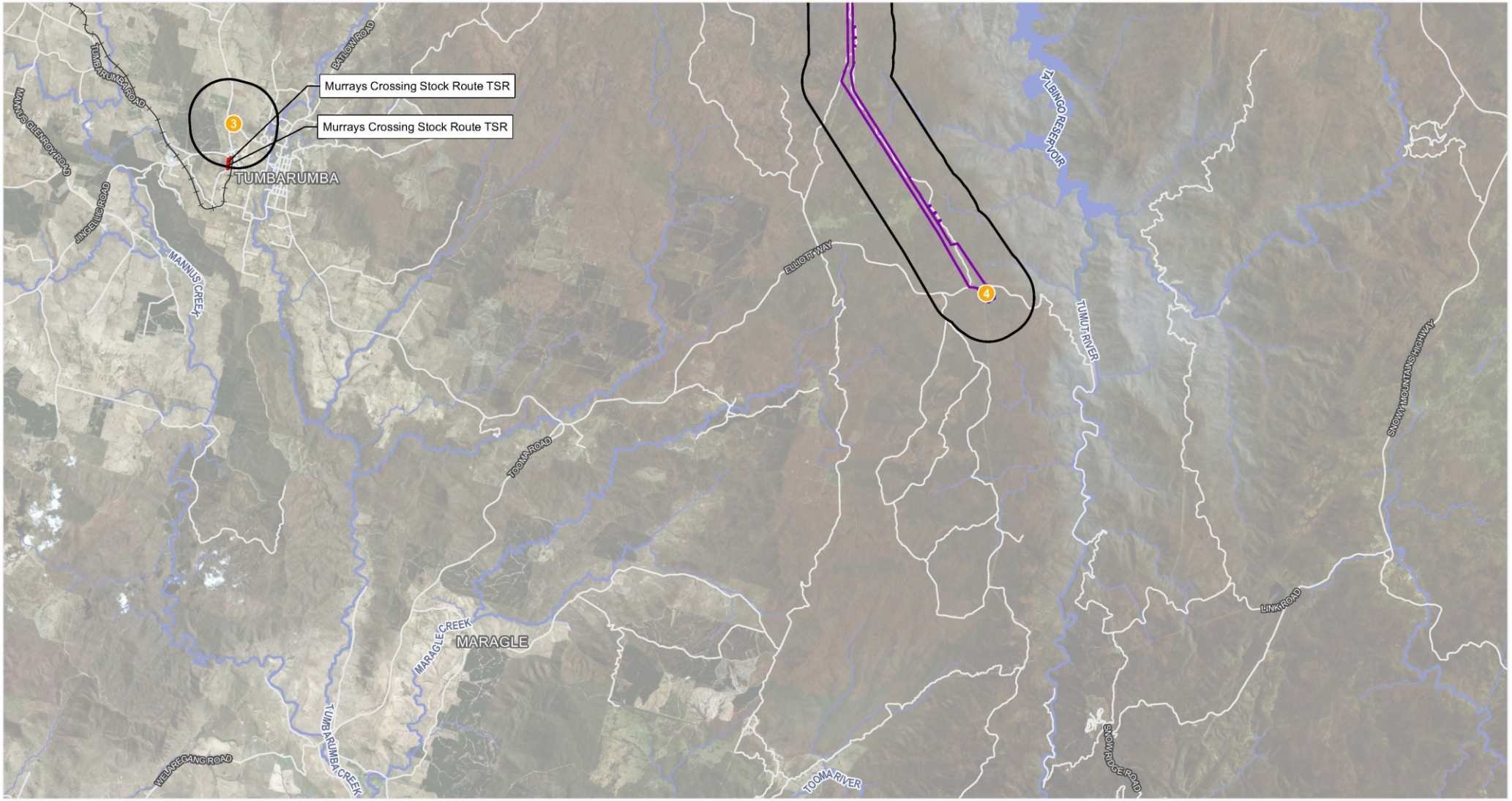
Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 5 of 10**

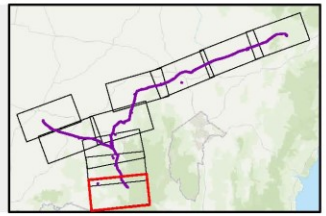


Project footprint
Agricultural study area
Travelling stock reserve
Waterbody
Waterway
Railway

Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)

4 Maragle 500 kV substation compound (C05)



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

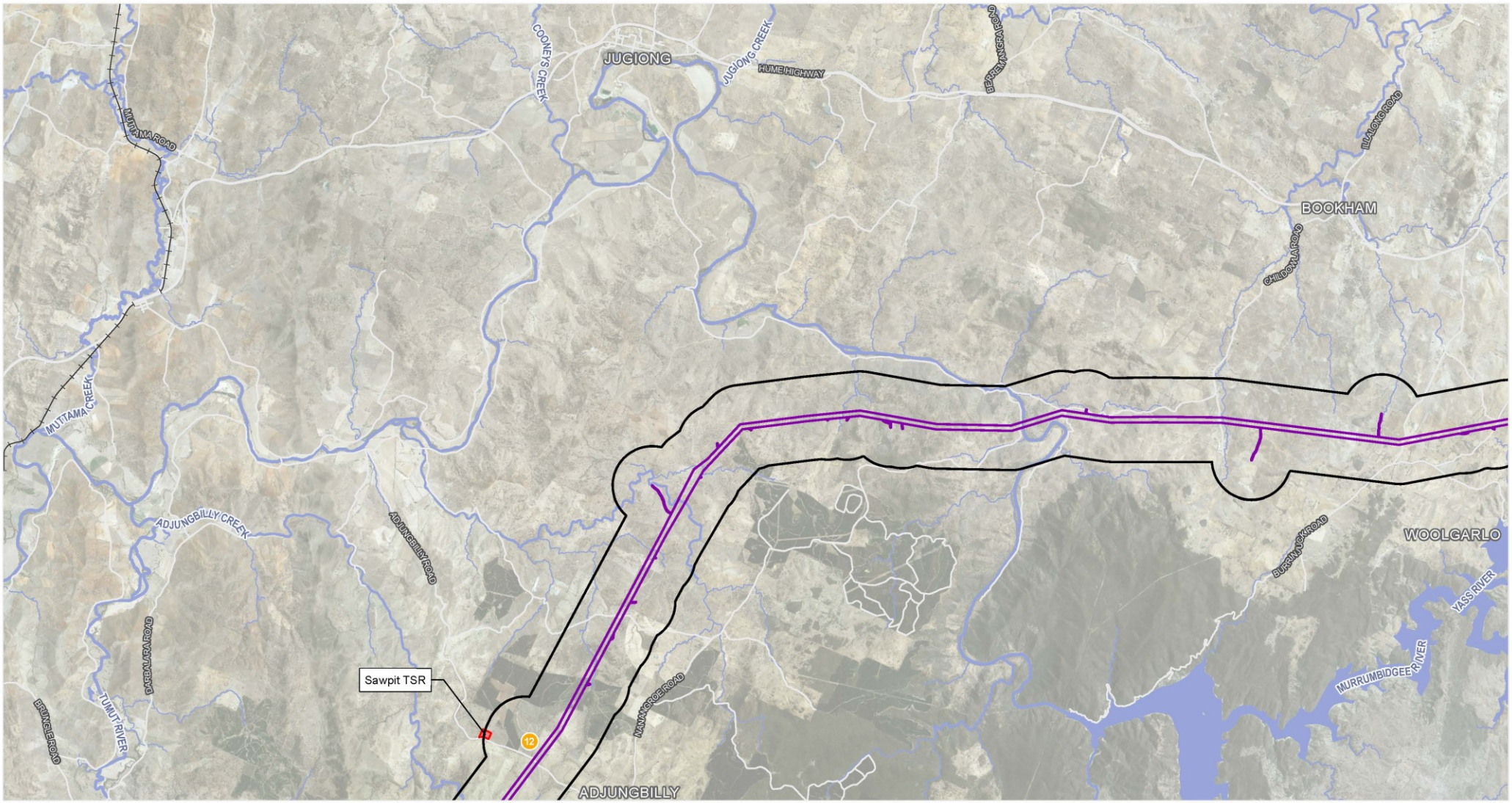
1:150,000

0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

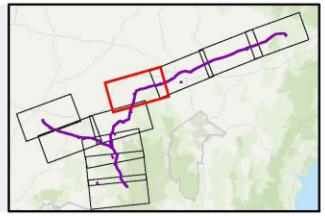
Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 6 of 10**



Project footprint
Agricultural study area
Travelling stock reserve
Waterbody
Waterway
Railway

