



Mount Piper to Wallerawang Transmission Line Upgrade







Technical Report 9 – Hazard and Risk Assessment

Transgrid

August 2025

→ The Power of Commitment



Project name		Mount Piper to Wallerawang Transmission Line Upgrade					
Document title		Mount Piper to Wallerawang Transmission Line Upgrade Technical Report 9 – Hazard and Risk Assessment					
Project number		12612502					
File name		MP2W_Hazard and Risk.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	D. Redhu	F. Duncan B. James	 	G. Marshall		31/07/25
S4	1	D. Redhu	F. Duncan B. James	 	G. Marshall		18/08/25

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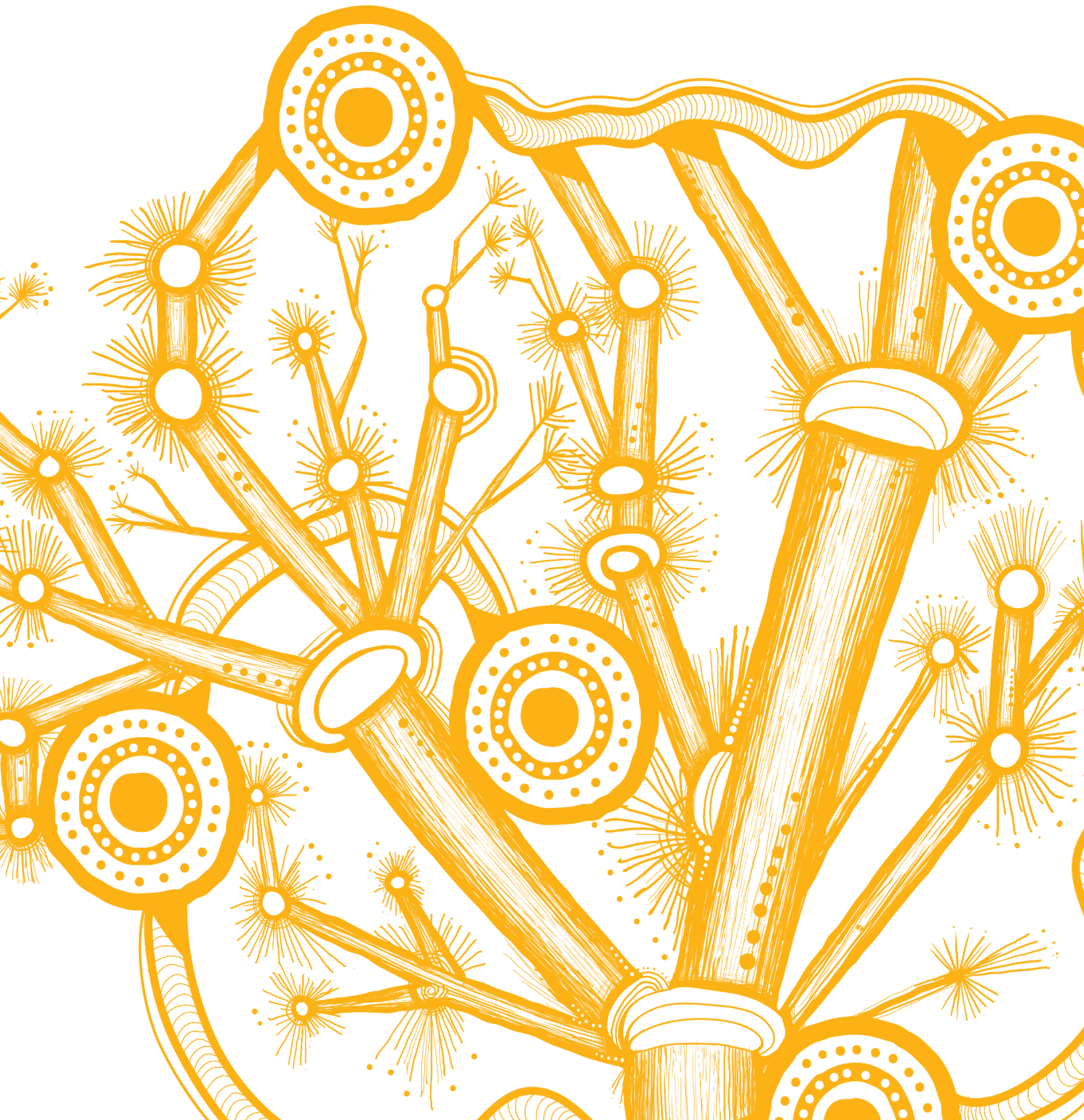
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Acknowledgement of Country

Transgrid and GHD acknowledge Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. Transgrid and GHD are committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.



Executive summary

The project

Transgrid proposes to deliver approximately eight kilometres (km) of new 330 kilovolt (kV) transmission line and double circuit transmission structures located between the Mount Piper and Wallerawang 330 kV substations (the project). The project would incorporate sections of an existing, single-circuit 132 kV transmission line, where the two transmission lines would share a widened easement and transmission structures. The project is located within the Central West region of NSW within the Lithgow Local Government Area (Lithgow LGA).

The project is identified in the NSW Network Infrastructure Strategy (EnergyCo, 2023) and also supports the key tenets of the NSW Electricity Infrastructure Roadmap (DPIE, 2020). The Roadmap identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from Renewable Energy Zones (REZ) in inland NSW to key demand centres. The Mount Piper to Wallerawang Transmission Line Upgrade Project would provide the additional capacity required to reliably transmit power from the Central West Orana REZ to the Greater Sydney region.

Purpose of the report

The assessment addresses the Secretary's Environmental Assessment Requirements (SEARs) for the project issued on 4 October 2024 for telecommunication system impacts, electrical and magnetic fields (EMF), public safety and aviation impacts. The results of the following specialist assessments are included as appendices to this report for specific potential risks:

- telecommunication system impacts and EMF
- bushfire
- aviation.

Existing environment

Key features of the existing environment that relate to potential hazards in the project footprint include:

- two 330 kV transmission lines (TL70 and TL71)
- one 132 kV transmission line (TL94E).

The project footprint is classified as bushfire prone land, associated with the vegetation within the Gardens of Stone State Conservation Area and vegetation areas around the Mount Piper Power Station.

The nearest residences are located approximately 60 metres (m) from the project footprint at Duncan Street, Lidsdale in NCA2.

The closest uncertified aerodrome to the project is Portland Helicopter Lift Services (HLS), which is within 10 km of the Mount Piper Power Station.

The closest certified aerodrome, Bathurst Aerodrome (YBTH), is about 35 km to the west of the project footprint.

Impact from the project

The assessments indicate that the risks to public safety associated with EMF and dangerous goods are negligible.

There are no high-pressure gas pipelines within proximity of the project, therefore the project does not present any risk to public safety associated with gas pipelines.

The public safety risks associated with bushfires and emergency egress can be managed by implementing the identified standard mitigation measures.

The project does not impact on the safety of aircraft movements.

The project would potentially result in telecommunication interference for the AM band for a distance up to 15 m from the easement boundary. Within this distance of the easement, the use of AM band could be impacted however there are limited receivers within this distance along the proposed transmission line.

The hazard and risk assessment has identified mitigation measures to be implemented during the design, construction and operation to manage and, where possible, minimise identified risks.

Recommended mitigation measures

Mitigation and management measures are required to ensure that the risk scenarios identified in this assessment are controlled to an adequate level. With adoption of the mitigation and management measures, the hazards with potential off-site impact would be suitably controlled. The key mitigation measures to manage risks include:

- ongoing consultation with landowners and other stakeholder with regards to radio interference impacts and impacts on aviation of operational transmission line.
- Emergency management plan to include bushfire emergency management and an evacuation plan
- Bushfire Management Plan.

During operation, Transgrid's existing operational procedures would be used to manage any risks associated with the project.

Conclusion

Risks to public safety and worker safety during construction is considered to be negligible. Risks associated with bushfire during construction are considered management with the implementation mitigation measures to ensure the safety of the general public and the project's construction workforce.

During operation, risks associated with bushfires and aviation risks would largely be managed through implementing well established transmission design elements and/or the existing Transgrid operational procedures. Further consultation would be ongoing to manage any potential risks associated with aerial application operations and radio interference, however both risks are considered to be manageable.

Overall, the hazard and risk assessment demonstrates that the project can be designed, constructed and operated in a manner that would manage the associated risks so far as is reasonably practical.

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Appendix B	Electric and magnetic fields report
Appendix C	Bushfire risk assessment
Appendix D	Aviation impact assessment

Key terms, acronyms and abbreviations

Abbreviations	Definitions
a.c.	alternating current
ADG	Australian dangerous good
AM	Amplitude modulation
APZ	Asset Protection Zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS	Australian Standard
AS/NZS	Australian Standard/ New Zealand Standard
BESS	Battery energy storage system
CEMP	Construction environment management plan
CWO REZ	Central West Orana Renewable Energy Zone
DG	Dangerous good
DG Class	Dangerous good classification
Easement	<p>A legal property right attached to a parcel of land that enables the use of an identified part 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 330 kV transmission lines would typically be 60 metres wide. The easement grants a right of access and for construction, maintenance and operation of the transmission line and other operational assets.</p> <p>For the project, some easements may overlap with existing easements such that the final easement width for the new easement would be narrower than 60 m (e.g. where paralleling the existing transmission line north of the Wallerawang 330 kV substation) and in other areas it may be wider to accommodate diverging transmission lines (e.g. in the area south of the Mount Piper 330 kV substation).</p>
EIS	Environmental impact statement
EMF	Electromagnetic field
EP&A Act	NSW Environmental Planning and Assessment Act 1979
FM	Frequency modulation
FRACM	Fire Risk Assessment and Control Measures
g	gram
GHD	GHD Pty Ltd
Hazard tree	A hazard tree is defined as a tree or part of tree that if it were to fall would infringe on the vegetation clearance requirements at maximum conductor sag of the transmission lines.
Hazchem	Hazardous chemical
HIPAP	Hazardous industry planning advisory paper
HLS	Helicopter lift services
Hz	Hertz
IBC	Intermediate bulk container
ICAO	International Civil Aviation Organization
ICNIRP	International Commission on Non-Ionizing Radiation Protection
OLS	Obstacle limitation surfaces
kg	Kilogram
KHz	Kilohertz
Km	Kilometre

Abbreviations	Definitions
kV	Kilovolt
kV/m	Kilovolt per metre
L	Litre
LGA	Local government areas
LPG	Liquified Petroleum Gas
LSALTs	Lowest safe altitudes
m	Metre
mG	Milligauss
MHz	Megahertz
MW	Megawatt
MWh	Megawatt hour
NASF	National Airports Safeguarding Framework
NPWS	NSW National Parks and Wildlife Service
N/A	Not applicable
NSW	New South Wales
OLS	Obstacle Limitation Surfaces
PANS-OPS	Procedures for Air Navigation Services - Aircraft Operations
PHA	Preliminary hazard analysis
PPE	Personal protective equipment
Project	The CSSI project "Mount Piper to Wallerawang Transmission Line Upgrade Project", which is the subject of this Environmental Impact Statement. The project involves the construction and operation of high voltage transmission lines between the Mount Piper and Wallerawang 330 kV substations.
Project footprint	Area that is to be directly affected by the construction and operation of the project.
REZ	Renewable Energy Zone
RFS	Rural Fire Service
SCA	State Conservation Area
SDS	Safety data sheet
SEAR	Secretary's environmental assessment requirement
SEPP	State Environment Planning Policy
SWMS	Safe work method statement
TL	Transmission Line
TLDM	Transmission Line Design Manual
µT	Micro Tesla
UN	United Nations
VHF	Very High Frequency
YBTH	Bathurst aerodrome

1. Introduction

1.1 Background

The Commonwealth and NSW governments have both established targets to achieve net-zero emissions by 2050. Achieving these targets requires low emissions technologies to be deployed at scale across all sectors of the economy, including the electricity generation sector, currently Australia's largest source of greenhouse gas emissions.

The NSW Transmission Infrastructure Strategy (DPE, 2018) aims to engage the private sector to invest in priority energy infrastructure projects, which can deliver low-cost, clean and reliable energy to consumers

As part of the Transmission Infrastructure Strategy, the NSW Government has developed a plan to establish five Renewable Energy Zones (REZs) to increase renewable energy generation, reduce carbon emissions, and help deliver lower wholesale electricity costs to consumers. The Central-West Orana REZ (CWO REZ), being the first REZ established, is planned to generate at least 4.5 gigawatt by the late-2020s.

The NSW Government's Electricity Infrastructure Roadmap (DPIE, 2020) identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from REZs in inland NSW to key demand centres. Interest in new energy generation projects in the CWO REZ is forecasted to exceed the existing transmission network capacity in several locations. The existing infrastructure located between the Mount Piper 550/330 kilovolt (kV) substation (Mount Piper 330 kV substation) and the Wallerawang 330/132 kV substation (Wallerawang 330 kV substation) has been identified in the NSW Network Infrastructure Strategy (EnergyCo, 2023) as requiring upgrades. The Mount Piper to Wallerawang Transmission Line Upgrade Project (the project) would provide the additional capacity required to reliably transmit power from the CWO REZ to the Greater Sydney region.

1.2 Location

The project is located within the Central West region of NSW within the Lithgow City Council Local Government Area (LGA). It is located approximately 14 kilometres (km) north-west of Lithgow situated on the western fringes of the Blue Mountains (Figure 1.1).

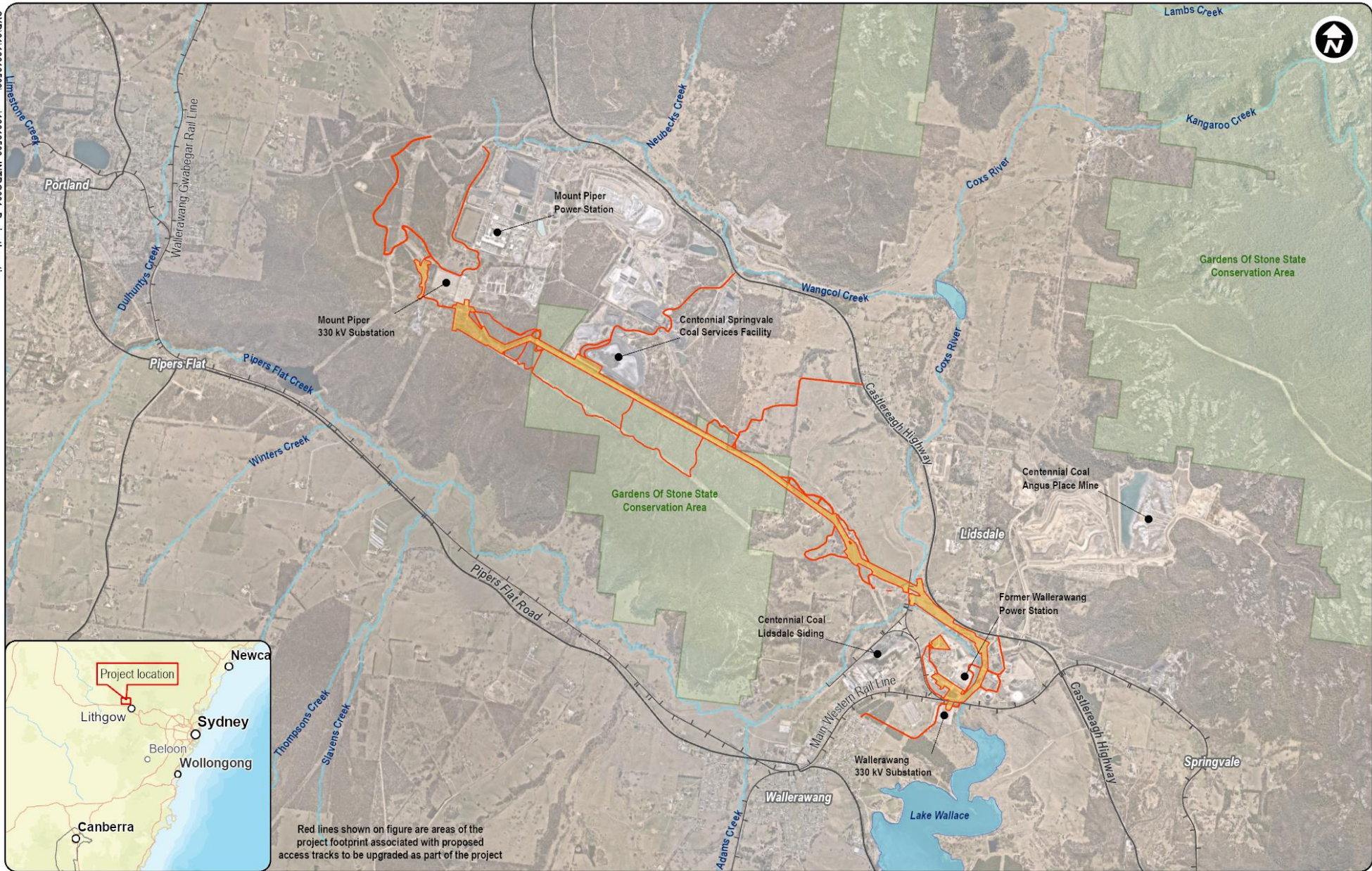
The area that is to be directly affected by the construction and operation of the project, is referred to as the project footprint and is shown in Figure 1.1. The project footprint is approximately 86.5 hectares in size and is generally bounded by the following:

- Castlereagh Highway to the north
- Former Wallerawang Power Station site to the east
- Gardens of Stone State Conservation Area (SCA) to the south
- Mount Piper Power Station to the north-west.

Land uses within and adjacent to the project footprint include:

- Electricity generation at Mount Piper Power Station
- Electricity transmission, including the Mount Piper and Wallerawang 330 kV substations, and associated transmission lines
- Mining activities, with several Centennial Coal operations including the former Ivanhoe Coal Mine and Springvale Coal Services overlapping the project footprint
- Agriculture, primarily livestock grazing
- Conservation, notably the Gardens of Stone SCA
- State and local road reserves including the Castlereagh Highway, Boulder Road and Brays Lane
- Rail corridors including the Main Western Rail Line and a disused railway line near Brays Lane.

A mixture land uses are proposed at the former Wallerawang Power Station site including predominately commercial land uses in the vicinity of the project. This may include redevelopment of the land for commercial and industrial land use and also the development of a Battery Energy Storage System (BESS).



Project components
 Project footprint
Existing environment
 Gardens of Stone SCA
 Roads
Railway
 Watercourse

Rev: A
 Date: 4/04/2025
 1:50,000 @ A4
 0 500 1,000
 Metres
 Grid: GDA2020 MGA Zone 56

Figure 1.1 Project location and regional context

1.3 The project

The project would involve construction and operation of approximately 8 km of new 330 kV transmission line between the Mount Piper and Wallerawang 330 kV substations as shown in Figure 1.2. The project would also include the replacement of transmission structures, partial adjustment of existing transmission lines, permanent and temporary access tracks, construction compounds and laydown areas.

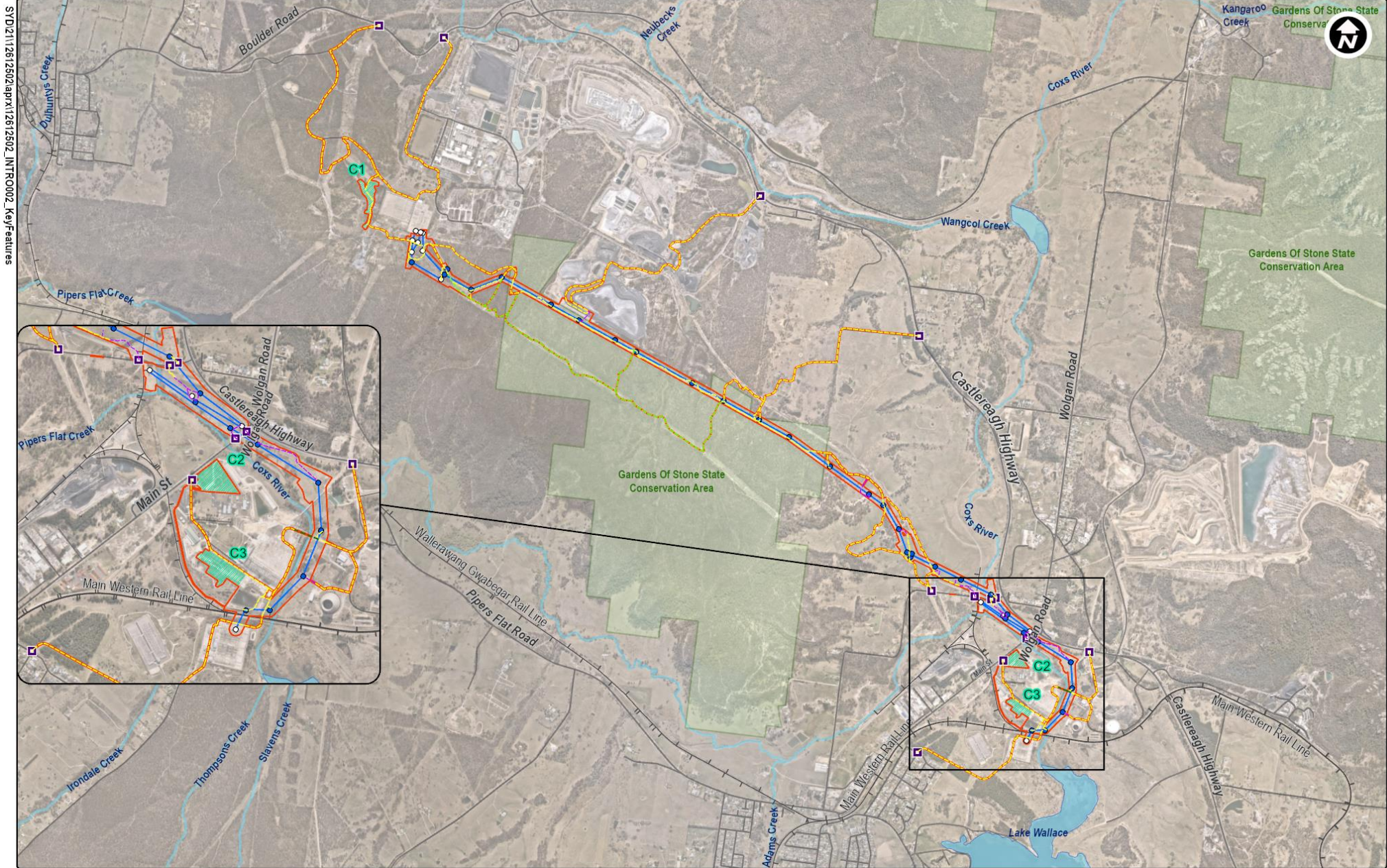
Table 1.1 outlines the key features of the project. The description of the project in Table 1.1 is based on the current concept design. Further detail is provided in Chapter 3 of the Environmental Impact Statement (EIS). The project will continue to be refined as part of detailed design.

Table 1.1 The project

Feature	Description
Design	
Transmission line and easement	<p>Approximately 8 km of new 330 kV transmission line between the existing Mount Piper 330 kV and Wallerawang 330 kV substations that would include (from north-west to south-east):</p> <ul style="list-style-type: none"> widening of approximately 0.5 km of existing easements in the vicinity of the Mount Piper 330 kV substation by up to 40 metres (m) to accommodate the new 330 kV transmission line and adjustments to existing 132 kV and 330 kV transmission lines widening of the existing 132 kV easement from 45 m to 60 m for 4.8 km to accommodate double circuit transmission structures for the existing 132 kV transmission line and the new 330 kV transmission line installation of two 132 kV pole structures where the existing 132 kV transmission line is restrung onto the new double circuit transmission structures construction of 1.2 km of new 330 kV transmission line from the existing 132 kV transmission line south-east to the intersection of Main Street and the Castlereagh Highway on a 60 m easement construction of 1.5 km of new 330 kV transmission line on a 40 m easement running parallel to existing 330 kV transmission lines for approximately 1.1 km and then diverging and widening to 60 m for the remaining 0.4 km to the Wallerawang 330 kV substation. <p>The standard easement widths for 132 kV and 330 kV transmission lines are 45 m and 60 m respectively. However, easements may vary in width where multiple transmission lines converge/diverge or where they overlap with an existing easement.</p>
Transmission structures	<p>Transmission structures for the project include approximately 28 new steel lattice towers and four steel and/or concrete pole structures. Transmission structures would range in height from approximately 14 to up to 60 m, however these heights would be subject to detailed design. The image below presents an indicative illustration of the types of structures proposed for the project and their maximum heights.</p> <p>The steel transmission structures would generally be spaced between 100 m to 550 m apart and the pole structures about 30 m to 50 m apart.</p> <p>New conductors, earth wires and optical ground wire (OPGW) would be installed on the new transmission structures for the new 330 kV and existing 132 kV lines.</p>

Feature	Description																																																																																																																														
	<p>Local adjustment of existing transmission structures would be required in the vicinity of the Mount Piper 330 kV substation to minimise crossover of transmission lines.</p> <p>Redundant transmission structures, including the gantry immediately north of the Main Western Rail Line, would be removed and recycled, where possible.</p>																																																																																																																														
Construction																																																																																																																															
Program	<p>Construction of the project would commence once all necessary approvals are obtained. It is anticipated that construction would commence in late 2026.</p> <p>Construction would be undertaken in stages over a period of approximately 20 months. The key activities and their indicative durations shown in the below table.</p> <table border="1"> <thead> <tr> <th>Activity</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> <th>12</th> <th>13</th> <th>14</th> <th>15</th> <th>16</th> <th>17</th> <th>18</th> <th>19</th> <th>20</th> </tr> </thead> <tbody> <tr> <td>Site establishment</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Civil works</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Assembly of structures</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Testing and commissioning</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>De-mobilisation</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Site establishment																					Civil works																					Assembly of structures																					Testing and commissioning																					De-mobilisation																				
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Construction methodology	<p>Construction of the project would include:</p> <ul style="list-style-type: none"> – site establishment including vegetation removal, construction compound establishment, access track construction and upgrade – removal of existing transmission structures where required – civil works involving earthworks and establishment of construction benches for each transmission structure, and establishment of brake and winch sites – construction of footings and foundation work for the new transmission structures – assembly and erection of new transmission structures – stringing of conductors. 																																																																																																																														
Construction hours	<p>The proposed construction working hours for the project are 7am to 7pm Monday to Sunday. Out-of-hours construction work will likely be required between 7pm to 7am Monday to Sunday and public holidays, to align with scheduled outages.</p> <p>Justification for the out-of-hours works includes:</p> <ul style="list-style-type: none"> – proximity to live transmission lines requiring the work to be completed under a scheduled outage for network and worker safety – the need to complete works within a limited time window to meet a timeframe to re-energise the transmission line to avoid disruption to customers – minimising disruptions to the use of the Main Western Rail Line during stringing. 																																																																																																																														
Construction workforce	Expected to peak at about 150 personnel and contractor, with an average workforce of about 60 personnel and contractor.																																																																																																																														
Construction compounds and laydown areas	<p>A total of three construction compounds would support the construction of the project. One would be located at the western end of the project near the Mount Piper 330 kV substation and two located at the eastern end of the project within the former Wallerawang Power Station site. The locations of these compounds are shown in Figure 1.2.</p> <p>Laydown of materials (e.g. poles, cable drums, other large equipment, etc.) would also occur at specified locations along the easement within the project footprint, particularly at transmission structure locations.</p>																																																																																																																														
Access	<p>To facilitate efficient construction access, the following is required:</p> <ul style="list-style-type: none"> – upgrading and widening of approximately 25 km of existing access tracks to at least 6 m, with some sections widened up to 10 m due to local topography – construction of approximately 2 km of new 6 m wide access tracks. <p>In addition to those tracks, approximately 4 km of existing track would be used only by light vehicles. The light vehicle tracks may require minor repairs (for example, filling potholes), but would not be graded or widened.</p> <p>The project footprint would be accessed from public roads at 13 access points, with the majority of these being existing property access points.</p>																																																																																																																														

Feature	Description
	<p>Existing access tracks would be used in preference to new tracks wherever possible. Access track upgrades and widening would include required drainage.</p> <p>Access points and access tracks established for the construction of the project that are not required for future operation and maintenance activities would be returned to pre-project conditions, subject to agreement with landowners.</p>
<p>Utility adjustments and infrastructure crossings</p>	<p>The new transmission line would need to cross the following utilities and infrastructure:</p> <ul style="list-style-type: none"> – water pipeline operated by WaterNSW – distribution lines operated by Endeavour Energy – rail signal power supply – council drainage and other assets – public roads at Brays Lane and Main Street – rail lines at the Main Western Rail Line and the disused rail line travelling north of Brays Lane. <p>It is not currently anticipated that the project would require the adjustment of any nearby utilities. Further investigations and consultation with asset owners would be undertaken during detailed design.</p>
<p>Vegetation clearing</p>	<p>The project would require the clearance of vegetation for a number of activities including but not limited to building new access tracks and widening existing ones, establishment of construction compounds, laydown areas, and brake and winch sites, construction of the transmission structures, and establishing and maintaining the vegetation clearance requirement for the transmission lines.</p> <p>Vegetation clearing would be undertaken either with the use of machinery or manually, where it is unsafe to operate machinery, or when access is limited. Root balls would be retained where possible. Clearing methods would be determined with consideration to vegetation type or structure, slope and terrain, and environmental and ecological constraints. Removed vegetation, which is weed free, would be mulched for beneficial reuse, where appropriate.</p> <p>Areas cleared for construction, that are not needed for operation of the project, would be rehabilitated to a stable and weed free condition.</p>
<p>Testing and commissioning</p>	<p>Testing and structure checks would form part of the final construction and installation work. These activities would ensure the project has been installed in accordance with the design and statutory standards and is safe to proceed to commissioning which would include, but not be limited to:</p> <ul style="list-style-type: none"> – transmission line cut-in and connection to the electrical network – protection, control and metering checks – high voltage equipment operation and energisation – post commissioning testing and verification.
<p>Demobilisation and rehabilitation</p>	<p>Upon completion of the construction works, all construction equipment, temporary fencing and waste would be removed.</p> <p>All disturbed areas would be rehabilitated to a stable, weed-free condition, unless designated as a permanent access track. This would include spreading topsoil, cleared and stockpiled at the beginning of construction, across the disturbed area to stabilise it to a state where natural regrowth can occur.</p>
<p>Operation</p>	
<p>Design life</p>	<p>About 50 years.</p>
<p>Maintenance</p>	<p>All project infrastructure would require regular maintenance to maintain serviceability and maximise its operational life. Maintenance activities would include:</p> <ul style="list-style-type: none"> – transmission structure monitoring – annual aerial inspection – routine vegetation management on the easement and in the hazard tree zone – access tracks would be maintained in a trafficable condition. <p>Should any irregularities be identified following routine inspections, a work crew would be dispatched from existing Transgrid maintenance depots to rectify any defects found.</p> <p>Periodic inspection and maintenance work would be managed by Transgrid as part of existing operations, with no additional personnel requirements.</p>



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<p>Project components</p> <ul style="list-style-type: none"> Project footprint New and adjusted transmission line ● Proposed transmission structure ○ Existing transmission structure to be reused 	<p>Construction compounds</p> <ul style="list-style-type: none"> Access tracks - new Access tracks - minor upgrades as required (light vehicles only) Access tracks - upgrade and widen Access tracks - existing (no change) ■ Access point 	<p>Existing environment</p> <ul style="list-style-type: none"> Gardens of Stone SCA Roads Railway Watercourse 	<p>Rev: A Date: 7/07/2025 1:40,000 @ A4</p> <p>0 500 1,000 Metres</p> <p>Grid: GDA2020 MGA Zone 56</p>
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Figure 1.2 Key features of the project

1.4 Environmental assessment requirements

This hazard and risk assessment has been prepared to address the Secretary’s Environmental Assessment Requirements (SEARs) for the project issued on 22 May 2025. Table 1.2 outlines the requirements relevant to this assessment.

Table 1.2 Relevant SEARs

Requirements	Where addressed in this report
Hazards	
Identify possible effects on telecommunications systems, assess impacts and mitigation measures to avoid potential disruptions to radio communication services, which may include the installation and maintenance of alternative sites	Section 4.1.1 (Construction impacts – Telecommunications) Section 4.2.1 (Operational impacts – Telecommunications) Appendix A
An assessment of potential hazards and risks associated with electric and magnetic fields (EMF) having regard to the latest advice of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)	Section 4.1.2 (Construction impacts – Electric and magnetic fields) Section 4.2.2 (Operational impacts – Electric and magnetic fields) Appendix B
An assessment of the risks to public safety, paying particular attention to bushfire risks, emergency egress and evacuation, the handling and use of any dangerous goods and potential impacts to high pressure gas pipelines	Section 4.1.3 (Construction impacts – Public safety) Section 4.1.3.1 (Bushfires) Section 4.1.3.2 (Emergency egress and evacuation) Section 4.1.3.3 (Dangerous goods) Section 4.1.3.4 (High pressure gas pipelines) Section 4.2.3 (Operational impacts – Public safety) Section 4.2.3.1 (Bushfires) Section 4.2.3.2 (Emergency egress and evacuation) Section 4.2.3.3 (Dangerous goods) Section 4.2.3.4 (High pressure gas pipelines) Appendix C
Assess potential impacts on aviation safety, including: <ul style="list-style-type: none"> – defined air traffic routes, aircraft operating heights, approach / departure procedures, radar interference, communication systems, navigation aids, use of emergency helicopter access, aerial baiting and culling in the National Parks, safe and efficient aerial application of agricultural fertilisers and pesticide, and aerial fire control – identify certified aerodromes within 30 km of the transmission line and uncertified aerodromes and landing areas within 10 km of the transmission line, and consider the impact to nearby aerodromes, aircraft landing areas – address impacts on obstacle limitation surfaces – identify aviation marking requirements 	Section 4.1.4 (construction impacts – aviation safety) Section 4.2.4 (Operational impacts – aviation safety) Appendix D

1.5 Purpose and structure of this report

This report has been prepared by GHD Pty Ltd (GHD) as part of the Environmental Impact Statement (EIS) for the project.

The purpose of this report is to assess potential hazard and risk issues from the construction and operation of the project, and where required, identify feasible and reasonable mitigation and management measures.

The report is structured as follows:

- Section 1 – provides an introduction to the project and the assessment
- Section 2 – describes the methodology for the assessment
- Section 3 – describes the existing conditions
- Section 4 – assesses the impacts of the construction and operation of the project
- Section 5 – provides mitigation measures for the impacts identified
- Section 6 – conclusion
- Section 7 – references.

The report presents the results of a number of specialist assessments for specific potential risks including:

- Appendix A – Corona Noise Report (report includes effects on telecommunication systems)
- Appendix B – Electric and Magnetic Fields Report
- Appendix C – Bushfire Assessment
- Appendix D – Aviation Impact Assessment.

2. Assessment approach and methodology

2.1 Relevant legislation and guidelines

The key legislation, guidelines and/or policies informing the approach to the assessment are outlined in Table 2.1.

Table 2.1 Relevant legislation and guidelines for each risk assessment

Risk assessment	Legislation and guidelines
Telecommunications	Australian Standards, AS 2344: <i>Limits of electromagnetic interference from overhead a.c. powerlines and high voltage equipment installations in the frequency range 0.15 MHz to 3000 MHz</i> , 2016
EMF	International Commission on Non-Ionizing Radiation Protection (ICNRP), <i>Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic Fields (1 Hz – 100 kHz)</i> , 2010 Transgrid, <i>Transmission Line Design Manual (TLDM)</i> , 2021
Bushfires	NSW Rural Fire Service (RFS), <i>Planning for Bush Fire Protection</i> , 2019
Dangerous goods and potentially hazardous industry	State Environment Planning Policy (<i>Resilience and Hazards</i>)2021 Hazardous Industry Planning Advisory Paper, No 3 – <i>Risk Assessment</i> , 2011 Hazardous Industry Planning Advisory Paper, No 4 – <i>Risk Criteria for Land Use Safety Planning</i> , 2011
Aviation safety	International Civil Aviation Organization (ICAO), <i>Doc 8168 Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS)</i> , 2020 National Airports Safeguarding Framework (NASF), <i>Guideline F: Managing the Risk of Intrusions into the Protected Airspace of Airports</i> , 2012 NASF, <i>Guideline G: Protecting Aviation Facilities—Communications, Navigation and Surveillance</i> , 2016 Department of Infrastructure, Transport, Regional Development, Communications and the Arts, <i>Civil Aviation Safety Regulations</i> , 1998

2.2 Methodology

2.2.1 Study area

For the purposes of the assessment, the project footprint and study area have been defined as follows:

- Project footprint – the area that would be directly disturbed by construction and the location of operational infrastructure. The disturbance area would include clearing areas, construction activity zones and access tracks.
- Study area – the area investigated which includes the footprint of the project and surrounding area, with the potential to be directly or indirectly affected by the project in a significant way. The study area for the specific hazards is different and are summarised in Table 2.2.

Table 2.2 Study area of hazard assessment forming part of this report

Risk	Study area
Aviation	Areas within 30 nautical miles (55.56 km) of the proposed transmission line to ensure compliance with the requirements of Airservices Australia to identify potential impacts to certified aerodromes.
Bushfire	The project footprint and a buffer area of up to 140 m from the project footprint, as required by <i>Planning for Bush Fire Protection</i> (RFS, 2019). The broader landscape is also considered to capture the risk of landscape scale fires originating in surrounding areas and spreading to the project footprint.
EMF	Transmission line easement as well as other nearby existing transmission lines.

2.2.2 Hazard assessment

Each hazard identified in the SEARs has a unique assessment methodology as outlined below.

2.2.2.1 Telecommunications

Transmission lines have the potential to interfere with radio frequencies and impact telecommunications (including internet and phone reception), and television signals in close proximity. Australian Standard AS2344 outlines the limits of electromagnetic interference to ensure that infrastructure does not interfere with telecommunications. The standard applies to installations in the 0.15 megahertz (MHz) to 3000 MHz frequency range. Accordingly, in Australia the limit of radio interference at 50 Hz (fair weather) is 36 dB μ V/m. This limit is conservative in comparison to other international standards.

Corona can be a source of severe interference on the AM broadcast band, especially during bad weather. The FM broadcast band (87 to 108 MHz) is not affected as much by corona from overhead line interference.

Modelling for the radio interference and corona was completed using the CDEGS SES Enviroplus software package. The assessment was completed at 1.8 m at the average ear height of the normal standing position of the general public (1.8 m above ground level).

The following five scenarios were modelled and are shown in Figure 3-5 of Appendix B:

- Scenario 1: Span 5C to 6C parallel to existing 330kV transmission line (TL)70/71
- Scenario 2: Span 9D to 10D, TL70 cross-over to the new 330kV tower
- Scenario 3: Span 12D to 13D, 330kV TL71 crossing 132kV TL94E
- Scenario 4: Span 17D to 18D
- Scenario 5: 27D to 28D parallel to 23 to 24.

A review of existing point to point communication links was undertaken by reviewing the location of the existing NSWTA links and also the latest ACMA RRL archive (in November 2024).

The following weather conditions were assessed in the model:

- fair weather
- light rain: simulated at a rain rate of 0.75 millimetres per hour (mm/h)
- heavy rain: simulated at a rain rate of 18 mm/h.

2.2.2.2 Electric and magnetic fields

The ARPANSA is the Federal Government agency charged with the responsibility for protecting the health and safety of people, and the environment, from EMF. The ARPANSA recommends the use of the exposure guidelines provided by International Commission on Non-Ionizing Radiation Protection (ICNIRP), called *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic Fields (1 Hz – 100 kHz)*, ICNIRP, 2010. Additionally, the impact of EMF on human health is further detailed in Appendix B.

The ICNIRP reference levels for exposure of the public are 2000 milligauss (mG) and 5 kV/m for magnetic and electric fields respectively. These limits apply to both children and adults. The essential biological basis for the guidelines has remained unchanged for more than 20 years. ICNIRP's limiting thresholds for general public exposure are widely accepted as providing complete protection against all known adverse health effects of electric and magnetic fields.

Limitations of exposure that are based on the physical quantity or quantities directly related to the established health effects are termed basic restrictions. In the ICNIRP publication, the physical quantity used to specify the basic restrictions on exposure to EMF is the internal electric field strength, as it is the electric field that affects nerve cells and other electrically sensitive cells. The internal electric field strength is difficult to assess. Therefore, for practical exposure assessment purposes, reference levels of exposure are provided.

The Transmission Line Design Manual (TLDM; Transgrid 2021) specifies that the ICNIRP General Public Reference levels for Electric Fields (5 kV/ m) shall be complied with where possible. For less publicly frequented areas within an easement, the TLDM suggests the maximum external electric field shall not exceed 9.1 kV/m at 1 m height above the ground under contingency operation (double circuit transmission structures with single circuit operating), and the maximum electric field shall not exceed 7.8 kV/m under

normal operation (double circuit transmission structures with double circuit operating). The TLDM has based this number of an internal dosimetry study to meet the ICNIRP thresholds for general public exposure.

The TLDM specifies that locations accessible to the general public shall also limit magnetic field exposure to 100 micro Tesla (μT) (which equates to 1000 mG) to avoid interference with implantable medical devices. This is more stringent than the ICNIRP limits of 2000 mG for public exposure.

Based on the ICNIRP and Transgrid requirements, the reference levels for the EMF assessment are summarised in Table 2.3.

Table 2.3 ICNIRP and Transgrid EMF reference levels for assessment of health effects to the general public

Parameter	Reference level
Electric Field	<ul style="list-style-type: none"> – 5 kV/m at the edge of easement (ICNIRP) – 7.8 kV/m within easement (Transgrid Standard) – normal operation) – 9.1 kV/m within easement (Transgrid Standard) – contingency operation)
Magnetic Field	<ul style="list-style-type: none"> – 2,000 mG (ICNIRP) – 1,000 mG (Transgrid Standard)

Modelling for the electric field assessment and the magnetic field assessment was completed using the CDEGS SES Enviroplus software package. Electric fields have been modelled at a height of 1 m above ground level as detailed in the TLDM.

The following five scenarios (same as used in the telecommunications assessment in section 2.2.2.1 and shown in Figure 3-5 of Appendix B) were modelled to capture key elements of the proposed transmission network augmentation:

- Scenario 1: Tower 3C to 8C, a 100 m easement for the new 330 kV left-hand-side circuit, running in parallel with the 330 kV existing double circuit
- Scenario 2: Site-specific assessment of span 9D-10D to the nearest receiver
- Scenario 3: Site-specific assessment of 330kV to 132kV TL crossing at span 12D-13D
- Scenario 4: Tower 13D to 27D, a 60 m easement for the new left-hand-side 330 kV circuit and the right-hand-side 132 kV circuit
- Scenario 5: Site-specific assessment of parallel line section (proposed and existing) at span 27D-28D.

The scenarios modelled cover all transmission structure types proposed as part of this project. Based on the modelled scenarios anticipated EMF levels were assessed for the transmission lines against the relevant criteria. This then informed the identification of mitigation measures to be adopted during the detailed design.

2.2.2.3 Bushfires

The bushfire assessment’s purpose is to assess potential bushfire issues from the construction and operation of the project. The methodology of the assessment included three steps:

1. A desktop assessment of:
 - a. Bushfire prone land mapping
 - b. Vegetation types, classification, structure and fuel characteristics identified during the surveys undertaken as part of the Biodiversity Development Assessment Report, satellite imagery and the NSW SEED database
 - c. Existing infrastructure and assets and the project description, including design, construction, commissioning and operation activities
 - d. Bushfire history (mapped locations and years for both planned and unplanned fire)
 - e. Regional weather data and topography
 - f. Potential bushfire behaviour and risk scenarios
 - g. Proposed changes/upgrades to access and egress.

2. A site inspection:
 - a. Completed on 15 and 16 October
 - b. Ground truthing the findings of the desktop assessment with a site inspection of the bushfire study area.
3. A risk assessment across all phases of the project, including:
 - a. Bushfire risk arising from the potential for the project to start a bushfire and impact public safety
 - b. The risk of bushfire from areas outside the project footprint affecting the project.

2.2.2.4 Emergency egress and evacuation

A desktop review of disruptions to access routes in and out of the footprint was completed to identify any potential public safety impacts to the ability of emergency services' emergency egress and evacuation processes, including consideration of the impacts of the proposed changes/upgrades to access proposed as part of the project.

2.2.2.5 Dangerous goods

Dangerous goods handling and use is assessed using the process set out in SEPP Resilience and Hazards. SEPP Resilience and Hazards applies to any project which falls under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'.

A 'hazardous industry' is one in which when all locational, technical, operational and organisational safeguards are employed, continues to pose a significant risk (as per the requirements of SEPP Resilience and Hazards). A 'potentially offensive industry' is one which would, in the absence of safeguards, emit a polluting discharge which would cause a significant level of offence (potential discharge that has adverse impacts to public health).

The risk screening process for potentially hazardous facilities concentrates on the storage of specific dangerous good classes that have the potential for significant offsite effects. Specifically, the assessment involves the identification of classes and quantities of all dangerous goods to be used, stored or produced on site with an indication of storage locations. The quantities of dangerous goods are then assessed against the SEPP Resilience and Hazards threshold quantities.

Following risk screening, SEPP Resilience and Hazards requires a determination as to whether the project poses significant risk or offence. This requires identification of potential hazards to highlight any risks associated with the interaction of the project (as a whole) with the surrounding environment (that is, a systematic process to identify any potential offsite impacts). The aim of the hazard identification process is to determine whether the development project is considered a hazardous industry.

Where a development is classified as 'potentially hazardous industry', a Preliminary Hazard Assessment (PHA) is required to determine the risk to people, property and the environment at the proposed location and in the presence of controls. Criteria of acceptability are used to determine if the development project is classified as a 'hazardous industry'. If this is the case, the development project may not be permissible.

2.2.2.6 High pressure gas pipelines

A review of aerial photography and information on the Gas Bulletin Board website (AEMO, 2025) on the position of high pressure pipelines across Australia was undertaken to determine if there were any high pressure gas pipelines in or adjacent to the project footprint.

2.2.2.7 Aviation safety

The aviation impact assessment includes:

- identification of certified aerodromes that are located within 30 nautical miles (55.56 km) of the project and their associated approach and landing procedures
- identification of the Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces associated with the nominated certified aerodromes
- assessment of low level flight operations including agricultural spraying operations, aerial baiting and culling, and aerial firefighting in the area

- assessment of impacts to:
 - operational airspace of the aerodromes
 - potential infringements to the OLS and PANS-OPS surfaces
 - air routes published in aeronautical charts
 - aeronautical navigation facilities
- identification of relevant civil aviation safety requirements/standards with respect to existing aerodrome conditions and whether these standards are met
- consultation with airports and aircraft operating agencies
- provision of recommendations to minimise impacts and ensure aviation safety is maintained throughout the construction and operation of the project.

2.2.2.8 Mine subsidence

The project footprint is not located within a declared Mine Subsidence District. Underground historic mine workings are known to occur in the area, as informed by the NSW Subsidence Advisory (Subsidence Advisory 2024). The risk of subsidence associated with these underground historic mine workings has been assessed separately by the project's Geotechnical Investigation Report (SMEC, 2024). Geotechnical investigations were carried out across the transmission line route for the design of transmission structures and their footings. The investigation included 25 geotechnical bore holes. With the extent of Centennial Coals mining leases, 9 bore holes were completed across the transmission route.