Construction ancillary facilities

12 Adjungbilly Road compound (C09)



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

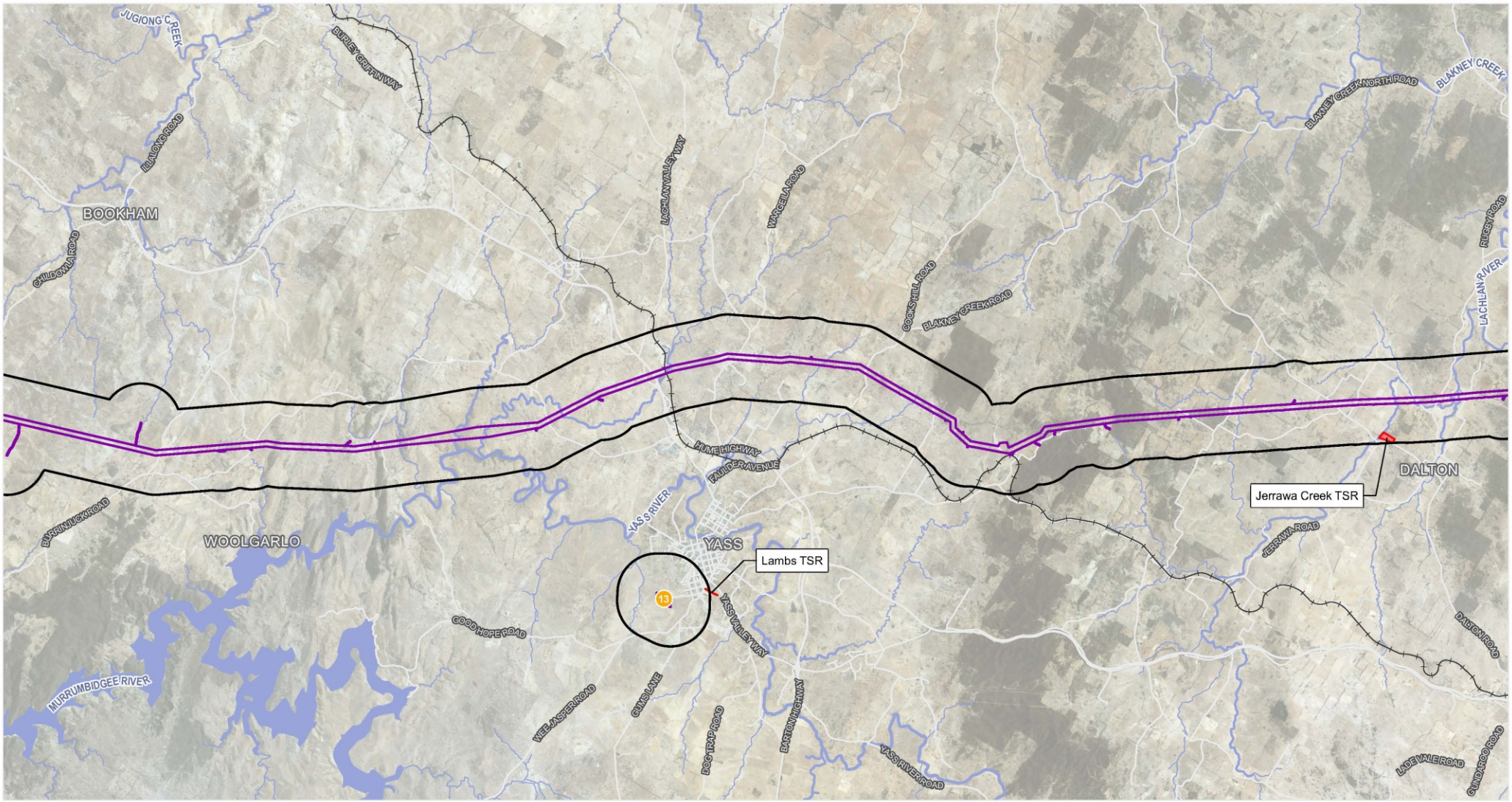
1:150,000

0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

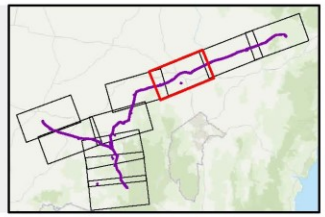
Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 7 of 10**



Project footprint
Agricultural study area
Travelling stock reserve
Waterbody
Waterway
Railway

Construction ancillary facilities

13 Yass substation compound (C10)



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

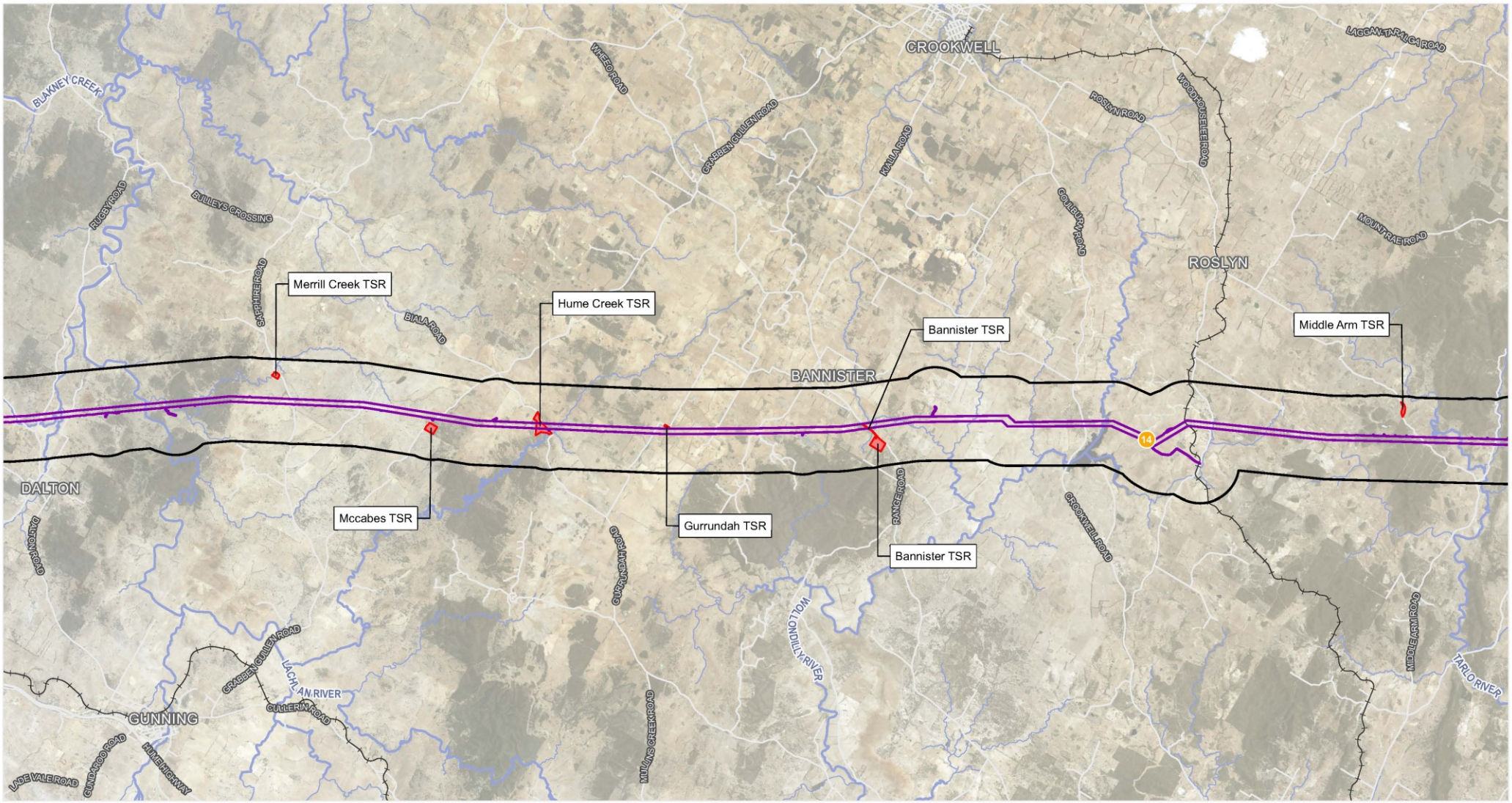
1:150,000

0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

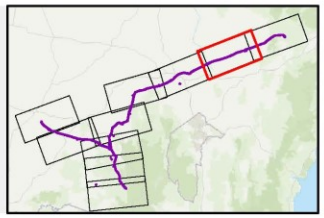
Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 8 of 10**



Project footprint
Agricultural study area
Travelling stock reserve
Waterway
Railway

Construction ancillary facilities

14 Woodhouselee Road compound (C11)



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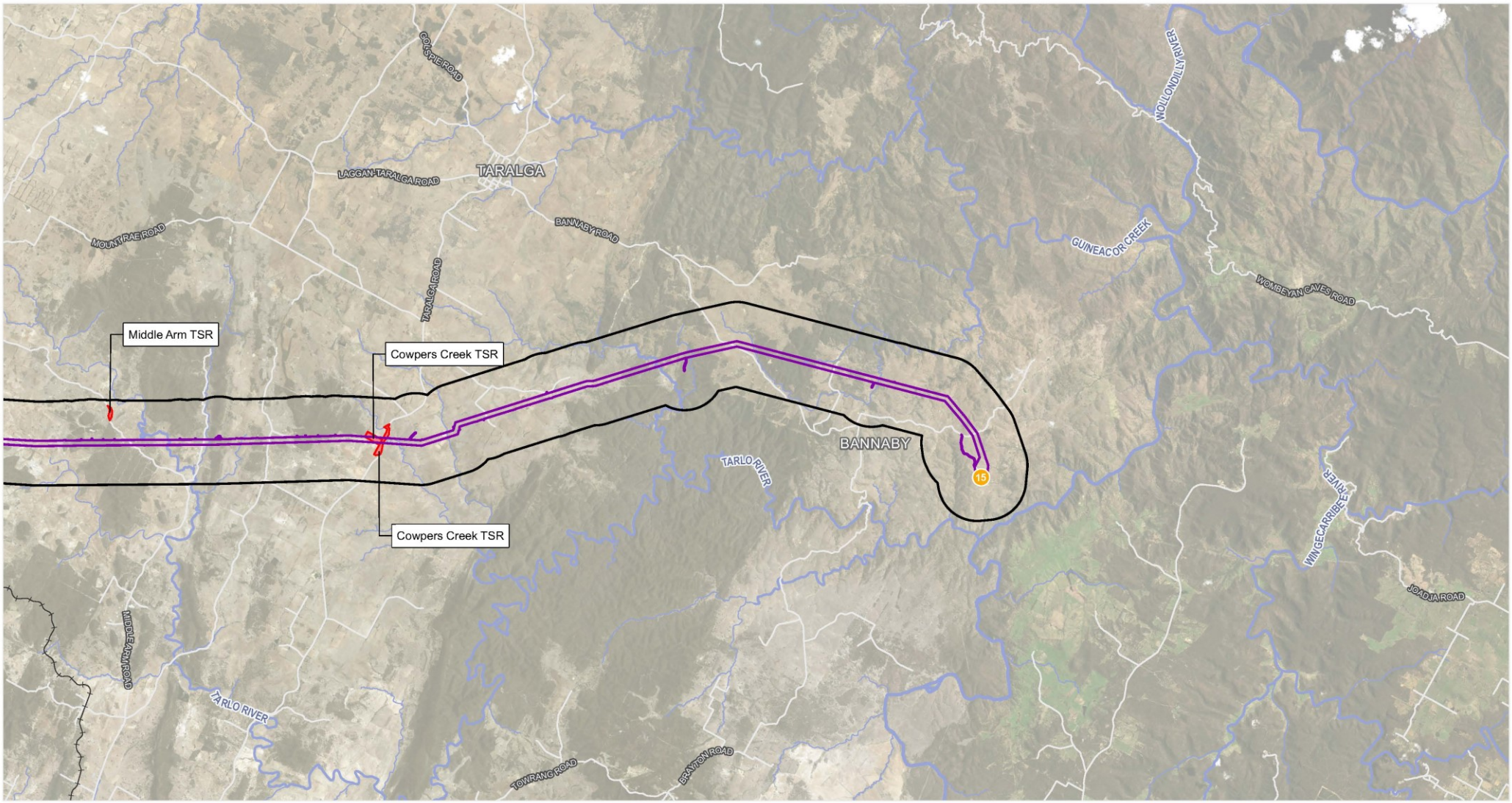
Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

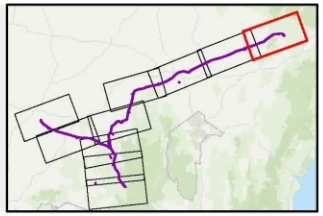
Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 9 of 10**



Project footprint
Agricultural study area
Travelling stock reserve
Waterway
Railway

Construction ancillary facilities

15 Bannaby 500 kV substation compound (C12)



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

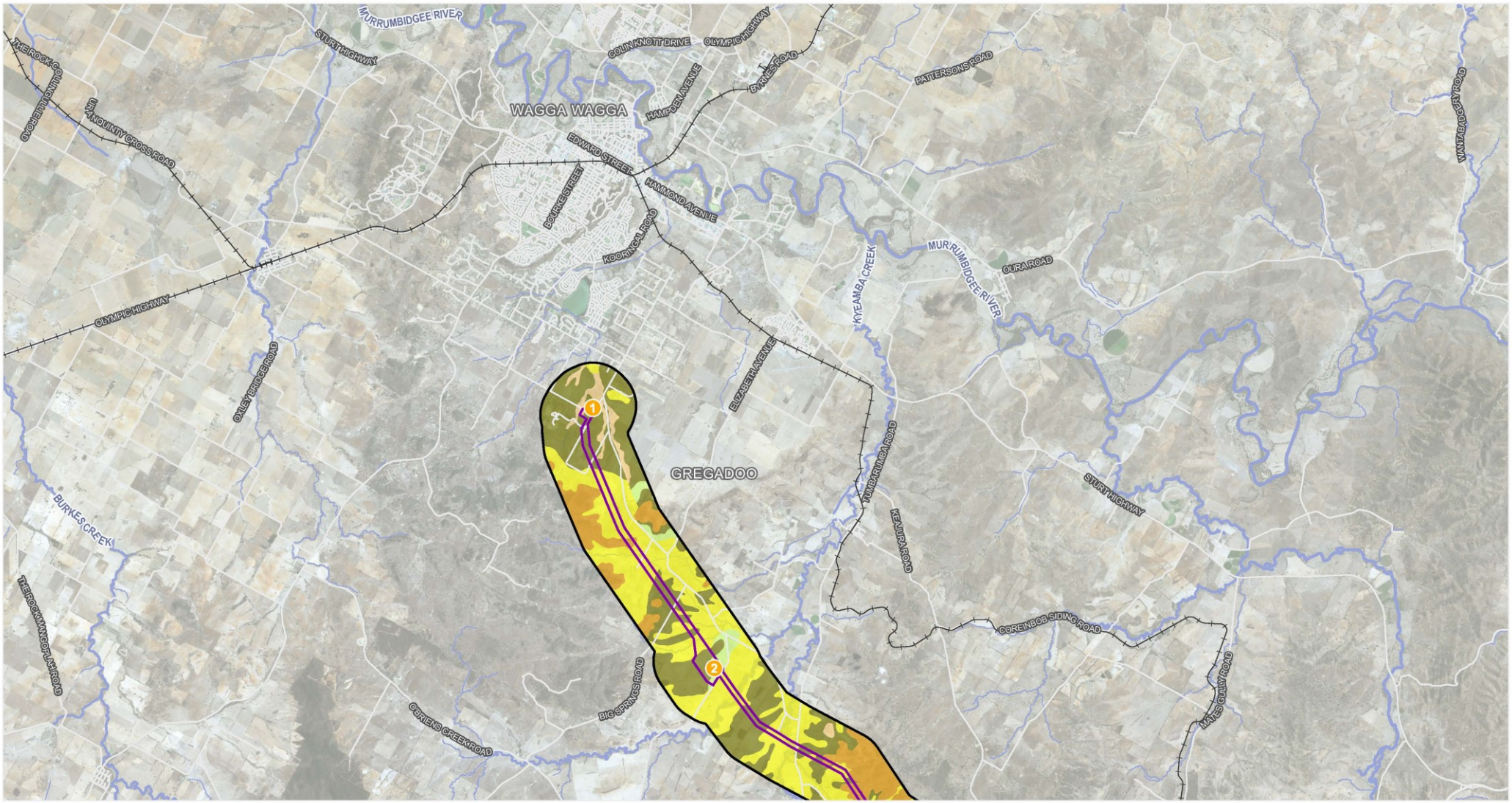
1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 3: Travelling Stock Reserves within the project footprint **Attachment 10 of 10**