3. Existing environment

The project footprint largely aligns with the existing transmission line infrastructure between the Mount Piper and Wallerawang 330 kV substations. Currently, there are two 330 kV transmission lines (TL70 and TL71) on double circuit transmission structures that run between the substations. There is also one single circuit 132 kV transmission line (TL94E) that runs between the substations. The existing substations and transmission lines are a source of interference and EMF.

The area along the project footprint consists of steep, hilly terrain associated with the Gardens of Stone SCA immediately south-west of the project, and flatter, gently undulating rural land to the north-east and south around Lidsdale, Wallerawang and Pipers Flat Road. Land use predominately consists of highly modified, cleared land for rural and residential uses with scattered, remnant vegetation mostly bordering creek lines and property boundaries. A large area of bushland is in the centre and north-west of the study area as part of the Gardens of Stone SCA.

There are several residential dwellings within the area, located on Brays Lane, Wolgan Road, View Street and Pipers Flat Road. The nearest residences are located approximately 58 m from the project footprint at Duncan Street, Lidsdale in NCA2. Similarly, there are small local businesses located north and south of Wallerawang 330 kV substation.

A summary of the key features of the existing environment that relate to the relevant hazards is found in the following sections. Their relative location to the project footprint is provided in Figure 3.1.

3.1 Electric and magnetic fields (EMF)

3.1.1 What is EMF?

EMF are both naturally occurring and found wherever there is electricity. Natural occurrences include from lightning, solar activity and the earth itself. All living organisms produce EMF. Wherever electricity is flowing or there is an electrical force, EMF are produced.

The presence of EMF is an essential part of the electricity process. EMF are not the same as the electromagnetic radiation (EMR) associated with radio waves, microwaves and x-rays. EMF cause energy to be transferred along electric wires whereas EMR causes energy to be radiated away from the source and can be detected at a great distance.

Internationally, there have been almost 3,000 studies carried out in relation to EMF. Leading health bodies such as the World Health Organisation (WHO), the US National Institute of Environmental and Health Sciences and the UK National Radiological Protection Board have evaluated the research to assess the likelihood of health effects associated with exposure to EMF. Transgrid is guided by the advice from the WHO and Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), the responsible agency in Australia for advising on exposure limits to EMF.

The equipment used for the transmission of electricity for the project would operate at a frequency of 50 Hertz (Hz), which falls into a range referred to as extremely low frequency (ELF) EMF. While there is currently no scientific evidence or research that confirms exposure to ELF EMF causes any health effects, Transgrid takes a precautionary approach of 'prudent avoidance'.

Electric fields

An electric field occurs around any area where electric charges experience a force. The strength of this force is related to the voltage: the higher the force/voltage, the stronger the electric field. The level of electric fields is measured in thousands of volts per metre (kV/m).

Electric fields are strongest closest to the source but reduce quickly with distance. In addition, most materials act as a barrier to electric fields.

Magnetic fields

A magnetic field occurs around any area where magnetic materials experience a force. Magnetic fields are produced by the flow of an electric current: the higher the current (measured in amps), the greater the magnetic field. The strength of magnetic fields is measured in milliGauss (mG).

Like electric fields, magnetic fields are highest closest to the source but also reduce quickly with distance.

Unlike electric fields, magnetic fields are only present when an electric current is flowing. As most materials will not act as a shield or barrier to magnetic fields, this is a reason why research into EMF and health generally focuses on magnetic fields

3.1.2 Sources of EMF in vicinity of project

EMF exists wherever electricity is generated, transmitted or distributed in transmission lines or cables, or used in electrical appliances. Existing sources of EMF relevant to the project include transmission lines and high voltage equipment:

- two 330 kV substations (Mount Piper and Wallerawang)
- high voltage overhead lines include:
 - two 330 kV transmission lines (TL70 and TL71)
 - one 132 kV transmission line (TL94E).

3.2 Bushfire

The project footprint is classified as bushfire prone land. Vegetation Category 1 (the highest bushfire risk) occurs in the northern extent of the project footprint around the Mount Piper 330 kV substation. Vegetation Category 2 occurs in the southern extent of the project footprint around the Wallerawang 330 kV substation.

There are large parcels of forest and woodland areas on either side of the existing easement. Some of these areas have substantial surface and near surface fuels. For example, dry sclerophyll shrubby forest vegetation has an overall fuel load of 31.5 tonnes/hectare, which includes bark and canopy fuel. The surface fuel load of 22 tonnes/hectare (see section 4.4.2 of Appendix C Bushfire Risk Assessment).

The eastern end of the project footprint includes areas where the vegetation is dominated by grasses with land leased for agricultural purposes. These grassy areas typically have fuel loads of up to 6 tonnes/hectares.

The existing easement contains a fairly continuous elevated fuel load with plants present in high densities. This includes significant weed encroachment (e.g. blackberry) in some areas which increase the fuel load in these areas.

Potential bushfire ignition sources currently exist due to the rail lines and sidings (Wallerawang Gwabegar Rail Line, Main Western Rail Line and Lidsdale siding), the surrounding road network (Castlereagh Highway and Pipers Flat Road), industrial operations (Mount Piper Power Station, Centennial colliery and substations) and general farm operations.

3.3 Emergency egress

Access and egress to the project footprint is predominantly via a network of existing unsealed access tracks (of varying widths) which provide access from the south via the SCA. The SCA can be accessed from its northern and southern ends via public roads or via private properties, which includes locked gates in many locations.

Some existing tracks which provide access to the project footprint include operating infrastructure (for example the Centennial Coal conveyor) and structures such as culverts and bridge crossings at various points which could constrain access by heavy vehicles.

3.4 Dangerous goods

Existing industrial operations (Mount Piper Power Station, Centennial colliery and substations) and farm operations require the storage dangerous goods (e.g. diesel, compressed oxygen and sulfuric acid). Such goods are considered limited in the project footprint but are present on adjacent lands.

3.5 High pressure pipelines

There are no high pressure pipelines in the study area.

3.6 Aviation safety

The closest uncertified aerodrome to the project is Portland Helicopter Lift Services (HLS), which is approximately 4.3 km from the western end of the project footprint. The closest certified aerodrome, Bathurst Aerodrome (YBTH), is about 35 km to the west of the project footprint.

3.7 Mine subsidence

Although the project footprint is not located within a declared subsidence district, historical mine workings are present. The proposed location of transmission structures 23D to 25D are undermined by historical bord and pillar mine workings and are located next to former open cut workings of Lamberts Gully Colliery (SMEC, 2024). Transmission structure 22D is also adjacent to the former open cut workings of Lamberts Gully Colliery. The geotechnical investigation for the project (SMEC, 2024), which involved boreholes ranging between 8 to 11 m in depth, did not encounter the workings.

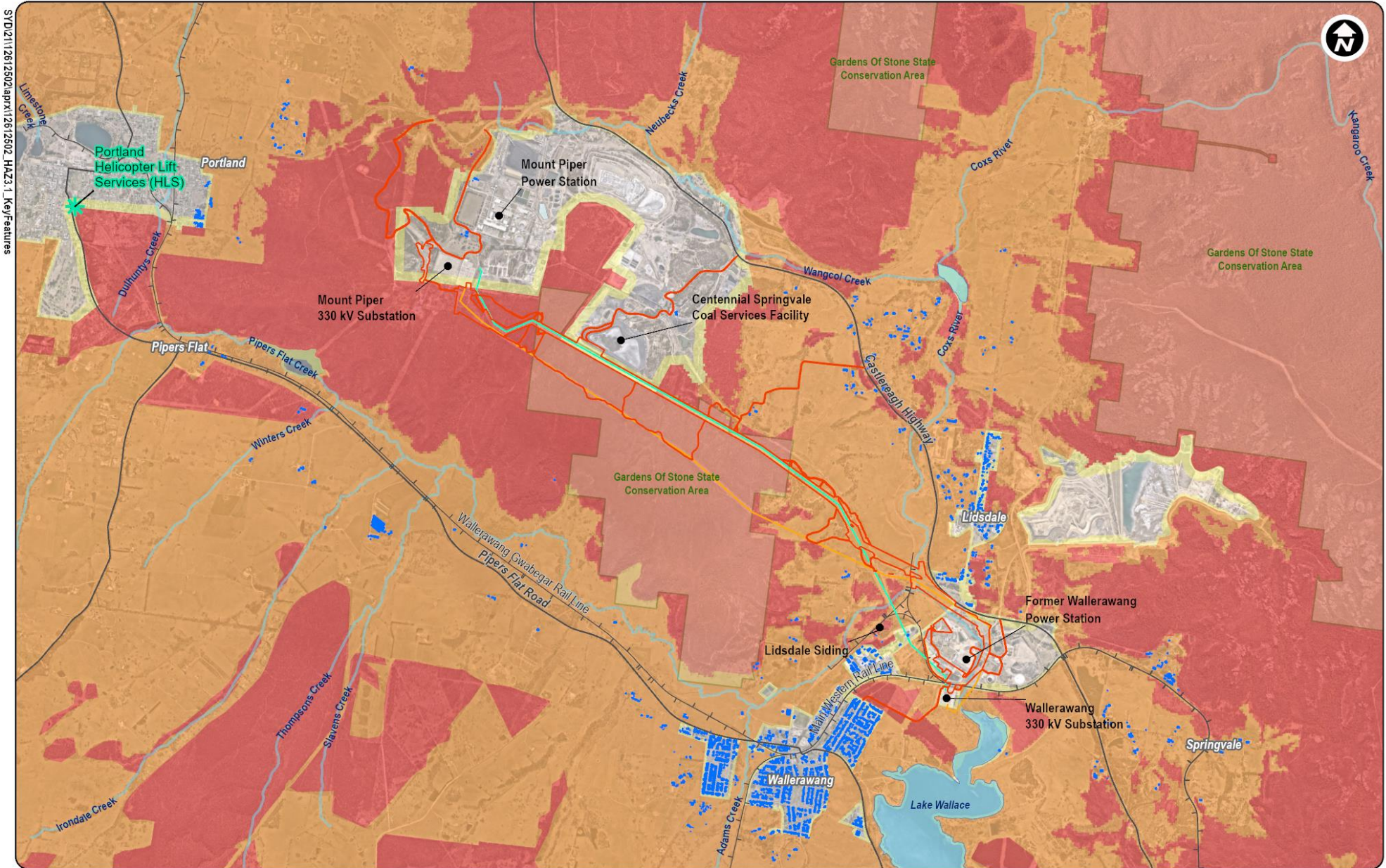


Figure 3.1 Key features of the existing environment

4. Impact assessment

4.1 Construction impacts

4.1.1 Telecommunications

As the new transmission lines would not be energised during the construction, there would be no impact to telecommunications during the construction of the project. Any impacts associated with the energisation of the new transmission lines during commissioning and operation has been addressed as part of the operational phase impacts (see section 4.2).

4.1.2 Electric and magnetic fields

As the new transmission lines would not be energised (i.e. would not be operational) during construction, there would not be any EMF impact during the construction of the project. Any impacts associated with energisation of the new transmission lines during commissioning and operation has been addressed as part of the operational phase impacts (see section 4.2).

4.1.3 Public safety

4.1.3.1 Bushfires

During construction there are several activities that provide a potential ignition source for a bushfire, these are:

- hot works, including welding
- vehicle and machinery use, including equipment used for vegetation removal – hot exhaust
- onsite human activity (unauthorised fire and smoking)
- storage of combustible material, including residue from vegetation removal
- machinery use – sparks caused from friction with rocks.

Control of these activities would be included in a Bushfire Management Plan that forms part of the Construction Environment Management Plan (CEMP) for the project. Specific items to be covered in the Bushfire Management Plan are:

- hot works that should not be carried out during a total fire ban
- asset protection zone requirements for construction compound boundaries
- vegetation removal requirements
- availability of firefighting equipment
- firefighting water supply near any temporary buildings or site offices within each construction compound
- appropriate bushfire emergency management planning.

With the implementation of the Bushfire Management Plan, the risk of ignition of a bushfire as a result of the project is considered to be very low. Construction would therefore have no material impact on public safety.

In the event of an externally generated bushfire. The Bushfire Management Plan would also include the following measures to manage risk to workforce safety during bushfire danger periods:

- managing worker access and construction activities during elevated fire danger periods and especially during Total Fire Bans (TOBAN) and evacuation procedures to ensure safe and timely evacuations if required
- establishing safe work systems and protocols and reliable communications with all personnel
- early and reliable warning systems, and awareness of bushfire danger and safety precautions
- location and work-specific safety analyses, training in emergency response and provision of fire suppression equipment.

In addition, to manage the potential impact of bushfires on the construction of the project a Bushfire Emergency Management and Evacuation Plan will be prepared that outlines emergency response procedures and evacuation routes to be used if a bushfire was to occur during construction.

For further details regarding bushfire risk and management measures, see Appendix C.

4.1.3.2 Emergency egress and evacuation

Construction works would upgrade about 25 km of existing access tracks in the project footprint where existing constraints may limit the size of emergency vehicle which can access the existing easement. The project would also construct 1.7 km of new access tracks to avoid areas where existing tracks have height and weight restrictions. This would improve access during both construction and operation.

There are 13 access points available during construction, allowing multiple routes for emergency egress from the project footprint to surrounding road network in the event that evacuation is required for any reason. Wherever possible, existing roads and tracks would be used to minimise further disturbance and upgrade to any of these tracks would be staggered to maintain access in the event of an emergency. The project is not expected to impact traffic along public roads to a level that potentially poses a risk to public safety in the event of an emergency.

The need for short term road closure (full or partial) while stringing conductors would be confirmed during detailed design process and discussed with the relevant road authority. It is currently expected that closures would be limited to periods of a few minutes. Connectivity and unobstructed road access for emergency evacuation would consider detour routes, which would be outlined in the Emergency Management Plan and the Traffic and Transport Management Plan. Road closures are further described in Technical Report 8 – Traffic and Transport Assessment.

The Emergency Response Plan will consider access and egress in response to threats such as bushfires, floods and medical emergencies. The Plan will be developed in consultation with other stakeholders to ensure that construction does not affect emergency access or egress to their properties or the implementation of property-specific Emergency Response Plans. Where upgrades to an access track are proposed that would impact emergency access or egress, an alternate evacuation route would be defined in the Emergency Response Plan. The construction compounds will have two separate egress routes to facilitate evacuation.

During construction, public safety risks associated with emergency egress and evacuation would be managed through applying the recommended mitigation measures.

4.1.3.3 Dangerous goods

During construction, various dangerous goods and chemicals are expected to be used and/or stored onsite. Only minor amounts of each will be present during construction, for use as needed. No stockpiling or bulk use is anticipated to be required on site. Table 4.1 shows the expected dangerous goods and chemicals that will be used during construction. Table 4.2 shows the expected quantities of goods with reference to the thresholds outlined in SEPP Resilience and Hazards.

Table 4.1 Expected chemical usage during construction

Chemical / product	UN identification code	DG class	Packing group	Indicative storage quantity	Indicative quantity (tonne)
LPG	1075	2.1	N/A	2 cylinders stored on site	0.09
Acetylene (welding)	1001	2.1 - pressurised	N/A	5 ten m ³ cylinder stored on site	0.05
Line marking paint and cold-galvanising paint (spray can)	1950	2.1 - pressurised	N/A	20 boxes of spray paint with 6 cans in each box, each can with approx. 350 g of paint	0.04
Oxygen (welding)	1072	5.1	N/A	5 cylinders stored on site	0.25
Paint (oil based considered worst case)	1263	3	II	Minimal amount stored on site	0.1
Solvents	multiple	3	II	Minimal amount stored on site	0.1
Epoxy resins	multiple	3	III	Minimal amount stored on site	0.1
Hand sanitiser	1987	3	III	Minimal amount stored on site	0.05
Cleaning products	multiple	8	II	Minimal amount stored on site	0.005

Chemical / product	UN identification code	DG class	Packing group	Indicative storage quantity	Indicative quantity (tonne)
Diesel (C1)	3082	9	III	Minimal amount stored on site	2.5
General oils and lubricants (C2)	1791	9	III	Minimal amount stored on site	0.5
Concrete	N/A	Not classified as DG		Used as required and not stored onsite	Undetermined
Steel structural members	N/A	Not classified as DG		Stored onsite in construction compounds	Undetermined
Sealants / joint fillers	N/A	Not classified as DG		Minimal amount stored on site	0.05
Detergent	N/A	Not classified as DG		Minimal amount stored on site	0.005
Herbicides	N/A	Not classified as DG		Minimal amount stored on site	0.005

Table 4.2 Summary of dangerous goods quantities and thresholds

DG class	Combined storage threshold (tonnes)	Combined quantity (tonne)	Exceedance of threshold?
2.1 - pressurised (excluding LPG)	0.1	0.09	Does not exceed
2.1 (LPG only)	10	0.09	Does not exceed
3-II	5	0.20	Does not exceed
3-III	5	0.15	Does not exceed
5.1	5	0.25	Does not exceed
8 - II	25	0.005	Does not exceed
9 - III	None	3.0	Not applicable – SEPP has no threshold for this DG class

Dangerous goods associated with the construction are not expected to be stored in large quantities and would not exceed the thresholds quantities outlined in SEPP Resilience and Hazards. The construction of the project is therefore not considered 'potentially hazardous' and a PHA is not required.

4.1.3.4 High pressure gas pipelines

There are no high pressure gas pipelines within the project footprint and therefore there would be no impacts to any high pressure gas pipelines during construction. The nearest pipeline is located about 2.7 km south of the project footprint and this pipeline supplied gas to Lithgow.

4.1.4 Aviation safety

The aviation impact assessment identified one certified and one uncertified aerodrome within the specified radius for these types of aerodromes (30 and 3 nautical miles respectively), and concluded that construction of the project would not impact the aerodromes. Additionally, during construction, the project will not impact:

- aircraft operating heights including air route and grid lowest safe altitudes (LSALTs)
- airspace protection including obstacle limitation surfaces
- approach and departure procedures for nearby certified and uncertified aerodromes
- aviation facilities, including:
 - navigation aids
 - air traffic control radar facilities
 - aviation communication facilities
- aerial operations for application of agricultural fertilisers, firefighting and aerial baiting and culling in the National Parks
- aeromedical services.

As the assessment indicates, there is no impact to aviation safety during construction, the risk from the project to aviation safety is negligible. For further details regarding aviation safety, see Appendix D.

4.1.5 Mine subsidence

Mine subsidence occurs when old mine workings collapse or old pillars become crushed (SMEC, 2024). At the surface, subsidence shows as potholes or shallow troughs at ground level. Construction of the project would include piling activities that may reach a maximum depth of up to 18 m below ground. Proposed works in the vicinity of transmission structures 23D to 25D are underlain by historical mine workings and have the potential to encounter the workings. The risk of encountering the workings and risk of pothole subsidence is considered to be very low (SMEC 2024). The risk of subsidence impacts to proposed transmission structures 22D, 24D and 25D located next to former open cut working of the Lamberts Gully colliery is considered negligible (SMEC, 2024).

4.2 Operational impacts

4.2.1 Telecommunications

Results of the modelling against the adopted reference levels for radio frequency interference are summarised in Table 4.4. Structure locations are shown in Figure 4.1.

AS2344 specifies the limits of electromagnetic interference to radio frequencies from overhead transmission lines in the frequency range 0.15 MHz to 30 MHz. The AM band operates between 0.54 MHz and 1.6MHz in Australia.

Table 4.3 Radio frequency interference modelling results at the easement boundary against reference levels

From structure	To structure	Fair weather (dBµV/m)	Light rain (dBµV/m)	Heavy rain (dBµV/m)	Fair weather reference level (Derived from AS2344)	Maximum distance from easement boundary to reference level (m)
5C	6C	40	58	66	36 dBµV/m	15
9D	10D	40	58	66	36 dBµV/m	15
17D	18D	39	56	65	36 dBµV/m	10
27D	28D	40	58	66	36 dBµV/m	15

The AS 2344 derived limit of 36 dBµV/m is exceeded for radio interference at the easement edge in all scenarios modelled. The limit of 36 dBµV/m would be met at a distance of 15 m from the easement boundary for all but structure 17D where it would be met at a distance of 10 m from the easement boundary. Within these distances the use of the AM band could be impacted however it is noted there are limited receivers within this distance along the proposed transmission line. In addition to this, radio listening on the AM band had been largely replaced by digital FM radio operating at above 174 MHz (which is unaffected by TL interference).

Accordingly, at these frequencies, interference in AM systems may not be necessarily an issue for nearby landowners. Therefore, significant impacts to AM systems for nearby receivers are considered unlikely.

The very high frequency (VHF) band is used for communication at the adjacent mining operations at Centennial Springvale Coal facility. The VHF band may also be used as part of the machinery GPS systems for agricultural operations. VHF sits between 30 – 300 MHz on the radio spectrum. Significant impacts to the VHF band are considered unlikely given that electromagnetic interference to radio frequencies from overhead transmission lines generally occur below the 30 MHz range, as specified in AS2344.

The project is designed to avoid and minimise any radio frequency interference. However, Transgrid will continue engaging with local landowners post construction and if interference is identified to materially impact a landowner's ability to operate, an appropriate signal booster arrangement will be provided.

Review of existing point to point communication links identified that no existing links currently intersect with the proposed transmission line alignment.

4.2.2 Electric and magnetic fields

The maximum electric field under normal operation at the edge of the transmission line easement is less than 0.3 kV/m, which is about six per cent of the ICNIRP General Public Guideline Level of 5 kV/m. The maximum electric field within the transmission line easement and directly under the conductor is 7.5 kV/m, which is below the 7.8 kV/m required in the Transgrid TLDM (Transgrid, 2021).

The maximum magnetic field levels at all the assessed scenarios was below 500 mG, less than 25 per cent of the 2,000 mG limit set by ICNIRP and less than 50 per cent of the 1,000 mG limit set by Transgrid to avoid interference with implantable medical devices.

Results of the modelling against adopted reference levels are summarised in Table 4.4. Structure locations are shown in Figure 1.2.

Table 4.4 EMF modelling results against

From structure	To structure	Maximum electric field under the line (kV/m)	Reference level under the line (kV/m)	Maximum electric field at easement edge (kV/m)	Reference level at easement edge (kV/m)	Maximum magnetic field, anywhere within easement (mG)	Reference level anywhere within easement (mG)
1C	3C	6.5	7.8 (Transgrid TLDM)	0.3	5.0 (ICNIRP)	340	2000 (ICNIRP) 1000 (Transgrid TLDM)
3C	8C/8D	7.5		0.3		440	
8C/8D	10D	6.5		0.3		480	
10D	12D	6.5		0.3		340	
12D	13D	1.3		0.3		160	
13D	27D	6.5		0.3		340	
27D	28D	6.1		0.3		440	

Overall, it is unlikely that there would be any prolonged human exposure to EMF from the proposed transmission lines given the project would comply with the ICNIRP guidelines.

4.2.3 Public safety

4.2.3.1 Bushfires

During operation, there are several activities that provide a potential ignition source for a bushfire if appropriate management and mitigation measures are not implemented. They are:

- hot works
- vehicle and machinery use, including equipment used for vegetation removal and sparks from friction with rocks
- onsite human activity (smoking)
- storage of combustible material, including residue from vegetation removal
- weather effects including lightning strike.
- transmission line operation if direct contact of vegetation or mechanical failure occurs.

During operation, well established transmission design elements and maintenance procedures will mitigate the risk from bushfires, both to the transmission lines and from the transmission lines. These are:

- Steel and concrete transmission structures.
- Lightning protection systems.
- Compliance with Transgrid's Hot Work and Fire Risk Work Procedure (2020).
- Compliance with Transgrid's Fire Risk Assessment and Control Measures (FRACM) assessments.
- Transmission lines maintained in line with Transgrid's Maintenance Plan – Easements and Access Tracks (2018).

- Compliance with vegetation clearing requirements around transmission lines. This includes routine and reactive removal of vegetation that has potential to encroach into minimum safety clearances and management of vegetation that could pose a safety hazard (hazard tree management).

In addition, during operation the public safety risks associated with bushfires would be managed by implementing well established transmission design standards and the use of existing Transgrid maintenance procedures in particular Transgrid’s FRACM assessments for the management of bushfire risk.

Transmission lines are designed to operate continuously in bushfire prone environments and are considered to have a low vulnerability to bushfire impact due to their robust, non-combustible and highly reliable design.

Given the existing transmission lines in the area, the project would not increase the bushfire risk profile of the area. During operation, bushfire risks would be acceptably managed by applying the recommended bushfire risk mitigation measures. Therefore, the operational bushfire risk as a result of the project and the operational bushfire risk to the proposed transmission line is considered low.

For further details regarding bushfire risk, see Appendix C.

4.2.3.2 Emergency egress and evacuation

The benefits from the upgrade to the access tracks during construction will transition into the operation phase. These access tracks will improve access to the transmission easement and provide the opportunity for Category 1 bushfire response vehicles to traverse parts of the easement and may also provide emergency access for bushfire response activities, if their condition is assessed as being suitable by the fire response crew. The upgraded access and egress tracks for the project are expected to reduce the risk to public safety and personnel within the easement and response personnel in the event of an emergency during operation by providing adequate evacuation routes.

In addition, Transgrid has existing documentation for emergency management and egress across its network, which will also apply to the project. This emergency management documentation in conjunction with the upgrade of the access tracks provide appropriate mitigation in relation to access and egress in the event of an emergency during operation.

4.2.3.3 Dangerous goods

No dangerous goods and hazardous materials would be stored along the transmission line during operation, although small amounts may be transported, and used on site during maintenance activities. A summary is provided in Table 4.5, with the relevant thresholds shown in Table 4.6. Information in the table indicates that the threshold quantities outlined in SEPP Hazards and Resilience are not exceeded and therefore the project is not considered ‘potentially hazardous’ and a PHA is not required.

Table 4.5 Expected chemical usage during operation

Chemical / product	UN #	DG class	Packing group	Maximum storage quantity	Quantity (kilograms)	Notes
Line marking paint and cold-galvanising paint (spray can)	1950	2.1 - pressurised	N/A	1 box of spray paint with 6 cans in each box, each can with approx. 350g of paint	2	Located in maintenance vehicle and not stored onsite
Solvents	multiple	3	II	Minimal amount stored on site	10	Located in maintenance vehicle and not stored onsite
Hand sanitiser	1987	3	III	Minimal amount stored on site	0.5	Located in maintenance vehicle and not stored onsite
Cleaning products	multiple	8	II	Minimal amount stored on site	5	Located in maintenance vehicle and not stored onsite

Chemical / product	UN #	DG class	Packing group	Maximum storage quantity	Quantity (kilograms)	Notes
Herbicides	N/A	Not classified as DG		Minimal amount stored on site	44	Located in maintenance vehicle and not stored onsite

Table 4.6 Operational SEPP Resilience and Hazards threshold summary

DG class	Combined storage threshold (tonnes)	Combined quantity (tonne)	Exceedance of threshold
2.1 - pressurised (excluding LPG)	0.1	0.002	Does not exceed
3 - II	5	0.01	Does not exceed
3 - III	5	0.0005	Does not exceed
8 - II	25	0.005	Does not exceed

Leaks or accidental spills of hazardous materials and chemicals used onsite may impact the surrounding community, the environment and/or personnel. However, with the implementation of the chemical management measures, these materials would not pose a substantial risk during operation of the project.

4.2.3.4 High pressure gas pipelines

As stated in section 4.1.3.4, the nearest high pressure gas pipeline is located about 2.7 km south of the project footprint and therefore there would not be any impacts to the pipeline during operation of the project.

4.2.4 Aviation safety

As with construction, operation of the project will not impact the certified and uncertified aerodrome located within the designated distance of concern. The project is outside of controlled airspace and is not in any prohibited, restricted or danger areas. The project is also located outside the clearance zones for all aviation navigation aids for certified airports. Operation of the project would not impact:

- aircraft operating heights including air route and grid lowest safe altitudes (LSALTs)
- airspace protection including obstacle limitation surfaces
- approach and departure procedures for nearby certified and uncertified aerodromes
- aviation facilities, including:
 - navigation aids
 - air traffic control radar facilities
 - aviation communication facilities
- aerial operations for application of agricultural fertilisers, firefighting and aerial baiting and culling in the National Parks
- aeromedical services.

For further details regarding aviation safety, see Appendix D.

4.2.5 Mine subsidence

Mine subsidence has the potential to impact and damage the integrity of transmission structures as a result of (SMEC, 2024):

- tilting of the ground surface
- development of tensile and or compressive strains in the structure
- changes in ground levels.

During operation, the risk of subsidence impacts from historical mine workings would be no different to the construction phase. The risk would be very low for transmission structures 23D to 25D, and negligible for the structures next to the former open cut Lambert Gully colliery (SMEC, 2024).

The design of the transmission structures in the vicinity of structures 23D to 25D would consider the results of geotechnical studies for the design of foundations to mitigate any potential future subsidence risks and impacts. Ongoing maintenance and inspection would be undertaken to confirm the presence of any mine subsidence occurring the vicinity of the affected transmission structures.

Ongoing maintenance and inspection would be undertaken to confirm the presence of any mine subsidence occurring the vicinity of the affected transmission structures.

4.3 Cumulative impacts

Section 21.2 of the EIS outlines the assessment methodology for cumulative impacts including the methods for identifying what projects have been considered as part of the cumulative assessments for the project.

The following 10 projects within 20 km of the project footprint were identified for consideration as part of the cumulative impact assessment and are shown in Figure 4.1.

- Wallerawang Battery Energy Storage System
- Mount Piper Battery Energy Storage System
- Great Western Battery Energy Storage System
- Pinecrest Battery Energy Storage System
- Lake Lyell Pumped Hydro Energy Storage
- Ben Bullen Wind Farm
- Sunny Corner Wind Farm
- Wallerawang Power Station Ash Dam
- Wallerawang residential subdivision (DA226/22)
- Wallerawang Station upgrades.

Table 4.7 outlines the potential cumulative impacts relevant to each project. Details assessments of cumulative impacts for bushfire and aviation are outlined in Appendix C and Appendix D respectively.

Overall, the cumulative risk for all nearby projects is considered negligible and unlikely.

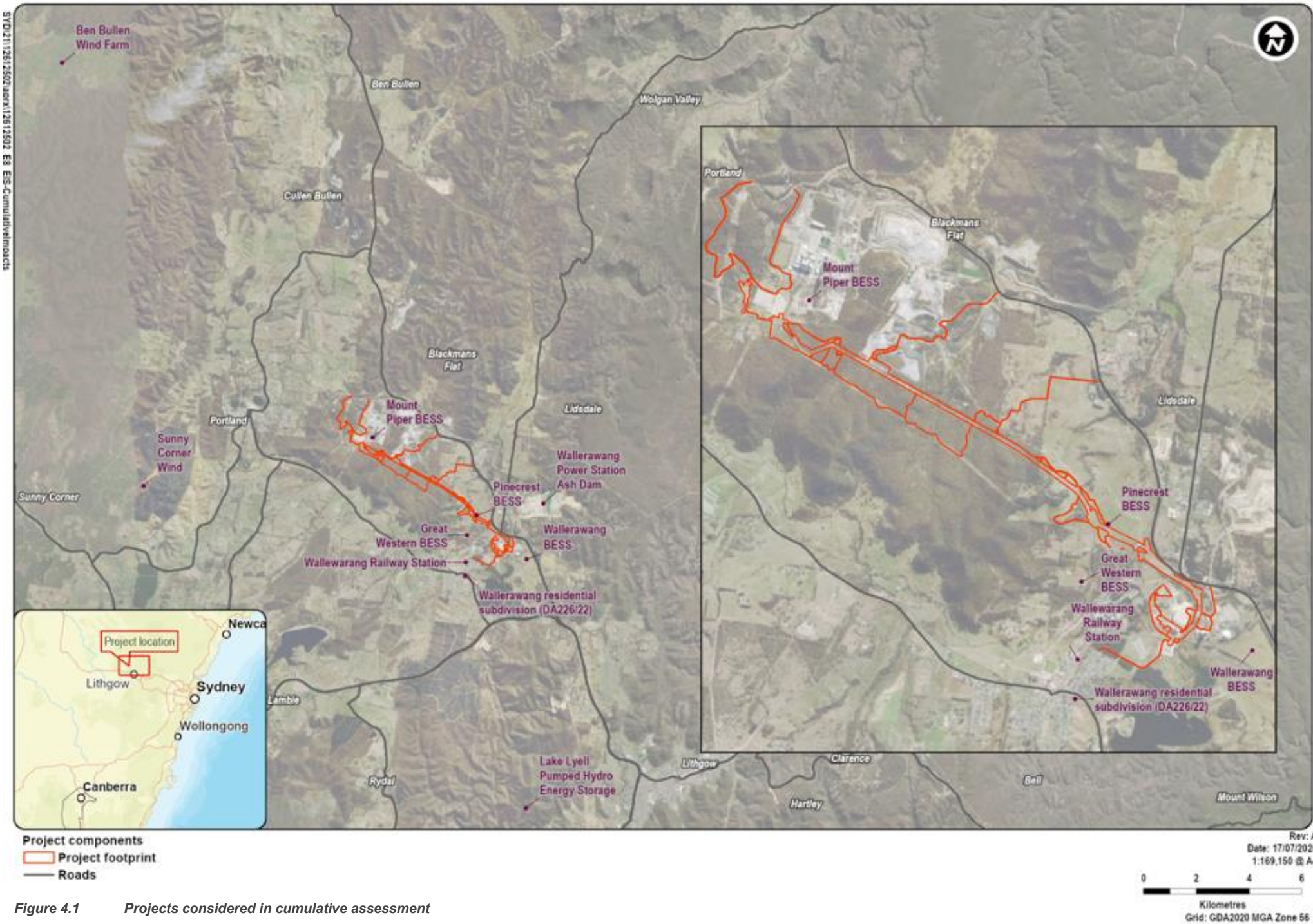


Figure 4.1 Projects considered in cumulative assessment

Table 4.7 Potential cumulative impacts of relevant future projects

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
Wallerawang BESS	Design changes to optimise the layout of the approved Wallerawang BESS (500 MW and 1,000 MWh of battery storage capacity)	500 m east of the project footprint	Approved 4/8/2022 Current modification at response to submissions stages Construction period of 1 to 2 years, expected to commence from 2025, construction does not appear to have commenced Operational period unchanged	Due to the distance between the project and this site, cumulative hazard and risk impacts are not considered likely.
Mount Piper BESS	Development of a grid-scale BESS with a capacity of up to 500 MW	Immediately north of the project footprint	Approved 15/11/2024 Construction period of 18-24 months expected to commence from mid-2026 at the earliest Potentially operational by 2027/2028 and would operate for about 20 years	Due to the distance between the project and this site, cumulative hazard and risk impacts are not considered likely.
Great Western BESS	Development of a 500 MW / 1,000 MWh BESS and associated infrastructure	300 m west of the project footprint	Approved 2/11/2023 Project has not yet commenced construction and construction start date is not known however is expected to occur over 12-14 months once the modification is approved The BESS is intended to have an operational life of up to 20 years	It is assumed that hazards and risk for the project would be effectively managed within the site given the mitigation proposed. There is negligible likelihood of cumulative hazard and risk impacts for the project.
Pinecrest BESS	Development of 500 MW battery storage capacity and 1,000 MWh of storage with (2-hour duration) connecting to the grid via underground cabling	Layout shown in scoping report is located within project footprint, with Transgrid undertaking ongoing consultation with Banpu Energy regarding positioning of the site.	Scoping report prepared with SEARs not yet issued EIS is expected to be submitted in early 2026 Construction period of 18 months commencing in late 2026 if approved. Operations proposed to start in 2028	Assuming a similar scale and type of development to other BESS projects, hazards and risk for the project would be effectively managed within the site using standard mitigation measures. There is negligible likelihood of cumulative hazard and risk impacts for the project.
Lake Lyell Pumped Hydro Energy Storage	Development of the Lake Lyell Pumped Hydro Energy Storage Scheme (that will provide between 300 to 350 MW of electricity generating capacity for up to 8 hours during peak demand)	10 km south of the project footprint	EIS in preparation Technical design expected to conclude in 2025. Construction expected commence in late 2026 and to take four years with operation commencing in 2029	Due to the distance between the project and this site, cumulative hazard and risk impacts are not considered likely.

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
Ben Bullen Wind Farm	Construction of approximately 64 wind turbine generators, a BESS and ancillary infrastructure	20 km north-west of the project footprint	EIS in preparation Construction in 2028 for 18-24 months Operational life of 35 years+	Due to the distance between the project and this site, cumulative hazard and risk impacts are not considered likely.
Sunny Corner Wind Farm	Construction of approximately 80 wind turbine generators, a BESS and ancillary infrastructure	6 km west of the project footprint	EIS in preparation Construction in 2030 for 36 months Operational life of 30 years	Due to the distance between the project and this site, cumulative hazard and risk impacts are not considered likely.
Wallerawang Power Station Ash Dam	Use of part of the lands lying north of the Castlereagh Highway that were once used by the former Wallerawang Power Station as coal ash dam repositories	Immediately north of the project footprint	Approved 13/10/2023 The modification proposes an additional ten years for the importation of capping material	Due to the distance between the project and this site, cumulative hazard and risk impacts are not considered likely.
Wallerawang residential subdivision (DA226/22)	Torrens Subdivision - 1 Lot into 54 Residential Allotments, 4 New Roads, 2 lots for drainage and public reserve Allotment	19 Barton Avenue Wallerawang 2 km south-west of the project footprint	Currently being re-exhibited till 13 June 2025	Due to the nature of the development, cumulative hazard and risk impacts are not considered likely.
Wallerawang Railway Station upgrade	Works to upgrade the existing station, closed in 1989, so that passenger services can be restated	850 m southwest of project footprint	Project has been announced on Transport for NSW website Early enabling works will be carried out from March to August 2025. Once the design is finalised, construction will commence later in 2025, with re-opening of the station planned for late 2026	As this is residential subdivision, cumulative hazard and risk impacts are not considered likely.

5. Mitigation and management of impacts

Table 5.1 lists the mitigation and management measures that would be implemented to manage potential impacts to hazards and risks identified in section 4.

Table 5.1 Hazard and risk mitigation and management measures

Impact	Environmental safeguard	Timing
AM and VHF band telecommunication interference from high voltage transmission lines	If adverse radio interference effects are reported within 12 months of operation, practical rectification measures (including signal boosting equipment) will be considered. This will be carried out in consultation with the relevant landowners.	Operations
EMF exposure from high voltage transmission lines	Design of the transmission line will be in accordance with the ICNIRP guidelines and Transgrid's Transmission Line Design Manual – Major New Build Rev 2.0. This will include phasing of the conductors to minimise the level of electric and magnetic fields generated.	Detailed design
Bushfire occurs due to construction activities	<p>A Bushfire Management Plan will be prepared and implemented as part of the Emergency Management Plan in consultation with the RFS and NPWS and include the following:</p> <ul style="list-style-type: none"> – asset protection zones (APZs) for construction compounds following consultation with relevant landowners in relation to APZ locations and management – avoidance of local concentration of bushfire fuels from vegetation removal – safe work systems for workforce and firefighter safety from bushfire impacts, including bushfire hazard identification, hazard reduction and controls including the siting of flammable materials – safe work procedures for activities that have potential for fire ignition, including hot works and flammable material storage – induction and training of personnel, including risks and management measures associated with construction equipment and activities – firefighting equipment to be provided on site – details of site access and internal road plans based on construction staging – provision of adequate water supply for fire fighting. 	Pre-construction and construction
Emergency access during bushfire	The Emergency Management Plan to be developed for the project will include bushfire emergency management and an evacuation plan consistent with the Guide to Developing a Bush Fire Emergency Management and Evacuation Plan (RFS, 2014). The Emergency Management Plan will address the requirements for evacuation routes and access as outlined in NSW Fire Trail Standards (RFS, 2023).	Pre-construction, construction and operation
Safety of aircraft movements	If local aerial operators identify the need for a risk assessment, the standards outlined in the AS 3891.2:2018 Air navigation – Cables and their supporting structures – Marking and safety requirements Part 2: Low level aviation operations will be followed.	Detailed design

6. Conclusion

This report includes an assessment of the potential hazards from the project in accordance with the requirements of SEPP (Resilience and Hazards). The hazards identified include:

- telecommunications
- EMF
- public safety: bushfire, emergency egress and evacuation, dangerous goods and high pressure gas pipelines
- aviation safety.

Impacts to telecommunications would be localised and similar to those associated with the existing transmission lines.

The results of the assessment indicate that the risks to public safety associated with EMF and dangerous goods are negligible.

There are no high pressure gas pipelines within proximity of the project, therefore this is no risk associated with this hazard.

The public safety risks associated with bushfires during construction would be managed by the implementation of an Emergency Management Plan, which would include a Bushfire Management Plan. During operation, the public safety risks associated with bushfires would be managed by the implementation of Transgrid maintenance procedures.

The Emergency Management Plan would outline emergency access and egress routes. Impacts to emergency access and egress during construction would be managed by staggering the upgrade of access tracks. Impacts to public roads are expected to be limited to stringing of conductors' activities between transmission structures, where impacts to public safety including impacts to emergency egress and evacuation would be managed through implementation of the traffic and transport management plan. During operation, Transgrid's existing operational procedures will continue to manage emergency egress and evacuation risks.

The project does not impact on the safety of aircraft movements. The location of the new transmission structures would be included in aeronautical charts for the area and with any local aerial operators to be made aware of the changes.

Based on modelling results, it is predicted that the transmission line would cause AM radio interference up to 15 m from the easement boundary. There are no permanent receivers (for example dwellings) located within this distance of the easement.

Digital FM radio operating above 87 MHz, which is more frequently used than AM radio, is unaffected by interference caused by transmission lines. The very high frequency (VHF) band is used for communication at the adjacent mining operations at Centennial Coal. Rural personnel engaged in farming activities surrounding the project footprint may also use the VHF band as part of the machinery GPS systems for agricultural operations. VHF sits between 30 – 300 MHz on the radio spectrum. Significant impacts to the VHF band are considered unlikely given that electromagnetic interference to radio frequencies from overhead transmission lines generally occur below the 30 MHz range, as specified in AS2344.

Mitigation and management measures (as defined in Table 5.1) are required to ensure that the risk scenarios identified are controlled to an adequate level. With adoption of the mitigation and management measures, the hazards with potential off-site impact would be suitably controlled.

The hazard and risk assessment demonstrates that the project can be designed, constructed and operated in a manner that will manage the associated risks so far as is reasonably practical.

Any changes to the assumptions used in this report should result in a review of the hazard and risk assessment process and update as required.

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Appendices

Appendix A

Corona noise report

Central-West Orana Renewal Energy Zone – TL7G/71

Corona Noise Report

Transgrid

Reference: P528069

Revision: C

14 March 2025

aurecon

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to life*

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Document code		528069-0001-REP-EE-0001	Project number		P528069	
File path		https://aurecongroup.sharepoint.com/sites/528069/5_WorkingFiles/528069-0001-REP-EE-0001_0.docx				
Client		Transgrid				
Client contact		Ellen Liu, Christine Lussier	Client reference			
Rev	Date	Revision details/status	Author	Reviewer	Verifier (if required)	Approver
A	2025-02-03	Draft report for review	ES	AG	LF	LF
B	2025-02-28	Final report	ES	AG	LF	LF
C	2025-03-14	Final report	ES	AG	LF	LF
Current revision		C				

Approval			
Author signature		Approver signature	
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 Table 9-2: NPfl significance of residual noise impacts and treatment examples

1 Project Overview

The NSW Government's Electricity Infrastructure Roadmap (DPIE 2020) identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from REZs in inland NSW to key demand centres. Interest in new energy generation projects in the CWO REZ is forecasted to exceed the existing transmission network capacity in several locations. The existing infrastructure located between the Mount Piper 550/330 kV substation (Mount Piper 330 kV substation) and the Wallerawang 330/132 kV substation (Wallerawang 330 kV substation) has been identified in the NSW Network Infrastructure Strategy (EnergyCo 2023) as requiring upgrades.

The Mount Piper to Wallerawang Transmission Line Upgrade Project (the project) would provide the additional capacity required to reliably transmit power from the CWO REZ to the Greater Sydney region. The project would comprise construction and operation of approximately 8 km of new 330 kV transmission line between the Mount Piper and Wallerawang 330 kV substations. The standard easement widths for 132 kV and 330 kV transmission lines are 45 m and 60 m respectively. However, easements may vary in width where multiple transmission lines converge/ diverge or where they overlap with an existing easement.

1.1 Report scope

This report assesses the impact of audible noise and radio interference from the proposed 330 kV double circuit transmission line constructed between Mt Piper Substation and Wallerawang Substation.

1.2 Abbreviations and Definitions

Abbreviation	Description
ACSR/GZ	Aluminium Conductor Steel Reinforced/Galvanized
BYDA	Before You Dig Australia
CBL	Calculated Breaking Load (kN)
CWO REZ	Central-West Orana Renewal Energy Zone
EDMS	Electronic Document Management System
EMF	Electromagnetic Field
Hz	Hertz SI unit of frequency
ICAO	International Civil Aviation Organisation
ICNIRP	International Commission on Non-Ionising Radiation Protection
LHS	Left Hand Side
LIDAR	A remote sensing technology that measures distance by illuminating a target with a laser and analysing the reflected light.
MOT	Maximum Operating Temperature
NPfl	EPA Noise Policy for Industry
OHEW	Overhead Earth Wire
OPGW	Optical Fibre Ground Wire
PSSR	Power System Safety Rules
RHS	Right Hand Side

SC/AC	Steel Conductor/Aluminium Clad
SC/GZ	Steel Conductor/Galvanized
SRF	Span Reduction Factor (unitless)
SWMS	Safe Work Method Statements

1.3 References

1.3.1 Transgrid project requirements and standards

Table 1-1: Transgrid standards and requirements

Document No.	Document Title
TLDM – MNB Rev 2.0	Transmission Line Design Manual – Major New Build Rev 2.0

1.3.2 Australian standards

Table 1-2: Australian standards

Document No.	Document Title
AS 1154.1-2009	Insulator and conductor fittings for overhead power lines, Part 1: Performance, material, general requirements and dimensions
AS 1154.3-2009	Insulator and conductor fittings for overhead power lines, Part 3: Performance and general requirements for helical fittings
AS 2344:2016	Limits of electromagnetic interference from overhead a.c. powerlines and high voltage equipment installations in the frequency range 0.15 MHz to 3000 MHz
AS IEC 60437-2005	Radio interference test on high-voltage insulators
AS/NZS 7000:2016	Overhead line design
HB 102-1997 (CJC 6)	Coordination of power and telecommunications - Low Frequency Induction (LFI) - Application Guide to the LFI Code. Standards Australia Committee ET/7
Noise Policy for Industry	Noise Policy for Industry (2017)

1.3.3 International standards and guidelines

Table 1-3: International standards and International industry technical bodies

Document No.	Document Title
CISPR TR 18-2:2017	Radio interference characteristics of overhead power lines and high-voltage equipment - Part 2: Methods of measurement and procedure for determining limits.
IEEE Transactions on Power Delivery (Volume: 7, Issue: 2, April 1992), Page(s): 903 - 913	Comparison of several methods for calculating power line electromagnetic interference levels and calibration with long term data
EPRI, 1982	Transmission Line Reference Book 345 kV and Above

2 Design criteria

2.1 Audible noise

Transgrid Transmission Line Design Manual – Major New Build (Rev 2) states that transmission line audible noise shall not show worse performance than 50 dB (A) at the edge of the line easement in L50 wet conditions.