Attachment 4 Land and soil capability maps



Project footprint

Agricultural study area

Waterway

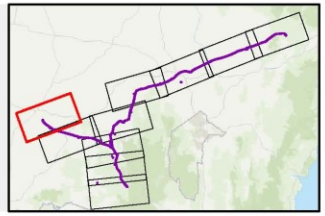
Railway

Construction ancillary facilities

1. Wagga 330 kV substation compound (C01)
2. Gregadoo Road compound (C06)

Most limiting land and soil capability

- 3 - Moderate limitations
- 4 - Moderate to severe limitations
- 5 - Severe limitations
- 6 - Very severe limitations
- 7 - Extremely severe limitations



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000

0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 1 of 10**

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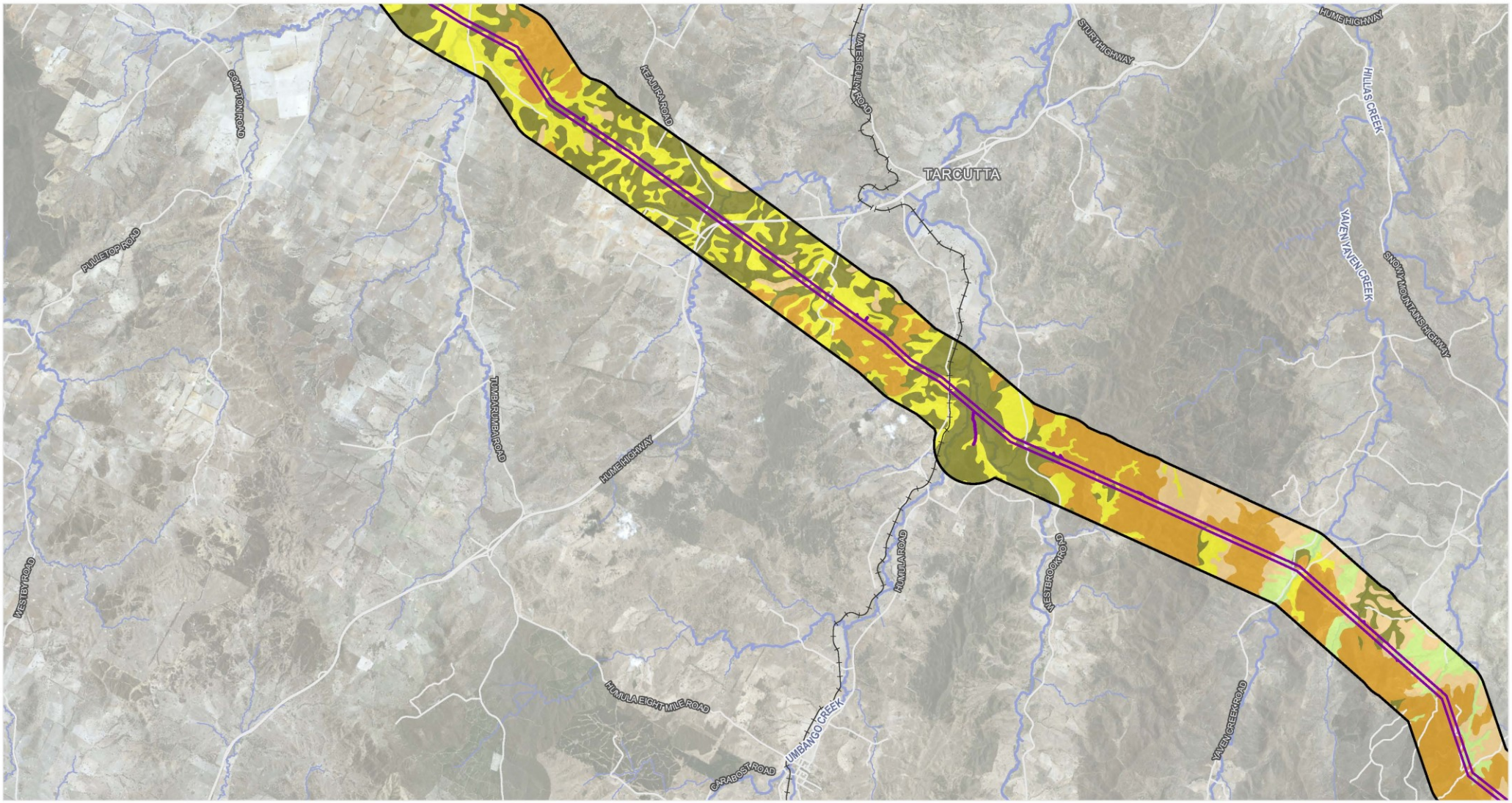


Project footprint

Agricultural study area

Waterway

Railway

Most limiting land and soil capability

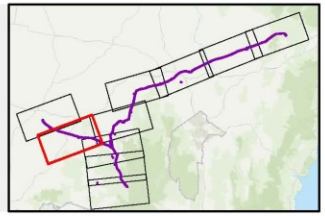
3 - Moderate limitations

4 - Moderate to severe limitations

5 - Severe limitations

6 - Very severe limitations

7 - Extremely severe limitations



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000

0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 2 of 10**

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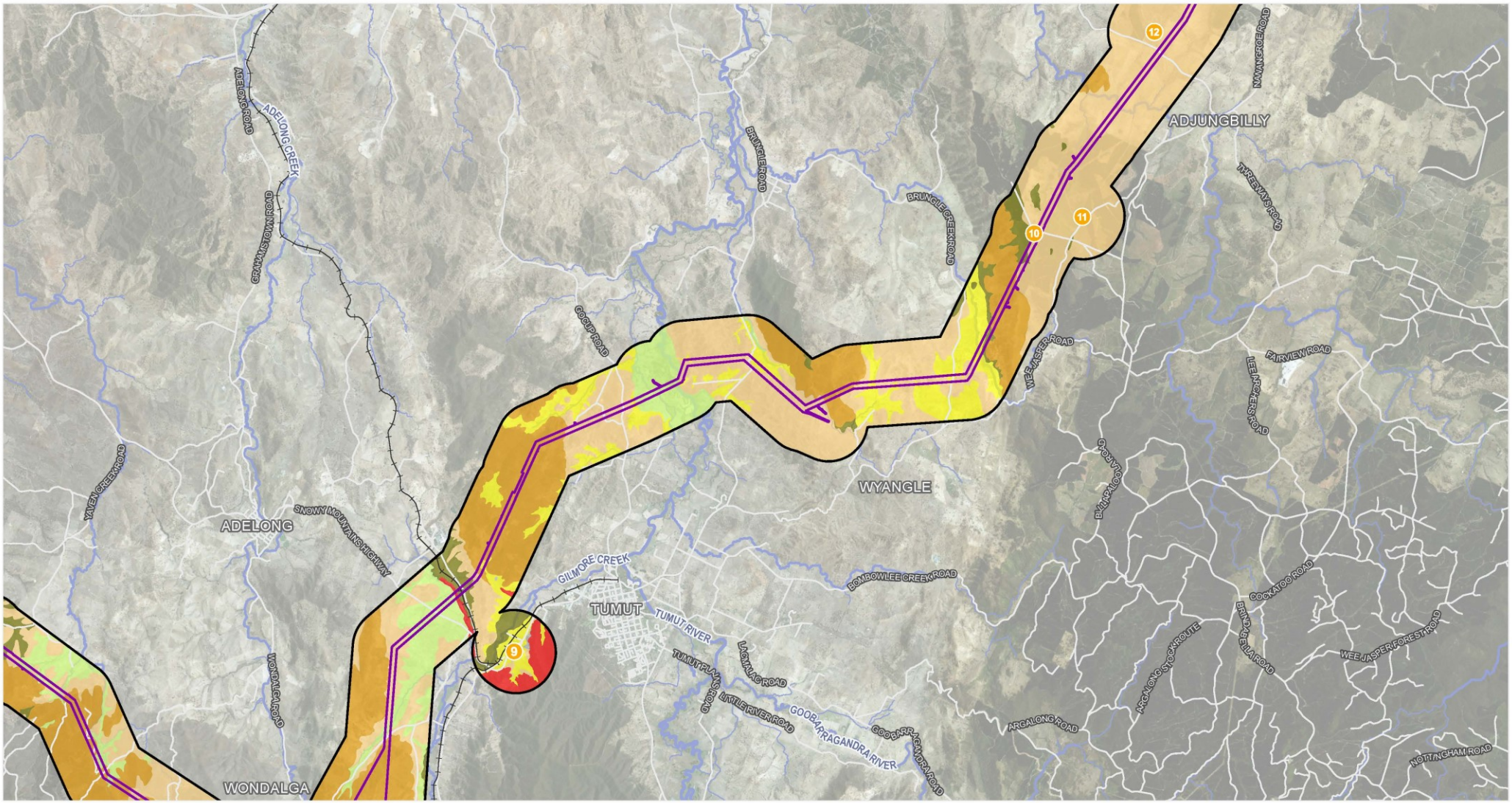