EPA Noise Policy for Industry (NPfI) provides a benchmark to assess both the increase in noise level above background levels (intrusiveness noise level) and the absolute level of noise from industrial sources (amenity noise level). The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source does not exceed the background noise level based on L90 descriptor by more than 5 dB when beyond a minimum threshold. The recommended amenity noise levels for each new source of industrial noise level should be the recommended amenity noise level minus 5 dB(A).

NPfI provides a minimum intrusiveness noise of 35 dB(A) ($L_{Aeq,15min}$) for night time. Also, based on NPfI Table 2.2, the minimum amenity noise level for a new source of industrial noise is 38 dB(A) for night time rural residential areas. These noise levels will be assessed under all weather conditions.

2.2 Radio Frequency Interference (RFI)

AS2344 specifies the limits of electromagnetic interference from overhead A.C powerlines and high voltage equipment installations in the frequency range 0.15 MHz to 30 MHz.

Table 2-1: Table 1 from AS2344 – Limits of radiated radio disturbance 0.15 MHz to 30 MHz

TABLE 1
LIMITS OF RADIATED RADIO DISTURBANCE
0.15 MHz TO 30 MHz

Frequency (MHz) ⁽⁵⁾	Field strength ⁽²⁾ (dB μ A/m) at the boundary of the line corridor ⁽¹⁾ or 30 m from an installation		
	Region 3 (Australia)		
	Zone A	Zone B	Zone C
0.15–0.3	–4.5	5.5	–1.5
0.3–3 ⁽³⁾	–18.5	–8.5	–15.5
3 to 30 ⁽⁴⁾	–18.5 to –31.5	–8.5 to –21.5	–15.5 to –28.5

NOTES:

- 1 The corridor width is determined by the relevant regulatory authority or from Table 3 where no regulation is applicable.
- 2 The limits of Tables 1 and 2 apply at the distances defined in Clause 7(c).
- 3 The limits given for Region 3 apply to rural areas and to urban areas not serviced by local m.f. broadcasts. For urban areas serviced by local broadcast stations, the limits may be increased by 14 dB over the frequency range of 0.5 MHz to 1.7 MHz.
- 4 The limit decreases linearly with the logarithm of the frequency from 3 MHz to 30 MHz.
- 5 At the transition frequency the lower limit applies.

In the AS2344 standard Table 1 gives the following limits for Radio Interference as follows. Interpreting the table, the project is considered to be located in Zone C (taken from the figure below) and the boundary of the line corridor is interpreted as the edge of the easement as detailed above in the Observational Zones section.

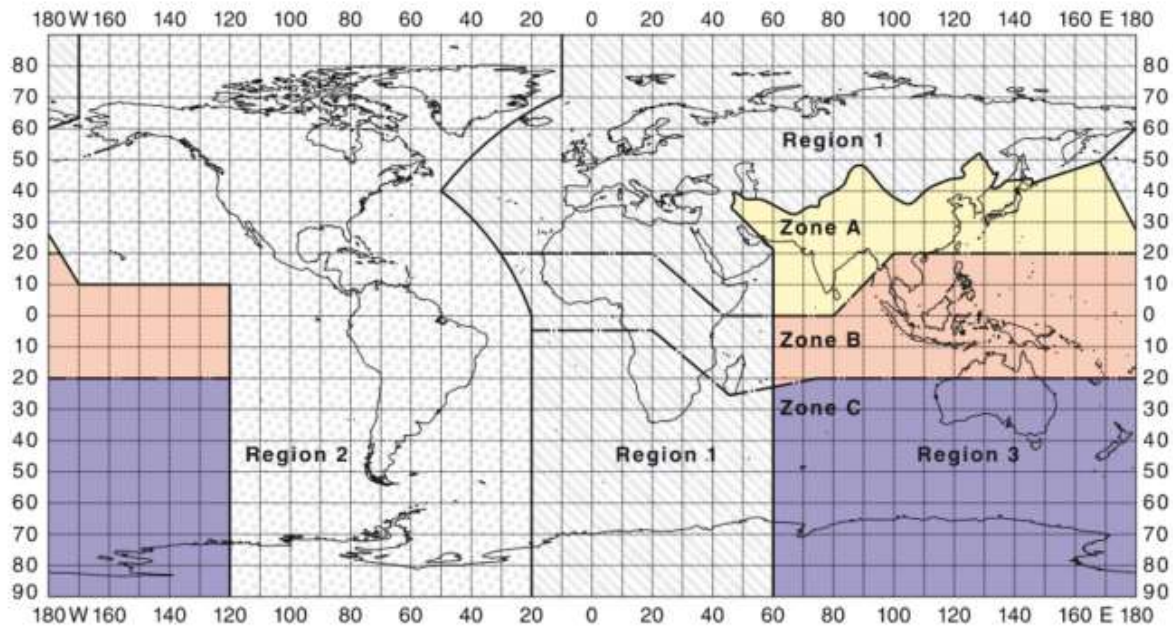


Figure 2-1 Map from AS2344 showing regions and zones for classification of field strength

As shown by the figure above, the proposed transmission line is located in the Zone C section. The Zone C field strength limit at 50 Hz in AS 2344 Table 1 is $-15.5 \text{ dB}\mu\text{A/m}$.

Calculation of the radio interference limit according to AS2344:

- 0.3 to 3 MHz radio interference field strength limit of $-15.5 \text{ dB}\mu\text{A/m}$.
- AS 2344 page 9 specifies the following formula to convert $\text{dB}\mu\text{A/m}$

$$\text{Limit in dB } \mu \frac{V}{m} = \text{dB } \mu \frac{A}{m} + 51.5^*$$

$$\begin{aligned} \text{Limit in dB } \mu \frac{V}{m} &= -15.5 + 51.5 \\ &= 36 \text{ dB } \mu \frac{V}{m} \end{aligned}$$

*51.5 = the characteristic impedance of free space (377 ohms) in decibels.

Accordingly, the limit of radio interference at 50 Hz (fair weather) is $36 \text{ dB}\mu\text{V/m}$. This limit is conservative in comparison to other international standards.

2.3 Radio Interference at higher frequencies

Corona can be a source of severe interference on the AM broadcast band, especially during foul weather, however very few complaints over recent years have been received in this frequency band due to corona. This is part due to the popularity of the FM broadcast band (87 to 108 MHz) which is not affected as much by overhead line interference.

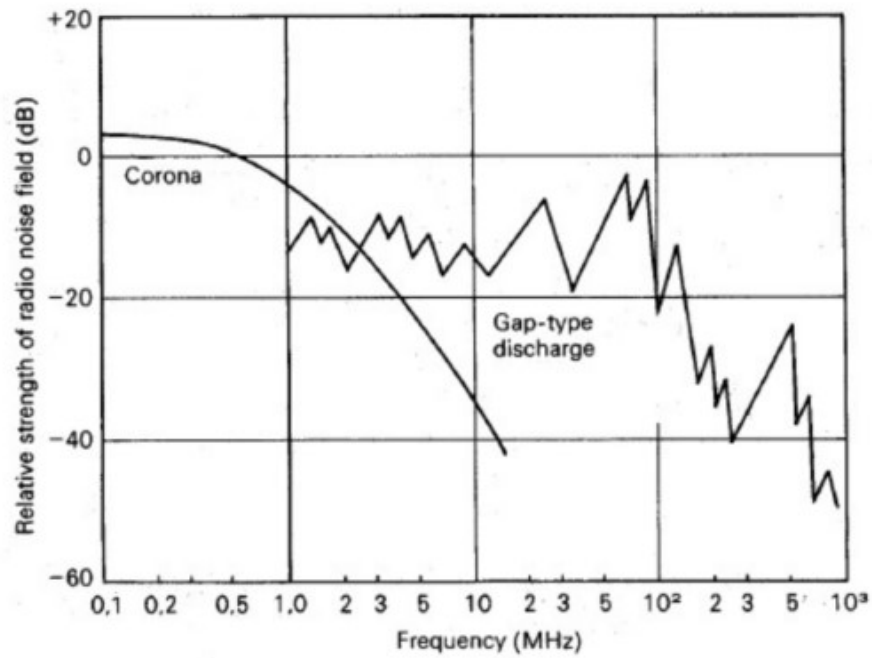


Figure 2-2: Relative strength of corona and gap type discharges as a function of frequency

As can be seen from the figure above, radio interference due to the corona rapidly decreases at frequencies above 3.0 MHz. The AS 2344 limit for radio interference increases at frequencies above 30 MHz, meanwhile the noise produced by the line decreases with frequency. Accordingly, frequencies above 30 MHz are not expected to present any radio interference problems.

3 Assessment inputs and methodologies

3.1 Tower geometry

Existing 330kV line 70/71 and new 330kV line 7G runs between Mt Piper 500/330 kV substation and Wallerawang 330/132kV substation. Existing 132kV line 94E runs between Mt Piper 132 kV substation and Wallerawang 330/132kV substation.

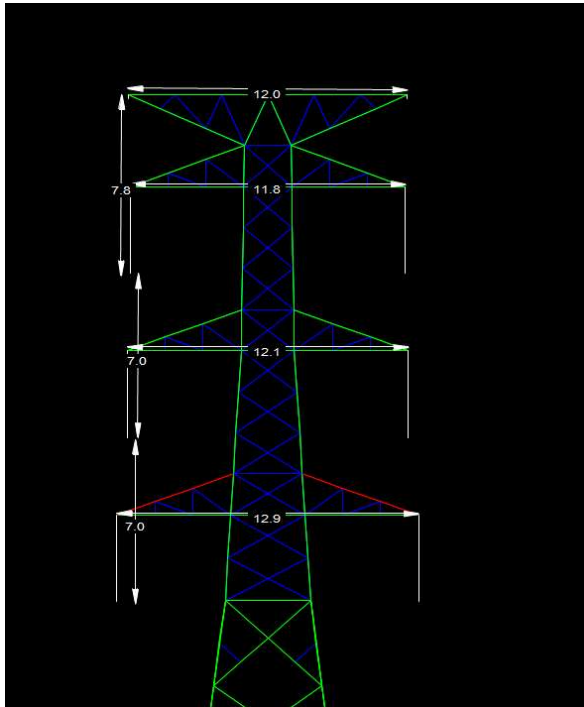
To enable the establishment of 330kV feeder 7G, new 330kV double circuit towers and an associated 60m easement will be established between the Wallerawang substation and the existing 94E line crossing. Then, between the 94E line crossing and Mt Piper 500/330 kV substation, the existing single circuit 132kV poles will be rebuilt to 330kV double circuit towers with the easement widened from 45m to 60m.

The new easement primarily traverses the Gardens of Stone State Conservation Area and several land parcels designated RU1 Primary Production.

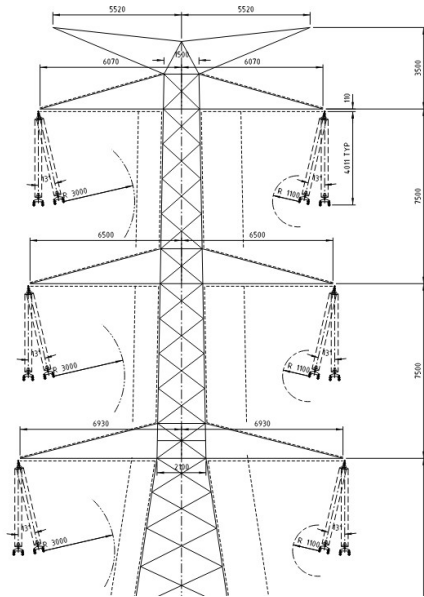
The minimum conductor height has been modelled to determine the anticipated audible noise and radio interference from the line. The lowest conductor height represents a worst-case as it is the closest the conductors will be to receivers. Where the audible noise and radio interference do not comply with the minimum requirements, a more detailed analysis was undertaken, which reviewed the site-specific conductor height and existing noise of the line.

The following tower structures were provided by Transgrid and used as a basis for the audible noise and radio interference studies:

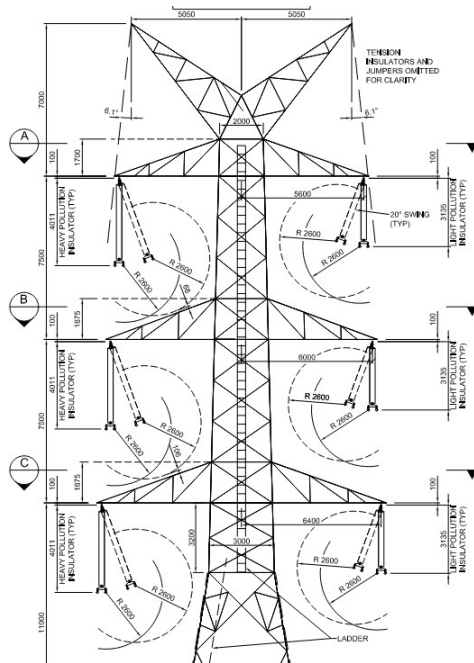
- Existing line 70/71, 330kV Double Circuit Suspension (DSR)



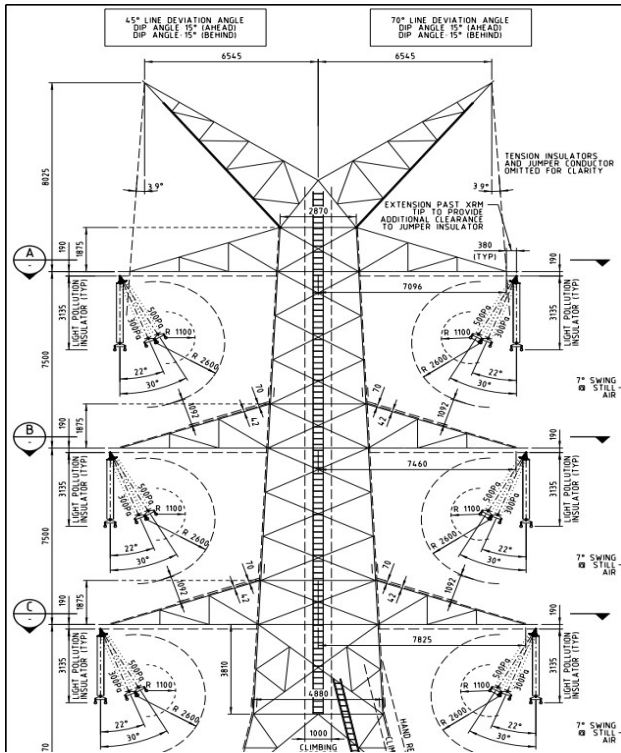
- Proposed 330kV Double Circuit Light Suspension (RSR)



- Proposed 330kV Double Circuit Light Strain (RWA)



- Proposed 330kV Double Circuit Light Terminal (RWD) / 330kV Double Circuit Buckarm (RWD)



3.2 Modelled cases

The following cases were modelled to cover the proposed transmission network augmentation:

- Scenario 1: Tower 3C to 8C, typical 100m easements consist of the new 330kV tower line with LHS 330kV circuit 7G, running in parallel with the existing double circuit 330kV tower line 70/71
- Scenario 2: Site-specific assessment of span 9D-10D to the nearest receiver
- Scenario 3: Site-specific assessment of 330kV to 132kV line crossing at span 12D-13D
- Scenario 4: Tower 13D to 27D, typical 60m easements consist of the standalone new 330kV tower line with left-hand-side (LHS) 330kV circuit 71 and right-hand-side (RHS) 132kV circuit 94E
- Scenario 5: Site-specific assessment of parallel line section at span 27D-28D

330 kV line with only one circuit energised (1C to 3C, 10D to 13D) is expected to produce less noise than the scenario of both circuits energised. Therefore, the conclusions can be conservatively covered in Scenario 4.

Refer to Figure 3-1 and the modelled line parameters below, which are confirmed by Transgrid. The circuit current is based on the design rating of the line, which is to cover both normal and contingency operations.

All cases have been modelled at an observational plane (height above the ground) of 1.8 metre, frequency of 50 Hz and operating voltage of 1.1 p.u.

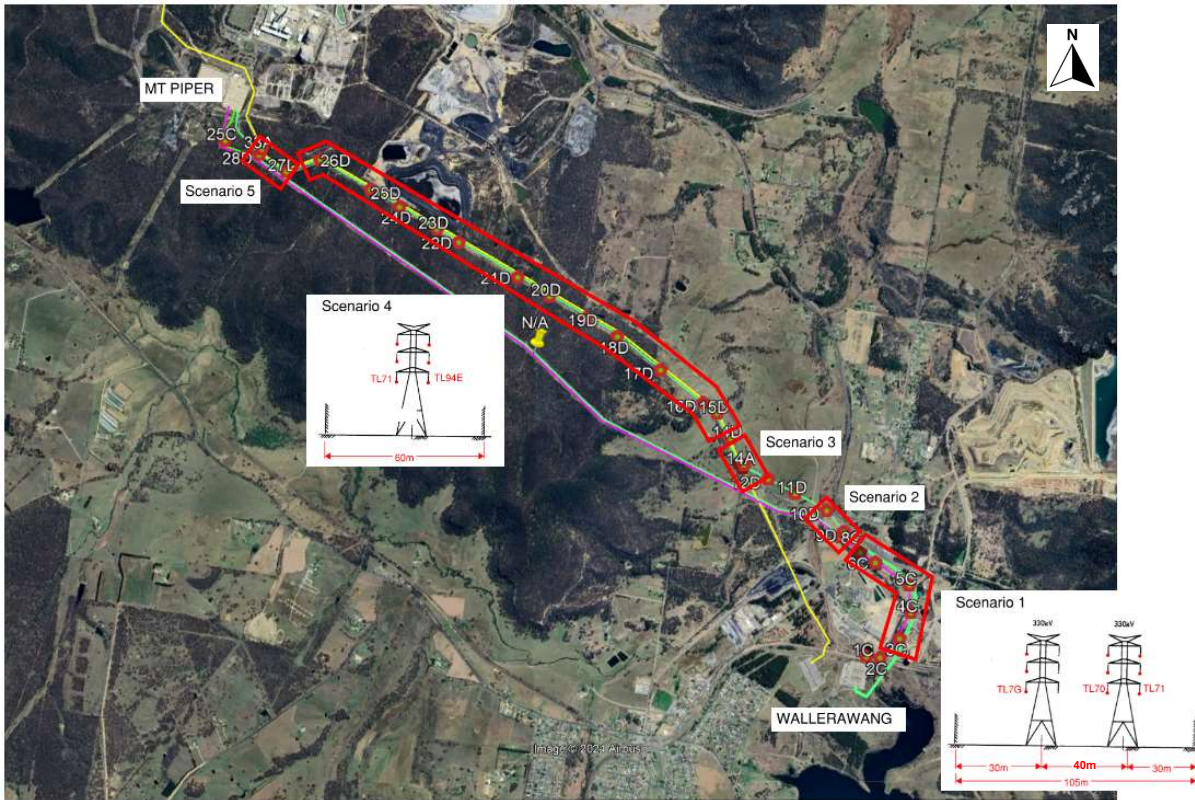


Figure 3-1: Noise assessment locality plan

3.2.1 Scenario 1: Typical case taken at Span 5C to 6C parallel to existing 330kV line 70/71

Model Input	5C to 6C LHS (7G)	7 to 8 LHS (70)	7 to 8 RHS (71)
Shield wire conductors	OPGW	GRAPE	OPGW
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RWD	DSR	DSR
Phase configuration	R	B	B
	W	W	W
	B	R	R
Voltage	330 kV	330 kV	330 kV
Current rating	2865 A	2168 A	2167 A

3.2.2 Scenario 2: Span 9D to 10D, TL70 cross-over to the new 330kV tower

Model Input	8C to 10 LHS (7G)	8C to 10 RHS (70)	9D to 10D RHS (71)
Shield wire conductors	GRAPE	OPGW TYBE B - LHS	OPGW TYBE B - LHS
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RWA	RWA	RWA
Phase configuration	R	B	B
	W	W	W
	B	R	R
Voltage	330 kV	330 kV	330 kV
Current rating	2721 A	2167 A	2168 A

3.2.3 Scenario 3: Span 12D to 13D, 330kV line 71 crossing 132kV line 94E

Model Input	13A to 14A (71)	12D to 13D (94E)
Shield wire conductors	GRAPE	OPGW
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RWD	LUB-LUK
Phase configuration	B	R
	W	W
	R	B
Voltage	330 kV	132 kV
Current rating	2168 A	1067 A

3.2.4 Scenario 4: Typical case taken at Span 17D to 18D

Model Input	17D to 18D LHS (71)	17D to 18D RHS (94E)
Shield wire conductors	OPGW	GRAPE
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RSR	RSR
Phase configuration	B	R
	W	W
	R	B
Voltage	330 kV	132 kV
Current rating	2168 A	1067 A

3.2.5 Scenario 5: 27D to 28D parallel to 23 to 24

Model Input	23 to 24 LHS (7G)	23 to 24 RHS (70)	27D to 28D RHS (71)	27D to 28D RHS (94E)
Shield wire conductors	GRAPE	OPGW	GRAPE	OPGW
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	DSR	DSR	RWD	RWD
Phase configuration	R	B	B	R
	W	W	W	W
	B	R	R	B
Voltage	330 kV	330 kV	330 kV	132 kV
Current rating	2721 A	2167 A	2168 A	1067 A

3.3 CDEGS Methodology

Audible noise assessment was undertaken to the EPRI semi-empirical calculation method.

RFI calculations were undertaken to CISPR 18-2 "Methods for measurement of RI characteristics of overhead power lines and high voltage equipment".

The modelling for the radio interference and audible noise assessment was completed using SES EnviroPlus. The assessment was completed at 1.8 metres at the average ear height of the normal standing position of the general public (1.8 metres above ground level).

The scenarios detailed above in section 3.2 have been modelled in SES EnviroPlus. The conductor heights have been assessed at lowest conductor height, where results are found to not meet this requirement a more detailed assessment is done using the average conductor height and existing line noise.

A line voltage equal to the system highest voltage of 10% above normal and the rated line loading outlined in was applied for the calculations. To represent the maximum line voltage, the voltage applied to the model included a c factor of 1.1.

3.4 Accumulative noise

If the noise level at a reference point differs by more than 10 dB between sources, the effect of the lower source is negligible due to the log scale used for noise measurements. The following formula (EPRI, 1982) can be applied to calculate the accumulative noise of more than one source with similar frequencies.

$$dB_{total} = 10 \times \log\left(\sum_{i=1}^n 10^{\left(\frac{dBi}{10}\right)}\right)$$

There are 330 kV existing transmission lines running parallel to the proposed new Piper to Wallerawang transmission line.

3.5 Weather

The following inputs were used through the CDEGS SES Enviroplus software when simulating the noise and radio interference of the 330 kV transmission line to produce results under various weather conditions:

- Fair weather
- L50 (Light Rain): L50 rain is simulated at a rain rate of 0.75mm/h
- Heavy Rain: heavy rain is simulated at a rain rate of 18mm/h

For the audible noise in rain, the assessment is based on the most commonly used calculation methods (Chartier and Stearns 1981; EPRI 1982) refer to the median value, which is the L50 exceedance level, during periods of measurable rain. Transgrid has adopted the same approach in TLDM-MNB based on the local experience.

It shall be noted that based on evidence provided in the EPRI AC Transmission Line Reference Book, a transmission line in heavy rain is expected to produce higher audible noise than in light rain. However, during heavy rain, the ambient noise is very high due to the rain hitting various surfaces. Therefore, for audible noise assessment, it is of more interest to examine L50 rain since this will cause more noise than fair weather, while the sound of the light rain is not expected to mask the sound of the transmission line so effectively.

3.6 Observation Zone

- Audible Noise observational zone – 1.8 m metre above the ground (typical ear height of a person standing)
- Easement width: Transgrid standard 330kV double circuit line easement width is 60m.
- Parallel line separation: As per the transmission line layout design provided for the assessment

4 Surface Voltage Gradients Calculation

Refer to the table below for the calculated surface voltage gradients of the proposed twin Olive conductor bundle. The maximum surface voltage gradient is 16 kV/cm, which is aligned with the TLDM and AS/NZS 7000:2016 recommendation to limit the generation of corona discharges.

Table 4-1: Calculated maximum surface voltage gradients of 330kV Twin Olive

Scenario	Circuit	Phase A	Phase B	Phase C
Scenario 1	7G	15 kV/cm	16 kV/cm	16 kV/cm
	70	15 kV/cm	16 kV/cm	16 kV/cm
	71	15 kV/cm	16 kV/cm	16 kV/cm
Scenario 2	7G	15 kV/cm	16 kV/cm	16 kV/cm
	70	16 kV/cm	16 kV/cm	16 kV/cm
	71	16 kV/cm	16 kV/cm	16 kV/cm
Scenario 3	71	15 kV/cm	16 kV/cm	15 kV/cm
	94E	7 kV/cm	7 kV/cm	7 kV/cm
Scenario 4	71	15 kV/cm	16 kV/cm	16 kV/cm
	94E	7 kV/cm	6 kV/cm	7 kV/cm
Scenario 5	7G	16 kV/cm	16 kV/cm	16 kV/cm
	70	16 kV/cm	16 kV/cm	16 kV/cm
	71	16 kV/cm	16 kV/cm	16 kV/cm
	94E	7 kV/cm	6 kV/cm	7 kV/cm

5 Audible noise results

Refer to the calculated audible noise levels for each assessment scenario. The noise results and easement width in the figures cover both the existing and new lines. Worst-case L50 results are used to generate the audible noise sensitive receiver mapping in Section 7.

5.1 Scenario 1: 5C to 6C parallel to 7

- Audible noise at the nearest receiver (70m from centreline): <30 dB(A), Fair Weather
- Audible noise at the edge of the easement: 48 dB(A), L50 condition
- Audible noise at the nearest receiver (70m from centreline): 44 dB(A), L50 condition

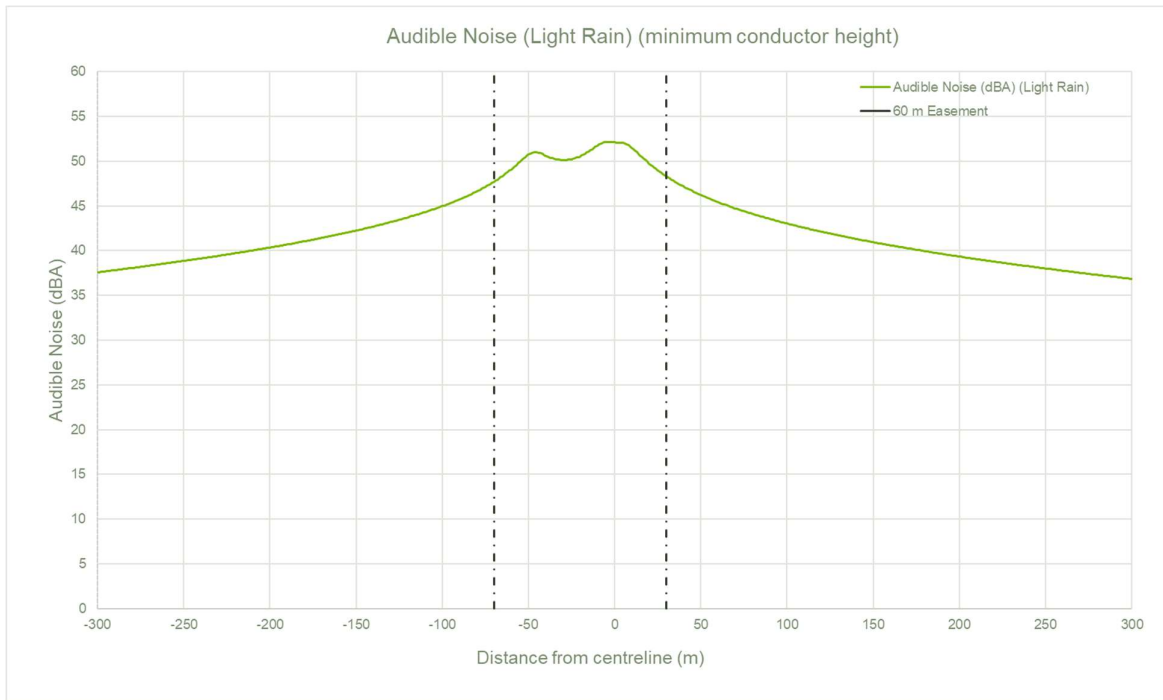


Figure 5-1: Scenario 1 Audible Noise (L50) minimum conductor height

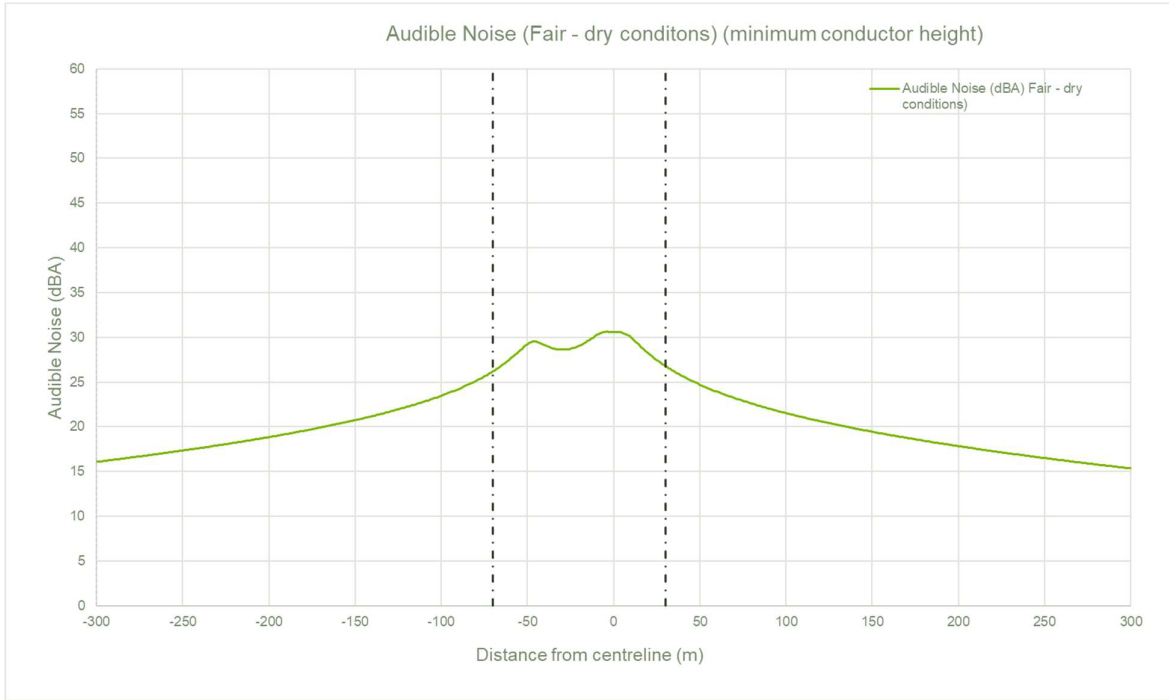


Figure 5-2: Scenario 1 Audible Noise (Fair Weather) minimum conductor height

5.2 Scenario 2: 9D to 10D parallel with 8C to 10

- Audible noise at the nearest receiver (90m from centreline): <30 dB(A), Fair Weather
- Audible noise at the edge of the easement: 48 dB(A), L50 condition
- Audible noise at the nearest receiver (90m from centreline): 43 dB(A), L50 condition

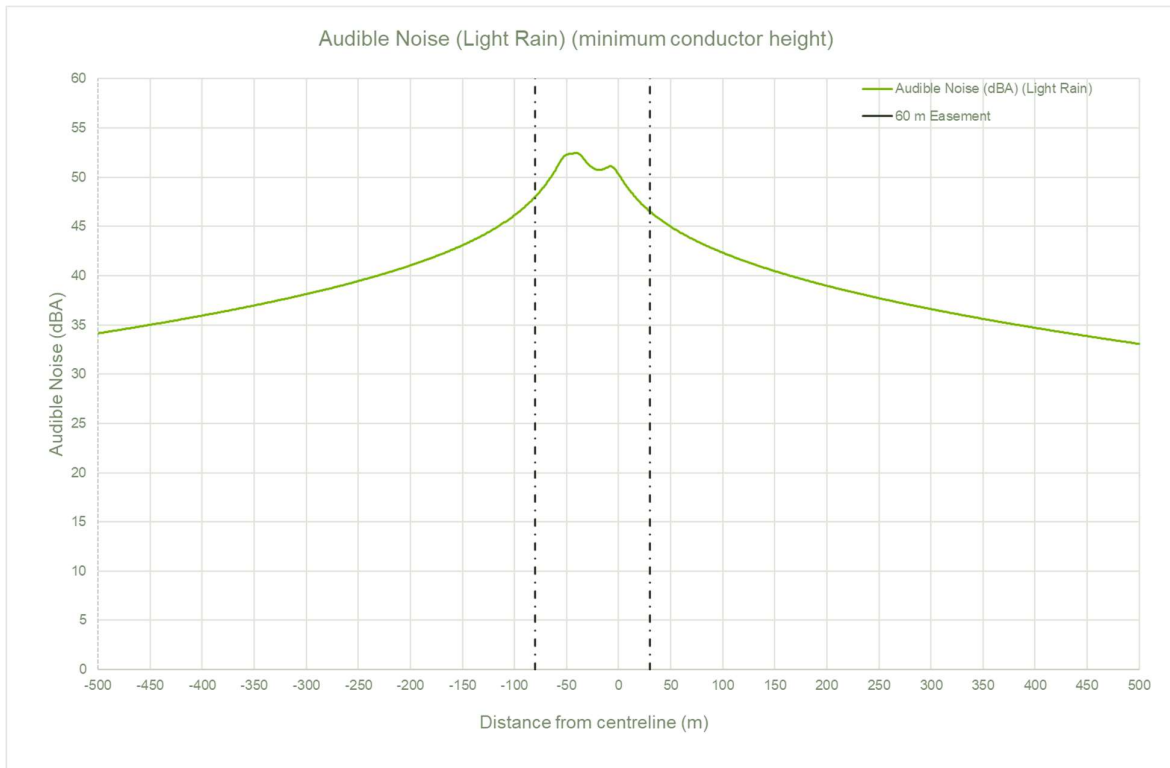


Figure 5-3: Scenario 2 Audible Noise (L50) minimum conductor height

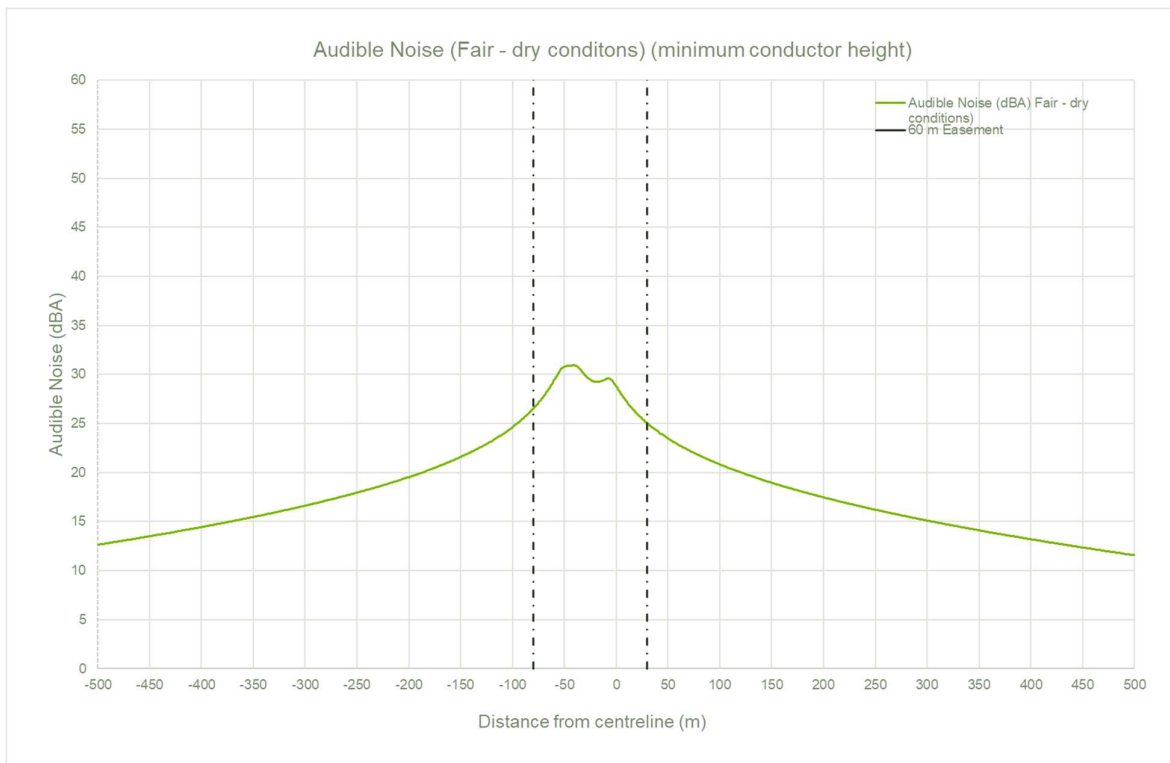


Figure 5-4: Scenario 2 Audible Noise (Fair Weather) minimum conductor height

5.3 Scenario 3: 14A to 13D cross-over

- Audible noise at the nearest receiver (300m from centreline): <30 dB(A), Fair Weather
- Audible noise at the edge of the easement: 48 dB(A), L50 condition
- Audible noise at the nearest receiver (300m from centreline): 32 dB(A), L50 condition

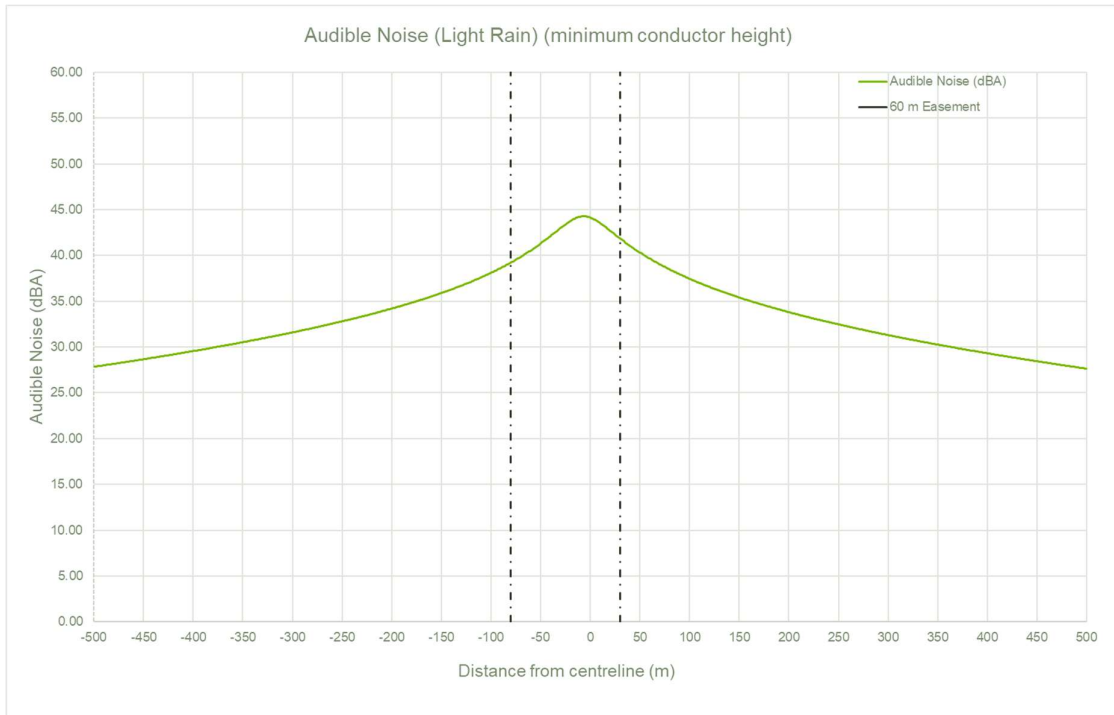


Figure 5-5: Scenario 3 Audible Noise (L50) minimum conductor height

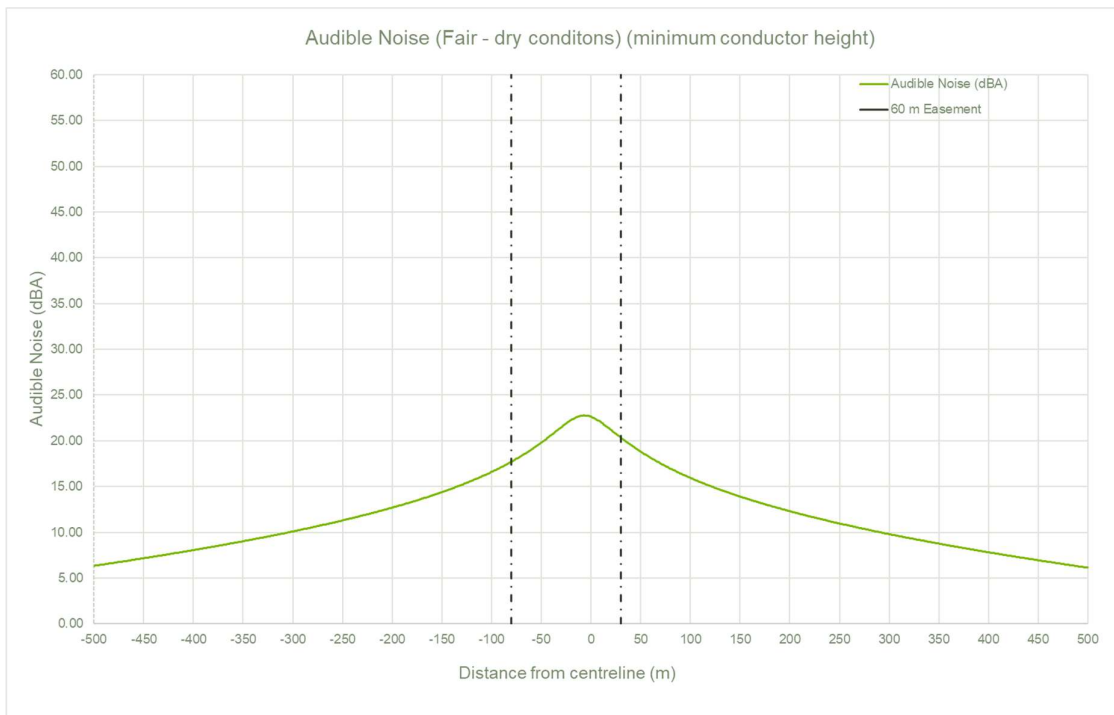


Figure 5-6: Scenario 3 Audible Noise (Fair Weather) minimum conductor height

5.4 Scenario 4: 17D to 18D

- Audible noise at the nearest receiver (250m from centreline): <30 dB(A), Fair Weather
- Audible noise at the edge of the easement: 46 dB(A), L50 condition
- Audible noise at the nearest receiver (250m from centreline): 34 dB(A), L50 condition

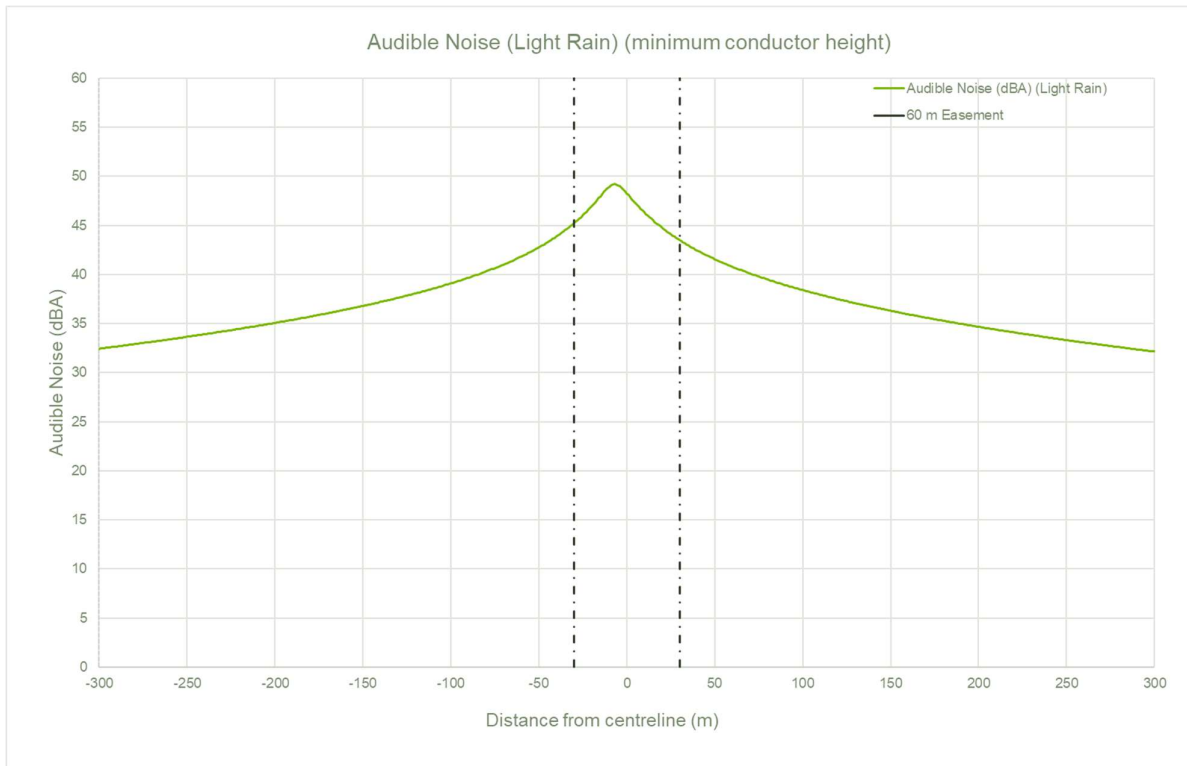


Figure 5-7: Scenario 4 Audible Noise (L50) minimum conductor height

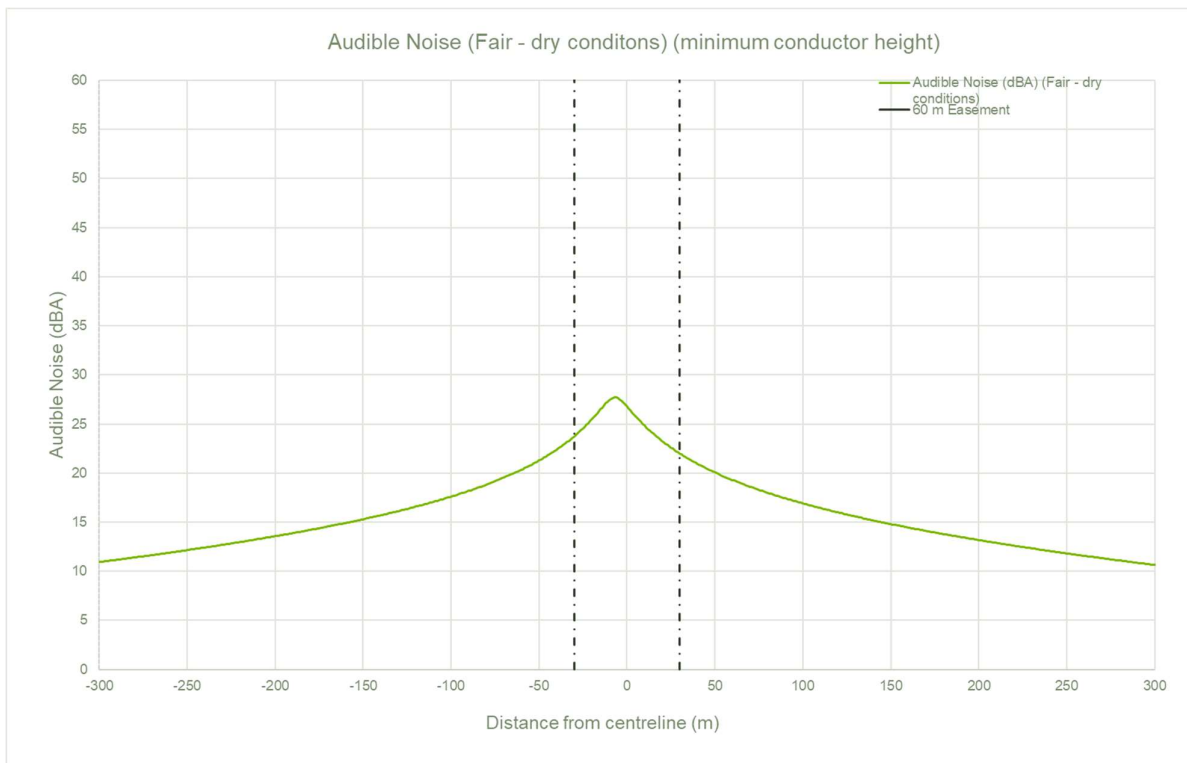


Figure 5-8: Scenario 4 Audible Noise (Fair Weather) minimum conductor height

5.5 Scenario 5: 27D to 28D parallel to 23 to 24

- Audible noise at the nearest receiver (>300m from centerline): <30 dB(A), Fair Weather
- Audible noise at the edge of the easement: 48 dB(A), L50 condition
- Audible noise at the nearest receiver (>300m from centreline): <30 dB(A), L50 condition

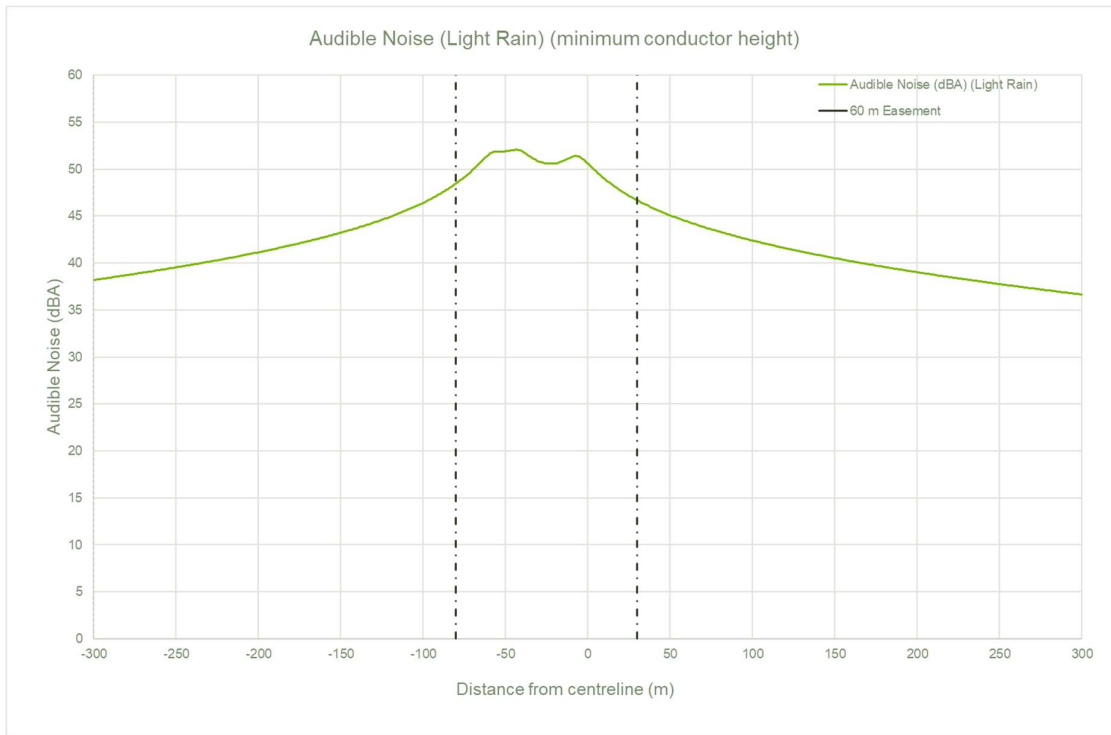


Figure 5-9: Scenario 5 Audible Noise (L50) minimum conductor height

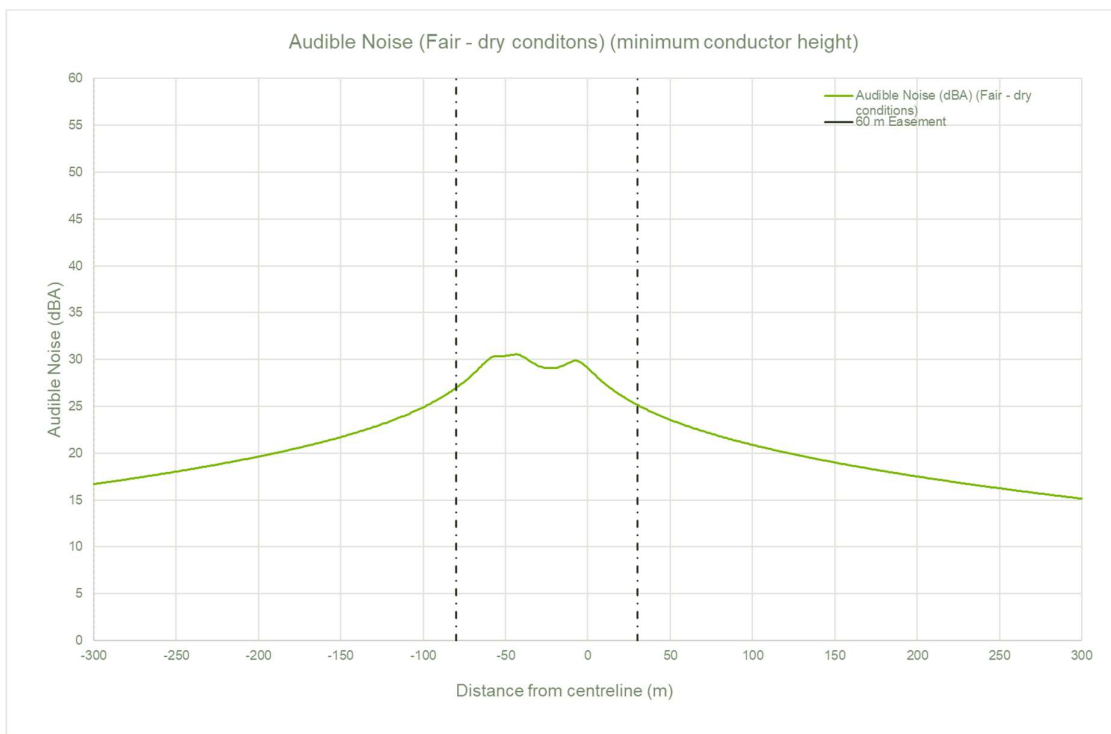


Figure 5-10: Scenario 5 Audible Noise (Fair Weather) minimum conductor height

6 Radio interference results

Refer to the calculated radio interference for each assessment scenario.

6.1 Scenario 1: 5C to 6C parallel to 7

- Radio Frequency Interference at the edge of easement: 40 dB μ V/m, Fair Weather
- Radio Frequency Interference at the edge of easement: 58 dB μ V/m, L50 condition
- Radio Frequency Interference at the edge of easement: 66 dB μ V/m, Heavy Rain

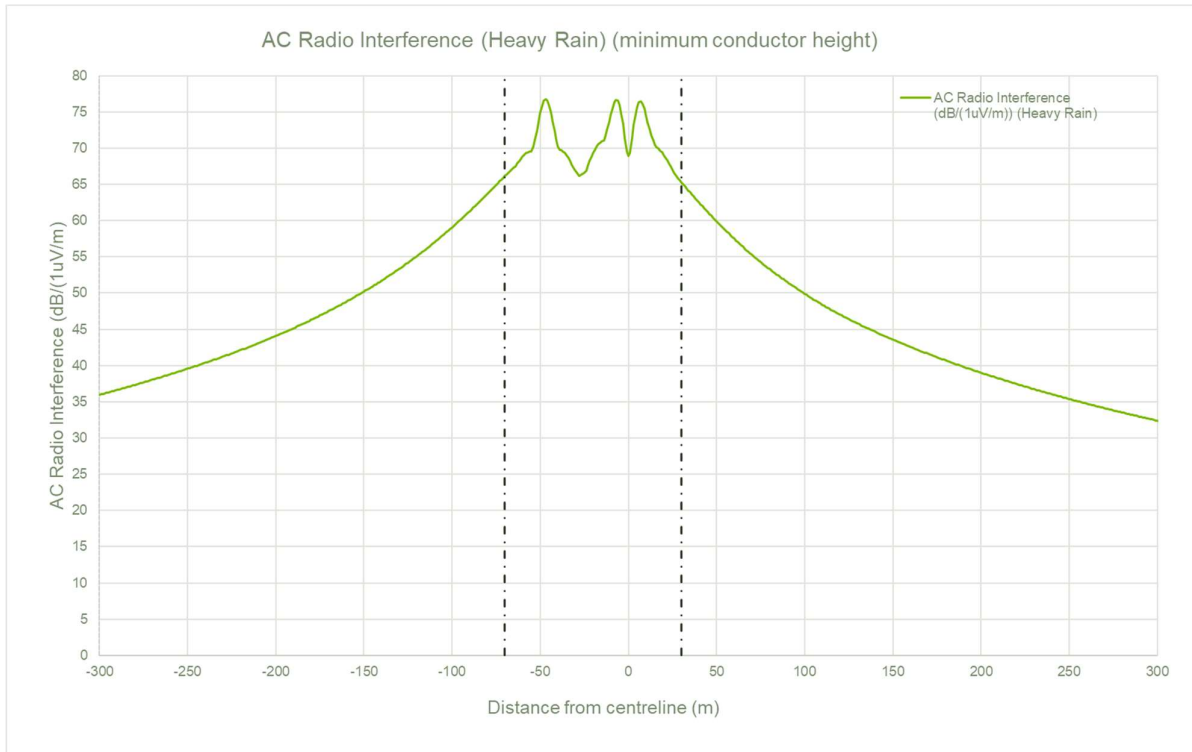


Figure 6-1: Scenario 1 AC Radio Interference (Heavy Rain) minimum conductor height

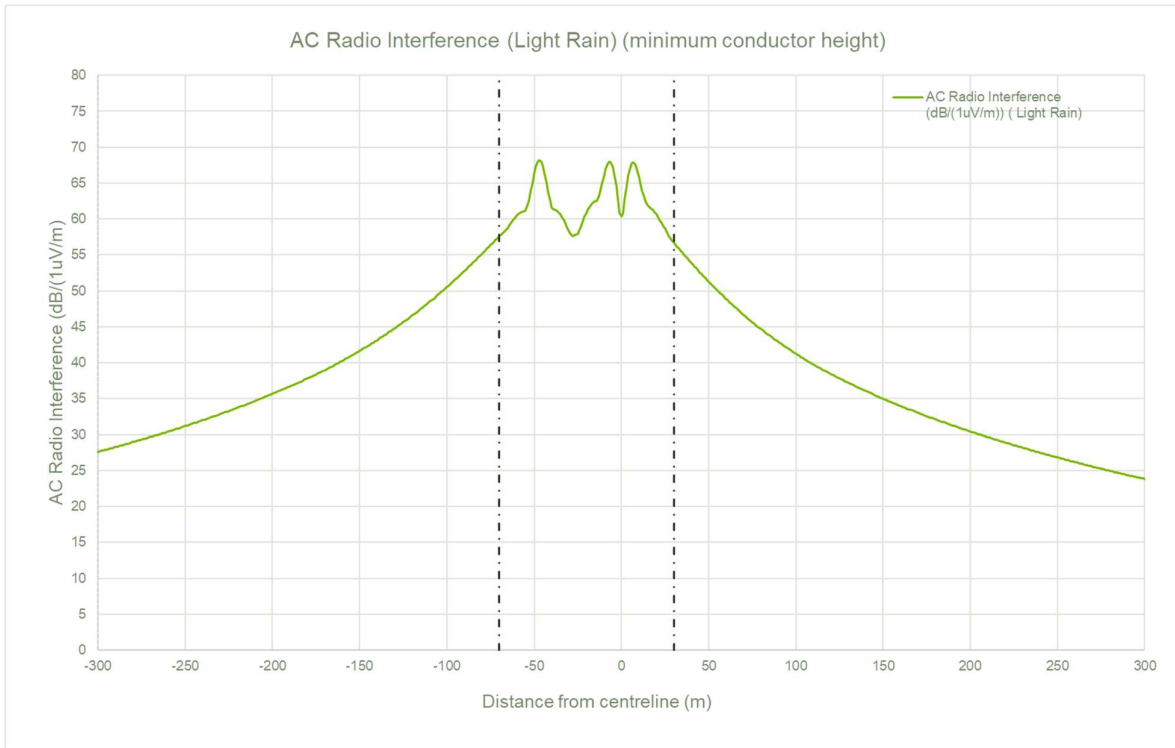


Figure 6-2: Scenario 1 AC Radio Interference (L50) minimum conductor height

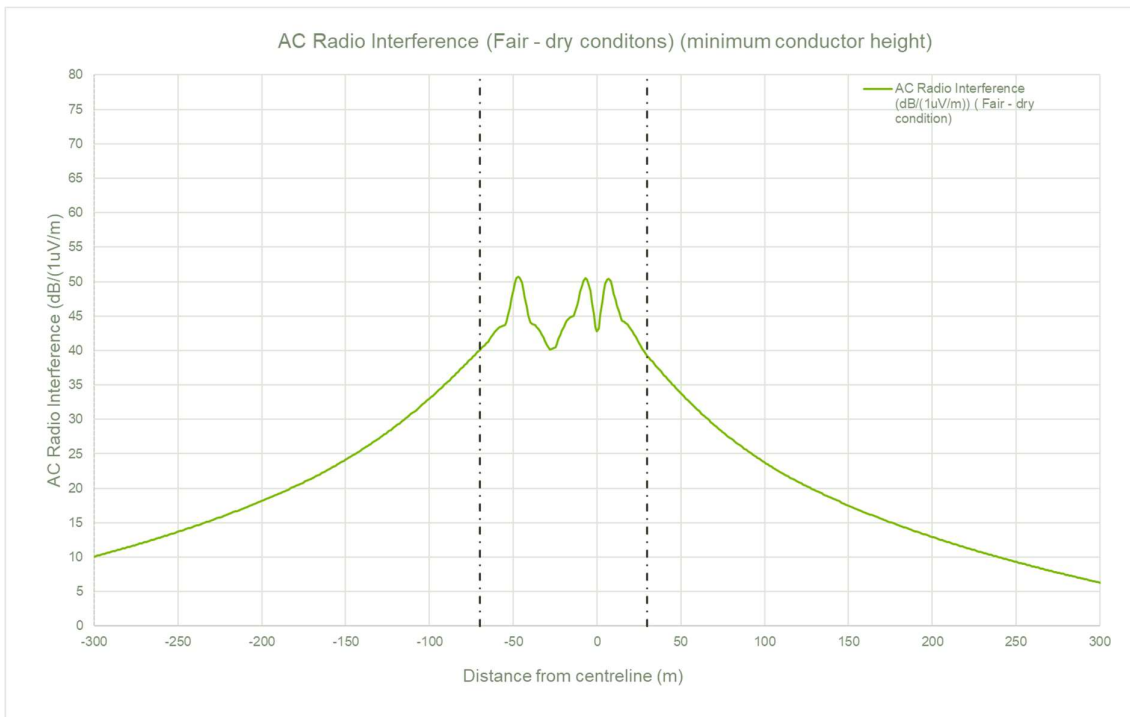


Figure 6-3: Scenario 1 AC Radio Interference (Fair Weather) minimum conductor height

6.2 Scenario 2: 9D to 10D parellel with 8C to 10

- Radio Frequency Interference at the edge of easement: 40 dB μ V/m, Fair Weather
- Radio Frequency Interference at the edge of easement: 58 dB μ V/m, L50 condition
- Radio Frequency Interference at the edge of easement: 66 dB μ V/m, Heavy Rain

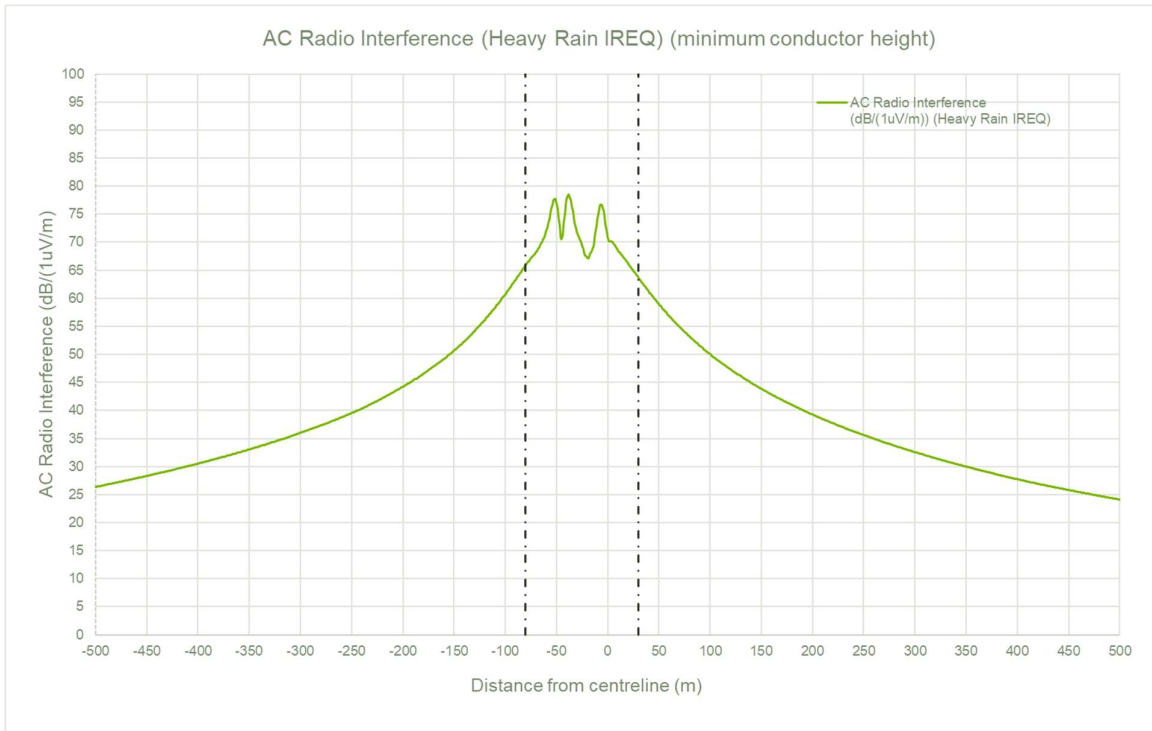


Figure 6-4: Scenario 2 AC Radio Interference (Heavy Rain) minimum conductor height



Figure 6-5: Scenario 2 AC Radio Interference (L50) minimum conductor height

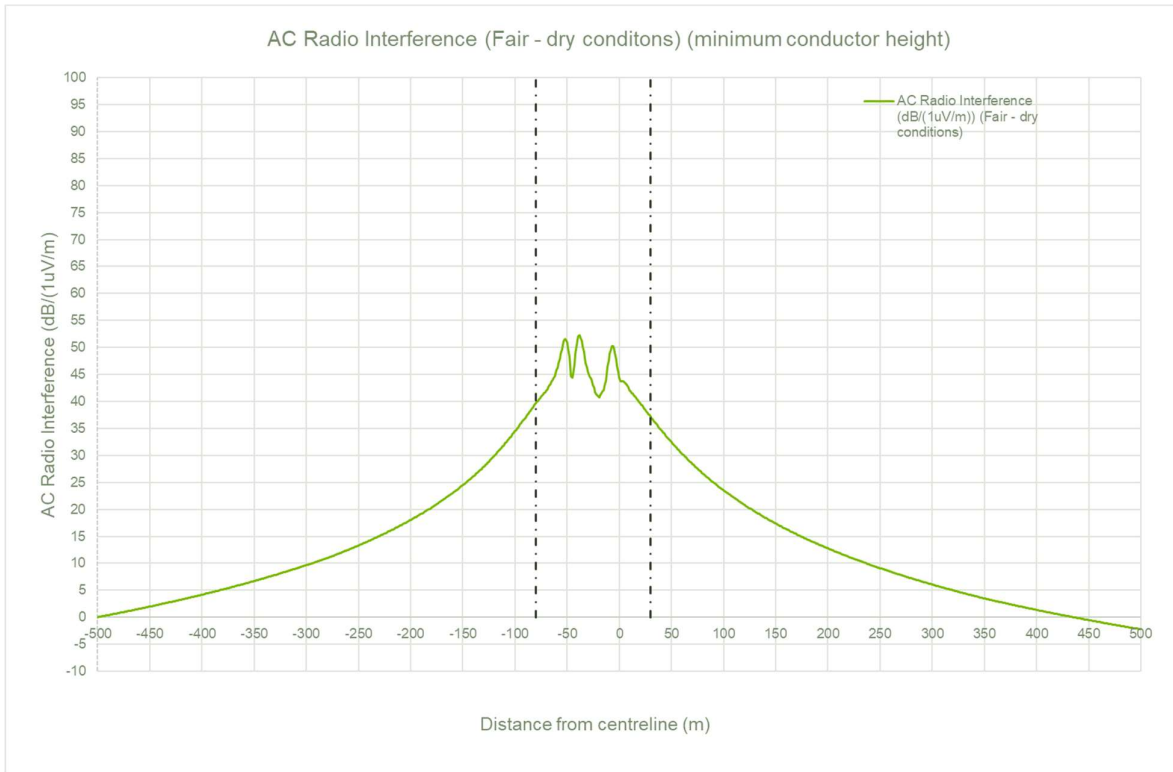


Figure 6-6: Scenario 2 AC Radio Interference (Fair Weather) minimum conductor height

6.3 Scenario 4: 17D to 18D

- Radio Frequency Interference at the edge of easement: 39 dB μ V/m, Fair Weather
- Radio Frequency Interference at the edge of easement: 56 dB μ V/m, L50 condition
- Radio Frequency Interference at the edge of easement: 65 dB μ V/m, Heavy Rain

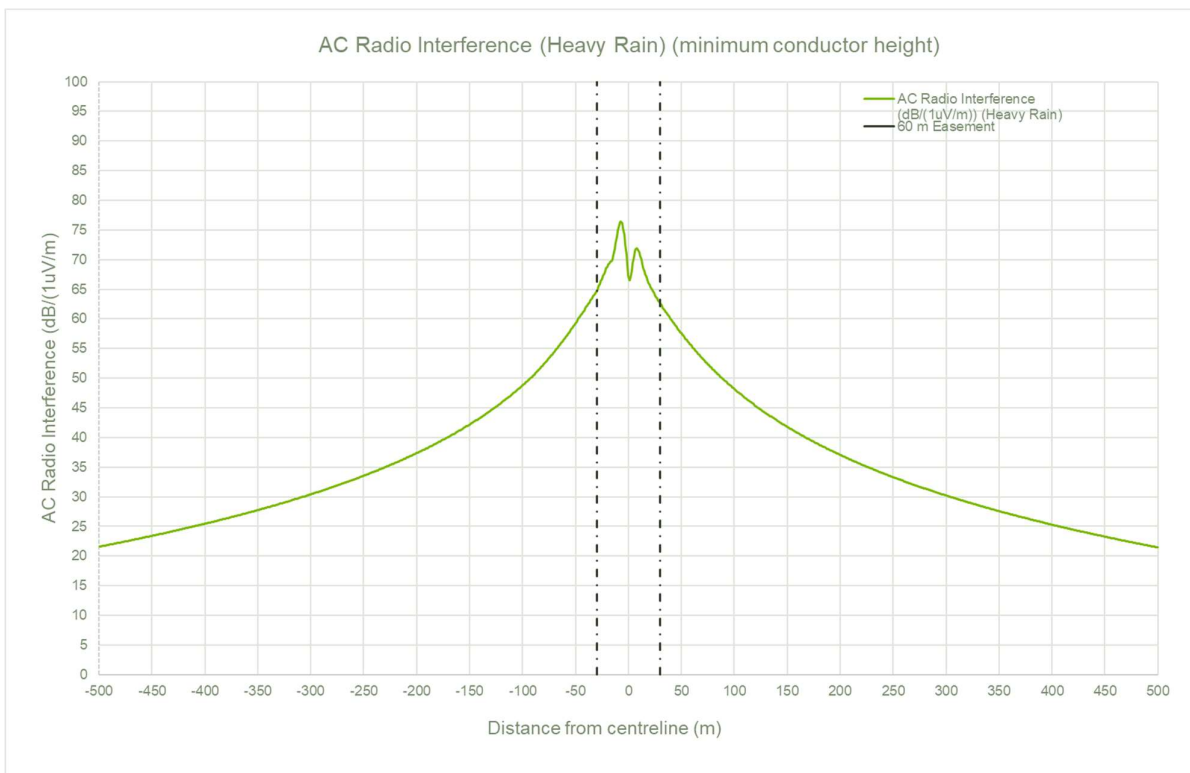


Figure 6-7: Scenario 4 AC Radio Interference (Heavy Rain) minimum conductor height

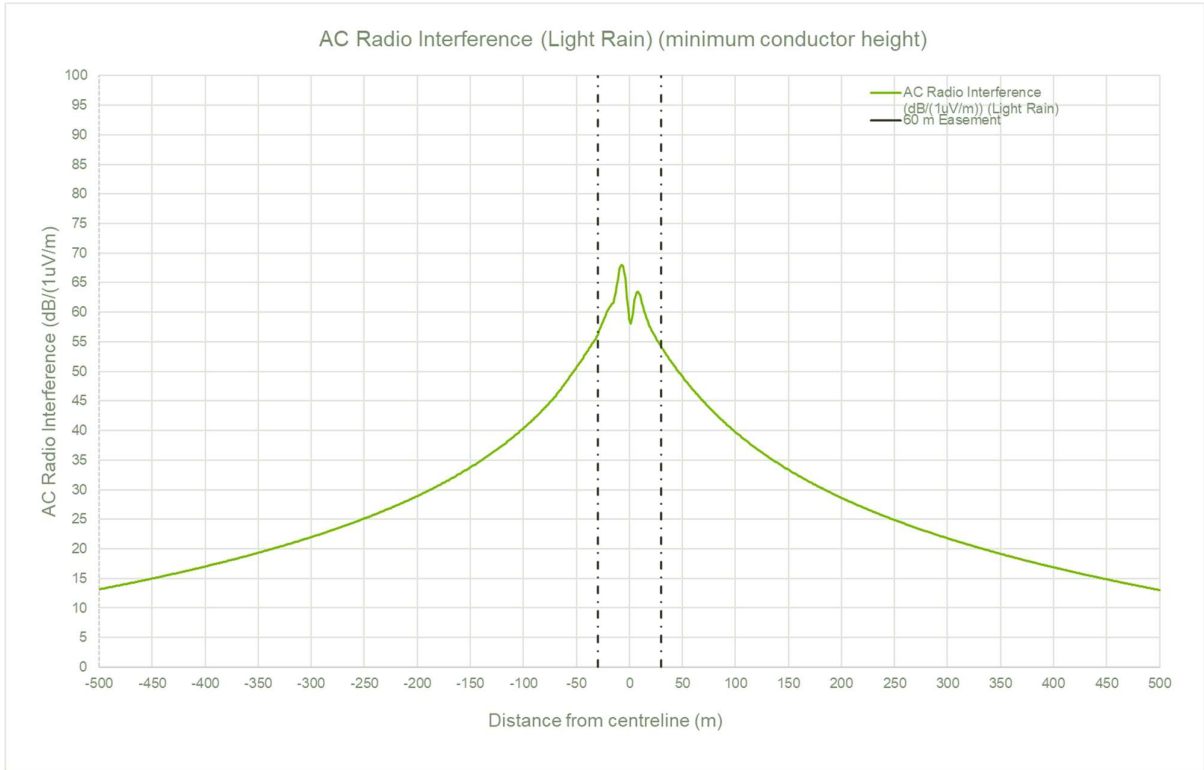


Figure 6-8: Scenario 4 AC Radio Interference (L50) minimum conductor height

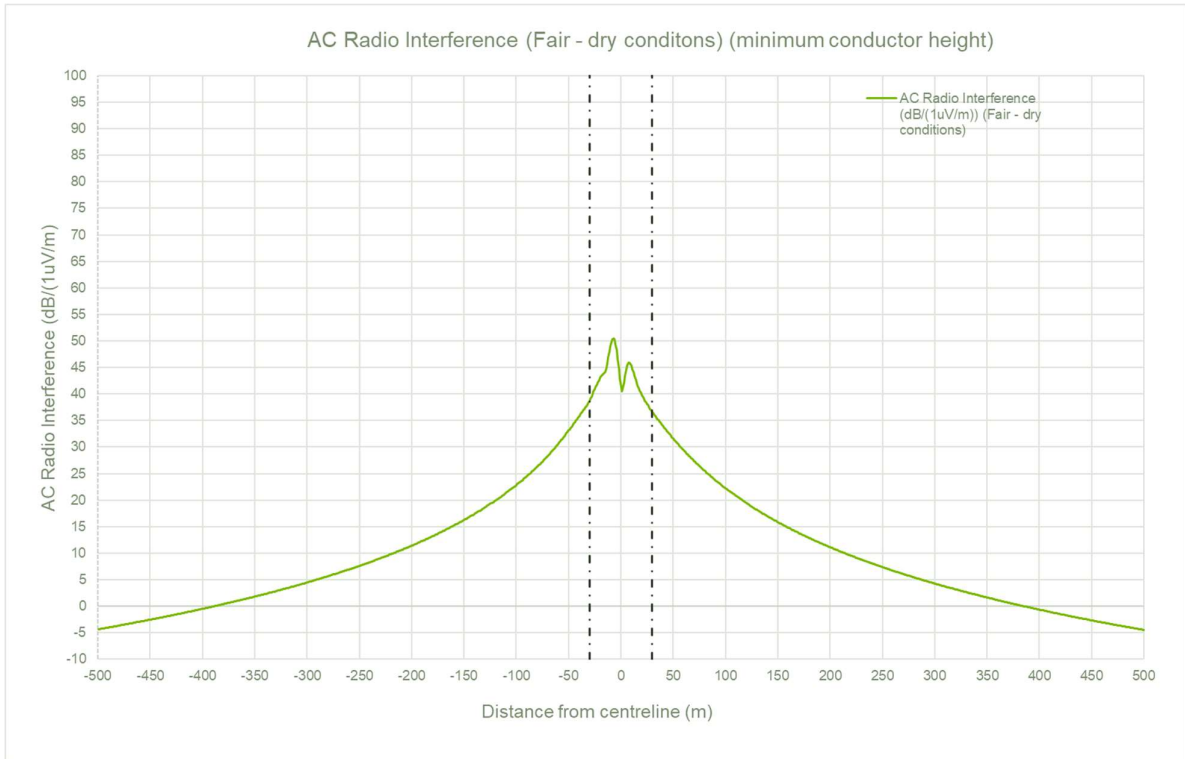


Figure 6-9: Scenario 4 AC Radio Interference (Fair Weather) minimum conductor height

6.4 Scenario 5: 27D to 28D parallel to 23 to 24

- Radio Frequency Interference at the edge of easement: 40 dB μ V/m, Fair Weather
- Radio Frequency Interference at the edge of easement: 58 dB μ V/m, L50 condition
- Radio Frequency Interference at the edge of easement: 66 dB μ V/m, Heavy Rain

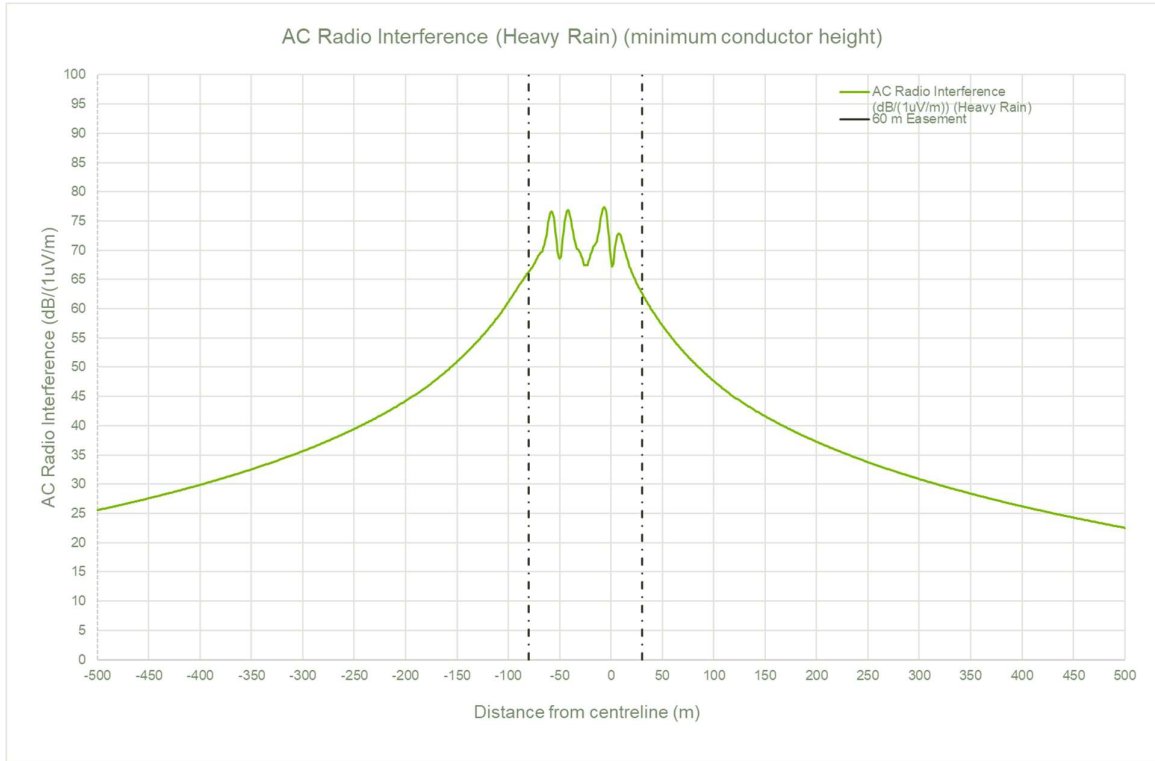


Figure 6-10: Scenario 5 AC Radio Interference (Heavy Rain) minimum conductor height

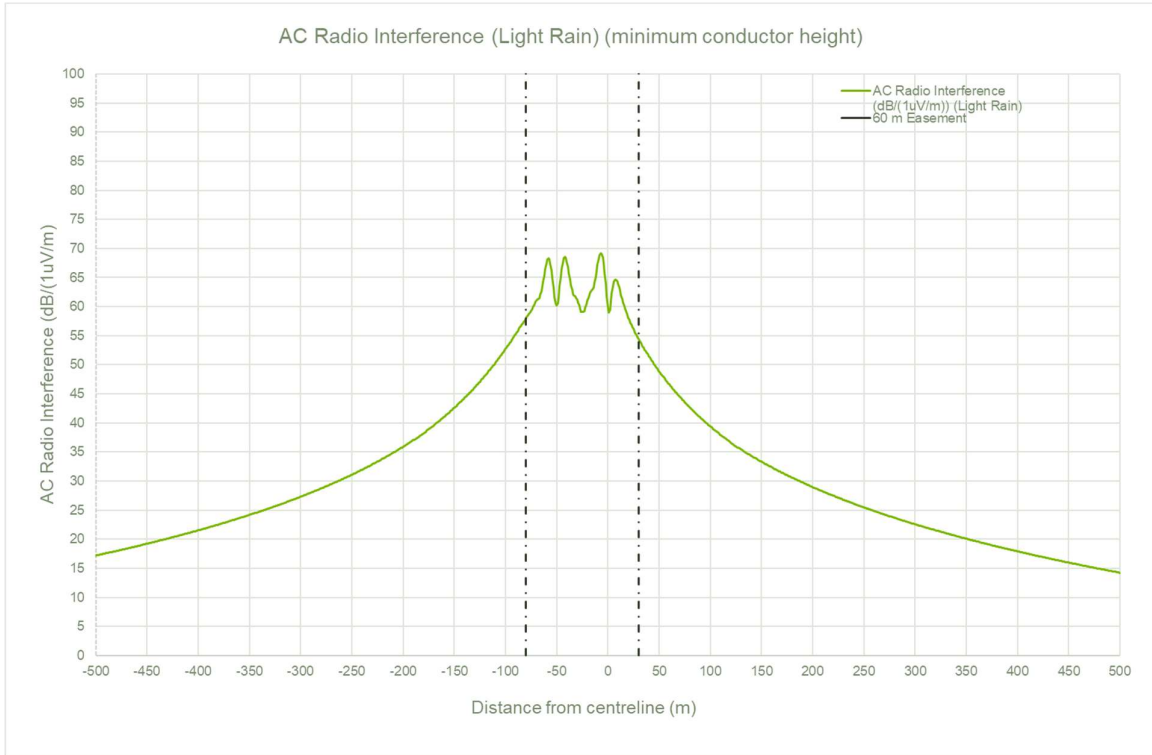


Figure 6-11: Scenario 5 AC Radio Interference (L50) minimum conductor height

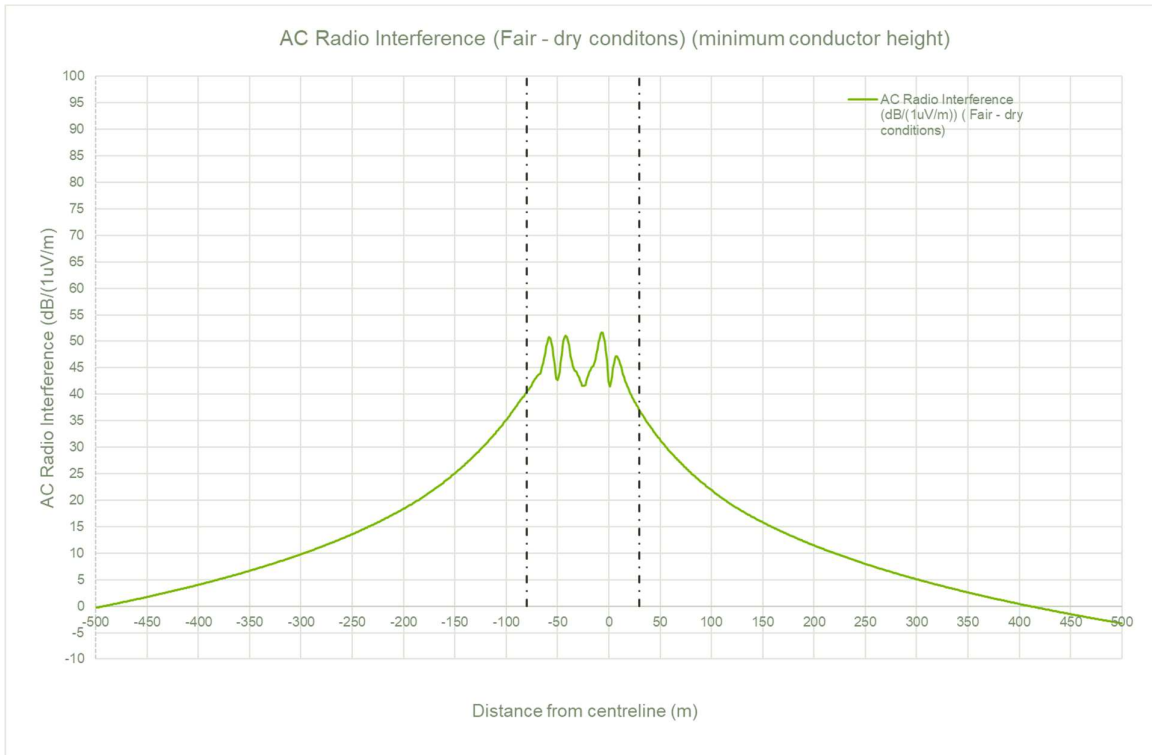


Figure 6-12: Scenario 5 AC Radio Interference (Fair Weather) minimum conductor height

7 Audible noise sensitive receiver mapping

7.1 Audible noise at L50 conditions

Refer to Figure 7-1 for the proposed transmission line operational noise impact mapping. With the most conservative assessment approach (minimum conductor heights and L50 conditions), residential receivers are generally outside the 35 dB(A) contour. The exceptions are near Duncan St, Wolgan Rd and Skelly Rd, where a further site-specific assessment was undertaken – refer to Section 0.

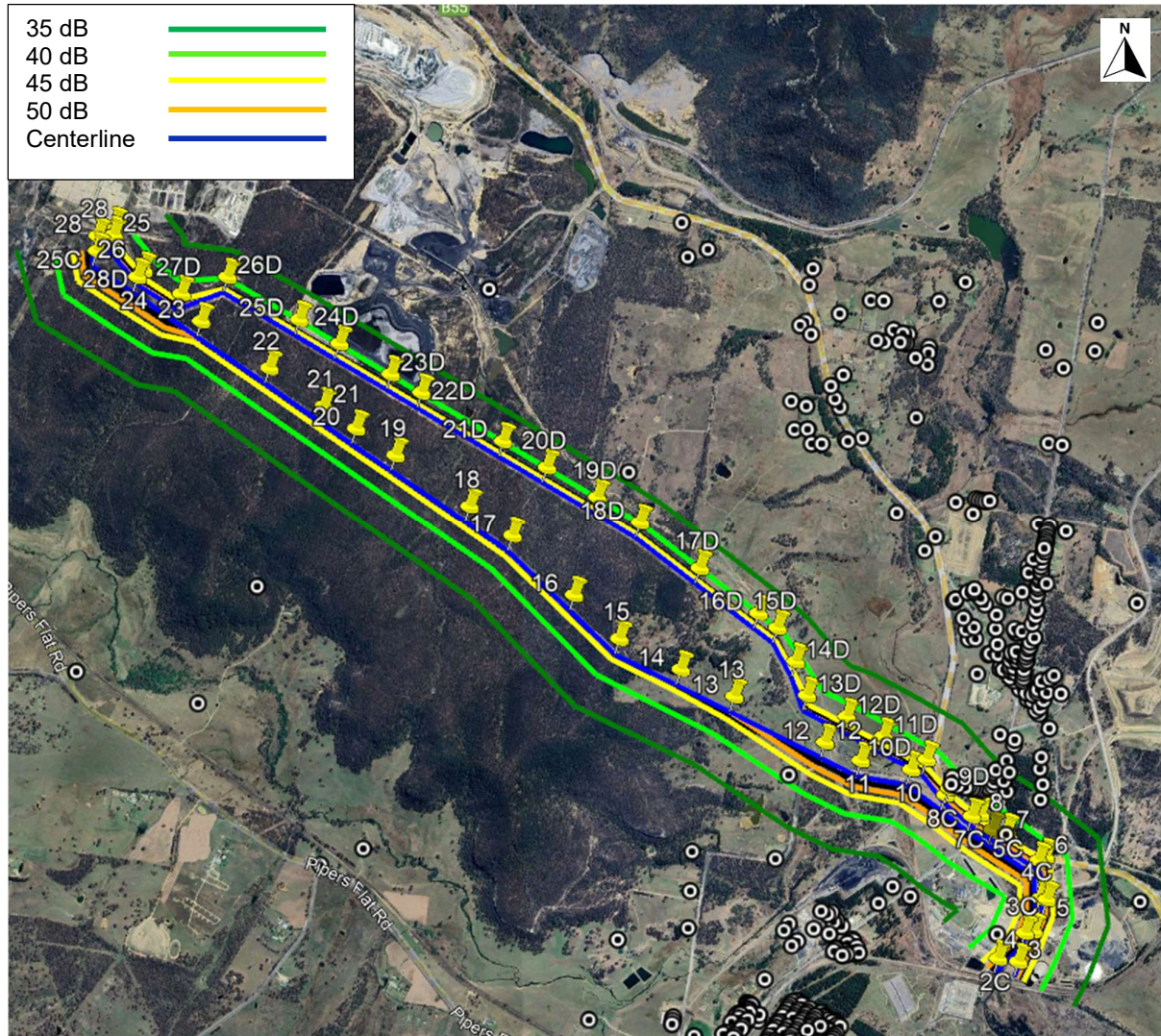


Figure 7-1: Sensitive receiver mapping, audible noise level at L50 conditions

7.2 Scenario 2 assessment – before and after commissioning of the new line

Scenario 2 results suggest that under Fair Weather, the audible noise level is expected to be below 35 dB(A) within and outside the transmission line easement (Section 5.2).

Under the less frequent L50 conditions (light rain or mist), the noise level at nearby receivers may exceed 35 dB(A). However by comparing the results to the noise model of only the existing lines, the anticipated noise increase is approximately 3 dB(A) which is considered minimal. Refer to Figure 7-2 for the noise model results. Refer to Figure 7-3 and Figure 7-4 for the additional receivers within the 35 dB(A) contour.