Project footprint

Agricultural study area

Waterway

Railway

Construction ancillary facilities

9 Snowy Mountains Highway compound (C02)

10 Honeysuckle Road compound (C07)

11 Red Hill Road compound (C08)

12 Adjungbilly Road compound (C09)

Most limiting land and soil capability

3 - Moderate limitations

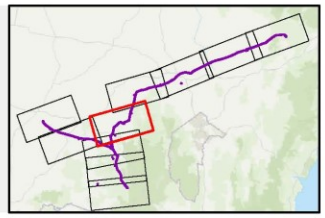
4 - Moderate to severe limitations

5 - Severe limitations

6 - Very severe limitations

7 - Extremely severe limitations

8 - Extreme limitations



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

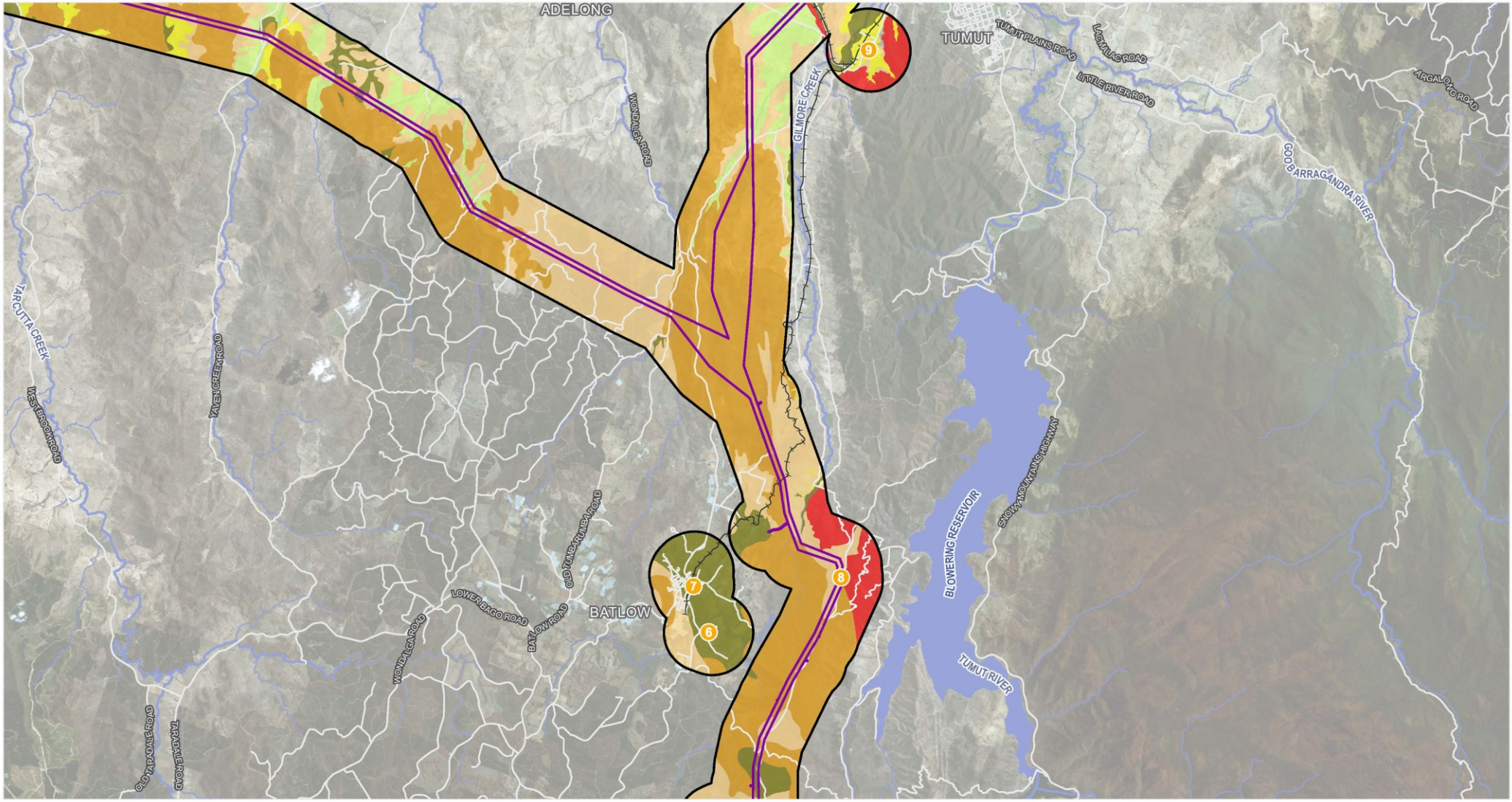
1:150,000

0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 3 of 10**



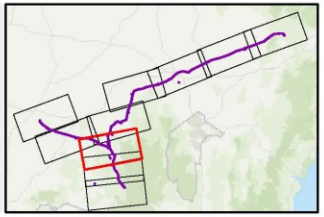
Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities

6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)
9 Snowy Mountains Highway compound (C02)

Most limiting land and soil capability

3 - Moderate limitations
4 - Moderate to severe limitations
5 - Severe limitations
6 - Very severe limitations
7 - Extremely severe limitations
8 - Extreme limitations



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 4 of 10**

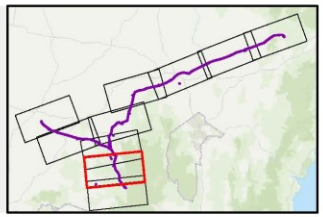
Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)
5 Snubba Road compound (C16)
6 Bowmans Lane compound (C15)
7 Memorial Avenue compound (C14)
8 Snubba Road compound (C03)

Most limiting land and soil capability

3 - Moderate limitations
4 - Moderate to severe limitations
5 - Severe limitations
6 - Very severe limitations
7 - Extremely severe limitations
8 - Extreme limitations



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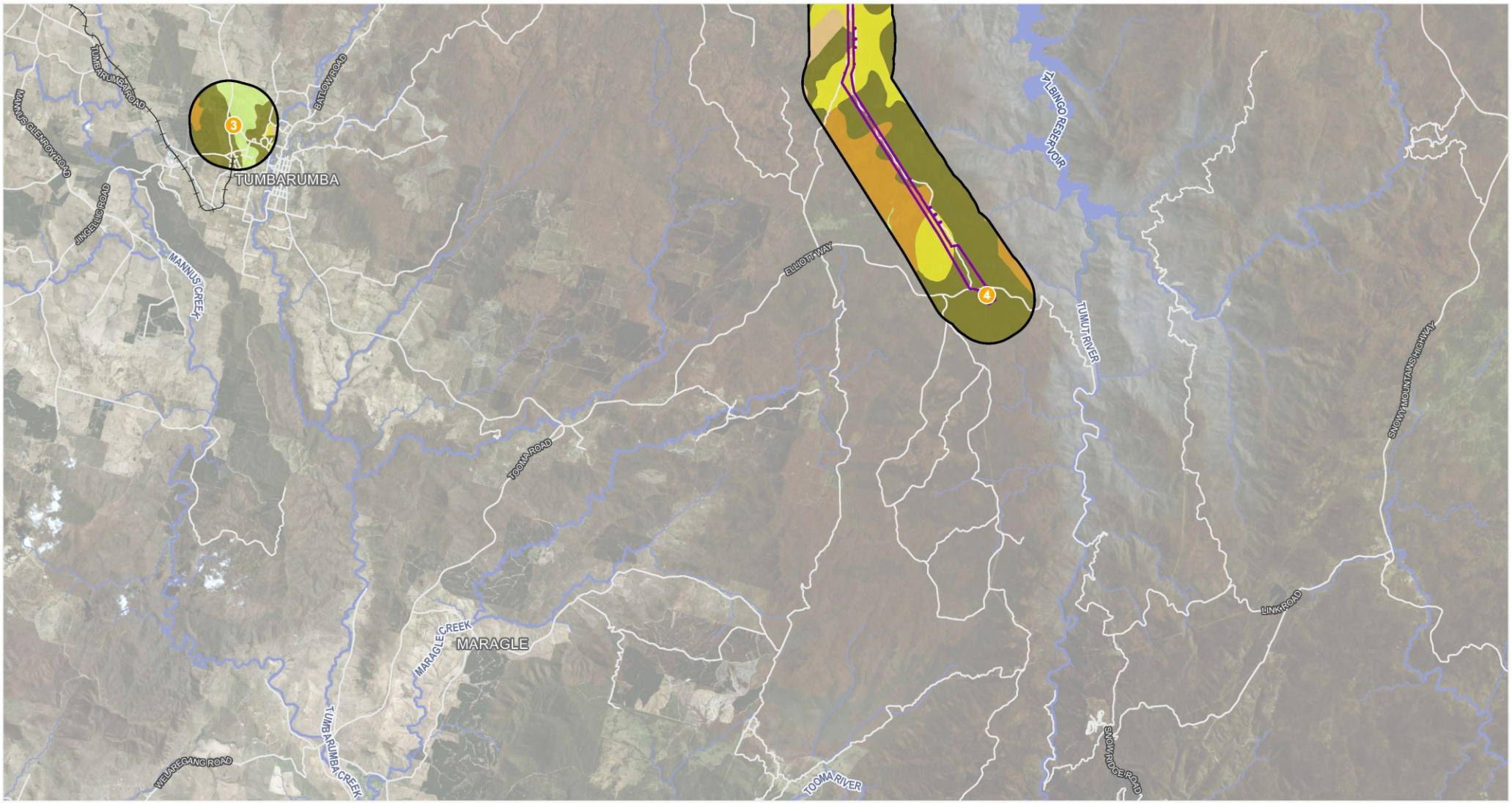
Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 5 of 10**