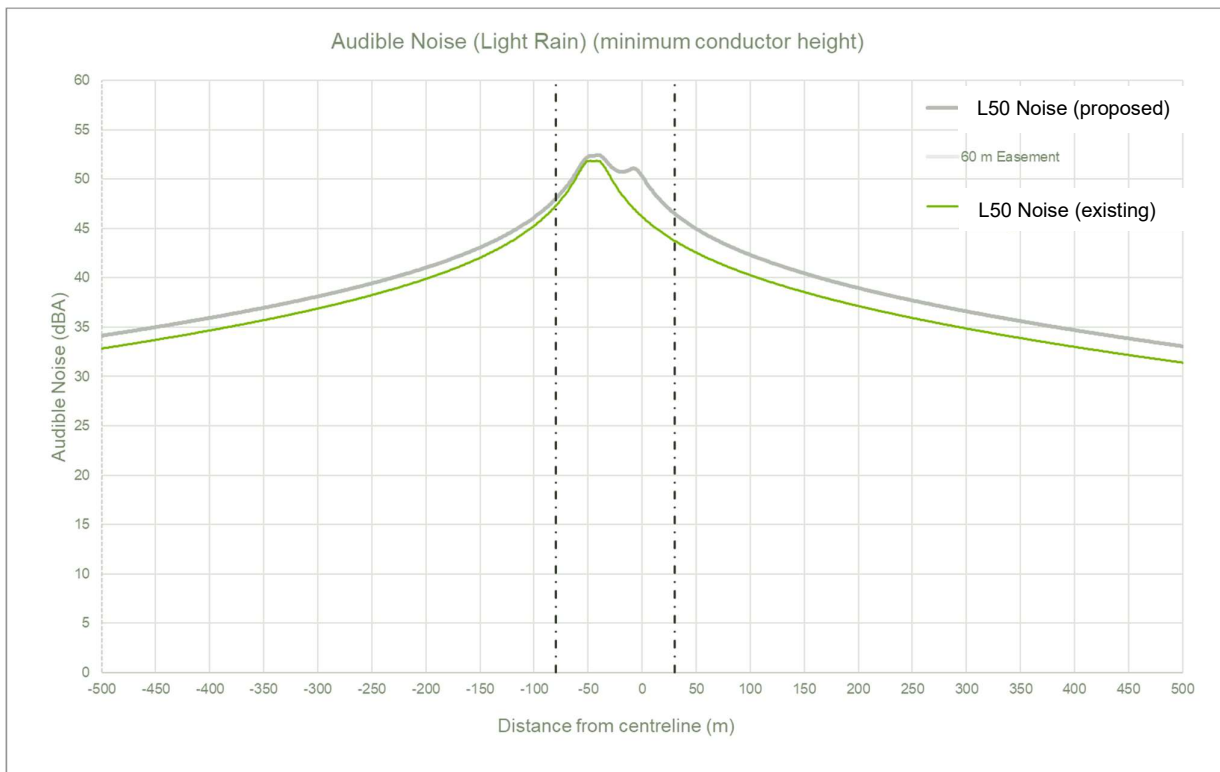


Figure 7-2: Scenario 2, audible noise at L50 conditions, before and after new line commissioning

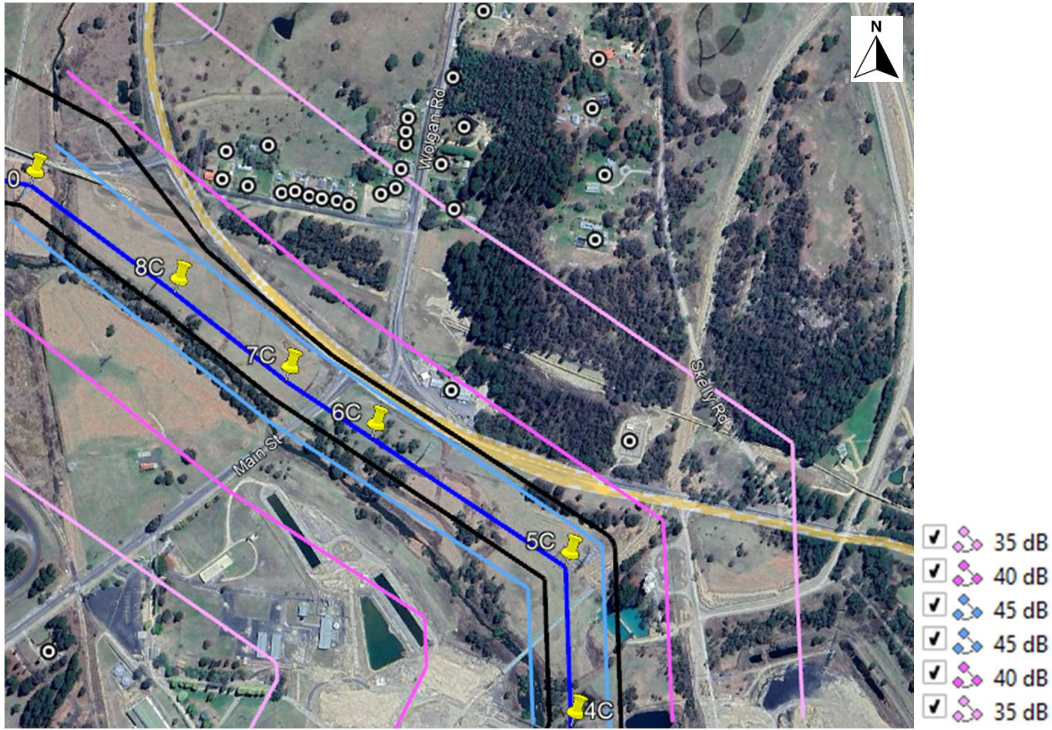


Figure 7-3: Sensitive receiver mapping, Scenario 2, audible noise at L50 conditions (existing)

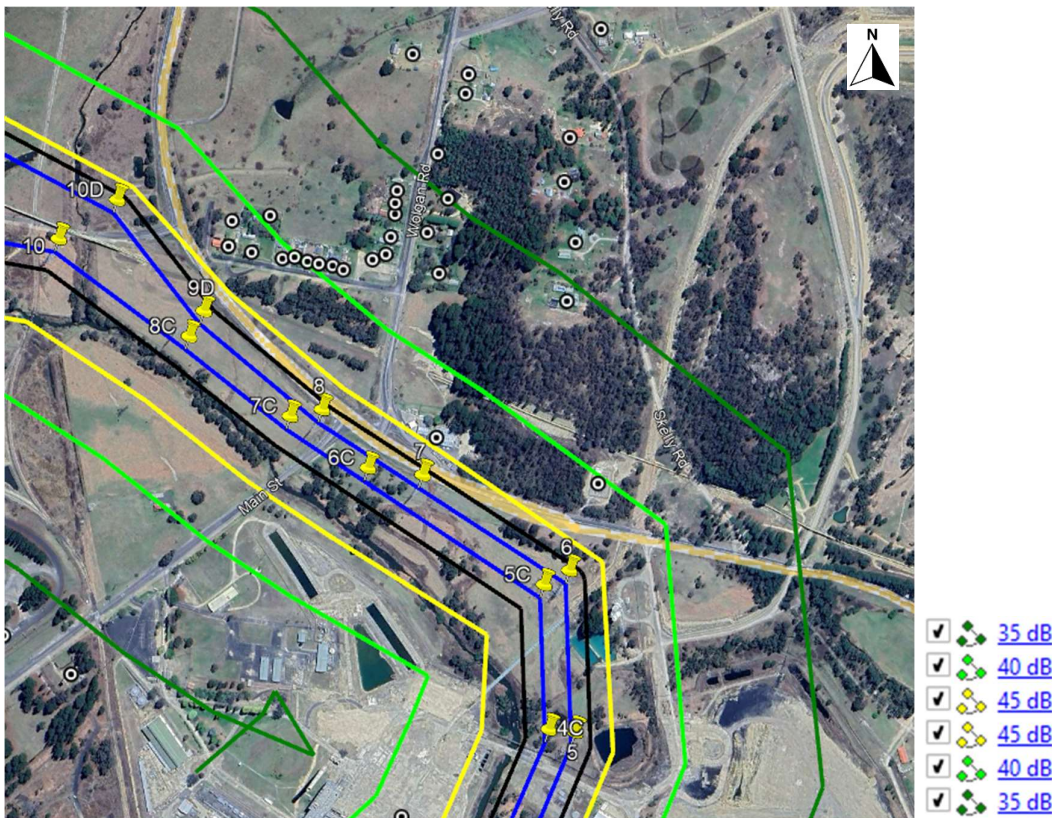


Figure 7-4: Sensitive receiver mapping, Scenario 2, audible noise at L50 conditions (proposed)

8 Point-to-Point Communication Links

An initial review was undertaken, which indicated the proposed transmission line does not impact existing NSWTA links. Refer to Figure 8-1.

Following the initial assessment, Transgrid has also engaged 3rd party to undertake a further desktop review of the latest ACMA RRL archive (dated 10/Nov/2024), and it confirmed that no linked ACMA device system was found to intersect with the new line proposed.

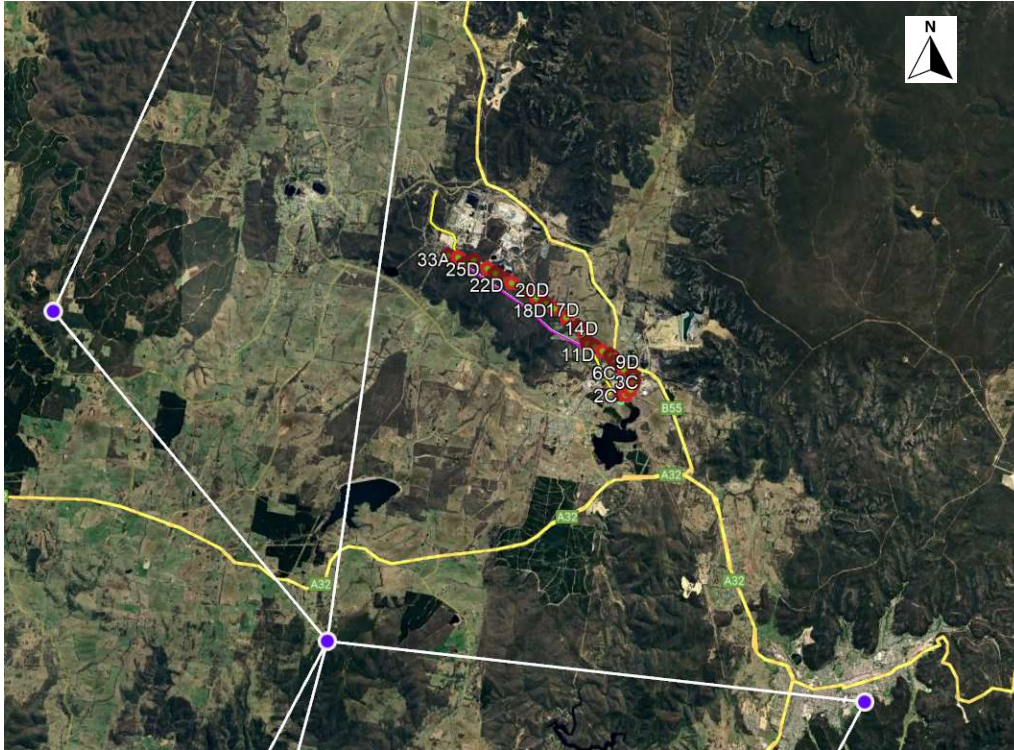


Figure 8-1: NSWTA links (White) in the vicinity of the project site

9 Conclusions

9.1 Audible noise

9.1.1 Assessment results

Refer to Table 9-1 for the transmission line operation audible noise assessment results and Section 7 for the transmission line operational noise-sensitive receiver mapping:

- In all the assessed scenarios, the anticipated transmission line audible noise level at the easement edge is less than 50 dB (A) under L50 wet conditions. This meets the Transgrid Transmission Line Design Manual – Major New Build (Rev 2) requirements.
- In all the assessed scenarios, the anticipated transmission line audible noise level at the nearest receivers is less than 30 dB (A) under Fair Weather conditions. This meets the NPfl requirements under the most prevailing meteorological conditions.
- Under less frequent L50 conditions (light rain or mist), the noise level at nearby receivers may exceed 35 dB(A). However, the model results suggest a marginal accumulative noise increase by comparing it to the noise generated by the existing lines only. (refer to Section 0)
- It shall be noted that the transmission line operational noise assessment results are conservative as the assessment assumes the line operating at maximum rating and does not account for the existing background noise level and local topography.

Table 9-1: Audible noise assessment results (cumulative noise from existing and proposed lines)

From Str. No.	To Str. No.	Max. AN at nearest receiver (Fair Weather)	Max. AN at easement edge (L50)	Max. AN at nearest receiver (L50)
1C	3C	< 30 dB(A)	-	-
		-	48 dB(A)	-
		-	-	< 30 dB(A)
3C	8C/9D	< 30 dB(A)	-	-
		-	48 dB(A)	-
		-	-	44 dB(A)
8C/9D	10D	< 30 dB(A)	-	-
		-	48 dB(A)	-
		-	-	43 dB(A)
10D	12D	< 30 dB(A)	-	-
		-	48 dB(A)	-
		-	-	< 30 dB(A)
12D	13D	< 30 dB(A)	-	-
		-	48 dB(A)	-
		-	-	32 dB(A)
13D	27D	< 30 dB(A)	-	-
		-	46 dB(A)	-
		-	-	34 dB(A)
27D	28D	< 30 dB(A)	-	-
		-	48 dB(A)	-
		-	-	< 30 dB(A)

9.1.2 Audible noise mitigations

The transmission line operational noise is expected to comply with the intrusiveness and amenity noise level under Fair Weather conditions. However, under L50 conditions (light rain or mist), the noise level may exceed the 35 dB(A)

($L_{Aeq,15min}$) limits at the nearest receivers. L50 conditions are considered less frequent given relatively dry climate in the study area, with an annual mean rainfall between 600 – 900mm recorded at the nearest weather station (also refer to Figure 9-1 for the BOM annual rainfall maps).

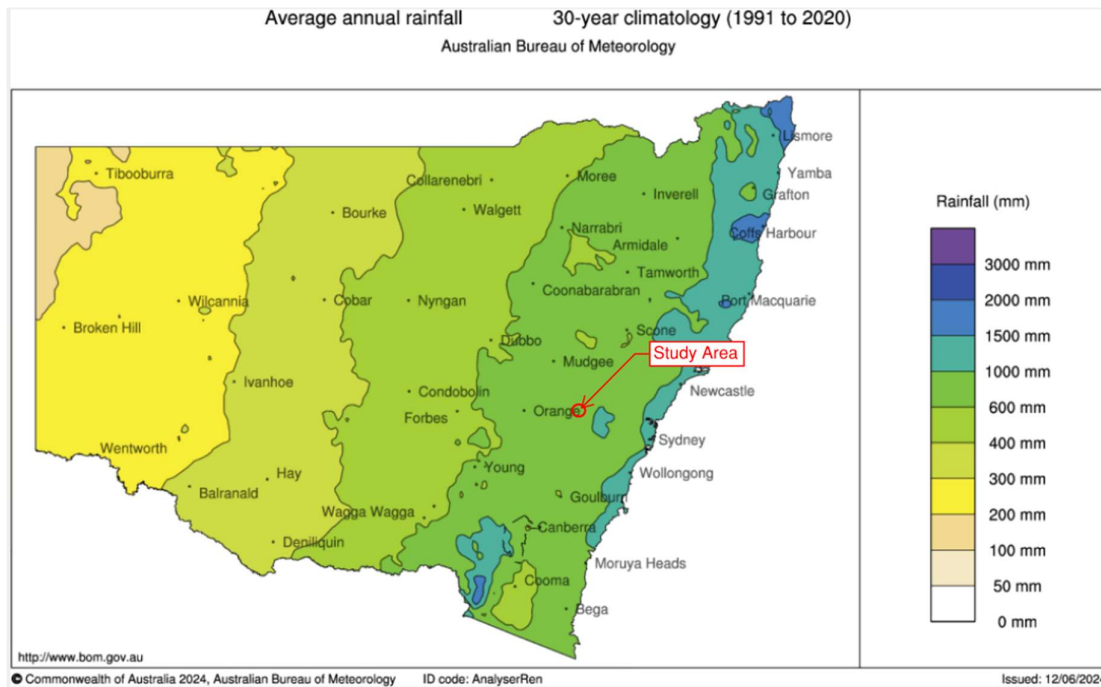


Figure 9-1: BOM average annual rainfall maps

It is understood that design mitigations have been implemented to minimise transmission line operation noise. In the line route selection, the proposed infrastructure is co-located with the existing lines or positioned to reuse the existing Transgrid easement to minimise the disturbed area. Conductor bundles are selected to control the surface voltage gradient to limit the generation of corona discharges.

To further reduce the potential noise impacts, it is the standard approach to source test records for the proposed insulator assemblies to confirm acceptable noise performance. During construction, adequate conductor stringing methodology will be implemented to avoid any damage and additional burrs leading to additional operational noise impacts.

Any potential audible noise concerns may be further verified via site monitoring before and after the commissioning of the new line. Treatments in accordance with NPfl recommendation can be provided for any proven residual noise impacts – refer to Table 9-2.

Table 9-2: NPfl significance of residual noise impacts and treatment examples

Predicted exceedance of PNTL	Predicted level relative to the amenity noise level	Significance	Example of potential treatment
≤ 2 dBA	-	Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
≥ 3 but ≤ 5 dBA	Less than the recommended amenity noise level or greater than the recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1 dB.	Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
≥ 3 but ≤ 5 dBA	Greater than recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB.	Moderate	As for 'marginal', but also upgraded facade elements, such as windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
> 5 dBA	Less than or equal to the recommended amenity noise level.		
> 5 dBA	Greater than the recommended amenity noise level.	Significant	May include suitable commercial agreements where considered feasible and reasonable.

Note 1: Reproduced from NPfI Table 4.1 and Table 4.2.

9.2 Radio interference and mitigations

The AS 2344 derived limit of 36 dB μ V/m seems impractical to achieve for the proposed lines. However, radio listening on the AM band had been largely replaced by digital radio operating at above 174 MHz, and accordingly, interference in AM systems may not necessarily be an issue for nearby landowners.

In cases where residents are impacted by radio interference, supplying improved antennas may be a cost-effective solution. In terms of sensitive equipment impacts, the land around the proposed transmission line is primarily rural – farming. Farmers sometimes use VHF as part of the machinery GPS systems for agricultural operations. Such stakeholders will need to be identified and existing field strengths will be measured in the VFH band. It is also recommended that mining sites shall be consulted on the potential impacts. If the project is causing nuisance radio interference, signal-boosting equipment or antenna upgrades may be required.

9.3 Point-to-point communication

No point-to-point communication links were found to cross the proposed transmission lines.

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Appendix B

Electric and magnetic fields report

Central-West Orana Renewal Energy Zone – TL7G/71

Electric and Magnetic Fields
Report

Transgrid

Reference: P528096

Revision: C

14 March 2025

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*Bringing ideas
to life*

Document control record

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Document control		aurecon				
Report title		Electric and Magnetic Fields Report				
Document code		528069-0001-REP-EE-0002	Project number		P528069	
File path		Https://aurecongroup.sharepoint.com/sites/528069/5_WorkingFiles/528069-0001-REP-EE-0002_0.docx				
Client		Transgri				
Client contact		Ellen Liu, Christine Lussier	Client reference			
Rev	Date	Revision details/status	Author	Reviewer	Verifier (if required)	Approver
A	2025-01-24	Draft report for review	E.S	A.G	L.F	L.F
B	2025-02-28	Final report	ES	AG	LF	LF
C	2025-03-14	Final report	ES	AG	LF	LF
Current revision		C				

Approval			
Author signature		Approver signature	
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Title	Electrical Engineer	Title	Associate

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1 Project Overview

The NSW Government's Electricity Infrastructure Roadmap (DPIE 2020) identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from REZs in inland NSW to key demand centres. Interest in new energy generation projects in the CWO REZ is forecasted to exceed the existing transmission network capacity in several locations. The existing infrastructure located between the Mount Piper 550/330 kV substation (Mount Piper 330 kV substation) and the Wallerawang 330/132 kV substation (Wallerawang 330 kV substation) has been identified in the NSW Network Infrastructure Strategy (EnergyCo 2023) as requiring upgrades.

The Mount Piper to Wallerawang Transmission Line Upgrade Project (the project) would provide the additional capacity required to reliably transmit power from the CWO REZ to the Greater Sydney region. The project would comprise construction and operation of approximately 8 km of new 330 kV transmission line between the Mount Piper and Wallerawang 330 kV substations. The standard easement widths for 132 kV and 330 kV transmission lines are 45 m and 60 m respectively. However, easements may vary in width where multiple transmission lines converge/ diverge or where they overlap with an existing easement.

1.1 Report scope

This report investigates the electric and magnetic fields expected to be produced by the proposed 330 kV and 132 kV transmission line augmentation between Mt Piper Substation and Wallerawang Substation. This EMF report will examine the EMF directly under the transmission line and at the edge of the easement. Both the new and existing transmission lines will be modelled for the cumulative impacts.

1.2 Abbreviations and Definitions

Table 1-1: Abbreviations and Definitions

Abbreviation	Description
ACSR/GZ	Aluminium Conductor Steel Reinforced/Galvanized
BYDA	Before You Dig Australia
CBL	Calculated Breaking Load (kN)
CWO REZ	Central-West Orana Renewal Energy Zone
EDMS	Electronic Document Management System
EMF	Electromagnetic Field
ICAO	International Civil Aviation Organisation
ICNIRP	International Commission on Non-Ionising Radiation Protection
LHS	Left Hand Side
LIDAR	A remote sensing technology that measures distance by illuminating a target with a laser and analysing the reflected light.
MOT	Maximum Operating Temperature
OHEW	Overhead Earth Wire
OPGW	Optical Fibre Ground Wire
PSSR	Power System Safety Rules
RHS	Right Hand Side

SC/AC	Steel Conductor/Aluminium Clad
SC/GZ	Steel Conductor/Galvanized
SRF	Span Reduction Factor (unitless)
SWMS	Safe Work Method Statements

1.3 Reference documentation

Reference should be made to the below table for the Transgrid standards and design documentation.

Table 1-2: Transgrid standards and requirements

Document No.	Document Title
TLDM – MNB Rev 2.0	Transmission Line Design Manual – Major New Build Rev 2.0
	Power Frequency Electric and Magnetic Fields Management Policy

1.4 Relevant standards

Table 1-3: Relevant standards

Document No.	Document Title
ENA EMF	EMF Management Handbook 2016. Energy Networks Association Limited
ICNIRP	ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz - 100 kHz), 2010.

2 Design criteria

This section provides an overview of EMF, setting out the exposure limits adopted for the new Mt Piper to Wallerawang 330 kV line, based on applicable national and international guidelines.

2.1 General description

Electric field:

Electricity has two principal components, an electrical component and a magnetic component. Electric fields are determined by voltage, and the electric field at any given location around a transmission line will be largely constant. The electric field is proportional to the voltage, which remains within a plus/minus 10% level while the equipment is energised. The higher the operating voltage of the line, the higher the electric field around the conductor itself. This is partially offset at ground level as the higher voltage lines are run at a greater height above ground.

The strength of the force associated with an electric field is related to voltage – the higher the voltage, the stronger the electrical field. The level of electric field is measured in volts per metre (V/m). Electric fields are strongest closest to the source but reduce quickly with distance. In addition, most materials act as a barrier to electric fields.

Magnetic field:

Magnetic fields change in strength over time in line with the magnitude of the current. Whenever an electric charge moves, a magnetic field is created that is proportional to the current. Therefore, the higher the current, the higher the magnetic field. Variations in the current follow fairly typical patterns, with morning and evening peaks, and larger loads reflecting seasonal variations. Magnetic fields are produced by the flow of an electric current – the higher the current, the greater the magnetic current. The strength of a magnetic field is measured in micro Tesla (μT).

Electric and magnetic fields reduce rapidly with distance from their source. For transmission lines, electric and magnetic fields are between approximately four to eight times lower for every doubling of distance from a line. Electric fields are shielded by most objects, including trees, buildings and human skin. Unlike electric fields, magnetic fields cannot easily be shielded and pass through most materials.

Like electric fields, the magnetic field is closest to the source but reduces quickly with distance. Unlike electric fields, magnetic fields are only present when an electric current is flowing.

2.2 Effects of Electric and Magnetic Fields on health

Biological effects of exposure to low frequency electromagnetic fields have been reviewed by the International Agency for Research on Cancer (IARC), ICNIRP, the World Health Organisation (WHO) and national expert grounds. Those publications provide the basis for the ICNIRP Guidelines.

The ICNIRP guidelines set out basic restrictions which are derived from the levels at which interactions with the central nervous system are established and include a safety factor.

2.3 Effects of Electric and Magnetic Fields on medical implants

In addition to the potential impacts that electric and magnetic fields have on the human body, it is known that electric and magnetic fields have the potential to interfere with Active Implanted Medical Devices (AIMD) such as pacemakers and insulin pumps.

Australian standard AS45502-1 (2002) states that AIMDs be immune from risks from 'reasonably foreseeable environmental conditions including electric and magnetic fields'. The standard cites a magnetic field level of 1885 mG.

The Transgrid standard also states "Locations accessible to the general public shall also limit magnetic field exposure to 100uT such to avoid interference with medical implants", noting that 100uT is equal to 1000mG.

Accordingly, as the highest magnetic fields associated with 330kV transmission lines are of the order of a 'few hundred mG' (refer to Section 5), from a practical perspective, AIMDs which comply with the relevant Standards should be immune from transmission line interference. Nevertheless, concerned wearers of AIMDs should consult their

treating physician for further information or advice.

2.4 Animals and Plants

As well as potential effects on humans, the possibility of EMF effects on plants and various animals, including cows, sheep, pigs and horses has been studied over the years, particularly in the 1970s and 1980s. A smaller number of studies have also been reported since that time.

2.4.1 Gibbs Inquiry

In 1991, the late Sir Harry Gibbs, a former Chief Justice of the High Court of Australia published the findings of an extensive inquiry into community needs and high voltage transmission line development.

As part of the Inquiry, he reviewed the body of research on the possibility of effects on native flora and fauna, farm animals and plants and reported his conclusions in Chapter 6.6 of his report (Ref D-1) as follows:

'Bees in hives under or near transmission lines are adversely affected by shocks created by currents induced by the lines but the effect can be mitigated by shielding'

'The Magnetic Fields created by power lines do not affect the health or reproductive capacity of farm animals or present a danger to native fauna.'

'The growth of trees which are close to a transmission line may be reduced by the effect of corona¹. In any case, the height of trees on a transmission line easement will be restricted when this is necessary in the interest of safety. Any loss which this causes to the landowner should be included in the compensation paid for the acquisition of the easement.'

'From a practical point of view, the Electric Fields created by transmission lines have no adverse effects on crops, pasture grasses or native flora, other than trees growing under or near to the line.'

His summary conclusion was:

'No reason exists for concern as to the effect of the fields on animals or plants.'

2.4.2 United Kingdom EMF National Policy Statement

More recently than Sir Harry Gibbs, in July 2011, the UK Government adopted a National Policy Statement (NPS EN-5) for Electricity Networks Infrastructure. This NPS, taken together with the Overarching National Policy Statement for Energy (EN-1), provides the primary basis for decisions taken by the UK Infrastructure Planning Commission (IPC) on applications it receives for electricity networks infrastructure.

In Clause 2.10.8, the NPS states:

'There is little evidence that exposure of crops, farm animals or natural ecosystems to transmission line EMFs has any agriculturally-significant consequences.'

2.4.3 Birdlife

While birds often perch on the conductors of lower voltage lines, line operation experience suggests that birds are unlikely to perch on 100 kV or higher voltage conductors, except some species may perch or nest on the supporting structures. Perhaps for this reason, over the years, there have been numerous studies on potential effects of EMF on a number of avian health endpoints. In 2005, Fernie and Reynolds [1] published a review of bird studies, both under aviary conditions and free ranging. They found that

"Most studies indicate that EMF exposure of birds generally changes, but not always consistently in effect or direction, their behaviour, reproductive success, growth and development, physiology and endocrinology, and oxidative stress under EMF conditions."

2.5 Prudent avoidance and protective measures

The prudent avoidance principle is based on designing the electrical infrastructure to reduce the intensity of the electric and magnetic fields. In addition to this, it is prudent to examine the location of the proposed electrical infrastructure to minimise the exposure to the general public over long periods of time.

Based on 10.8.1 of the TLDM, prudent avoidance measures need to be considered. As noted in ICNIRP, protective measures of workers include engineering and administrative controls and personal protection programs. Specific design measures include:

- Designing the transmission line to have as high as possible ground clearance levels
- Arranging the phase conductors in a way that minimises the level of electric and magnetic fields
- Restrict access to the general public in scenarios where the electric and magnetic fields are at the strongest

2.6 Health Guidelines

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is the Federal Government agency charged with the responsibility for protecting the health and safety of people, and the environment, from EMF. The ARPANSA recommends the use of the exposure guidelines provided by ICNIRP. These exposure guidelines are set out below.

The ICNIRP reference levels for exposure of the public are 2000 mG and 5 kV/m for magnetic and electric fields respectively. These limits apply to both children and adults. The essential biological basis for the guidelines has remained unchanged for more than 20 years. ICNIRP's limiting thresholds for general public exposure are widely accepted as providing complete protection against all known adverse health effects of electric and magnetic fields.

Limitations of exposure that are based on the physical quantity or quantities directly related to the established health effects are termed basic restrictions. In the ICNIRP publication, the physical quantity used to specify the basic restrictions on exposure to EMF is the internal electric field strength, as it is the electric field that affects nerve cells and other electrically sensitive cells. The internal electric field strength is difficult to assess. Therefore, for practical exposure assessment purposes, reference levels of exposure are provided.

TLDM-MNB, Rev 2.0 specifies that the ICNIRP General Public Reference levels for Electric Fields (5 kV/m) shall be complied with where possible. For less publicly frequented areas within the easement, Transgrid has completed dosimetry studies to meet the ICNIRP General Public Basic Restrictions, and it suggests the maximum external electric field shall not exceed 9.1 kV/m at 1 m height above the ground under contingency operation, and the maximum electric field shall not exceed 7.8 kV/m under normal operation.

TLDM-MNB, Rev 2.0 specifies that locations accessible to the general public shall also limit magnetic field exposure to 100 μ T (1000 mG) such to avoid interference with implantable medical devices. This is more stringent than the ICNIRP limits of 2000 mG for public exposure.

Based on the ICNIRP and Transgrid requirements, the following reference levels are selected for the EMF assessment (Table 2-1)

Table 2-1: ICNIRP Guideline and Transgrid Standard EMF Levels (General Public)

Parameter	Reference Level
Electric Field – General Public	5 kV/m at the edge of easement (ICNIRP) 7.8 kV/m within easement (Transgrid Standard)
Magnetic Field – General Public	1,000 mG (Transgrid Standard) 2,000 mG (ICNIRP)

Live line structure access is not anticipated for the proposed 330kV line, as such the associated occupational exposure assessment is not covered in the scope of this report.

3 Design inputs and aspects of field prediction

3.1 Methodology

The modelling for the general public electric field assessment and the magnetic field assessment was completed using the CDEGS software package. The assessment was completed at one metre above the normal standing position of the general public (one metre above ground level).

Along sections of the proposed transmission line, the installation is in the vicinity of existing transmission and distribution infrastructures. There is a cumulative effect arising from multiple electrical circuits. Multiple power lines can lead to enhancement or reduction of magnetic fields depending on their configuration. Given that the EMF levels fall away rapidly with distance, this effect is only notable when the lines are in very close proximity.

For known close transmission assets (i.e. 132kV and above), the cumulative effect will be calculated and included in the Electric and Magnetic Field Detailed Assessment. For the existing lower voltage distribution lines (i.e. 66kV and below), the assets will have much lower EMF levels, and therefore, the cumulative effect is considered negligible.

3.2 Tower geometry

Existing 330kV line 70/71 and new 330kV line 7G runs between Mt Piper 500/330 kV substation and Wallerawang 330/132kV substation. Existing 132kV line 94E runs between Mt Piper 132 kV substation and Wallerawang 330/132kV substation.

To enable the establishment of 330kV feeder 7G, new 330kV double circuit towers and an associated 60m easement will be established between the Wallerawang substation and the existing 94E line crossing. Then, between the 94E line crossing and Mt Piper 500/330 kV substation, the existing single circuit 132kV poles will be rebuilt to 330kV double circuit towers with the easement widened from 45m to 60m.

The new easement primarily traverses the Gardens of Stone State Conservation Area and several land parcels designated RU1 Primary Production.

The minimum conductor height has been modelled to determine the anticipated EMF.

The following tower structures were provided by Transgrid and used as a basis for the audible noise and radio interference studies:

- Existing line 70/71, 330kV Double Circuit Suspension (DSR)

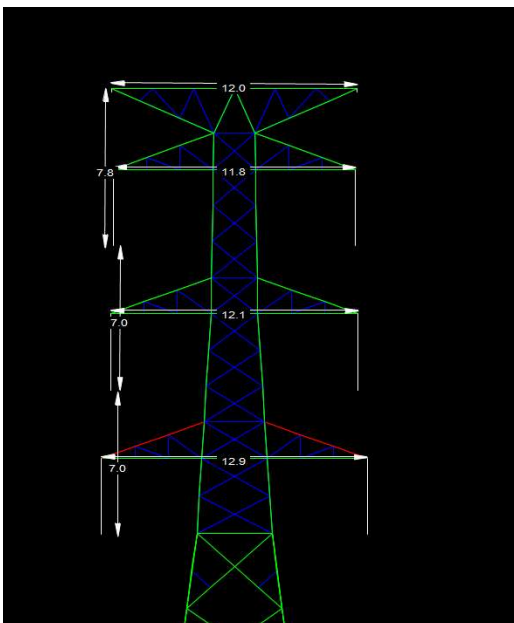


Figure 3-1: DSR tower general arrangement

- Proposed 330kV Double Circuit Light Suspension (RSR)

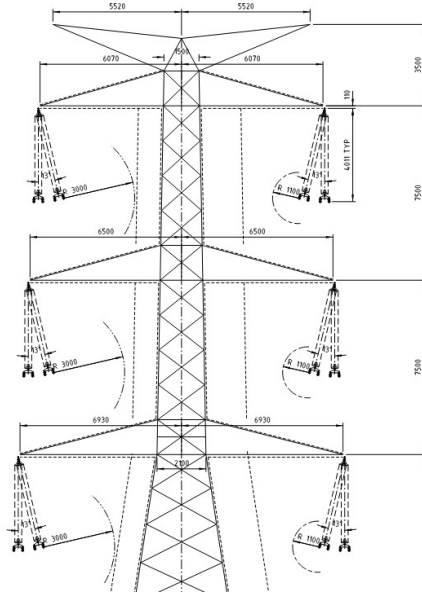


Figure 3-2: RSR tower general arrangement

- Proposed 330kV Double Circuit Light Strain (RWA)

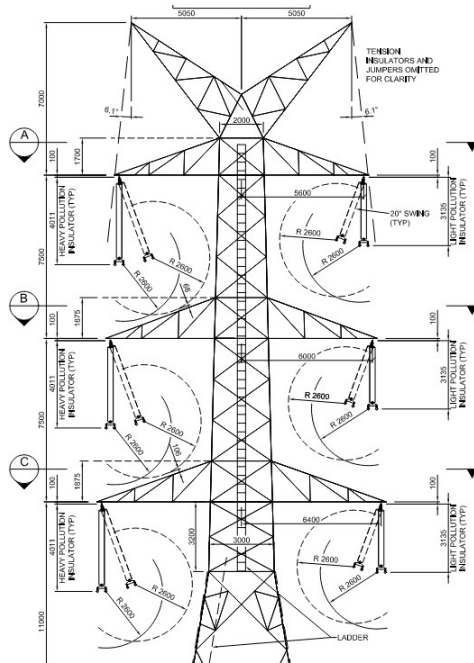


Figure 3-3: RWA tower general arrangement

- Proposed 330kV Double Circuit Light Terminal (RWD) / 330kV Double Circuit Buckarm (RWD)

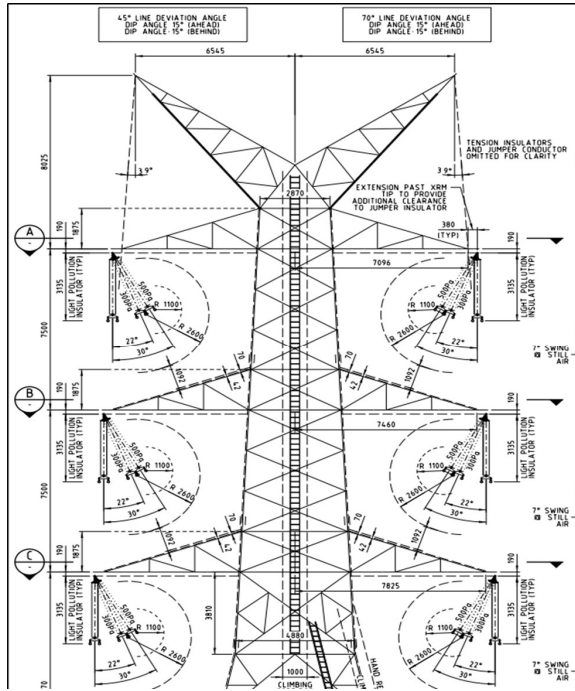


Figure 3-4: RWD tower general arrangement

3.3 Modelled cases

The following cases were modelled to cover the proposed transmission network augmentation:

- Scenario 1: Tower 3C to 8C, typical 100m easements consist of the new 330kV tower line with LHS 330kV circuit 7G, running in parallel with the existing double circuit 330kV tower line 70/71
- Scenario 2: Site-specific assessment of span 9D-10D to the nearest receiver
- Scenario 3: Site-specific assessment of 330kV to 132kV line crossing at span 12D-13D
- Scenario 4: Tower 13D to 27D, typical 60m easements consist of the standalone new 330kV tower line with left-hand-side (LHS) 330kV circuit 71 and right-hand-side (RHS) 132kV circuit 94E
- Scenario 5: Site-specific assessment of parallel line section at span 27D-28D

330 kV line with only one circuit energised (1C to 3C, 10D to 13D) is expected to produce less EMF than the scenario of both circuits energised. Therefore, the conclusions can be conservatively covered in Scenario 4. Similarly 28D to Mt Piper Substation can be conservatively covered in Scenario 5.

Refer to Figure 3-5 and the below modelled line parameters confirmed by Transgrid. Circuit current is based on the design rating of the line that is expected to cover both normal and contingency operations.

All cases have been modelled at an observational plane (height above the ground) of 1 metre, frequency of 50 Hz and operating voltage of 1.1 p.u.

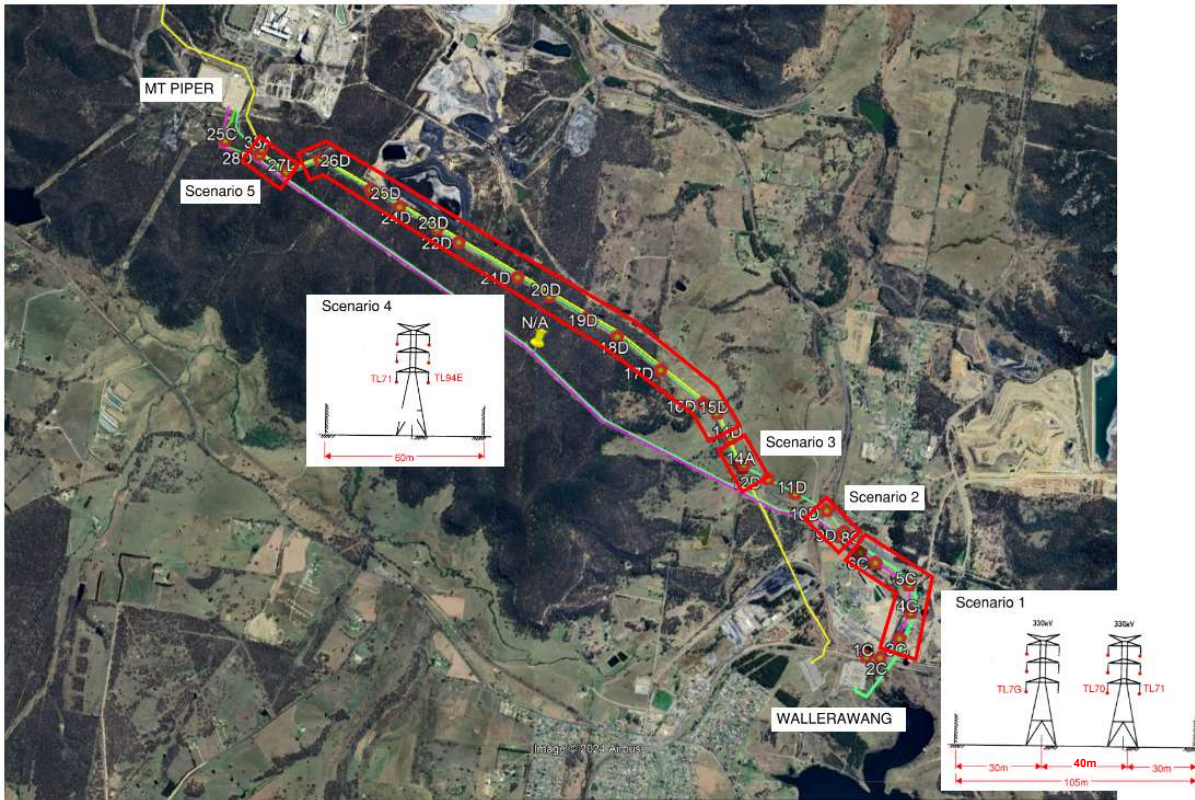


Figure 3-5: EMF assessment locality plan

3.3.1 Scenario 1: Section 3C to 8C, line 7G parallel to 70/71

Table 3-1: Scenario 1 line parameters

Model Input	5C to 6C LHS (7G)	7 to 8 LHS (70)	7 to 8 RHS (71)
Shield wire conductors	OPGW	GRAPE	OPGW
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RWD	DSR	DSR
Phase configuration	R	B	B
	W	W	W
	B	R	R
Voltage	330 kV	330 kV	330 kV
Current rating	2865 A	2168 A	2167 A

3.3.2 Scenario 2: Span 9D to 10D, 7G/70 parallel to line 71

Table 3-2: Scenario 2 line parameters

Model Input	8C to 10 LHS (7G)	8C to 10 RHS (70)	9D to 10D RHS (71)
Shield wire conductors	GRAPE	OPGW TYBE B - LHS	OPGW TYBE B - LHS
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RWA	RWA	RWA
Phase configuration	R	B	B
	W	W	W
	B	R	R
Voltage	330 kV	330 kV	330 kV
Current rating	2721 A	2167 A	2168 A

3.3.3 Scenario 3: Span 12D to 13D, 330kV line 71 crossing 132kV line 94E

Table 3-3: Scenario 3 line parameters

Model Input	13A to 14A (71)	12D to 13D (94E)
Shield wire conductors	GRAPE	OPGW
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RWD	LUB-LUK
Phase configuration	B	R
	W	W
	R	B
Voltage	330 kV	132 kV
Current rating	2168 A	1067 A

3.3.4 Scenario 4: Section 13D to 27D, 71/94E

Table 3-4: Scenario 4 line parameters

Model Input	17D to 18D LHS (71)	17D to 18D RHS (94E)
Shield wire conductors	OPGW	GRAPE
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	RSR	RSR
Phase configuration	B	R
	W	W
	R	B
Voltage	330 kV	132 kV
Current rating	2168 A	1067 A

3.3.5 Scenario 5: Span 27D to 28D, 71/94E parallel to 7G/70

Table 3-5: Scenario 5 line parameters

Model Input	23 to 24 LHS (7G)	23 to 24 RHS (70)	27D to 28D RHS (71)	27D to 28D RHS (94E)
Shield wire conductors	GRAPE	OPGW	GRAPE	OPGW
Phase conductors	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ	TWIN OLIVE ACSR/GZ
Tower arrangements	DSR	DSR	RWD	RWD
Phase configuration	R	B	B	R
	W	W	W	W
	B	R	R	B
Voltage	330 kV	330 kV	330 kV	132 kV
Current rating	2721 A	2167 A	2168 A	1067 A
Observational plane (height above the ground)	1 m	1 m	1 m	1 m
RI frequency	50 Hz	50 Hz	50 Hz	50 Hz

4 Electric field results

4.1 Scenario 1: Section 3C to 8C, line 7G parallel to 70/71

Maximum E-field within the easement: 7.6 kV/m – complies

Maximum E-field at the edge of the easement: 0.3 kV/m - complies

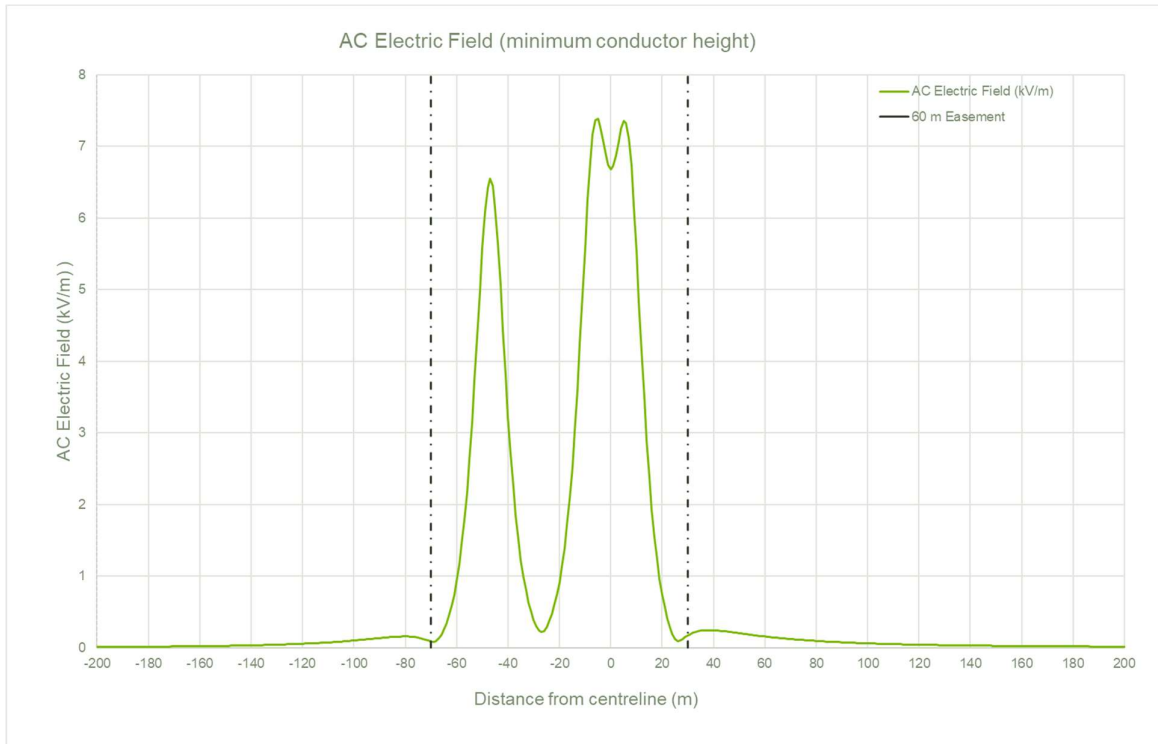


Figure 4-1: Scenario 1 E-field results

4.2 Scenario 2: Span 9D to 10D, 7G/70 parallel to line 71

Maximum E-field within the easement: 6.5 kV/m – complies

Maximum E-field at the edge of the easement: 0.3 kV/m - complies

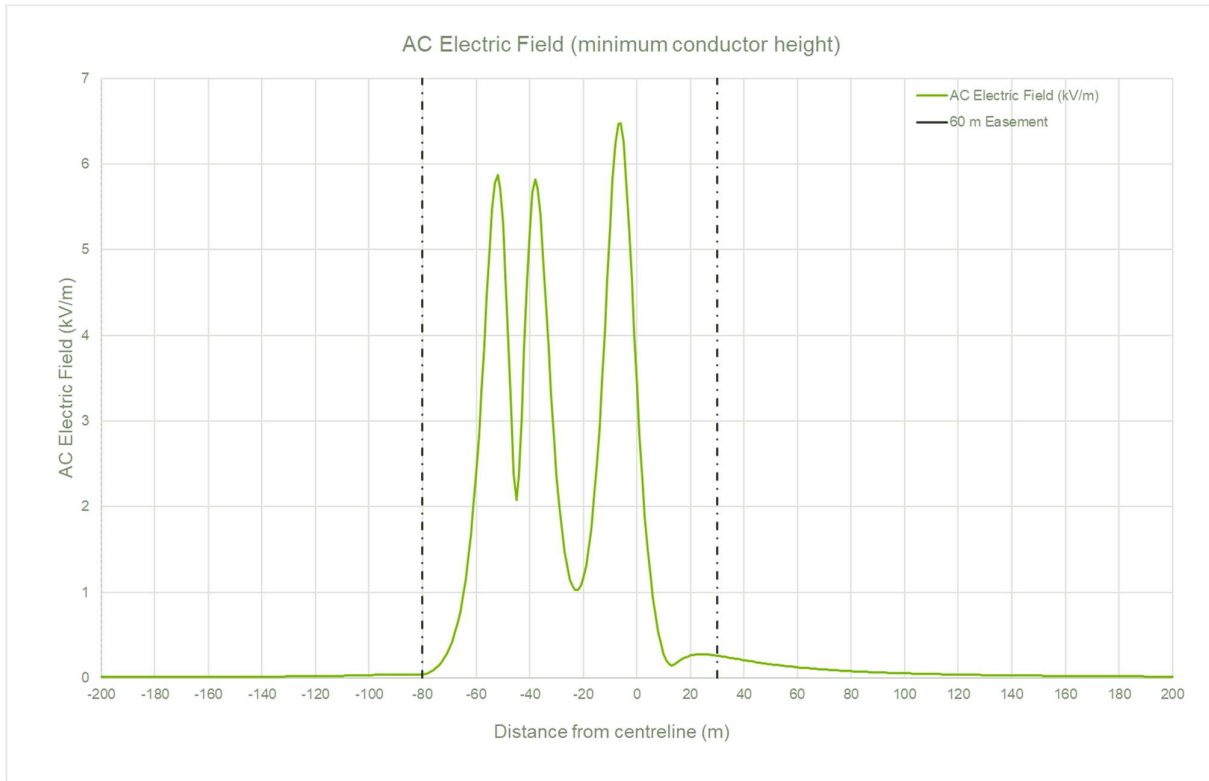


Figure 4-2: Scenario 2 E-field results

4.3 Scenario 3: 12D to 13D, 330kV line 71 crossing 132kV line 94E

Maximum E-field within the easement: 1.3 kV/m – complies

Maximum E-field at the edge of the easement: 0.3 kV/m - complies

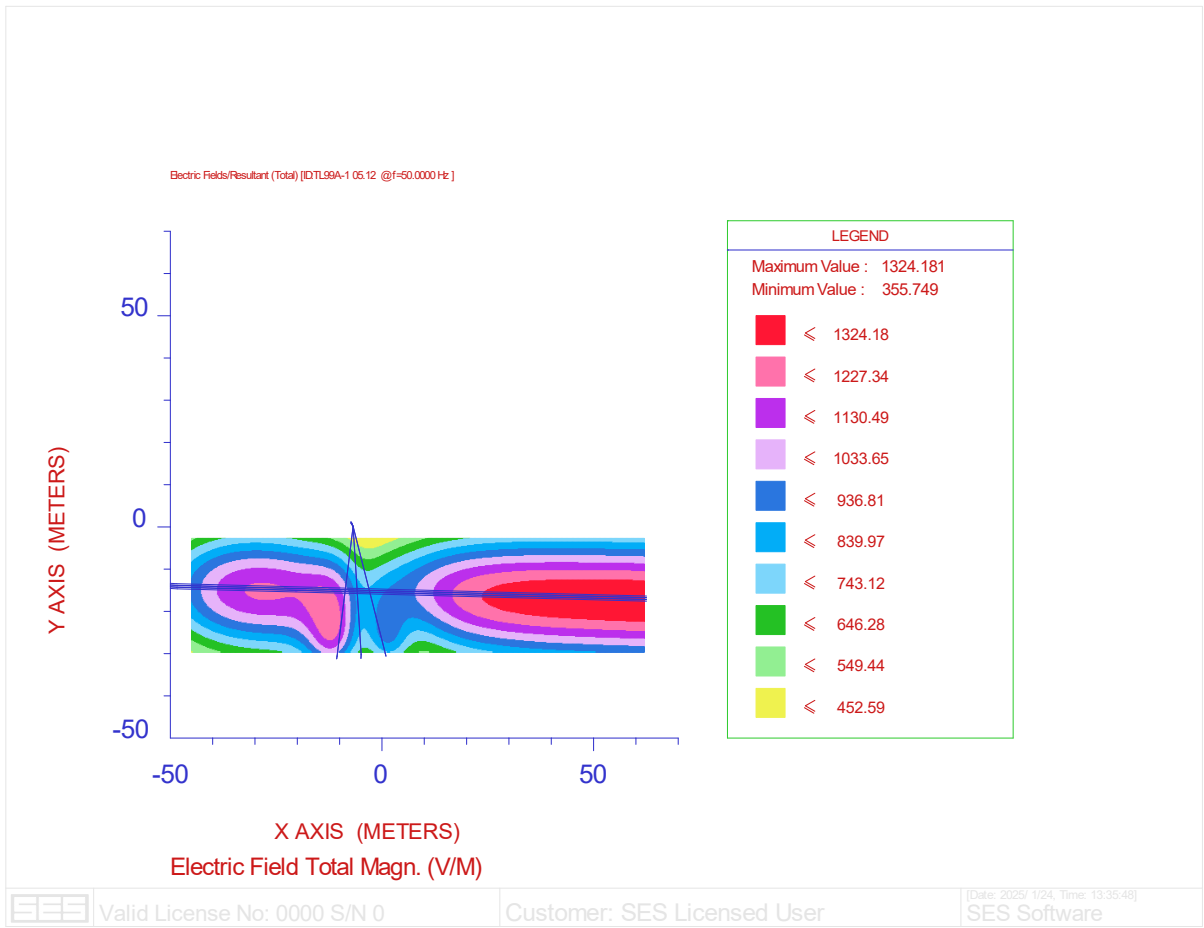


Figure 4-3 Scenario 2 E-field results

4.4 Scenario 4: Section 13D to 27D, 71/94E

Maximum E-field within the easement: 6.5 kV/m – complies

Maximum E-field at the edge of the easement: 0.3 kV/m - complies

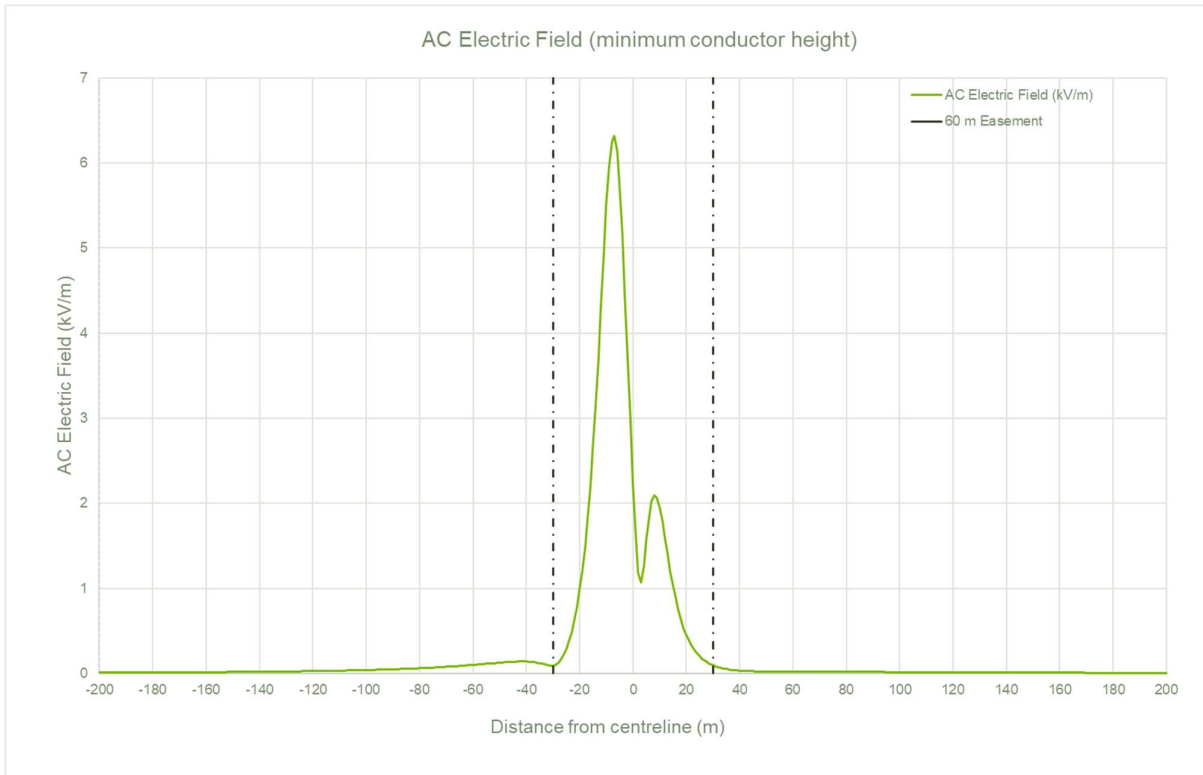


Figure 4-4: Scenario 4 E-field results

4.5 Scenario 5: Span 27D to 28D, 71/94E parallel to 7G/70

Maximum E-field within the easement: 6.1 kV/m – complies

Maximum E-field at the edge of the easement: 0.3 kV/m - complies

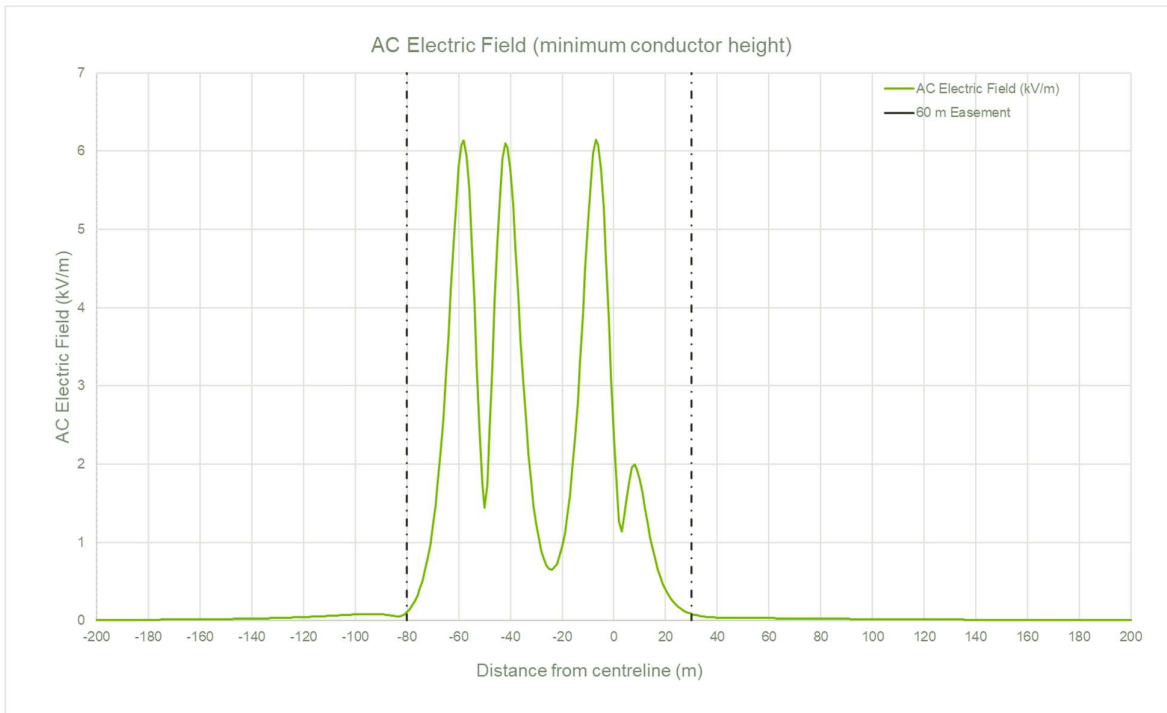


Figure 4-5: Scenario 5 E-field results

5 Magnetic field results

5.1 Scenario 1: Section 3C to 8C, line 7G parallel to 70/71

Maximum M-field: 440 mG – complies

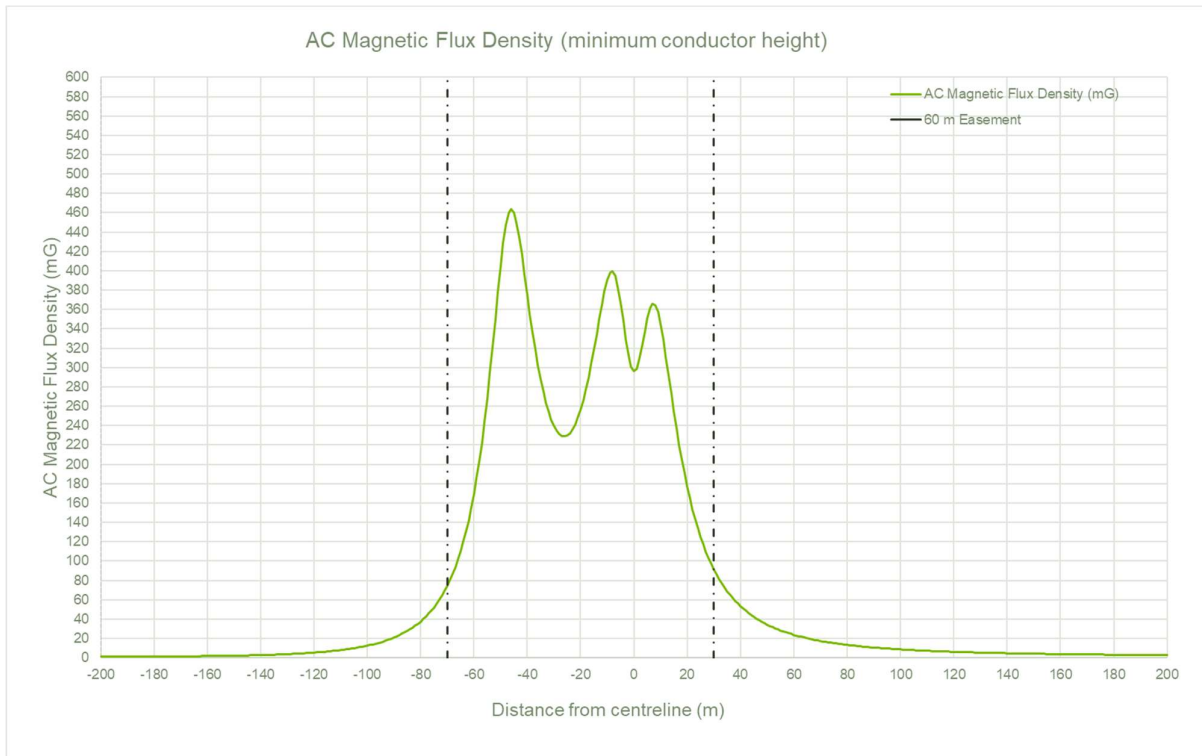


Figure 5-1 Scenario 1 Magnetic Flux Density

5.2 Scenario 2: Span 9D to 10D, 7G/70 parallel to line 71

Maximum M-field: 480 mG – complies

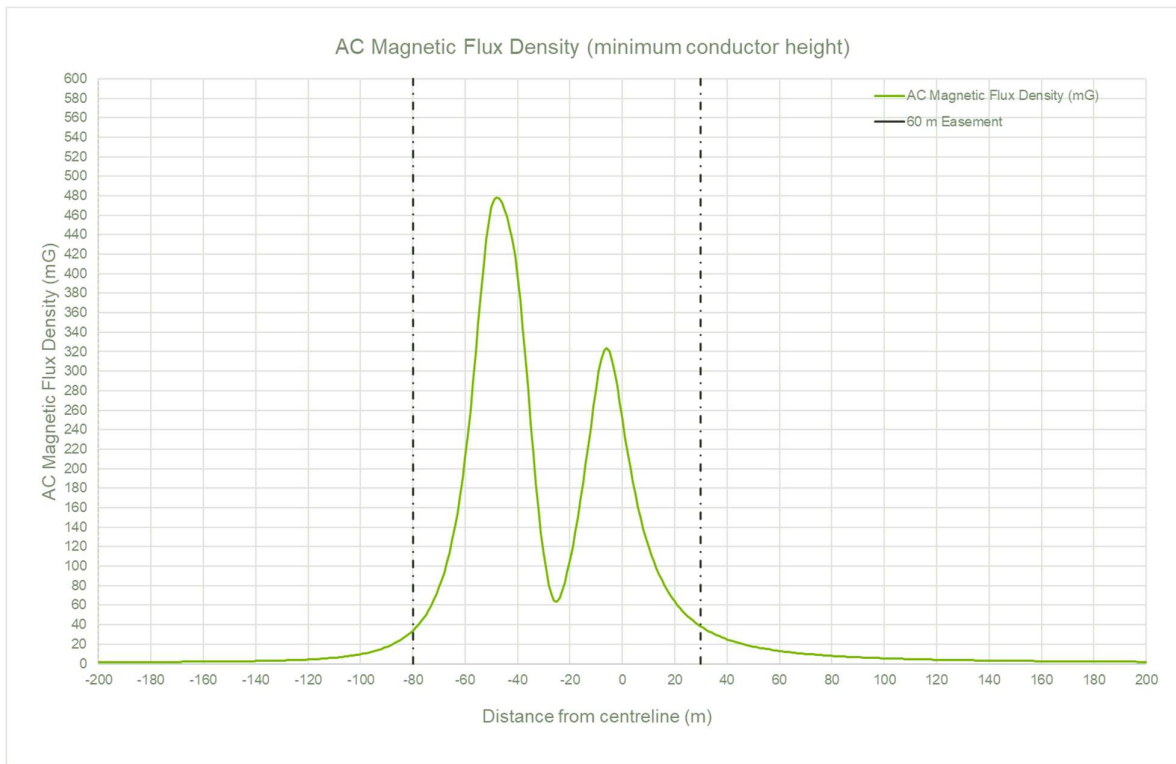


Figure 5-2 Scenario 2 Magnetic Flux Density

5.3 Scenario 3: 12D to 13D, 330kV line 71 crossing 132kV line 94E

Maximum M-field: 160 mG – complies

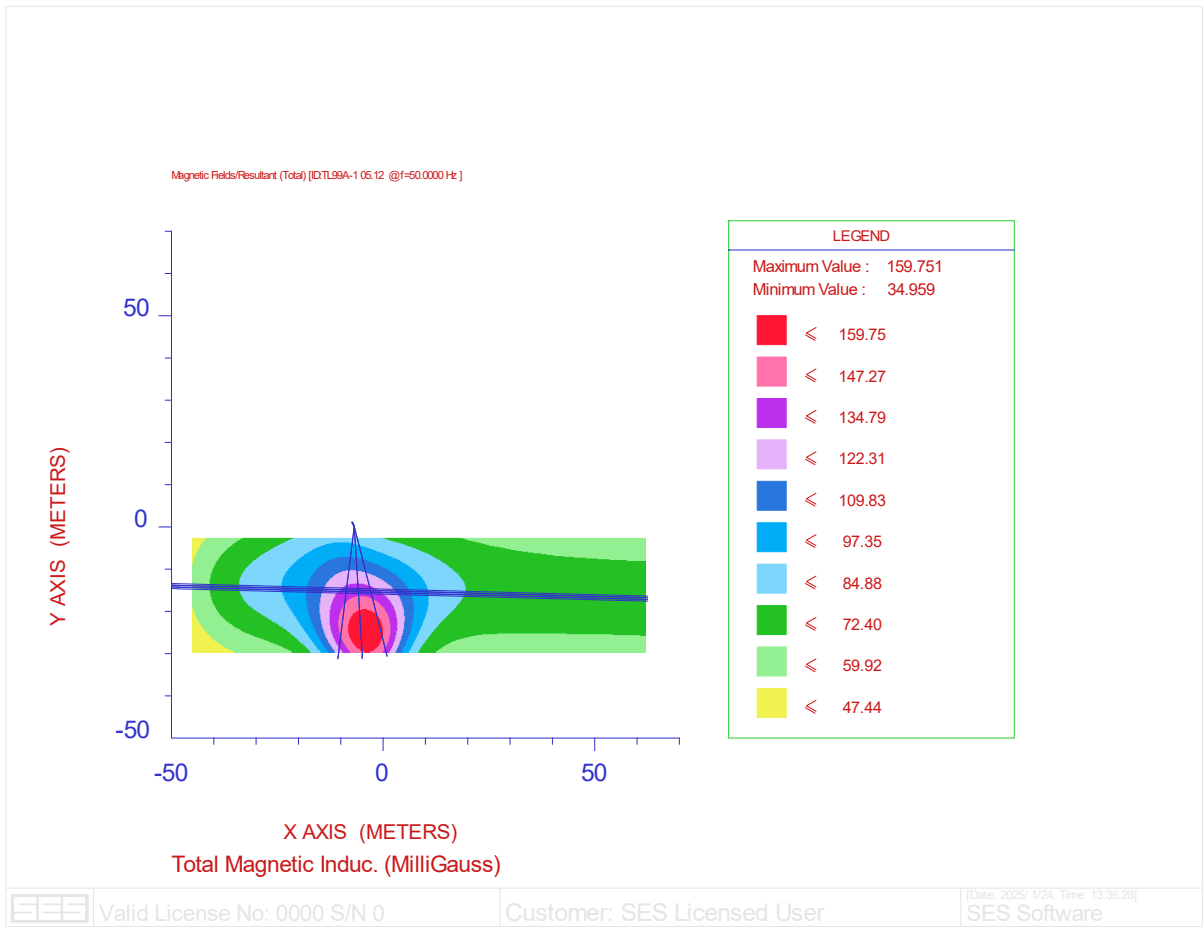


Figure 5-3 Scenario 3 Magnetic Flux Density

5.4 Scenario 4: Section 13D to 27D, 71/94E

Maximum M-field: 340 mG – complies

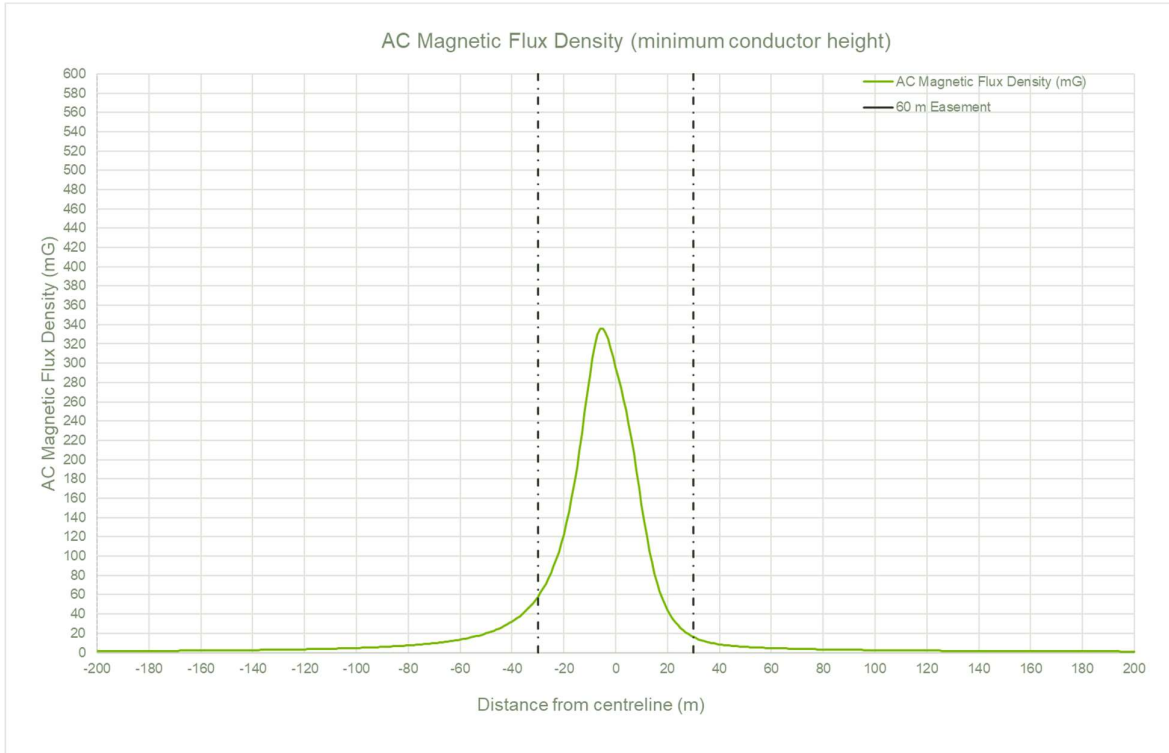


Figure 5-4 Scenario 4 Magnetic Flux Density

5.5 Scenario 5: Span 27D to 28D, 71/94E parallel to 7G/70

Maximum M-field: 435 mG – complies

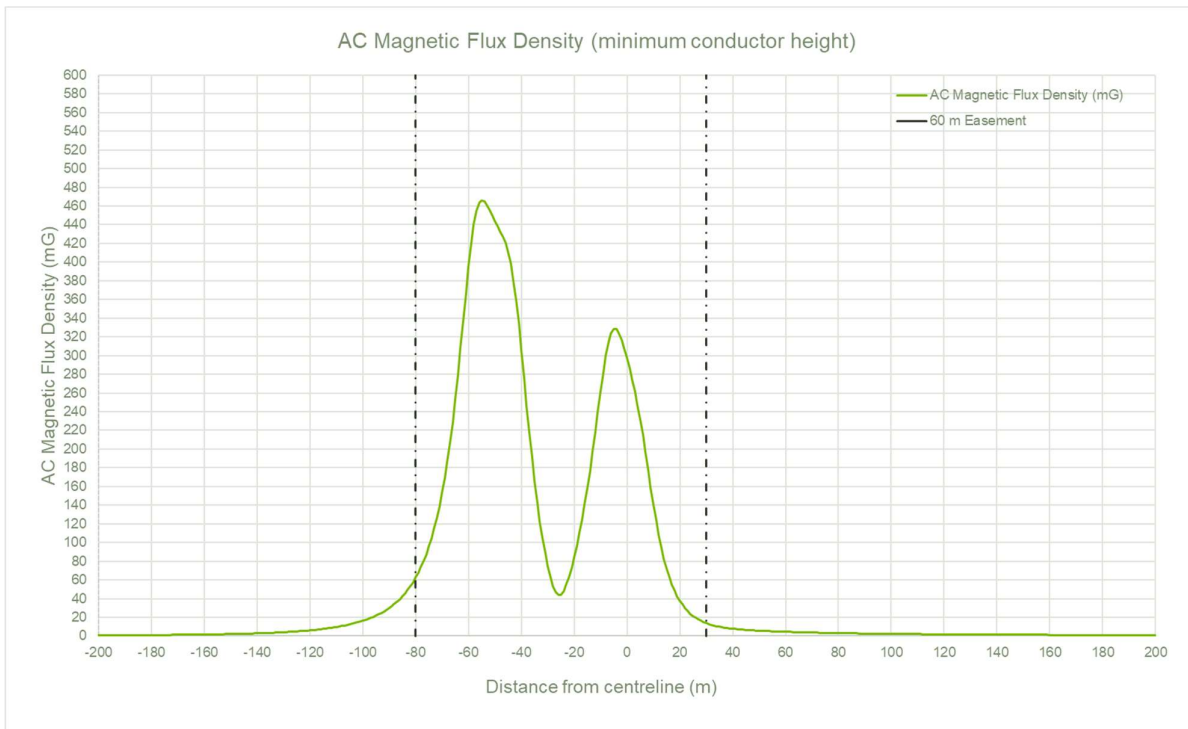


Figure 5-5 Scenario 5 Magnetic Flux Density

6 Conclusions

This Electric and Magnetic Fields Report study has been completed to assess the EMF of the existing and new transmission lines associated with project Central-West Orana Renewal Energy Zone – TL7G/71.

6.1 EMF assessment results

The maximum magnetic field levels at all the assessed scenarios are below 500 mG, less than 25% of the 2,000 mG limit set by ICNIRP. It is also less than 50% of the 1,000 mG limit set by Transgrid to avoid interference with implantable medical devices.

The maximum electric field at the edge of the transmission line easement is less than 0.3 kV/m, which is about 6% of the ICNIRP General Public Guideline Level of 5 kV/m. The maximum electric field within the transmission line easement and directly under the conductor is 7.5 kV/m that is below the 7.8 kV/m required in the Transgrid standards to minimise the impact of spark discharge.

It shall be noted that the EMF models are based on the designed minimum conductor clearance to the ground. The assessment results are considered conservative due to the expected additional conductor height beyond the lowest point of the conductor.

Table 5-1: Electric field assessment results

From Str. No.	To Str. No.	Max. E-Field under the line	Max. E-Field at the easement edge
1C	3C	6.5 kV/m	0.3 kV/m
3C	8C/9D	7.5 kV/m	0.3 kV/m
8C/9D	10D	6.5 kV/m	0.3 kV/m
10D	12D	6.5 kV/m	0.3 kV/m
12D	13D	1.3 kV/m	-
13D	27D	6.5 kV/m	0.3 kV/m
27D	28D	6.1 kV/m	0.3 kV/m

* Maximum electric field under the transmission line is 7.8 kV/m and outside the easement is 5.0 kV/m

Table 5-2: Magnetic field assessment results

From Str. No.	To Str. No.	Max. M-Field
1C	3C	340 mG
3C	8C/9D	440 mG
8C/9D	10D	480 mG
10D	12D	340 mG
12D	13D	160 mG
13D	27D	340 mG
27D	28D	440 mG

* Maximum allowable magnetic field is 1000 mG

6.2 Prudent Avoidance

Given the inconclusive nature of the science, it is considered that, in the circumstances, a prudent/precautionary approach continues to be the most appropriate response to health concerns regarding EMF. Under the approach, the following design measures have been adopted:

- Adopted additional conductor to ground clearance that is beyond the AS7000 requirements
- Designed conductor phasing arrangement that provided field cancellation
- Selected transmission line route to minimise the fields that people, especially children, encounter over prolonged periods

- Establishment of transmission line easement to restrict access to the general public and activities near the transmission lines

7 References

- [1] K. Fernie, S. J. Reynolds, "The Effects of Electromagnetic Fields From Power Lines on Avian Reproductive Biology and Physiology: A Review," *Journal of Toxicology and Environmental Health Part B*, vol. 8, no. 2, pp. 127-140, 2005.

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Appendix C

Bushfire risk assessment



Mount Piper to Wallerawang Transmission Line Upgrade




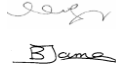


Bushfire Risk Assessment

Transgrid

August 2025

→ **The Power of Commitment**



Project name		Mount Piper to Wallerawang Transmission Line Upgrade					
Document title		Mount Piper to Wallerawang Transmission Line Upgrade Bushfire Risk Assessment					
Project number		12612502					
File name		MP2W_Bushfire Assessment.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	K. Dart M. George	M. George B.James	 	G. Marshall		30/07/25
S4	1	K. Dart M. George	M. George B.James	 	G. Marshall		18/08/25

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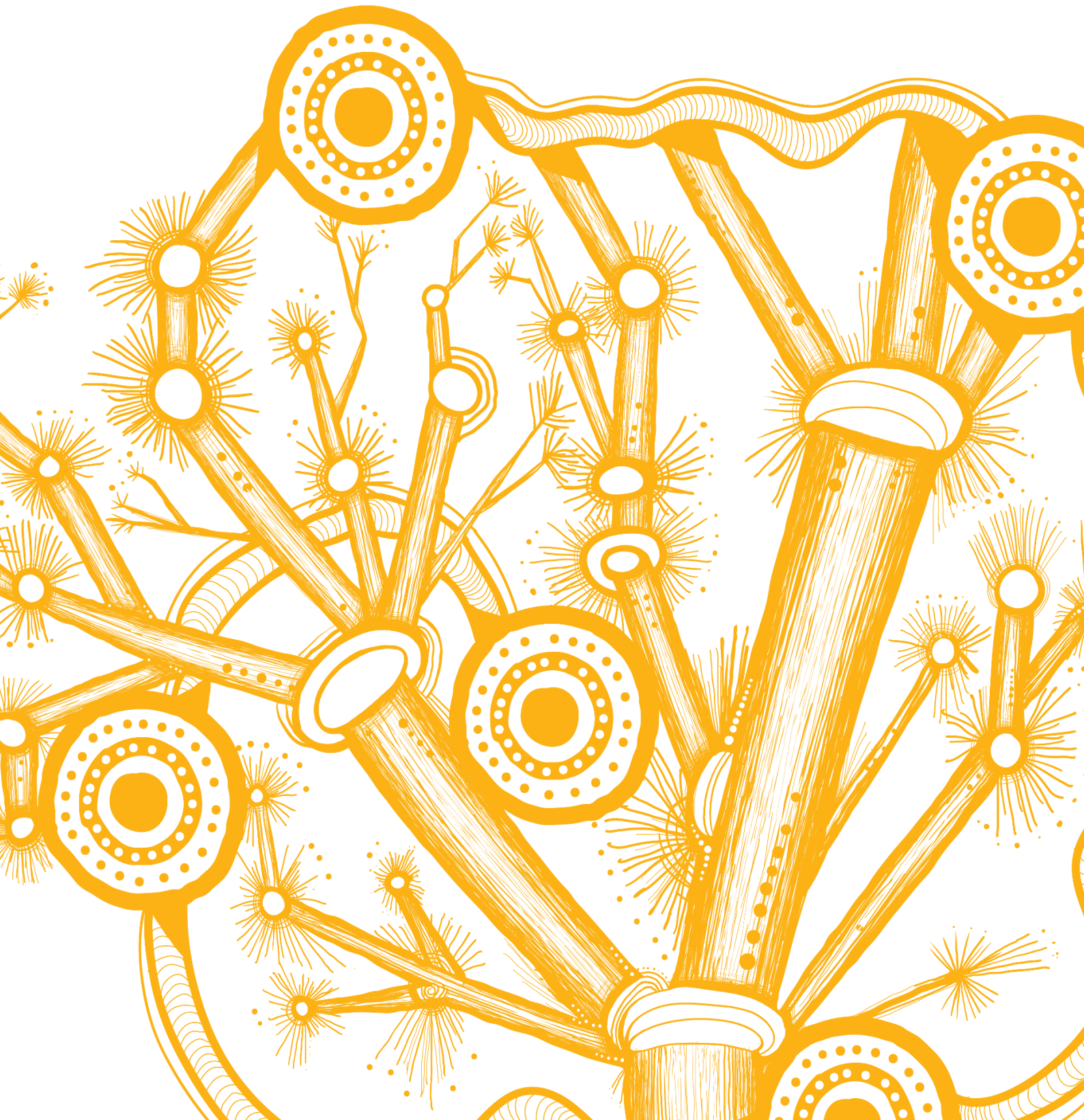
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Acknowledgement of Country

Transgrid and GHD acknowledge Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. Transgrid and GHD are committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.



Executive summary

The project

Transgrid proposes to deliver approximately eight kilometres (km) of new 330 kilovolt (kV) transmission line and double circuit transmission structures located between the Mount Piper and Wallerawang 330 kV substations (the project). The project would incorporate sections of an existing, single-circuit 132 kV transmission line, where the two transmission lines would share a widened easement and transmission structures. The project is located within the Central West region of NSW within the Lithgow Local Government Area (Lithgow LGA).

The project is identified in the NSW Network Infrastructure Strategy (EnergyCo, 2023) and also supports the key tenets of the NSW Electricity Infrastructure Roadmap (DPIE, 2020). The Roadmap identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from Renewable Energy Zones (REZ) in inland NSW to key demand centres. The Mount Piper to Wallerawang Transmission Line Upgrade Project would provide the additional capacity required to reliably transmit power from the Central West Orana REZ to the Greater Sydney region.

Purpose of this report

This bushfire risk assessment has been prepared as part of the Environmental Impact Statement (EIS) to assess potential bushfire risks resulting from the construction and operation of the project and also the potential impacts of bushfire on the project. The assessment has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs).

Existing environment

The project footprint is mapped as bushfire prone land. Bushfire risk is primarily associated with vegetated areas in the Gardens of Stone State Conservation Area (SCA) and around the Mount Piper Power Station and Centennial Springvale Coal Services facilities.

The study area for the assessment includes the existing operational infrastructure including 132 kV and 330 kV transmission lines between the Mount Piper and Wallerawang 330 kV substations and up to 140 metres (m) from the project footprint, as defined in *Planning for Bush Fire Protection* (PBP; RFS 2019), and the broader landscape to capture the risk of landscape fires coming from and spreading to the project footprint.

Desktop information indicates that there has been a very low historical incidence of bushfire, with no prior records of bushfires occurring on or surrounding the project footprint.

Bushfire risk assessment

The key bushfire scenarios that may affect or be caused by the project during construction are:

- A fire igniting in areas of continuous vegetation surrounding the project on a day of elevated fire danger, which burns towards/through the project footprint. Embers may carry across Castlereagh Highway and start a fire within the project footprint.
- Features of the project resulting in the ignition of fires within the project footprint, which could cause fire to travel into surrounding areas of vegetation, in particular the connected sections of the Gardens of Stone SCA.

As project construction would not materially alter the potential consequences of bushfires, and because bushfire ignition during the construction phase is very low on account of the risk controls proposed to be implemented (see section 6), the construction phase of the project would have no material impact on public safety risk in the landscape where construction would occur.

The operational bushfire risk from the transmission line is considered low as it has been designed in accordance with relevant design standards which consider the potential risks of transmission lines. Existing Transgrid maintenance procedures would also reduce this risk as they have also been established to minimise bushfire risk from transmission lines across the Transgrid network.

Most projects considered as part of the cumulative assessment present a low bushfire risk due to the nature of the works associated with those projects and/or their distance from the project. No cumulative bushfire risk from the project and nearby projects is considered likely as the nearby Battery Energy Storage Systems (BESS) would include appropriate bushfire protection measures in their design and layouts.

Bushfire risk management

Transgrid implements a range of existing procedures relating to bushfire risk management for the existing transmission lines in the project footprint and across the wider electricity network. The development of mitigation and management measures for the project has considered the existing controls and where required builds upon them as necessary to manage any project risks. The existing Transgrid procedures and policies used for the development of mitigation and management measures include:

- Hot Work and Fire Risk Work (corporate-wide procedure)
- Bushfire Risk Management Plan
- Bushfire Formal Safety Assessment
- Maintenance Plan – Easements and Access Tracks
- Hot Works permits and Fire Risk Assessment and Control Measures (FRACM) permits.

In addition to these procedures, Transgrid implements vegetation clearance requirements within easements to ensure to ensure vegetation is maintained with minimum clearances to conductor sag points as outlined in the *Maintenance Plan – Easements and Access Tracks* (Transgrid, 2018b).

The management of bushfire risks for the project would be undertaken through the development of a Bushfire Management Plan to minimise the impacts of bushfire. This plan would be developed with reference to PBP and in consultation with the Rural Fire Service (RFS) and National Parks and Wildlife Service.

Other measures include design of access tracks, including water crossings and entry/ access gates, to meet the relevant requirements outlined in *NSW Fire Trail Standards* (NSW RFS, 2023) and preparation of a Bushfire Emergency Management and Evacuation Plan consistent with RFS guidelines.

Conclusion

With the adoption of the measures described in this report, the level of bushfire risk for the project is expected to reduce to an acceptable level, both in terms of the risk of bushfire ignition by construction and/or operation of the project and the risk that bushfires in the landscape pose to the project.

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Key terms, acronyms and abbreviations

Term	Description
AHD	Australian Height Datum
Alignment	The geometric layout (vertical and horizontal) of the proposed project.
APZ	Asset Protection Zone
AS 3959:2018	Australian Standard 3959:2018 Construction of buildings in bushfire prone areas
AS 7000:2016	Australian Standard 7000:2016 Overhead line design
AWS	Automatic Weather Station
BAL	Bushfire Attack Level
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BFDP	Bushfire Danger Period
BFMC	Bush Fire Risk Management Committees
BFPL	Bushfire Prone Land
BFRMPs	Bush Fire Risk Management Plans
BoM	Bureau of Meteorology
BPM	Bushfire protection measures
Classifiable vegetation	Vegetation which may be classified in accordance with Table 2.3 of AS 3959:2018. Vegetation may be classified into one of the eight categories defined by AS 3959:2018, or as low-threat/non-hazardous vegetation.
CWO REZ	Central-West Orana Renewable Energy Zone
Daisy chain	A daisy chain lock system is a type of locking mechanism that consists of multiple interlocking loops or chains (usually on a gate), so that someone can gain easy, continuous access to a site or property.
DPIE	Department of Planning, Industry and Environment
DPE	Department of Planning and Environment
Easement	<p>A legal property right attached to a parcel of land that enables the use of an identified part 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 330 kV transmission lines would typically be 60 metres wide. The easement grants a right of access and for construction, maintenance and operation of the transmission line and other operational assets.</p> <p>For the project, some easements may overlap with existing easements such that the final easement width for the new easement would be narrower than 60 m (e.g. where paralleling the existing transmission line north of the Wallerawang 330 kV substation) and in other areas it may be wider to accommodate diverging transmission lines (eg in the area south of the Mount Piper 330 kV substation).</p>
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
ES Act	<i>Electricity Supply Act 1995</i>
EnergyCo	Energy Corporation of New South Wales
FDR	Fire Danger Rating
FDI	Fire Danger Index
Firefighting appliance	Any single vehicle within a suite of appliance types, being a Category 9, Category 7, Category 1 or any other designated category of fire vehicle.

Term	Description
Firefighting appliance categories: – Category 1 – Category 9	All fire trails are classified on the type of firefighting vehicle that can safely traverse the Trail. – Category 1 (Cat 1): This is a fire trail that can be safely traversed by a Category 1 firefighting appliance. – Category 9 (Cat 9): This is a fire trail that can be safely traversed by a Category 9 firefighting appliance.
FRACM	Fire Risk Assessment and Control Measures
GHD	GHD Pty Ltd
Hazard tree	A hazard tree is defined as a tree or part of tree that if it were to fall would infringe on the vegetation clearance requirements at maximum conductor sag of the transmission lines.
ISSC	Industry Safety Steering Committee
Keith Vegetation Formation	A classification system adopted as the framework for the NSW vegetation map. The system includes classification of 12 vegetation formations. Vegetation Formations are broad groups distinguished by major structural and physiognomic features.
km	Kilometre
kV	Kilovolt
kW/m ²	Kilowatt per square metre as a measure of radiant heat
LBFMC	Lithgow Bush Fire Management Committee
LGA	Local Government Area
m	Metre
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NSW RFS	NSW Rural Fire Service
PBP	Planning for Bushfire Protection 2019
Plant Community Types (PCT)	Plant Community Types identify and describe recurring patterns of native plant species assemblages in relation to environmental conditions (soil, temperature, moisture and other factors).
Poor Trail Grade	Poor Trail Grade has the same definition in this report as the NSW RFS Fire Trail Standards (2023). Trail is still usable, but significant reduction in trafficability. Low Range, Low gear is required. Significant evidence of compromised drainage, resulting in rutting, scouring and loss of material from the carriage way. Major repair or remediation works are now required.
Project	The CSSI project “Mount Piper to Wallerawang Transmission Line Upgrade Project”, which is the subject of this Environmental Impact Statement. The project involves the construction and operation of high voltage transmission lines between the 330 kV Mount Piper and Wallerawang substations.
Project footprint	Area that is to be directly affected by the construction and operation of the project.
REZ	Renewable Energy Zone
RF Act	<i>Rural Fires Act 1997</i>
SCA	State Conservation Area
SEARs	Secretary’s Environmental Assessment Requirements
SEED	Sharing and Enabling Environmental Data
Study area	The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the project.
Trafficable surface	Section of a fire trail that provides unobstructed access.
TOBAN	Total Fire Ban
VCR	Vegetation clearance requirement

1. Introduction

1.1 Background

The Commonwealth and NSW governments have both established targets to achieve net-zero emissions by 2050. Achieving these targets requires low emissions technologies to be deployed at scale across all sectors of the economy, including the electricity generation sector, currently Australia's largest source of greenhouse gas emissions.

The NSW Transmission Infrastructure Strategy (DPE, 2018) aims to engage the private sector to invest in priority energy infrastructure projects, which can deliver low-cost, clean and reliable energy to consumers

As part of the Transmission Infrastructure Strategy, the NSW Government has developed a plan to establish five Renewable Energy Zones (REZs) to increase renewable energy generation, reduce carbon emissions, and help deliver lower wholesale electricity costs to consumers. The Central-West Orana REZ (CWO REZ), being the first REZ established, is planned to generate at least 4.5 gigawatt by the late-2020s.

The NSW Government's Electricity Infrastructure Roadmap (DPIE, 2020) identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from REZs in inland NSW to key demand centres. Interest in new energy generation projects in the CWO REZ is forecasted to exceed the existing transmission network capacity in several locations. The existing infrastructure located between the Mount Piper 550/330 kilovolt (kV) substation (Mount Piper 330 kV substation) and the Wallerawang 330/132 kV substation (Wallerawang 330 kV substation) has been identified in the NSW Network Infrastructure Strategy (EnergyCo, 2023) as requiring upgrades. The Mount Piper to Wallerawang Transmission Line Upgrade Project (the project) would provide the additional capacity required to reliably transmit power from the CWO REZ to the Greater Sydney region.

1.2 Location

The project is located within the Central West region of NSW within the Lithgow City Council Local Government Area (LGA). It is located approximately 14 kilometres (km) north-west of Lithgow situated on the western fringes of the Blue Mountains (Figure 1.1).

The area that is to be directly affected by the construction and operation of the project, is referred to as the project footprint and is shown in Figure 1.1. The project footprint is approximately 86.5 hectares in size and is generally bounded by the following:

- Castlereagh Highway to the north
- Former Wallerawang Power Station site to the east
- Gardens of Stone State Conservation Area (SCA) to the south
- Mount Piper Power Station to the north-west.

Land uses within and adjacent to the project footprint include:

- Electricity generation at Mount Piper Power Station
- Electricity transmission, including the Mount Piper and Wallerawang 330 kV substations, and associated transmission lines
- Mining activities, with several Centennial Coal operations including the former Ivanhoe Coal Mine and Springvale Coal Services overlapping the project footprint
- Agriculture, primarily livestock grazing
- Conservation, notably the Gardens of Stone SCA
- State and local road reserves including the Castlereagh Highway, Boulder Road and Brays Lane
- Rail corridors including the Main Western Rail Line and a disused railway line near Brays Lane.