Project footprint
Agricultural study area
Waterbody
Waterway
Railway

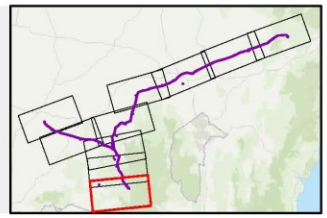
Construction ancillary facilities

3 Tumbarumba worker accommodation facility (AC1)

4 Maragle 500 kV substation compound (C05)

Most limiting land and soil capability

3 - Moderate limitations
4 - Moderate to severe limitations
5 - Severe limitations
6 - Very severe limitations
7 - Extremely severe limitations



Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 6 of 10**

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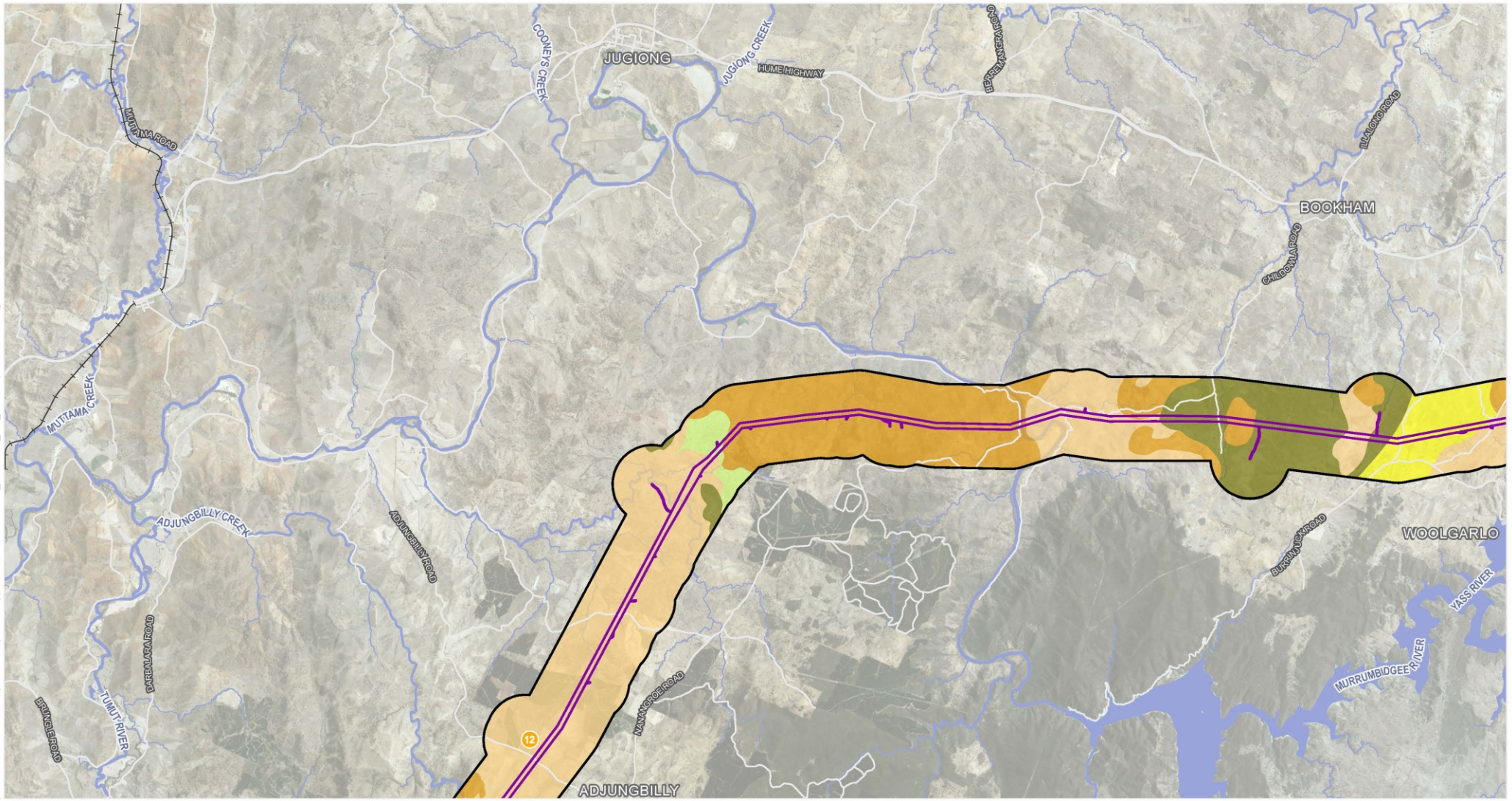