A mixture land uses are proposed at the former Wallerawang Power Station site. This may include commercial and industrial land use. Development of a Battery Energy Storage System is also proposed by others at the site.

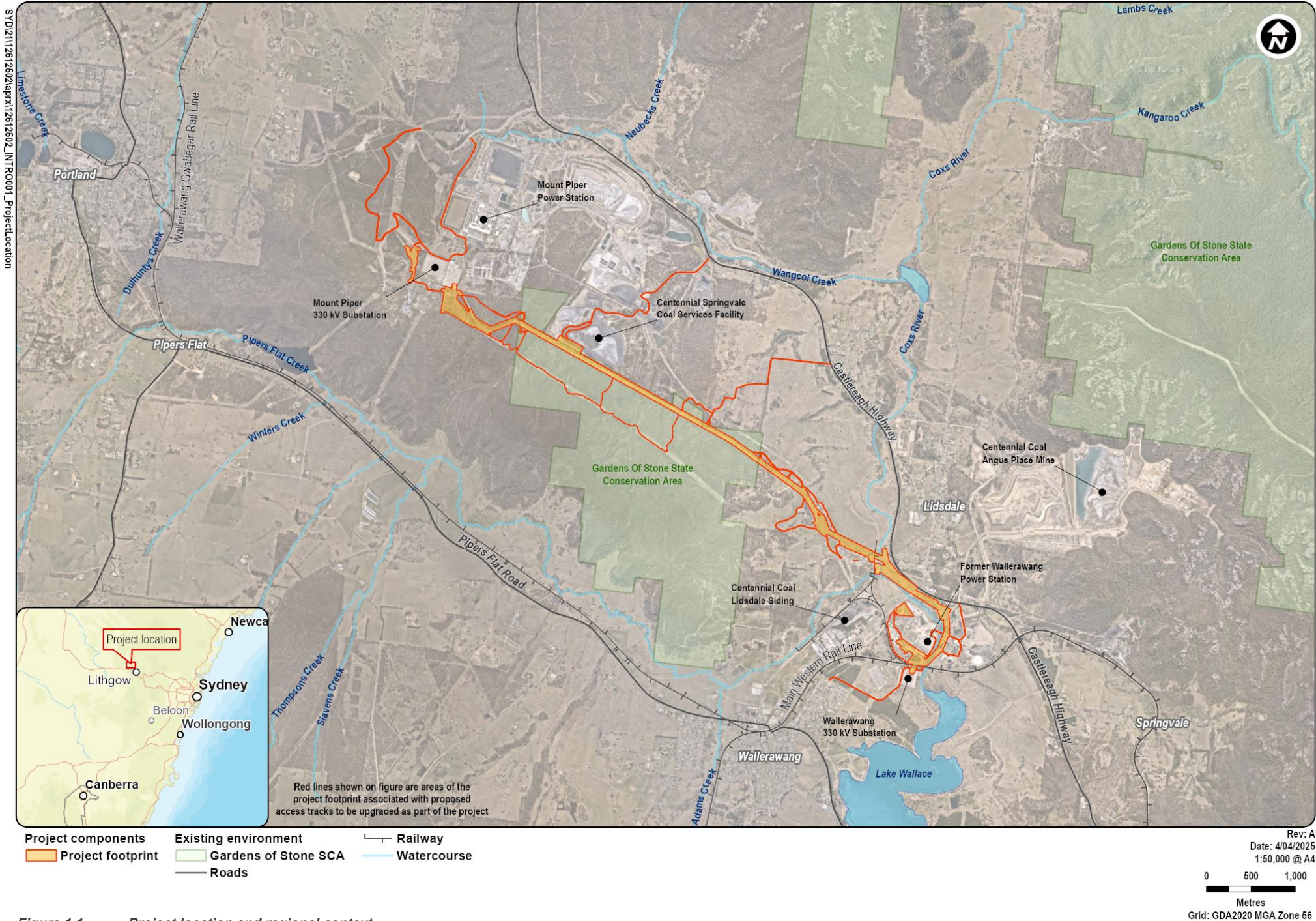


Figure 1.1 Project location and regional context

1.3 The project

The project would involve construction and operation of approximately 8 km of new 330 kV transmission line between the Mount Piper and Wallerawang 330 kV substations as shown in Figure 1.2. The project would also include the replacement of transmission structures, partial adjustment of existing transmission lines, permanent and temporary access tracks, construction compounds and laydown areas.

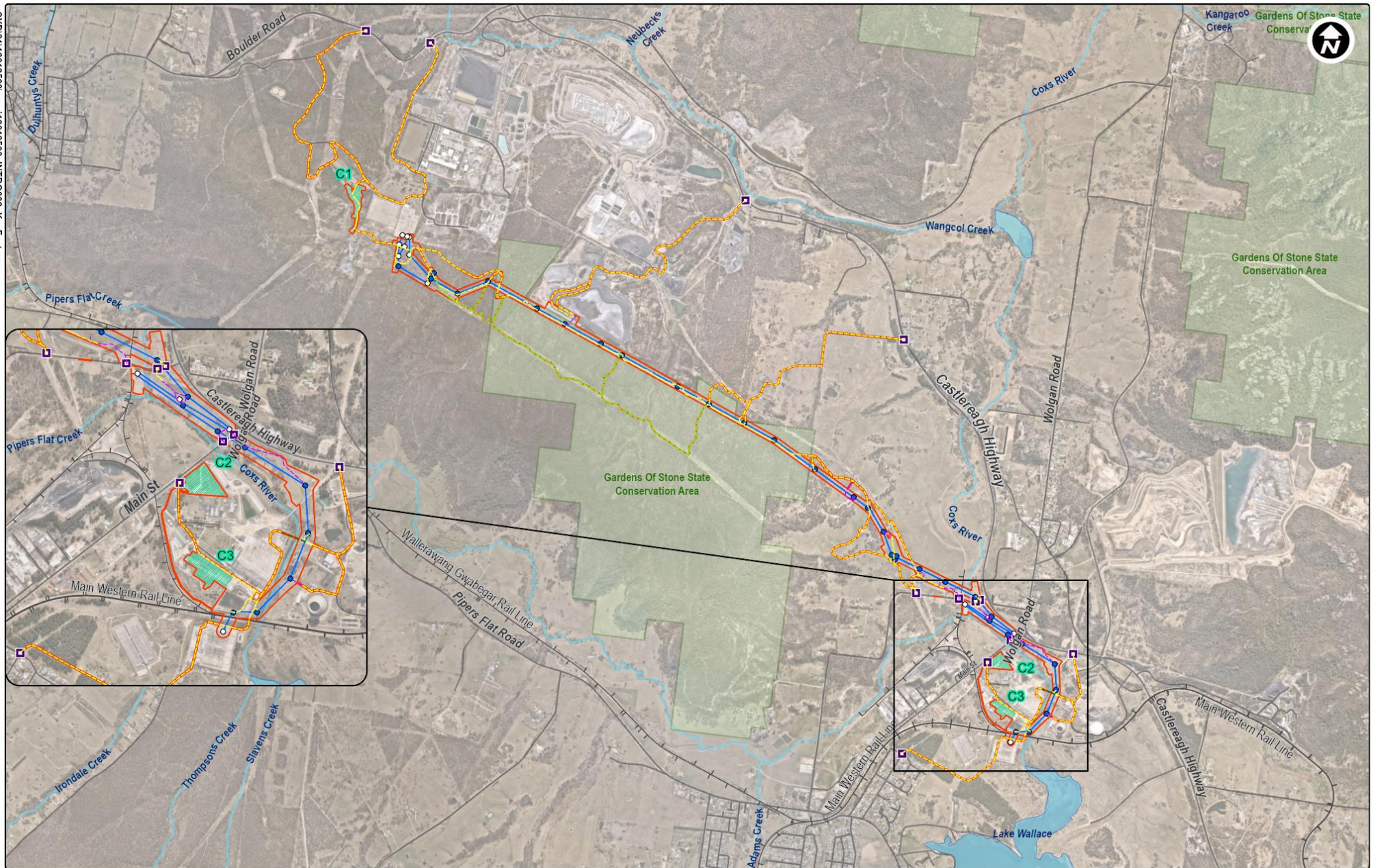
Table 1.1 outlines the key features of the project. The description of the project in Table 1.1 is based on the current concept design. Further detail is provided in Chapter 3 of the Environmental Impact Statement (EIS). The project will continue to be refined as part of detailed design.

Table 1.1 The project

Feature	Description
Design	
Transmission line and easement	<p>Approximately 8 km of new 330 kV transmission line between the existing Mount Piper 330 kV and Wallerawang 330 kV substations that would include (from west to east):</p> <ul style="list-style-type: none"> widening of approximately 0.5 km of existing easements in the vicinity of the Mount Piper 330 kV substation by up to 40 m to accommodate the new 330 kV transmission line and adjustments to existing 132 kV and 330 kV transmission lines widening of the existing 132 kV easement from 45 m to 60 m for 4.8 km to accommodate double circuit transmission structures for the existing 132 kV transmission line and the new 330 kV transmission line installation of two 132 kV pole structures where the existing 132 kV transmission line is restrung onto the new double circuit transmission structures construction of 1.2 km of new 330 kV transmission line from the existing 132 kV transmission line south-east to the intersection of Main Street and the Castlereagh Highway on a 60 m easement construction of 1.5 km of new 330 kV transmission line on a 40 m easement running parallel to existing 330 kV transmission lines for approximately 1.1 km and then diverging and widening to 60 m for the remaining 0.4 km to the Wallerawang 330 kV substation. <p>The standard easement widths for 132 kV and 330 kV transmission lines are 45 m and 60 m respectively. However, easements may vary in width where multiple transmission lines converge/diverge or where they overlap with an existing easement.</p>
Transmission structures	<p>Transmission structures for the project include approximately 28 new steel lattice towers and four steel and/or concrete pole structures. Transmission structures would range in height from approximately 14 m up to 60 m, however these heights would be subject to detailed design. The image below presents an indicative illustration of the types of structures proposed for the project and their maximum heights.</p> <p>The steel transmission structures would generally be spaced between 100 m to 550 m apart and the pole structures about 30 m to 50 m apart. New conductors, earth wires and optical ground wire (OPGW) would be installed on the new transmission structures for the new 330 kV and existing 132 kV lines.</p>

Feature	Description																																																																																																																														
	<p>Local adjustment of existing transmission structures would be required in the vicinity of the Mount Piper 330 kV substation to minimise crossover of transmission lines.</p> <p>Redundant transmission structures, including the gantry immediately north of the Main Western Rail Line, would be removed and recycled, where possible.</p>																																																																																																																														
Construction																																																																																																																															
Program	<p>Construction of the project would commence once all necessary approvals are obtained. It is anticipated that construction would commence in late 2026.</p> <p>Construction would be undertaken in stages over a period of approximately 20 months. The key activities and their indicative durations shown in the below table.</p> <table border="1"> <thead> <tr> <th>Activity</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> <th>12</th> <th>13</th> <th>14</th> <th>15</th> <th>16</th> <th>17</th> <th>18</th> <th>19</th> <th>20</th> </tr> </thead> <tbody> <tr> <td>Site establishment</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Civil works</td> <td></td> <td></td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Assembly of structures</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> </tr> <tr> <td>Testing and commissioning</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>De-mobilisation</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>█</td> </tr> </tbody> </table>	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Site establishment	█	█	█	█																	Civil works			█	█	█	█	█	█	█												Assembly of structures										█	█	█	█	█	█	█	█	█	█	█	Testing and commissioning																					De-mobilisation																				█
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Construction methodology	<p>Construction of the project would include:</p> <ul style="list-style-type: none"> – site establishment including vegetation removal, construction compound establishment, access track construction and upgrade – removal of existing transmission structures where required – civil works involving earthworks and establishment of construction benches for each transmission structure, and establishment of brake and winch sites – construction of footings and foundation work for the new transmission structures – assembly and erection of new transmission structures – stringing of conductors. 																																																																																																																														
Construction hours	<p>The proposed construction working hours for the project are 7 am to 7 pm Monday to Sunday. Out-of-hours construction work will likely be required between 7 pm to 7 am Monday to Sunday and public holidays, to align with scheduled outages.</p> <p>Justification for the out-of-hours works includes:</p> <ul style="list-style-type: none"> – proximity to live transmission lines requiring the work to be completed under a scheduled outage for network and personnel and contractor safety – the need to complete works within a limited time window to meet a timeframe to re-energise the transmission line to avoid disruption to customers – minimising disruptions to the use of the Main Western Rail Line during stringing. 																																																																																																																														
Construction workforce	Expected to peak at about 150 personnel and contractor, with an average workforce of about 60 personnel and contractor.																																																																																																																														
Construction compounds and laydown areas	<p>A total of three construction compounds would support the construction of the project. One would be located at the western end of the project near the Mount Piper 330 kV substation and two located at the eastern end of the project within the former Wallerawang Power Station site. The locations of these compounds are shown in Figure 1.2.</p> <p>Laydown of materials (e.g. poles, cable drums, other large equipment, etc.) would also occur at specified locations along the easement within the project footprint, particularly at transmission structure locations.</p>																																																																																																																														
Access	<p>To facilitate efficient construction access, the following is required:</p> <ul style="list-style-type: none"> – upgrading and widening of approximately 25 km of existing access tracks to at least 6 m, with some sections widened up to 10 m due to local topography – construction of approximately 2 km of new 6 m wide access tracks. <p>In addition to those tracks, approximately 4 km of existing track would be used only by light vehicles. The light vehicle tracks may require minor repairs (for example, filling potholes), but would not be graded or widened.</p> <p>The project footprint would be accessed from public roads at 13 access points, with the majority of these being existing property access points.</p>																																																																																																																														

Feature	Description
	<p>Existing access tracks would be used in preference to new tracks wherever possible. Access track upgrades and widening would include required drainage.</p> <p>Access points and access tracks established for the construction of the project that are not required for future operation and maintenance activities would be returned to pre-project conditions, subject to agreement with landowners.</p>
<p>Utility adjustments and infrastructure crossings</p>	<p>The new transmission line would need to cross the following utilities and infrastructure:</p> <ul style="list-style-type: none"> – water pipeline operated by WaterNSW – distribution lines operated by Endeavour Energy – rail signal power supply – council drainage and other assets – public roads at Brays Lane and Main Street – rail lines at the Main Western Rail Line and the disused rail line travelling north of Brays Lane. <p>It is not currently anticipated that the project would require the adjustment of any nearby utilities. Further investigations and consultation with asset owners would be undertaken during detailed design.</p>
<p>Vegetation clearing</p>	<p>The project would require the clearance of vegetation for a number of activities including but not limited to building new access tracks and widening existing ones, establishment of construction compounds, laydown areas, and brake and winch sites, construction of the transmission structures, and establishing and maintaining the vegetation clearance requirement for the transmission lines.</p> <p>Vegetation clearing would be undertaken either with the use of machinery or manually, where it is unsafe to operate machinery, or when access is limited. Root balls would be retained where possible. Clearing methods would be determined with consideration to vegetation type or structure, slope and terrain, and environmental and ecological constraints. Removed vegetation, which is weed free, would be mulched for beneficial reuse, where appropriate.</p> <p>Areas cleared for construction, that are not needed for operation of the project, would be rehabilitated to a stable and weed free condition.</p>
<p>Testing and commissioning</p>	<p>Testing and structure checks would form part of the final construction and installation work. These activities would ensure the project has been installed in accordance with the design and statutory standards and is safe to proceed to commissioning which would include, but not be limited to:</p> <ul style="list-style-type: none"> – transmission line cut-in and connection to the electrical network – protection, control and metering checks – high voltage equipment operation and energisation – post commissioning testing and verification.
<p>Demobilisation and rehabilitation</p>	<p>Upon completion of the construction works, all construction equipment, temporary fencing and waste would be removed.</p> <p>All disturbed areas would be rehabilitated to a stable, weed-free condition, unless designated as a permanent access track. This would include spreading topsoil, cleared and stockpiled at the beginning of construction, across the disturbed area to stabilise it to a state where natural regrowth can occur.</p>
<p>Operation</p>	
<p>Design life</p>	<p>About 50 years.</p>
<p>Maintenance</p>	<p>All project infrastructure would require regular maintenance to maintain serviceability and maximise its operational life. Maintenance activities would include:</p> <ul style="list-style-type: none"> – transmission structure monitoring – annual aerial inspection – routine vegetation management on the easement and in the hazard tree zone – access tracks would be maintained in a trafficable condition. <p>Should any irregularities be identified following routine inspections, a work crew would be dispatched from existing Transgrid maintenance depots to rectify any defects found.</p> <p>Periodic inspection and maintenance work would be managed by Transgrid as part of existing operations, with no additional personnel requirements.</p>



- | | |
|--|--|
| Project components | Construction compounds |
| Project footprint | Access tracks - new |
| New and adjusted transmission line | Access tracks - minor upgrades as required (light vehicles only) |
| Proposed transmission structure | Access tracks - upgrade and widen |
| Existing transmission structure to be reused | Access tracks - existing (no change) |
| | Access point |

- | |
|-----------------------------|
| Existing environment |
| Gardens of Stone SCA |
| Roads |
| Railway |
| Watercourse |

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 Date: 7/07/2025
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 Metres
 Grid: GDA2020 MGA Zone 56

Figure 1.2 Key features of the project

1.4 Environmental assessment requirements

This bushfire risk assessment has been prepared to address the Secretary’s Environmental Assessment Requirements (SEARs), which were issued on 22 May 2025. The SEARs in Table 1.2 outline the requirements relevant to this assessment, specifically the risk to public safety associated with bushfire risks.

This bushfire risk assessment informs the Hazard and Risk Assessment (Technical Report 9) for the project, which addresses all of the SEARs for ‘Hazards’ for the Environmental Impact Statement (EIS).

Table 1.2 Relevant SEARs

Requirements	Where addressed in this report
Hazards	
<ul style="list-style-type: none"> – An assessment of the risks to public safety, <i>paying particular attention to bushfire risks, emergency egress and evacuation</i>, the handling and use of any dangerous goods 	Section 5 (bushfire risk) Sections 5.1.1 and 5.2.1 (emergency egress and evacuation)

1.5 Purpose and structure of this report

This report has been prepared by GHD Pty Ltd (GHD) as part of the EIS for the project.

The purpose of this report is to assess potential bushfire issues from the construction and operation of the project, and where required, identify feasible and reasonable mitigation and management measures.

The report is structured as follows:

- section 1 – provides an introduction to the project and the assessment
- section 2 – describes the legislative context of the project relevant to bushfire risk
- section 3 – describes the methodology for the assessment
- section 4 – describes the bushfire risk factors within the study area
- section 5 – describes the bushfire risks associated with the project during construction and operation
- section 6 – provides summary of the mitigation approach for bushfire risk and details the recommended mitigation measures
- section 7 – provides a conclusion of the assessment.

2. Legislation and guidelines

2.1 Electricity Supply Act 1995

The *Electricity Supply Act 1995* (ES Act) requires network operators to take appropriate action to ensure public safety. This includes infrastructure considered to be a potential cause of bushfire. ‘Appropriate action’ can include modifying the infrastructure (through design), removing risky structures/items in proximity to the infrastructure, and trimming/removing vegetation.

Bushfire prevention works on transmission lines (or aerial consumer mains as per Section 53 of the ES Act) required under Section 53 of the ES Act supersedes environmental planning instruments including approval or consent requirements under other Acts (including the *Environmental Planning and Assessment Act 1979*, *Biodiversity Conservation Act 2016*, *Local Land Services Act 2013* (Part 5A) and *National Parks and Wildlife Act 1974*). However, this does not apply to vegetation in the vicinity of transmission lines in protected areas, such as National Parks (Section 48).

2.2 Electricity Supply (Safety and Network Management) Regulation 2014

The ES Regulation requires a network operator to take all reasonable steps to ensure that all aspects of its network are safe. This includes preventing network assets from igniting bushfires. Bushfire risk management must be part of an operator’s safety management system.

2.3 Environmental Planning and Assessment Act 1997

The *Environmental Planning and Assessment Act 1997* (EP&A Act) requires that any development on bushfire prone land for any purpose complies with the Planning for Bushfire Protection guideline (PBP) (NSW Rural Fire Service (RFS), 2019). Councils maintain and update maps of bushfire prone land in their region.

While the project is located on bushfire prone land (see Figure 4.3), state significant infrastructure is exempt from this requirement. Further information regarding PBP and its application to the assessment is provided in section 2.5.

2.4 Rural Fires Act 1997

In accordance with the provisions of the *Rural Fires Act 1997*, Bush Fire Risk Management Committees (BFMC) are constituted for LGAs or groups of LGAs to prepare Bush Fire Risk Management Plans (BFRMPs) for the areas under their jurisdiction. BFRMPs detail information on the bushfire risks within the BFMC area and outline how land managers along with fire authorities plan to effectively manage those risks through implementing various bushfire risk treatment strategies. Preparation of BFRMPs is an inter-agency process, led and facilitated by the RFS, with completed plans approved by the NSW Bush Fire Coordinating Committee.

The Lithgow Bush Fire Risk Management Plan prepared by the Lithgow Bush Fire Management Committee (LBFMC, 2020) applies to the study area.

2.5 Planning for Bushfire Protection

PBP is principally directed to assessing bushfire risk to residential and other development. Long distance or high voltage transmission lines are not specifically addressed in PBP. While state significant infrastructure is exempt from the requirement to comply with PBP, the document provides guidance for the consideration of bushfire risk to the project and has been used in this assessment.

The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment. It is underpinned by several principles:

- *Bushfire protection measures (BPMs)*: a range of measures used to minimise the risk from a bush fire that need to be complied with. They may include any combination of the following: APZs, construction provisions, suitable access, water and other utilities, landscaping, and emergency planning.
- *Risk*: the likelihood and consequence of a bushfire igniting, spreading and causing life loss or damage to assets of value to the community. Protection measures are proportional to the threat or risk bushfires pose to a development. Note that regardless of any setbacks or protection measures, the safety of a development exposed to a bushfire hazard cannot be entirely guaranteed.
- *Managing interfaces*: threats posed by bushfires are diminished by reducing the direct interface between developments and bushfire hazards.
- *Good practice in planning and management*: planning for bushfire resilience through design, building and operation of a development reduces risk and increases bushfire resilience of the development and its users.

The main bushfire risk associated with transmission lines as identified by PBP is the risk of ignition associated with electrical conduction. For this risk, PBP refers to *ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets* (ISSC, 2016). However, ISSC3 does not provide guidance for transmission lines. Commercial and industrial development with no residential component is held to the aims and objectives of PBP and requires that appropriate BPMs be put in place.

3. Assessment methodology

3.1 Study area

For the purposes of the assessment the project footprint and study area have been defined as follows:

- Project footprint – the area that would be directly disturbed by construction and the location of operational infrastructure as shown in Figure 3.1. The disturbance area would include clearing areas, construction activity zones and access tracks.
- Study area – the area that includes the project footprint and the surrounding area up to 140 m from the edge of the project footprint, as required by PBP. The study area is shown in Figure 3.1. The broader landscape, as shown in Figure 3.1, is also considered in the assessment to capture the risk of landscape scale fires originating in surrounding areas and spreading to the project footprint.

3.2 Desktop assessment

The desktop assessment included review of:

- bushfire prone land (BFPL) mapping via the NSW Planning Portal Spatial Viewer
- satellite imagery and the NSW SEED database concerning vegetation types, classification, structure and fuel characteristics. Information also included data from surveys undertaken as part of the Biodiversity Development Assessment Report (BDAR) for the project
- existing infrastructure and assets and the project description, including design, construction, commissioning and operation activities along with relevant Transgrid procedures and guidelines
- bushfire history (mapped locations and years for both planned and unplanned fire)
- regional weather and characteristics of the project footprint and study area topography
- potential bushfire behaviour and risk scenarios
- proposed changes/upgrades to access and egress.

3.3 Site inspection

A site inspection of the study area was undertaken on 15 and 16 October 2024. The site inspection involved a combination of survey undertaken on foot and in vehicle, with general observations made about the risk factors, landscape features, existing assets, infrastructure, access and water availability. While the majority of the project footprint was accessible during the site inspection, the following areas were not accessible at the time:

- former Wallerawang power station site at the eastern end of the project
- portion of the proposed access track from access point 1a
- proposed access track through the Centennial Springvale Coal Services facility.

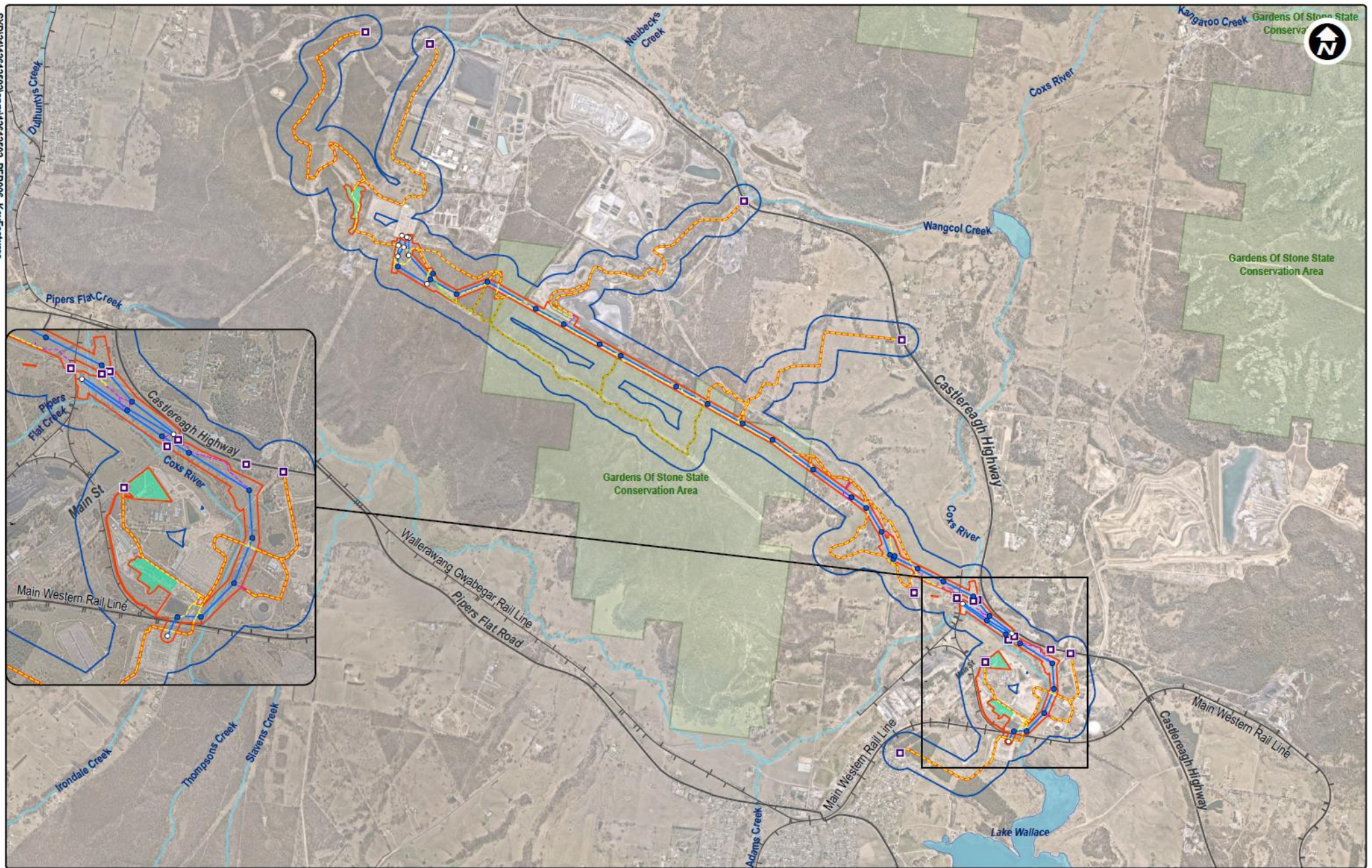


Figure 3.1 Bushfire risk assessment study area

3.4 Bushfire risk assessment

Bushfire risks have been assessed across all phases of the project, including during construction and over the operating life of the transmission line.

Bushfire risk arising from the potential for the project to start a bushfire and impact public safety has been assessed using an approach consistent with the risk assessment process established in *Australian Standard ISO 31000:2018 – Risk Management (ISO 31000)*. Risk is a function of consequence and likelihood. In a bushfire context, consequences are the potential future impacts of a bushfire across a range of impact domains including human life, property and economic values and the environment. Bushfire consequences, in particular to public safety, can vary influenced principally by the degree of bushfire hazard severity and the degree of exposure and vulnerability of communities to that hazard. Likelihood is the chance of a fire starting, spreading and resulting in the level of potential consequence identified as part of risk assessment.

The risk of bushfire from areas outside the project footprint affecting the project has also been assessed consistent with the site assessment methodology described in Appendix 1 of PBP. This includes identifying vegetation formations within 140 metres (m) of the project footprint, determining the effective slope of the land, establishing the relevant Fire Danger Index and determining the relevant Bushfire Attack Level (BAL) and Asset Protection Zone (APZ) for occupied facilities during construction and operation, as relevant.

4. Bushfire risk factors

4.1 Regional fire climate

The project is located within the Lithgow City Council LGA and has a Fire Danger Index of 80 as part of the Central Ranges fire weather district.

The proclaimed bushfire danger period (BFDP) in NSW is from 1 October to 31 March each year. However, the start and end of the BFDP may be varied locally by the RFS Commissioner to account for the early onset of bushfire hazardous conditions and/or such conditions extending beyond the proclaimed BFDP end.

In 2014, the NSW Government published a 'Climate Change Snapshot' for the Central West and Orana region (NSW Office of Environment and Heritage, 2014), incorporating analysis of projected changes to fire weather. Future occurrence of Extreme+ fire danger days is projected to increase by around 1.3 days per annum by 2070.

The worst extremes of fire weather on the Central West Slopes/Central Ranges are typically associated with hot dry north-westerly to westerly winds. Such winds can transport hot dry air from the continental interior across the NSW western plains toward the Great Dividing Range. Historically, the most severe fires in the Central West Slopes region have been fanned by north-westerly to westerly winds.

Dry lightning storms occur frequently during the BFDP with lightning strike the most common source of ignition in the Lithgow BFMC region mainly in late spring and early summer (SEED, 2024; LBFMC, 2020).

4.1.1 Temperature, rainfall and humidity

The nearest operational Bureau of Meteorology (BoM) weather station to the project footprint is the Mount Boyce Automatic Weather Station (AWS) (063292) located approximately 30 km from project footprint. The Mount Boyce AWS has been selected to source the historic weather and climate across the study area as consistent historical data was not available from closer weather stations.

The study area experiences distinct seasonal variations in temperature (refer Figure 4.1). The mean minimum and maximum summer temperatures range between 12.9 degrees Celsius (°C) and 23.4 °C, with mean minimum and maximum winter temperatures ranging between 3.2 °C and 10.4 °C (BoM, 2024). Historically (between 1990 and 2024), maximum temperatures within the statutory BFDP (1 October to 31 March) exceeded 30°C on 11 days per year (BoM, 2024). The historic (between 1991 and 2010) mean 3pm temperature is within 15 per cent of the mean maximum temperature for any given month (BoM, 2024).

The mean annual rainfall recorded at the Mount Boyce AWS between 1994 and 2024 is 1030.1mm (BoM, 2024). Mean monthly rainfall tends to be higher in the summer months accompanied by a greater mean number of days of rain when compared to the winter/spring period (refer Figure 4.1). Relative humidity shows slight variation across the year with a decrease in relative humidity in the spring/summer months and a decrease in relative humidity from 9am to 3pm (BoM, 2024).

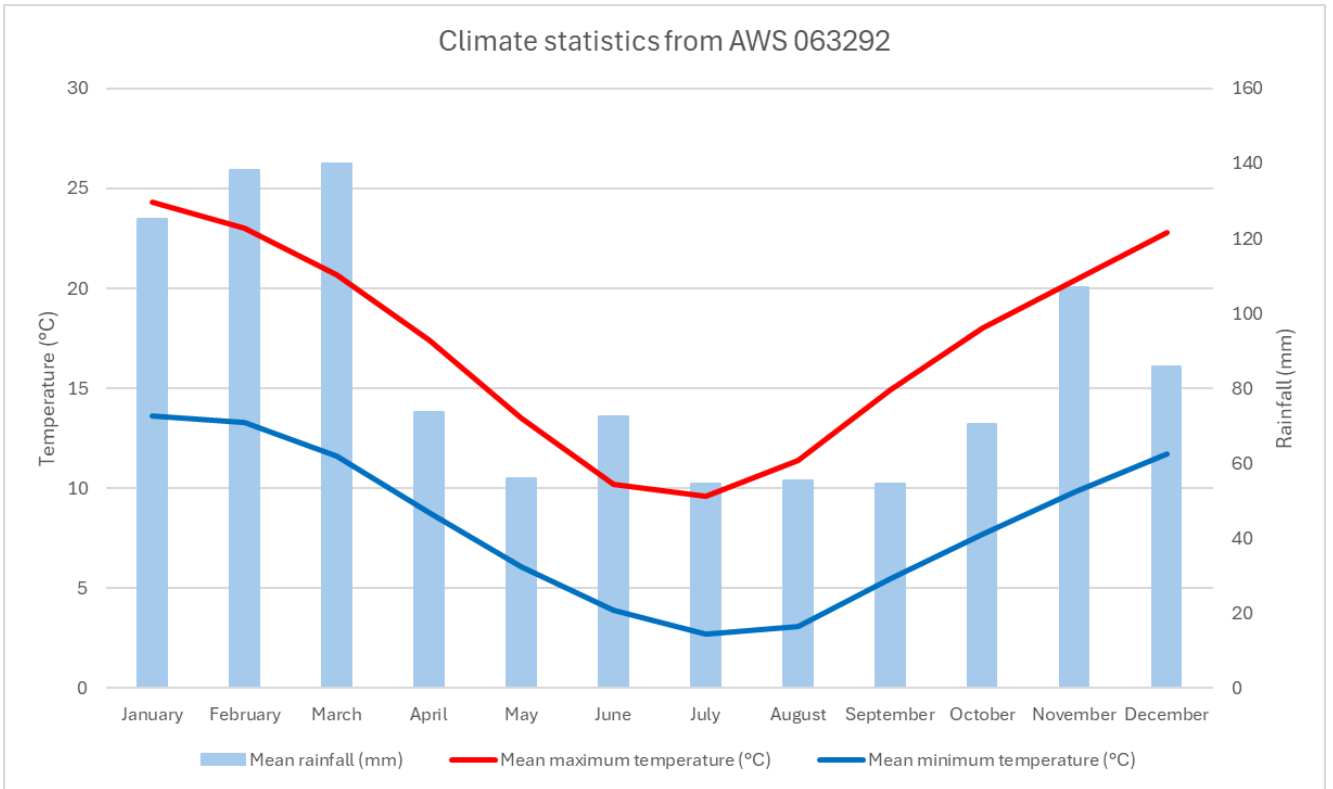
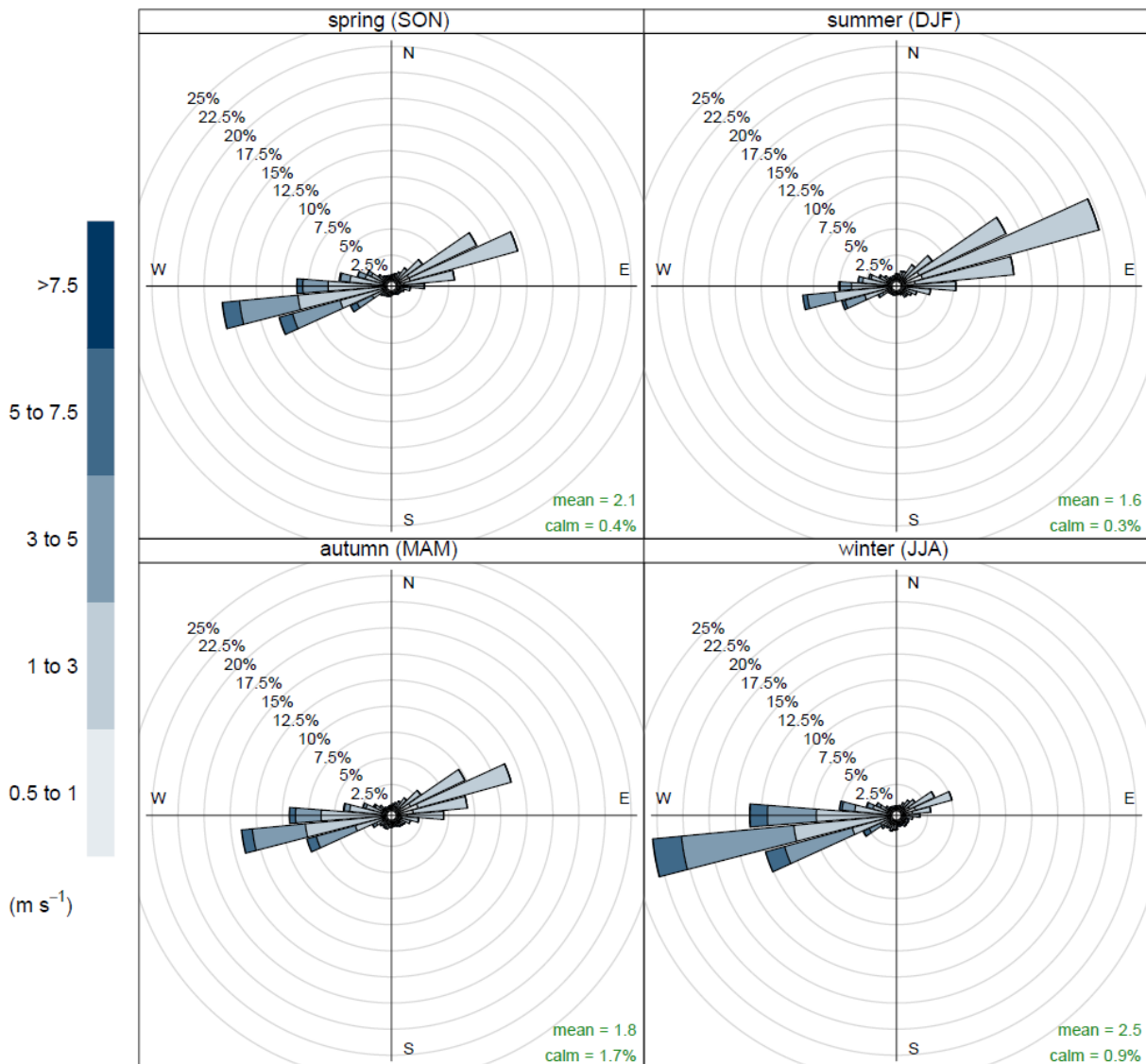


Figure 4.1 Seasonal rainfall and temperature variations in the study area (BoM AWS 063292) (BoM, 2024)

4.1.2 Wind

Wind roses, with seasonal breakdown from Mount Boyce AWS (063292), are shown in Figure 4.2. The overall annualised wind direction is from the west (with stronger gusts) and the north-east. The predominant wind direction through the summer months is north-east.



Frequency of counts by wind direction (%)

Figure 4.2 Wind roses for the study area - Mount Boyce AWS

4.2 Bushfire prone land

The project footprint is mapped as bushfire prone on the Lithgow City Council bushfire mapping. The bushfire mapping triggers the requirement to identify potential hazards and risks posed by the project as specified in Section 1.4 of PBP. The bushfire mapping for the project footprint is shown in Figure 4.3.

Large areas of the project footprint are characterised as Vegetation Category 1, the extents of which are shown in Figure 4.3. Vegetation Category 1 is considered to be the highest risk for bushfire. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production.

The project footprint also supports Vegetation Category 3. This category consists of grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands and is considered to be medium bushfire risk vegetation.

4.3 Historic bushfire events

Figure 4.4 provides the fire history mapping for the study area (and broader landscape) and indicates there is no recorded fire history within the project footprint, with only minor incursion into the study area during the 2019/2020 fire event to the north and east of the project footprint from the continuous forest vegetation of the SCA. There are no recorded instances of planned burns undertaken in the study area, however planned fires conducted by private landowners may not always be captured on the fire history data set maintained by the NSW National Parks and Wildlife Service.

Many fires throughout this area are of undetermined cause. However, where cause has been determined, the most commonly cited cause is lightning strike (SEED, 2024). Fires appear to have approached the project footprint in 2019/2020 under prevailing weather conditions from the north and north-east and were halted by the Castlereagh Highway and Boulder Road, which prevented further spread towards the project footprint.

4.4 Vegetation and bushfire hazard

4.4.1 Vegetation formations

In NSW, the native vegetation classification framework adopts a nested, three-level hierarchy to allow communication about characteristics of native vegetation with increasing complexity (NSW DCCEEW, 2024). For the purposes of the bushfire risk assessment, the Plant Community Type (PCT) classifications are categorised into their associated broader Keith (2004) vegetation formation, which aligns with PBP to assist in the assessment of fuel characteristics and potential fire behaviour (Keith, 2004). The PCTs and the relevant Keith vegetation classification, noting that there would be some variation across classifications, are provided in Table 4.1. Vegetation mapping in accordance with the Keith vegetation formation types for the study area is shown in Figure 4.5.

Table 4.1 PCT classification to Keith Vegetation Formation

PCT ID	PCT Name	Keith Vegetation Formation
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	Grassy Woodlands
3735	Central Tableland Peppermint Shrub-Grass Forest	Dry Sclerophyll Forests (Shrubby sub-formation)
3932	Central and Southern Tableland Swamp Meadow Complex	Freshwater Wetlands
3749	Western Blue Mountains Scribbly Gum Forest	Dry Sclerophyll Forests (Shrubby sub-formation)
3385	Southern Tableland Creekflat Swamp Woodland	Grassy Woodlands
3747	Southern Tableland Western Hills Scribbly Gum Forest	Dry Sclerophyll Forests (Shrubby sub-formation)
3376	Southern Tableland Grassy Box Woodland	Grassy Woodlands

The Keith Vegetation Formation types are adopted for the assessment of fuel characteristics and potential fire behaviour in section 5.1.2.

Vegetation within the project footprint forms part of a tract of vegetation generally associated with Gardens of Stone SCA. Other large tracts of vegetation are present to the north and east within the area however areas of agricultural lands provide some degree of separation. These agricultural lands are however still considered bushfire prone land as shown in Figure 4.3. Vegetated areas located within areas not mapped as bushfire prone land are associated with developed areas or areas managed as part of nearby mine or residential areas.