Project footprint

Agricultural study area

Waterbody

Waterway

Railway

Construction ancillary facilities

12 Adjungbilly Road compound (C09)

Most limiting land and soil capability

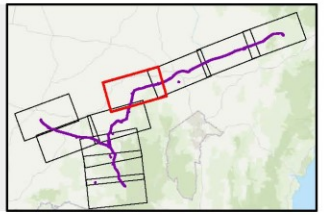
3 - Moderate limitations

4 - Moderate to severe limitations

5 - Severe limitations

6 - Very severe limitations

7 - Extremely severe limitations



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

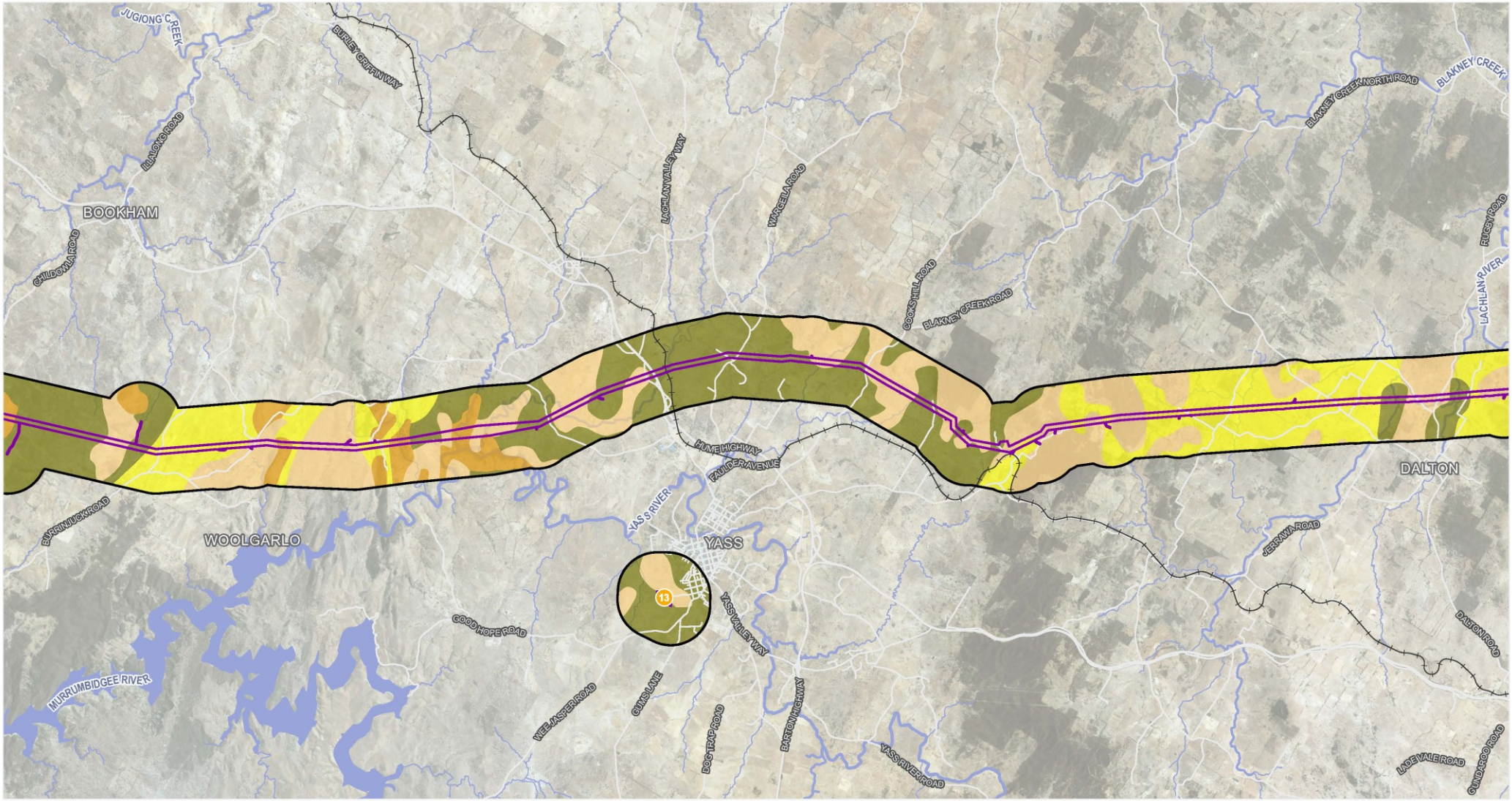
1:150,000

0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 7 of 10**



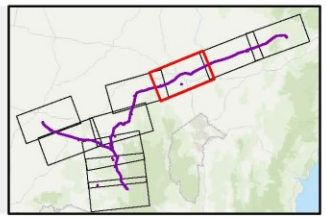
Project footprint
Agricultural study area
Waterbody
Waterway
Railway

Construction ancillary facilities

13 Yass substation compound (C10)

Most limiting land and soil capability

4 - Moderate to severe limitations
5 - Severe limitations
6 - Very severe limitations
7 - Extremely severe limitations



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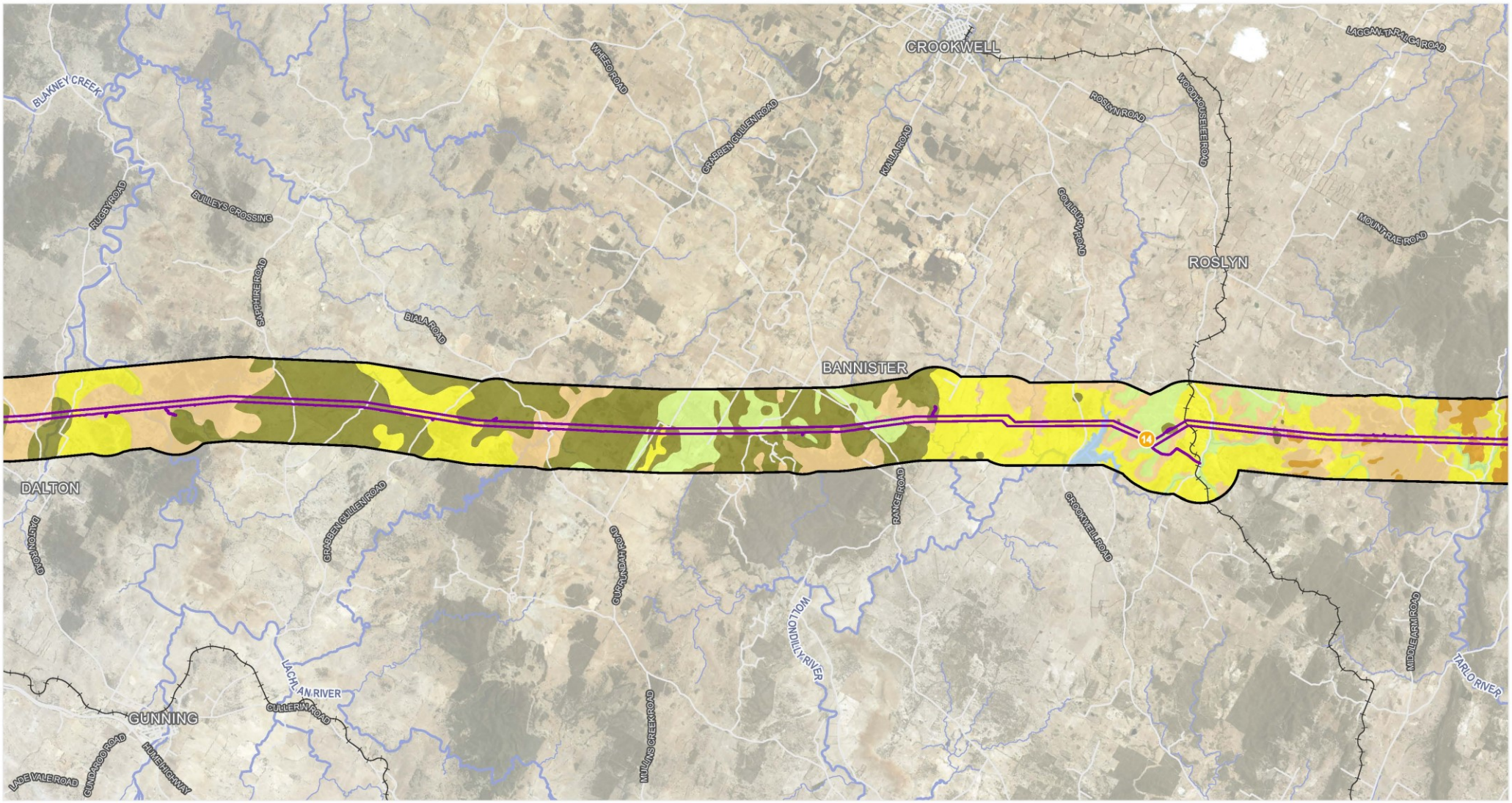
Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 8 of 10**



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Project footprint

Agricultural study area

Waterway

Railway

Construction ancillary facilities

14 Woodhouselee Road compound (C11)

Most limiting land and soil capability

3 - Moderate limitations

4 - Moderate to severe limitations

5 - Severe limitations

6 - Very severe limitations

7 - Extremely severe limitations

Water

Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

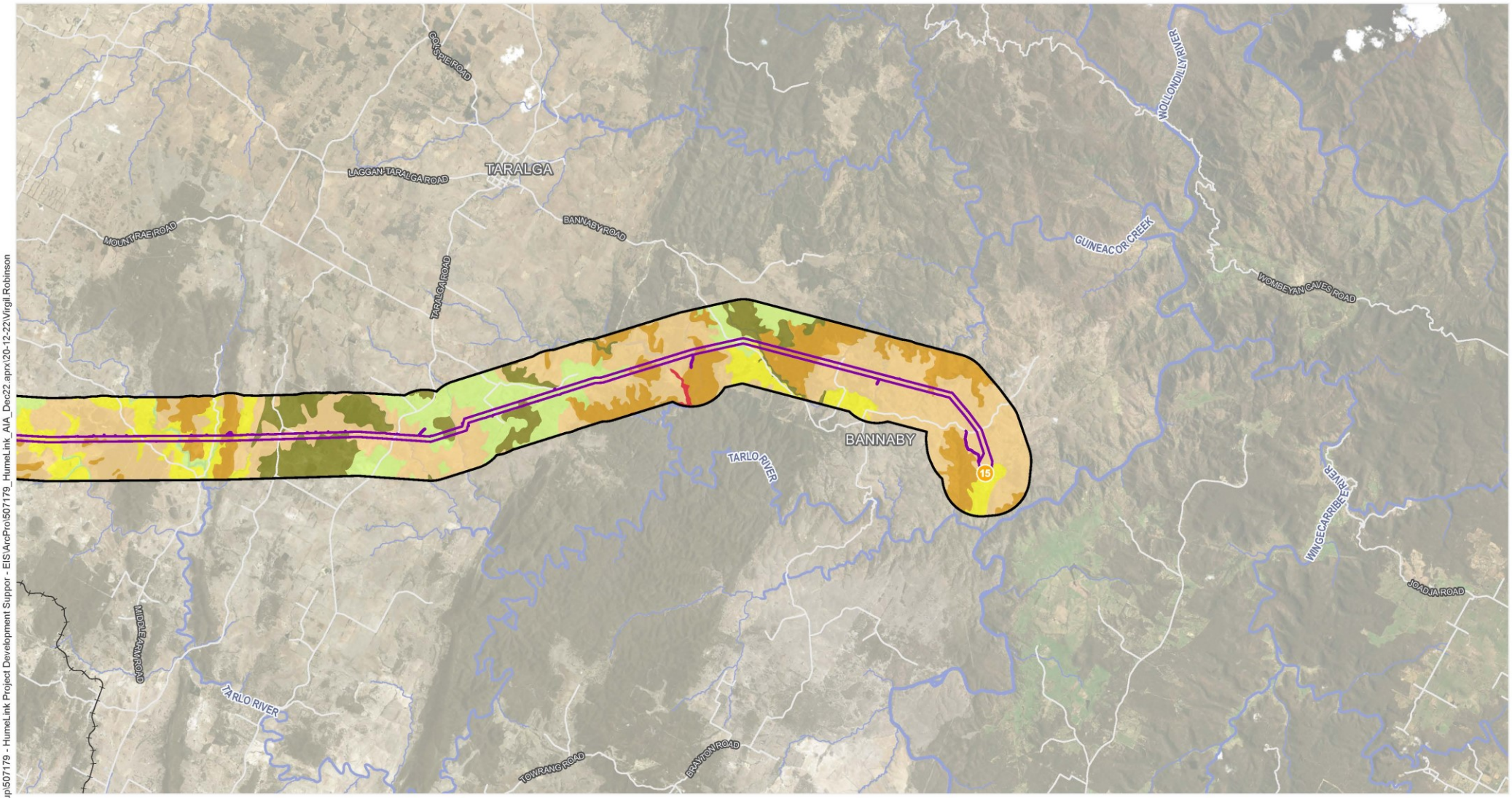
1:150,000

0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 9 of 10**



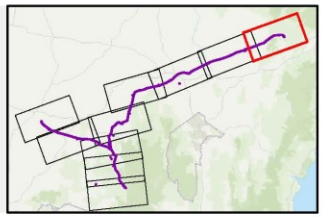
Project footprint
Agricultural study area
Waterway
Railway

Construction ancillary facilities

15 Bannaby 500 kV substation compound (C12)

Most limiting land and soil capability

3 - Moderate limitations
4 - Moderate to severe limitations
5 - Severe limitations
6 - Very severe limitations
7 - Extremely severe limitations
8 - Extreme limitations



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Source: *Base data (aerial imagery, transport, water, and cadastral themes); NSW Foundation Spatial Data Framework; Transgrid*

1:150,000
0 4 7 km

Projection: GDA 1994 MGA Zone 55

HumeLink

Attachment 4: Land Soil Capability **Attachment 10 of 10**

Attachment 5

Other regional weeds

		LLS	
Common name	**Scientific name**	**Riverina**	**South East**
African lovegrass	*Eragrostis curvula complex*	X	
Bear-skin fescue	*Festuca gautieri*	X	
Blue heliotrope	*Heliotropium amplexicaule*	X	
Blue stars/Blue corn-lily	*Aristea ecklonii*		X
Bridal creeper	*Asparagus asparagoides*	X	
Chinese knotweed	*Persicaria chinensis*		X
Chinese violet	*Asystasia gangetica subsp. micrantha*		X
Devil's claw	*Ibicella lutea or Proboscidea louisianica*	X	
Glory lily	*Gloriosa superba*		X
Golden dodder	*Cuscuta campestris*	X	
Green cestrum	*Cestrum parqui*	X	
Harrisia cactus	*Harrisia martinii and H. tortuosa*	X	
Himalaya honeysuckle	*Leycesteria formosa*	X	
Honey locust	*Gleditsia triacanthos*	X	
Hymenachne	*Hymenachne amplexicaulis and hybrids*		X
Khaki weed	*Alternanthera pungens*	X	
Kudzu	*Pueraria lobata*		X
Long leaf willow primrose	*Ludwigia longifolia*	X	
Pampas grass	*Cortaderia spp.*	X	
Prickly pear	*Cylindropuntia spp.*	X	
Privet (broad-leaf)	*Ligustrum lucidum*	X	
Privet (narrow-leaf)	*Ligustrum sinense*	X	
Ragwort	*Senecio jacobea*		X
Reed canary grass	*Phalaris arundinacea*		X
Reed sweet-grass	*Glyceria maxima*	X	
Sea wheatgrass	*Thinopyrum junceiforme*		X
Sicilian sea lavender	*Limonium hyblaeum*		X
Skunk vine	*Paederia foetida*		X
Spanish heath	*Erica lusitanica*	X	
Spiny burr grass	*Cenchrus incertus & C. longispinus*	X	
Spiny emex	*Emex australis*	X	
St John's wort	*Hypericum perforatum*	X	
Star thistle	*Centaurea calcitrapa*	X	
Tangled hypericum	*Hypericum triquetrifolium*	X	
Tree of heaven	*Ailanthus altissima*	X	
Water poppy	*Hydrocleys nymphoides*		X
White blackberry / Mysore raspberry	*Rubus niveus*		X
Yellow bells / Golden bells	*Tecoma stans*		X

Attachment 6

Biosecurity Information System weed records

Common name	Scientific name	Wagga to Tarcutta	Tarcutta to Tumut	Tumut to Maragle	Tumut to Bookham	Bookham to Dalton	Dalton to Bannaby
African boxthorn	*Lycium ferocissimum*	X	X				
African lovegrass	*Eragrostis curvula*	X	X			X	X
African olive	*Olea europaea* ssp. *cuspidata*	X					
Asparagus fern	*Asparagus virgatus*	X					
Bathurst burr	*Xanthium spinosum*	X	X	X		X	
Black locust	*Robinia pseudoacacia*	X					
Black willow	*Salix nigra*		X				
Blackberry	*Rubus fruticosus* species aggregate	X	X	X	X	X	X
Blue heliotrope	*Heliotropium amplexicaule*	X					
Blue passionflower	*Passiflora caerulea*					X	
Bridal creeper	*Asparagus asparagoides*	X	X				
Broad-leaf pepper tree	*Schinus terebinthifolius*	X					
Cane cactus	*Austrocylindropuntia cylindrica*	X					
Cane needle grass	*Nassella hyalina*	X					
Cape broom	*Genista monspessulana*						X
Cape tulip - one leaf	*Moraea flaccida*	X					
Cat's claw creeper	*Dolichandra unguis-cati*	X					
Chilean needle grass	*Nassella neesiana*	X	X	X		X	X
Common pear	*Opuntia stricta*	X					
Common thornapple	*Datura stramonium*	X					
Coolatai grass	*Hyparrhenia hirta*	X	X	X		X	
Cotoneaster	*Cotoneaster glaucophyllus*	X					
Fireweed	*Senecio madagascariensis*						X
Gorse	*Ulex europaeus*	X					X
Green cestrum	*Cestrum parqui*	X					
Horehound	*Marrubium vulgare*	X			X		
Illyrian thistle	*Onopordum illyricum*	X	X				
Indian fig	*Opuntia ficus-indica*	X					
Johnson grass	*Sorghum halepense*	X					
Khaki weed	*Alternanthera pungens*	X	X				
Mother-of-millions	*Bryophyllum* species	X					
Noogoora burr	*Xanthium occidentale*	X	X			X	
Ox-eye daisy	*Leucanthemum vulgare*			X			
Paterson's curse	*Echium plantagineum*	X	X	X			

Common name	Scientific name	Wagga to Tarcutta	Tarcutta to Tumut	Tumut to Maragle	Tumut to Bookham	Bookham to Dalton	Dalton to Bannaby
Peppercorn	*Schinus* species	X					
Prickly pears - Austrocylindropuntias	*Austrocylindropuntia* species	X					
Prickly pears - Cylindropuntias	*Cylindropuntia* species	X					
Prickly pears - Opuntias	*Opuntia* species	X				X	
Privet - broad-leaf	*Ligustrum lucidum*	X					
Privet - European	*Ligustrum vulgare*	X					
Privet - narrow-leaf	*Ligustrum sinense*	X					
Saffron thistle	*Carthamus lanatus*	X					
Scotch broom	*Cytisus scoparius*			X			X
Scotch thistle	*Onopordum acanthium*	X					
Serrated tussock	*Nassella trichotoma*		X	X	X	X	X
Silverleaf nightshade	*Solanum elaeagnifolium*	X	X				
St. Barnaby's thistle	*Centaurea solstitialis*	X	X		X		
St. John's wort	*Hypericum perforatum*	X	X	X	X	X	X
Sticky nightshade	*Solanum sisymbriifolium*					X	
Sweet briar	*Rosa rubiginosa*	X	X	X	X	X	
Taiwan lily	*Lilium formosanum*	X					
Tree-of-heaven	*Ailanthus altissima*	X					
Willows	*Salix* species	X					

'X' – Recorded in the section.