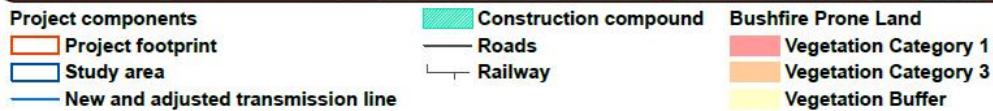
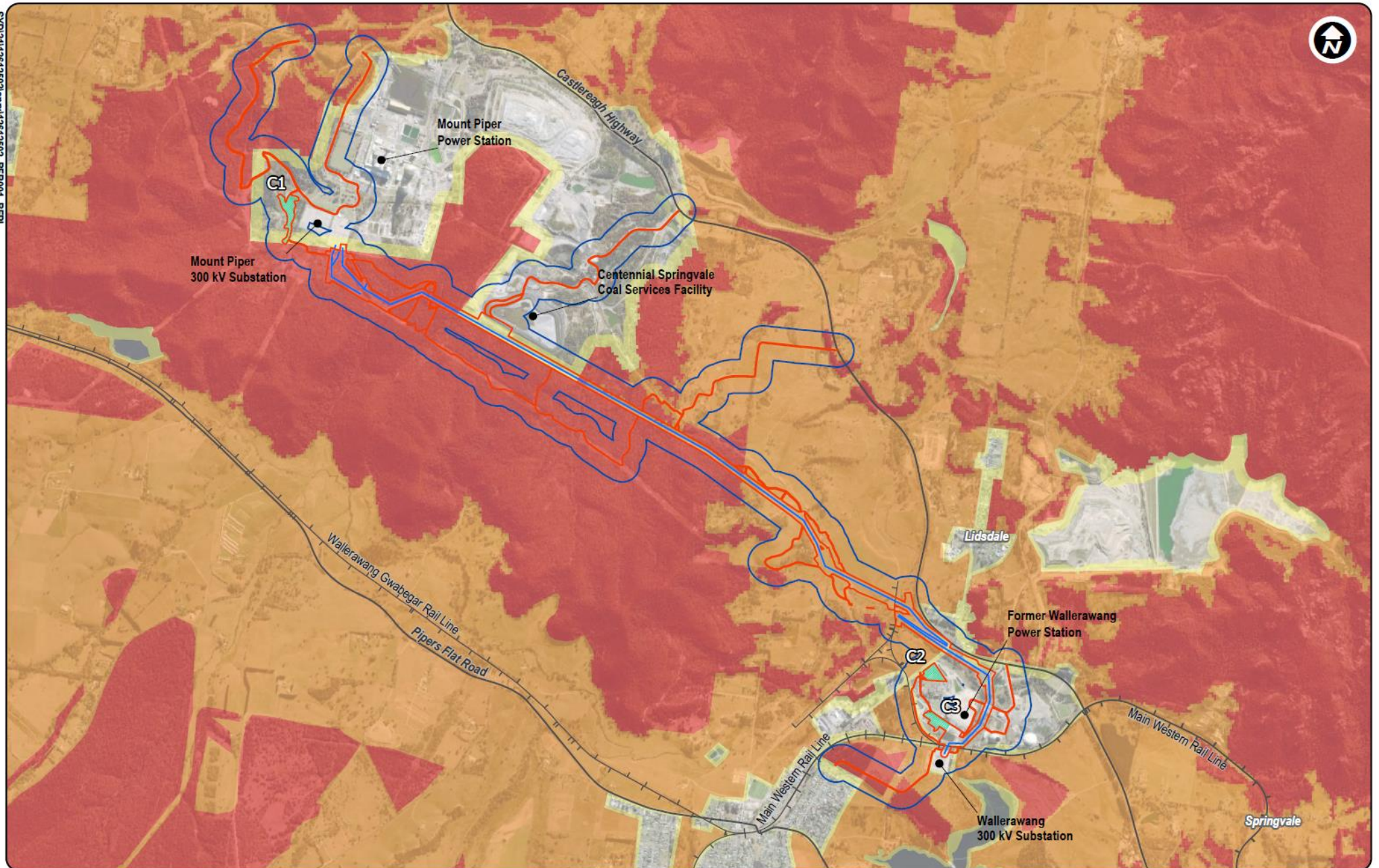


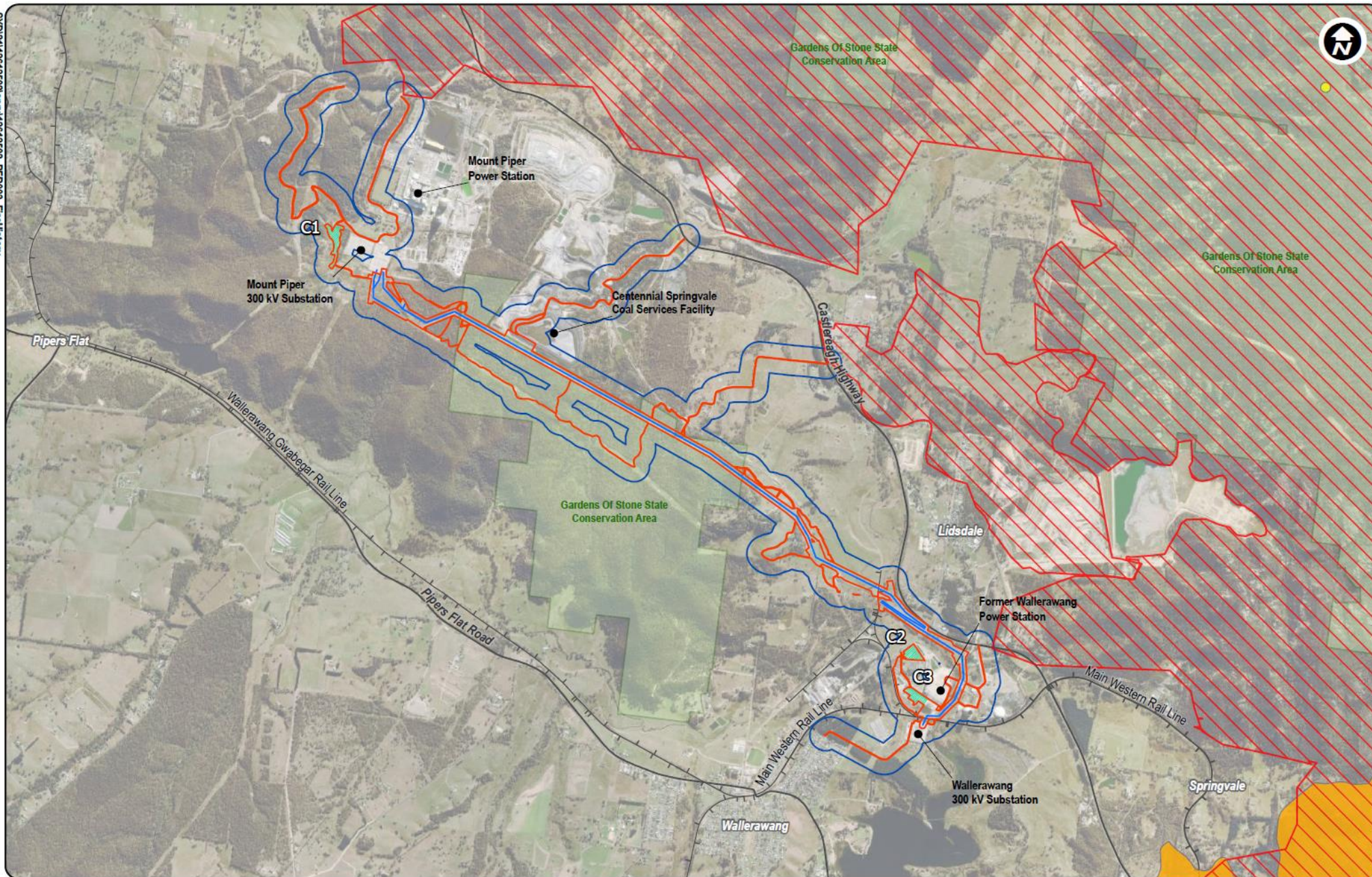
Figure 4.3 Mapped bushfire prone land in the study area

Rev: A
Date: 21/03/2025
1:40,000 @ A4

0 500 1,000
Metres

Grid: GDA2020 MGA Zone 56

S:\D\2112612502\mapx\12612502_BR_R003_FireHistory

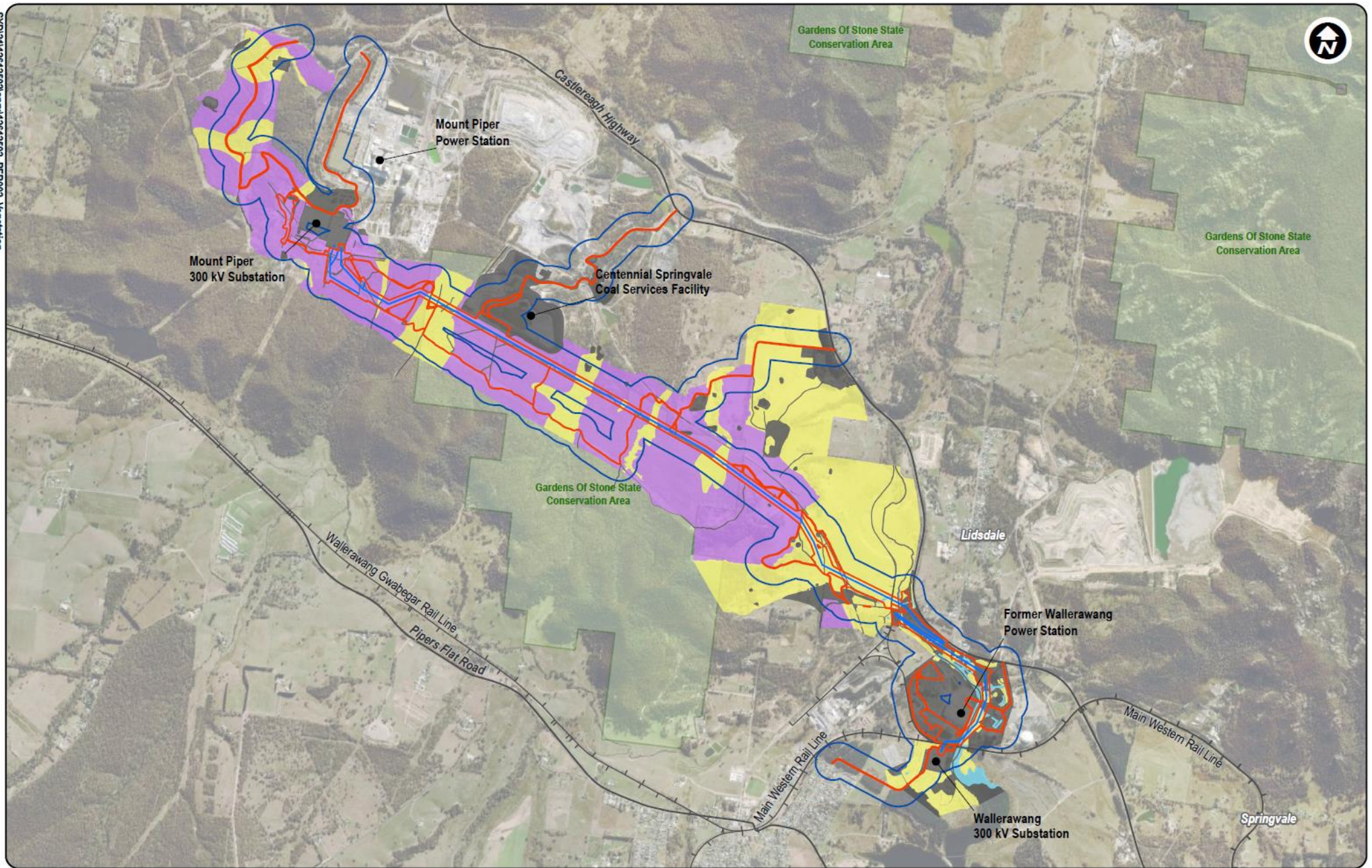


Project components	Existing environment	Fire history (Fire year)
Project footprint	Gardens of Stone SCA	199798
Study area	Roads	200607
New and adjusted transmission line	Railway	201920
Construction compound		

Rev: A
Date: 21/03/2025
1:45,000 @ A4

0 500 1,000
Metres
Grid: GDA2020 MGA Zone 56

Figure 4.4 Fire history in the study area



Project components	Existing environment	Keith Vegetation Formation	Rev: A
 Project footprint	 Gardens of Stone SCA	 Dry sclerophyll forests (shrubby sub-formation)	Date: 21/03/2025
 Study area	 Roads	 Freshwater wetlands	1:40,000 @ A4
 New and adjusted transmission line	 Railway	 Not classified	0 500 1,000
			Metres
			Grid: GDA2020 MGA Zone 56

Figure 4.5 Vegetation formations across the study area

4.4.2 Bushfire hazard

Across the project footprint, there are a range of types of fuel that have been influenced by current management practices of the existing easements and other land tenure. There are four 'types' of fuel that can contribute to bushfire hazard. They relate to the distribution and nature of combustible material within a vegetated environment and are defined by the industry standard *Overall Fuel Hazard Guide – Fourth Edition* (Department of Sustainability and Environment - Victoria, 2010) as:

- Bark fuel hazard – defined as bark on vegetation which has the potential travel significant distances and also provides the connection before surface fuels and the forest crown/canopy
- Elevated fuel load – defined as shrubs, heath and suspended material greater than 0.5m above the ground
- Surface and near surface fuel load - defined as the litter bed and vegetation up to 0.5m above the ground
- Surface fine fuels – defined as fuels such as grasses and other leaf litter or similar on the surface of the ground.

The level of bushfire hazard depends on the fuel continuity, height, amount of dead material, foliage thickness and flammability of live foliage. Flammability of vegetation is at the highest when combustion is fine, it contains a lot of dead material, is dense vertically and horizontally and has lower moisture content.

The southern portion of the project footprint includes areas where the vegetation is dominated by grasses with land leased for agricultural purposes. These agricultural areas include cattle grazing or grassed areas that are part of the former Wallerawang power station site. These grassy areas typically have fuel loads of up to 6 tonnes/ha. In areas of the project footprint where woodland vegetation formations are present, the fuel loads are typically up to approximately 20 tonnes/ha.

Vegetation within existing easements undergoes maintenance and management to ensure that adequate clearances between conductors and vegetation are maintained in line with Transgrid procedures. This is the vegetation clearance requirement (VCR), being the clearance extent under varying operating conditions based on PLS-CADD modelling). For 330 kV, the VCR is 3.0 m plus a safety buffer of 1.5 m for a total of 4.5 m. The area within 20 m of each span of the transmission line to each structure will be maintained free of shrubs and tree regrowth during operation, as required by the Transmission Line Design Manual (TLDM).

The existing easement contains a fairly continuous elevated fuel load with plants present in high densities. This includes significant weed encroachment (e.g. blackberry) in some areas which increase the fuel load.

Adjoining areas of vegetation on either side of the existing easement include forest and woodland formations. Some of these areas have substantial surface and near surface fuel loads, with dry sclerophyll shrubby forest vegetation having an overall fuel load of 36.1 tonnes/ha and surface fuel load of 22 tonnes/ha (RFS, 2019) as shown in Table 4.2.

Fuel loads for the vegetation formations of the study area are summarised in Table 4.2.

Table 4.2 Fuel loads for the Keith Vegetation Formation types in the study area (Table A1.12.8, PBP)

Keith vegetation formation	Fuel load (tonnes/ ha)	
	Surface and elevated	Overall (including bark and canopy)
Grassy Woodlands	10.5	20.2
Dry Sclerophyll Forests (Shrubby sub-formation)	22	36.1
Freshwater Wetlands	4.4	4.4

4.5 Topography, slope and access

4.5.1 Topography and slope

The topography across the project footprint is undulating, varying from approximately 870 m to 1020 m Australian Height Datum (AHD). The project footprint also includes some steep slopes throughout the alignment reaching up to approximately 15 degrees. These slopes are traversed in places by access tracks associated with the electricity infrastructure.

Fire behaviour through the existing easement and adjoining vegetation would be most affected by the topography of the landscape and fuel moisture content in the gully areas. With consideration to the characteristics of the existing environment, it is not expected that fire behaviour would be halted by discontinuous vegetation.

4.5.2 Access and restrictions

The Gardens of Stone SCA (formerly the Ben Bullen State Forest) can be accessed via public roads or via private properties such as the Mount Piper Power Station site, as described below. The existing tracks in the SCA are maintained to RFS/ National Parks and Wildlife Service (NPWS) standards to enable access for fire fighting vehicles. At the western end, the study area can be accessed from the Castlereagh Highway via Boulder Road around the perimeter of the Mount Piper Power Station. Further to the west along Boulder Road, other unsealed access tracks enter the SCA, associated with existing transmission line easements. At the eastern end, the SCA can be accessed via Brays Lane from the Castlereagh Highway via Centennial Springvale Coal Services facility 's property, which connects with the transmission line easements. The easement access tracks are generally only trafficable by four-wheel drive/light vehicles.

In between these areas, access is via unsealed access tracks, most often associated with existing electricity easements, but also using other four-wheel drive and fire trails in the former forestry area. These tracks vary in width, with structures such as culverts and bridge crossings at various points. As a result of the steep topography in some areas, these tracks are susceptible to erosion.

Other notable existing access restrictions relate to the limited crossings, over or under (refer Figure 4.6) the Centennial Springvale Coal Services facility conveyor, which runs parallel to the eastern side of the project footprint from Lidsdale Siding and Centennial Springvale Coal Services facility's Angus Place mine. Under road culverts also exist (refer Figure 4.6), which may present limits to the weight bearing capacity for larger and heavier vehicles. The culvert shown in Figure 4.6 would be upgraded to meet construction trafficability requirements for the project. For all firefighting appliance types, minor crossing structures are required to:

- be able to carry a Gross Appliance Mass of 15 tonnes; and
- have appropriate guidepost delineation for safe visibility.

Additional requirements are applied for major crossing structures including engineered culverts and bridges by appliance category for axle load (RFS, 2023).

Several locked and unlocked gates occur across the accesses within the project footprint. Where gates are locked, they are locked in a 'daisy chain' manner for various landowners and asset owners.

4.6 Water supply, availability and storage

There was no identified water supply for firefighting purposes within the project footprint. While tanks and hydrant points were identified in adjoining areas, none of these are available for use for firefighting purposes.



Figure 4.6 Existing structures within access tracks (left: bridge over conveyor belt; right: farm culvert along access point 3)

5. Bushfire risk assessment

5.1 Construction phase bushfire risks

5.1.1 Bushfire risk resulting from the project

Some activities associated with construction of the project have the potential to be sources of ignition, which if not quickly controlled, could escalate into a bushfire. Potential sources of ignition from construction activities include:

- Hot works – sparks from metal grinding, cutting, welding or other works capable of producing sparks that can land in dry, fine vegetative fuels.
- Vehicle use – vehicles driven or parked off-road in long vegetation can be ignition sources if contact is made with hot engine parts such as exhaust system components.
- Unapproved human activity – cigarette butts discarded by smokers into vegetative fuels or unauthorised fire use.
- Storage of combustible materials – combustible materials stored for use during construction can be ignited if sparks or flames are accidentally introduced to the area.
- Machinery use – the use of specialised slashers, mulching machines and bulldozers used for clearing vegetation or excavation can cause sparks from friction with rocks.

Effective, reliable and proven risk controls, including existing Transgrid procedures and controls (see section 6.1), can be applied to the range of construction activities to prevent accidental fire ignition and spread. With systematic risk controls addressing each of the fire ignition risks in place, the likelihood of fire ignition and spread during construction activities would be very low. Diligent implementation of risk controls can reasonably be expected to fully prevent fire ignition over the course of the project's construction phase.

The potential consequences of bushfires in the landscapes traversed by the project would not be significantly influenced by construction of the project. Potential bushfire consequences are dictated by the landform, vegetation cover and weather factors (discussed in section 4), in combination with existing levels of community exposure and vulnerability to bushfire. Although vegetation removal and access track works would be undertaken within parts of the study area, these works are not at a scale which would materially alter the consequences of bushfires on public safety.

As project construction would not materially alter the potential consequences of bushfires, and because bushfire ignition during the construction phase is very low on account of the risk controls proposed to be implemented (see section 6), the construction phase of the project would have no material impact on public safety risk in the landscape where construction would occur.

5.1.2 Bushfire risk to the project

Workforce

As the project footprint is located in bushfire prone areas, construction personnel and contractors may potentially be exposed to bushfire risks while travelling to/from and working at worksites. Bushfires may occur as a result of either natural causes (e.g. lightning strike) or as a result of human activity and the timing and location of bushfire ignitions is therefore not entirely foreseeable or predictable. During construction, it would be possible for significant bushfire safety risks to arise and systems for maintaining workforce safety need to be developed, specifically a Bushfire Emergency Management and Evacuation Plan.

Construction of the project would occur during the bushfire danger period (BFDP). With elements of the project requiring network outages some works would potentially be undertaken outside the BFDP as they coincide with periods when outages are difficult to plan due to increased demand during the summer months. Works during the BFDP would be subject to application of a range of prudent risk controls, comprising:

- managing personnel access and construction activities during elevated fire danger periods and especially during Total Fire Bans (TOBAN) and evacuation procedures to ensure safe and timely evacuations if required
- establishing safe work systems and protocols and reliable communications with all personnel and contractors

- early and reliable warning systems, and awareness of bushfire danger and safety precautions
- location and work-specific safety analyses, training in emergency response and provision of fire suppression equipment.

With a comprehensive bushfire safety system in place addressing as a minimum the above requirements, the bushfire risk to personnel and contractors would be as low as reasonably practicable.

Construction compounds

Three construction compounds may be required to support construction activities for the project. These compounds would include various uses including temporary storage of construction materials and equipment, and workforce parking. The compounds will not include any workforce temporary accommodation camps. Under PBP, fenced outdoor compounds, parking and laydown areas do not require BAL assessment and no performance criteria are established for the protection of such areas. Where construction compounds incorporate project/site office temporary portable buildings or combustible goods are stored, they require establishment and maintenance of an appropriate APZ as recommended by PBP.

APZs are intended to be enduring over the life of the asset and need to be regularly maintained to be effective. The APZs for construction compounds would only be maintained during the construction period when they are in use. Following completion of construction, the compounds would be removed and the APZ would no longer be maintained. It is noted that APZs are not required for the transmission lines.

Table 5.1 indicates the APZs recommended for each construction compound which are shown in Figure 5.1. The figure shows the APZ being applied within the identified area for the compound. The implementation of these APZs would be confirmed as part of the development of the Bushfire Management Plan and include consideration of whether agreement can be reached to manage adjacent land for the purposes of the APZ with surrounding landowners duration construction. The final location of construction compounds to be used and APZs to be implemented would be documented in the Bushfire Management Plan for the project, developed prior to construction. Further discussion with RFS would also be undertaken as part of developing the Bushfire Management Plan.

An APZ resulting in a radiant heat exposure of 29 kW/m² (BAL-29) would be applied to areas within the construction compounds where combustible goods are stored or where temporary site offices are located. The proposed temporary site offices are unlikely to meet all the construction requirements for a BAL-29-compliant APZ in accordance with *Australian Standard AS3959-2018 Construction of Buildings in Bushfire Prone Areas*, and therefore the requirements for a Bush Fire Emergency Management and Evacuation Plan would need to be scoped to cover temporary site office facilities.

Where compounds would not be used for the storage of combustible materials and do not contain site offices, a reduced APZ resulting in an exposure of 40 kW/m² (BAL-40) can be provided to avoid flame contact to stored materials and therefore lower the risk of fire spread (refer Table A1.12.6 of PBP). The management of the identified APZs would occur in accordance with the requirements for the inner protection area specifications detailed in Appendix 4 of PBP. Parking of vehicles is excluded from APZ specified areas.

Table 5.1 APZ requirements for proposed construction compounds to achieve 29kW/m² or 40kW/m² exposure

Compound ID	Aspect	Vegetation	Slope class (degrees)	BAL-29 APZ requirement (m)	BAL-40 APZ requirement (m)
C1 (Mount Piper)	North	Dry Sclerophyll Forest –Shrubby	Upslope/flat	20	15
	East	Dry Sclerophyll Forest – Shrubby	Upslope/flat	20	15
	South	Dry Sclerophyll Forest – Shrubby	Upslope/flat	20	15
	West	Dry Sclerophyll Forest – Shrubby	Upslope/flat	20	15
C2 (Wallerawang)	North	Grassland	0-5 downslope	11	8
	East	Grassland	0-5 downslope	11	8
	South	Grassland	Upslope/flat	10	7
	West	Grassland	Upslope/flat	10	7

Compound ID	Aspect	Vegetation	Slope class (degrees)	BAL-29 APZ requirement (m)	BAL-40 APZ requirement (m)
C3 (Wallerawang)	North-east	Grassland	Upslope/flat	10	7
	South-east	Grassland	Upslope/flat	10	7
	North-west	Grassland	Upslope/flat	10	7
	South-west	Grassland	Upslope/flat	10	7

Access and egress

The project footprint is currently accessible via a network of existing access tracks provided within the Gardens of Stone SCA as well as other properties. The project would include the upgrade of many of these tracks, with some new sections of track to be built (see Figure 1.2 for location of tracks).

Wherever possible, works on existing roads and tracks would be staggered to ensure unobstructed access is maintained throughout construction. Short term road closure (full or partial) during stringing of conductors would be confirmed during detailed design in consultation with the relevant authority. It is currently expected that closures would be limited to periods of a few minutes. Any full or partial road or track closures would consider detour routes for unobstructed road access for emergency evacuation, which would be outlined in the Emergency Response Plan and the Traffic Management Plan. Where property access tracks are proposed to be upgraded, procedures and evacuation routes would be defined during construction within an Emergency Response Plan.

The provision of these upgraded tracks would improve access and egress to/from the project footprint in the event of a fire. The proposed upgrades would improve trafficability within the project footprint, including providing access through the entirety of the easement for Category 1 response vehicles.

The proposed access track works would reduce the risk of safety for all personnel and contractors, and response personnel in the event of an emergency.

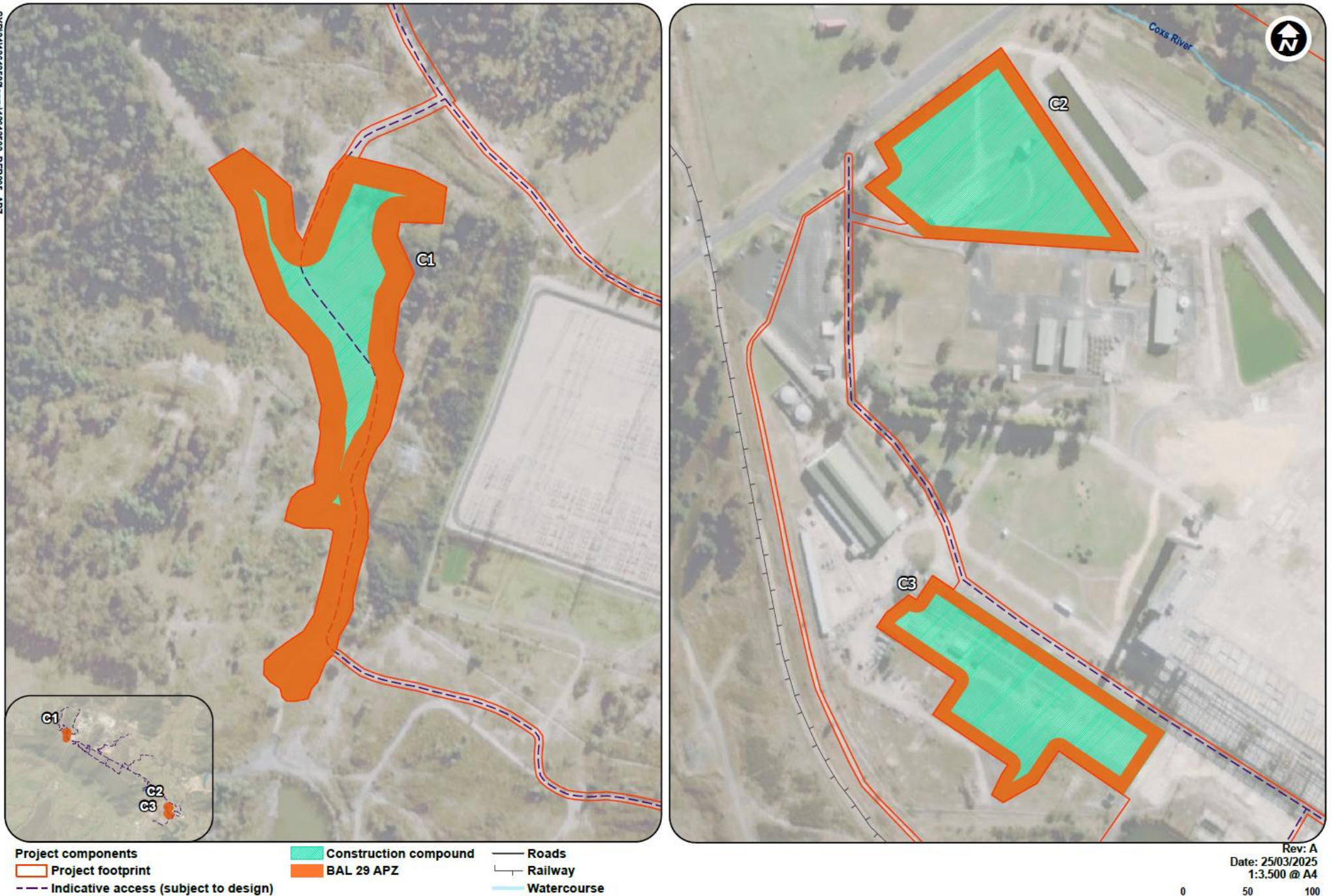


Figure 5.1 Indicative APZs at construction compounds

5.2 Operation phase bushfire risks

5.2.1 Bushfire risk resulting from the project

Design

The project will be designed and constructed to Transgrid's Transmission Line Design Standard which complies with *Australian Standard AS/NZS 7000:2016 Overhead Line Design* and is consistent with obligations under the Electricity Supply Act and Regulation which includes designing and operating a safe network and preventing network assets from igniting bushfires. This includes the provision of earthing of the transmission structures and line to minimise the risk from lightning strikes.

Due to their robust, non-combustible, high reliability design, it is very rare for 330kV lines to cause bushfire ignition. Historically major bushfire events caused by overhead powerlines are associated with distribution network infrastructure (up to 66kV) not the transmission network. Transgrid have previously reported that they have not found an instance of bushfire started by any transmission line (voltage more than 66kV) (NSW Parliament, 2023). This is supported by the Australian Energy Infrastructure Commissioner who reported transmission lines over 220kV had a near zero risk of causing bushfire, with the majority of the risk coming from the distribution network (NSW Parliament, 2023).

The resilience of the existing 132 kV transmission line will also be enhanced through its relocation to steel or concrete structures, which are highly resistant to bushfire impacts. This upgrade will eliminate the existing wooden pole transmission structures, which are vulnerable to damage and destruction from bushfire attack. The relocation of the 132 kV transmission line to the taller steel or concrete structures also reduces the risk from this transmission line as it would be positioned in a 60 m easement which is greater than the 45 m required for a 132 kV transmission line.

Lightning, and particularly dry lightning, strikes during summer storms, is the most commonly cited factor causing ignition of bushfire in remote areas. The lightning protection measures that would be adopted for the project would include installation of overhead earth wires (OHEWs), which connect to the transmission structure earthing. In the event that a transmission line is struck, the network's protection systems would register the power fluctuation and immediately isolate the affected line if required.

Lightning protection measures would be inspected and maintained in accordance with Transgrid's standard asset management practices.

Maintenance

The transmission line and transmission structures would be inspected by field personnel and contractors on a regular basis as part of routine maintenance. Key maintenance activities would include:

- regular inspection and maintenance of the transmission structures, footings, fittings, conductors and overhead earth wires, including hot and fire risk works
- hot works, if required to perform maintenance activities or rectify faults, as identified during routine maintenance inspections
- vegetation maintenance within the 60 m wide transmission corridor to maintain the VCRs between ground vegetation and the overhead transmission lines to mitigate the risk of flashovers
- removal of trees which have the potential to strike the overhead conductors if they were to fall (referred to as hazard trees), according to Transgrid's *Maintenance Plan - Easements and Access Tracks* (Transgrid, 2018).

It is expected that only light vehicles and small to medium plant would be needed to periodically access the transmission easement to undertake these activities.

Hot work refers to any work that involves the use of open flames, heat or that generates sparks and fire risk work refers to any activities or tasks that have the potential to start a fire or expose a workplace to fire hazards. Transgrid frequently undertakes routine maintenance activities that may potentially cause fire ignition. However, these risks would be satisfactorily managed using well established controls including Transgrid's Hot Work and Fire Risk Work Procedure, Hot Work Permits and *Fire Risk Assessment and Control Measures (FRACM)*.

To manage bushfire risks across the existing transmission network, Transgrid has a vegetation management program. The objective of vegetation management is to maintain the VCR and reduce fuel load under the assets, therefore reducing potential fire threats. This is achieved through a combination of tree trimming or removal and, where required, chemical control. Vegetation management is completed in accordance with Transgrid's Bushfire Risk Management Plan (Transgrid, 2021) and Industry Safety Steering Committee's Guide for the Management of Vegetation in the Vicinity of Electricity Assets (Resources and Energy NSW, 2016) based on the distances identified in AS/NZS7000:2016 Overhead Line Design. Ongoing vegetation management would be conducted in accordance with the abovementioned procedures for the purposes of maintaining the safe and effective functioning of the transmission connection and to minimise the risk of fire ignition from vegetation coming into close proximity to conductors. Routine physical inspections of the transmission network supported by remote sensing techniques is used to inform planned and preventative maintenance programs and to detect high risk vegetation requiring priority management.

The operational bushfire risk as a result of the project is therefore considered low.

5.2.2 Bushfire risk to the project

Information in section 4.3 documents historical fire activity in the study area and indicates there is no recorded fire history within the project footprint. Fires appear to have approached the project footprint in 2019 and 2020 under prevailing weather conditions from the north and north-east but were halted by the Castlereagh Highway and Boulder Road which prevented further spread towards the project footprint.

Transmission lines are designed to operate continuously in bushfire prone environments and are considered to have a low vulnerability to bushfire impact due to their robust, non-combustible and highly reliable design.

In terms of safety of personnel undertaking maintenance activities, it is not practical to prohibit personnel being present on days of elevated fire danger. Using Transgrid's established safety systems and a combination of risk assessments, Hot/Fire Risk permits and Transgrid's FRACM during periods of elevated FDR, the risk to personnel from an externally caused fire can be effectively mitigated.

While mainly used for vegetation management and infrastructure maintenance, access tracks may also provide access for bushfire response activities. This would only occur if fire crews assess their condition to be suitable as access tracks are not intended to provide defensible space in case of fire.

Transgrid's *Maintenance Plan – Easements and Access Tracks* (Transgrid, 2018) requires consideration of use by third parties, including as fire trails. As such, it is recommended they meet the standards for a Category 9 fire trail as detailed in Appendix A of NSW Fire Trail Standards (NSW RFS, 2023).

The project would include upgrades to the existing access tracks throughout the project footprint and provide additional new access tracks to aid construction efficiency. These works will improve access to the transmission easement and provide the opportunity for Category 1 response vehicles to traverse parts of the easement (this requires the trail to have a minimum width of 4 m and a minimum horizontal clearance of 3 m from the trafficable surface centreline).

The operational bushfire risk to the transmission line is considered low.

5.3 Cumulative impacts

Section 21.2 of the EIS outlines the assessment methodology for cumulative impacts/risks including the methods for identifying what projects have been considered as part of the issue-specific cumulative impact assessments for the project. The assessment has been undertaken in accordance with the Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE, 2022).

A total of 10 projects within 20 km of the project footprint were identified for consideration as part of the cumulative impact assessment and are shown in Figure 5.2. The following projects have been considered:

- Wallerawang Battery Energy Storage System
- Mount Piper Battery Energy Storage System
- Great Western Battery Energy Storage System
- Pinecrest Battery Energy Storage System
- Lake Lyell Pumped Hydro Energy Storage
- Ben Bullen Wind Farm

- Sunny Corner Wind Farm
- Wallerawang Power Station Ash Dam
- Wallerawang residential subdivision (DA226/22)
- Wallerawang Station upgrade.

Table 5.2 outlines the potential cumulative bushfire risks relevant to each project.

Table 5.2 Potential cumulative bushfire risks for the project

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative risk
Wallerawang BESS	Design changes to optimise the layout of the approved Wallerawang BESS (500 MW and 1,000 MWh of battery storage capacity)	500 m east of the project footprint	Approved 4/8/2022 Current modification at response to submissions stages Construction period of 1 to 2 years, expected to commence from 2025, construction does not appear to have commenced Operational period unchanged	Due to the bushfire protection measures required for BESS, as well as distance between the project and this site, cumulative bushfire risk is not considered likely.
Mount Piper BESS	Development of a grid-scale BESS with a capacity of up to 500 MW	Immediately north of the project footprint	Approved 15/11/2024 Construction period of 18-24 months expected to commence from mid-2026 at the earliest Potentially operational by 2027/2028 and would operate for about 20 years	Due to the bushfire protection measures required for BESS, cumulative bushfire risks are not considered likely.
Great Western BESS	Development of a 500 MW / 1,000 MWh BESS and associated infrastructure	300 m west of the project footprint	Approved 2/11/2023 Project has not yet commenced construction and construction start date is not known however is expected to occur over 12-14 months The BESS is intended to have an operational life of up to 20 years	Due to the bushfire protection measures required for BESS, cumulative bushfire risks are not considered likely.
Pinecrest BESS	Development of 500 MW battery storage capacity and 1,000 MWh of storage with (2-hour duration) connecting to the grid via underground cabling	Layout shown in scoping report is located within project footprint, with Transgrid undertaking ongoing consultation with Banpu Energy regarding positioning of the site	Scoping report prepared with SEARs not yet issued EIS is expected to be submitted in early 2026 Construction period of 18 months commencing in late 2026 if approved. Operations proposed to start in 2028	Assumed that the bushfire protection measures required for BESS and the potential currently unknown separation between the projects cumulative bushfire risks are not considered likely.
Lake Lyell Pumped Hydro Energy Storage	Development of the Lake Lyell Pumped Hydro Energy Storage Scheme (that will provide between 300 to 350 MW of electricity generating capacity for up to 8 hours during peak demand)	10 km south of the project footprint	EIS in preparation Technical design expected to conclude in 2025. Construction expected commence in late 2026 and to take four years with operation commencing in 2029	Due to the distance between the project and this site, cumulative bushfire risks are not considered likely.

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative risk
Ben Bullen Wind Farm	Construction of approximately 64 wind turbine generators, a BESS and ancillary infrastructure	20 km north-west of the project footprint	EIS in preparation Construction in 2028 for 18-24 months Operational life of 35 years+	Due to the bushfire protection measures required for WTGs and BESS, as well as distance between the project and this site, cumulative bushfire risks are not considered likely.
Sunny Corner Wind Farm	Construction of approximately 80 wind turbine generators, a BESS and ancillary infrastructure	6 km west of the project footprint	EIS in preparation Construction in 2030 for 36 months Operational life of 30 years	Due to the bushfire protection measures required for WTGs and BESS, as well as distance between the project and this site, cumulative bushfire risks are not considered likely.
Wallerawang Power Station Ash Dam	Use of part of the lands lying north of the Castlereagh Highway that were once used by the former Wallerawang Power Station as coal ash dam repositories	Immediately north of the project footprint	Approved 13/10/2023 The modification proposes an additional ten years for the importation of capping material	Existing land use with modification related to the extension of time for importation of fill material only. No change to existing bushfire risks and therefore no cumulative bushfire risks.
Wallerawang residential subdivision (DA226/22)	Torrens Subdivision - 1 Lot into 54 Residential Allotments, 4 New Roads, 2 lots for drainage and public reserve Allotment	19 Barton Avenue Wallerawang 2 km south-west of the project footprint	Currently being re-exhibited till 13 June 2025	Due to the bushfire protection measures required for residential subdivisions, cumulative bushfire risks are not considered likely.
Wallerawang Railway Station upgrade	Works to upgrade the existing station, closed in 1989, so that passenger services can be restated	850 m southwest of project footprint	Project has been announced on Transport for NSW website Early enabling works will be carried out from March to August 2025 Once the design is finalised, construction will commence later in 2025, with re-opening of the station planned for late 2026	Project is not located on bushfire prone land due to position within Wallerawang urban area. It would therefore not contribute to any cumulative bushfire risk.

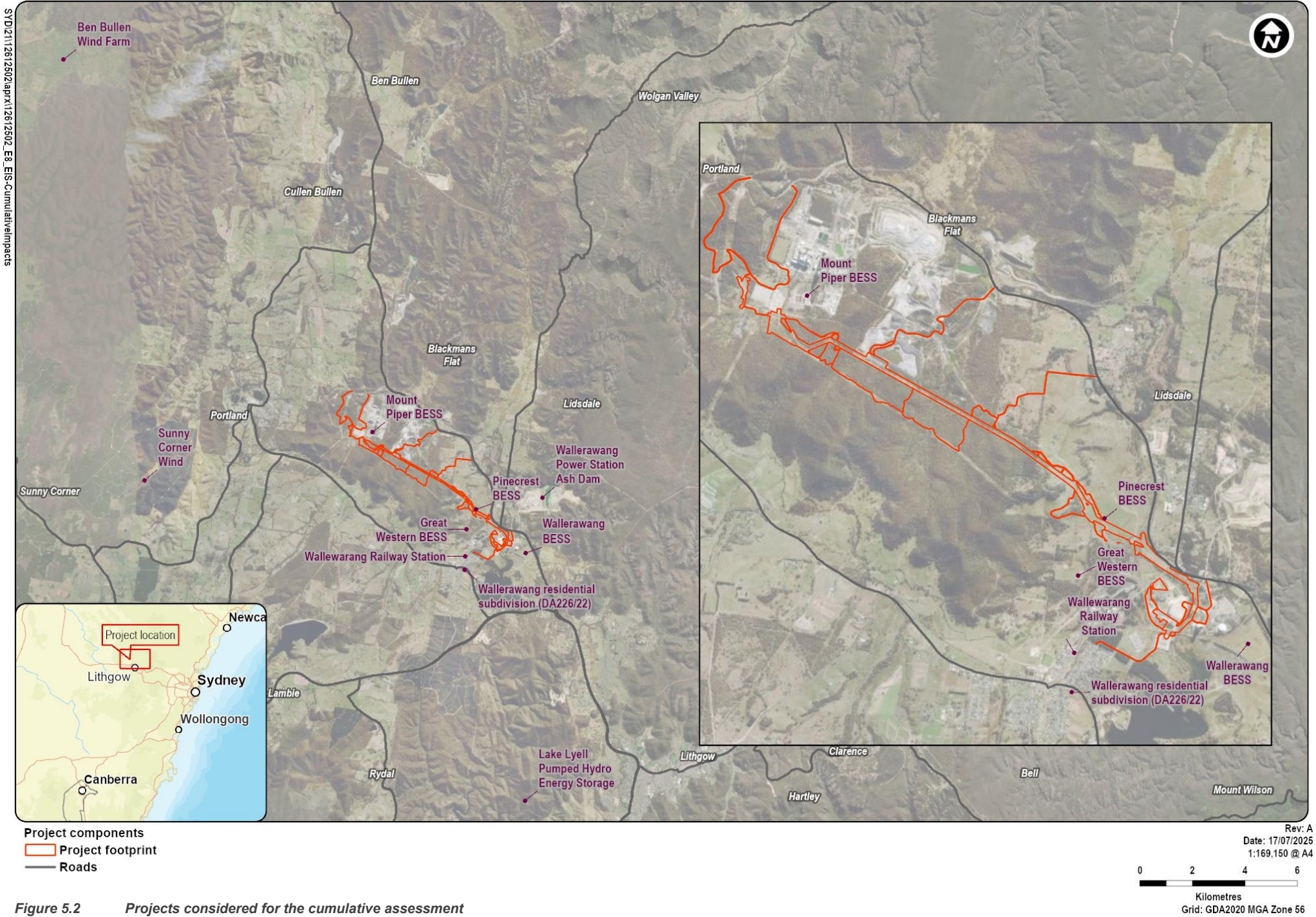


Figure 5.2 Projects considered for the cumulative assessment

6. Bushfire risk management

6.1 Approach

Transgrid implements a range of existing procedures relating to bushfire risk management for the existing transmission lines in the project footprint and the wider electricity distribution network, as discussed in section 5 and in accordance with its obligations under the *Electricity Supply Act 1995* and Regulations.

The mitigation and management measures for the project consider these existing controls and builds upon them as necessary to manage the identified project risks.

Works during construction of the project would be subject to the following existing Transgrid procedures and policies:

- Hot Work and Fire Risk Work (corporate wide procedure)
- Bushfire Risk Management Plan
- Bushfire Formal Safety Assessment
- Maintenance Plan – Easements and Access Tracks
- Hot Works permits and Fire Risk Assessment and Control Measures (FRACM) permits.

In addition to these procedures, Transgrid implement VCRs within easements to ensure to ensure vegetation is maintained with minimum clearances to conductor sag points as outlined in the *Maintenance Plan – Easements and Access Tracks* (Transgrid, 2018b).

Transgrid also undertakes LiDAR analyses of the transmission lines, vegetation and other above ground installations on a yearly basis with the primary purpose being the identification of:

- vegetation intrusions within vegetation clearing areas under various line operating conditions
- hazard trees, for example any tree or part of a tree located outside the easement that would infringe on the vegetation removal areas should it fall toward or into the easement
- public safety hazards, such as unauthorised easement encroachments and low ground clearances.

Hazard tree management is undertaken as maintenance and monitored during condition-based maintenance when safe to do so. This level of current management combined with the VCR, enables bushfire risk to and from the transmission lines to be effectively managed.

Further, the *Maintenance Plan – Easements and Access Tracks* (Transgrid, 2018b) refers to the *NSW Fire Trail standards* (RFS, 2023) and requires consideration of Category 9 fire trail standards.

In addition to these existing procedures and controls, the bushfire risk for the project would be managed through the implementation of a Bushfire Management Plan and a Bushfire Emergency Management and Evacuation Plan as part of the CEMP.

The Bushfire Management Plan will contain BPMs for the construction and operational phases of the project based on guidance from PBP, electrical network industry sources and Transgrid's standard bushfire risk management procedures (Transgrid, 2018a). Adoption of the measures described in this report is expected to reduce to an acceptable level, both the risk of bushfire ignition by construction and/or operation of the project and the risk that bushfires in the landscape pose to the project.

Transgrid will liaise and cooperate with NPWS and RFS on BPMs to minimise the risk of bushfire ignition from the transmission line into the Gardens of Stone SCA. Measures will include maintenance of vegetation removal areas between vegetation and the transmission line.

6.2 Construction measures

6.2.1 Workforce safety

The system of BPMs contemplated by PBP are not intended for management of construction workforce safety on construction sites, therefore it is not relevant to undertake BAL assessments or identify PBP compliance requirements for this risk. As construction of the project would be undertaken in bushfire prone environments, a workforce bushfire safety system which ensures personnel and contractors would not be directly exposed to bushfire impact would need to be developed. At a conceptual level, for construction work during the BFDP, the workforce bushfire safety system would entail:

- Ensuring personnel and contractors would not be working in bushfire prone worksite locations under elevated fire danger conditions when, in the event of a bushfire outbreak, timely evacuation may not be safely effected.
- Establishing safe work systems whereby systematic monitoring of fire weather and fire incident occurrence in the surrounding landscape would be undertaken while work crews are in the field, and warnings and evacuation directions can be promptly and reliably communicated to all field work crews.
- Ensuring that when work crews would be at, or enroute to/from project worksites, a systematic bushfire evacuation plan would be in place and understood by work crews, enabling early, prompt and safe evacuation if/when required.
- Ensuring that all work sites have supervisory systems in place such that during the BFDP, work crews would be briefed daily on fire danger levels, fire risks, worksite-specific evacuation arrangements, routes and procedural requirements, if site evacuation was required.
- All work crews engaged in activities with the potential to cause bushfire ignition (as assessed during Job Safety Analyses) would have appropriate training and portable fire extinguishers/equipment enabling any accidental fire ignition to be extinguished at-source, whilst in an incipient, controllable situation.

6.2.2 Hot works

Construction activities pose additional risks for on-site ignitions, which may result in a fire escaping to the surrounding areas. These mainly arise from hot works, vegetation clearing/machinery use and management and use of vehicles on site.

A Bushfire Management Plan, developed prior to construction commencing as part of the CEMP, would include BPMs and safe work procedures to ensure these risks are appropriately managed building on Transgrid's *Fire Risk Assessment and Control Measures (FRACM)*. Transgrid's *Hot Work and Fire Risk Work Procedure* (Transgrid, 2020) includes measures for determining when works must be suspended, such as during periods of elevated fire danger and TOBAN. The procedure does allow for some work activities to be carried out during these times, provided that conditions are met, including any and all requirements from the RFS.

6.2.3 Construction compounds

Section 5.1.2 outlines APZ requirements for the three construction compounds. The proposed APZs are contained within the project footprint and the boundaries of the construction compounds.

Confirmation of the use of construction compounds and APZs to be implemented would be documented in the Bushfire Management Plan for the project, prior to construction. As part of the development of the Bushfire Management Plan in consultation with RFS, the use of the APZ for the laydown of some materials would be considered.

Further discussion with RFS would also be undertaken as part of developing the Bushfire Management Plan.

6.2.4 Vegetation removal

Vegetation removal for the project includes:

- removal of trees and woody vegetation within the 60 m wide transmission corridor as required in line with the VCRs to provide adequate separation from vegetation and the overhead conductors
- removal of vegetation as part of the access track upgrades and new track construction.

The management and disposal of timber and vegetation debris would be developed in consultation with NPWS and other property owners to avoid local concentrations of bushfire fuels. It is expected to include a combination of:

- donation of timber to local charity/s for reuse
- processing timber through a mulcher and distributing mulch across exposed areas of the project footprint, in particular within the easement to assist in the prevention of erosion
- relocation of felled timber to provide erosion control
- relocation of felled timber containing hollows that could provide fauna habitat into the adjoining forested areas
- removal of timber off-site and stockpiling at a suitable location for potential re-use as building material or firewood.

6.2.5 Firefighting equipment

Firefighting equipment would be maintained at and/or be accessible to all active construction areas during the declared BFDP, and key site personnel trained in its use. Equipment should be appropriate to the activities being conducted and the fire danger at the time of works, but as a minimum should include:

- extinguishers
- knap sacks
- hand tools (e.g. fire rakes)
- trailer mounted water tanks.

6.2.6 Water supply

A static water supply of 20,000 L would be provided near any temporary buildings or site offices within each construction compound with the final requirements confirmed and documented in the Bushfire Management Plan. All above ground tanks should be manufactured from concrete or metal, with unobstructed access at all times.

6.2.7 Emergency management

Emergency management planning is necessary to mitigate bushfire risk.

The RFS and Fire and Rescue NSW are the primary emergency response agencies for any fire-related incident affecting the project footprint. The NPWS is also a fire-fighting agencies for bushfires occurring on their estate i.e. the Gardens of Stone SCA. In the case of a fire igniting in/around the project footprint:

- personnel who are present should attempt to extinguish the fire, if safe to do so
- others present on site should be alerted to the presence of the fire
- contact emergency services on 000
- evacuate personnel to a safe location.

A Bushfire Emergency Management and Evacuation Plan would be prepared and implemented for construction of the project in accordance with the *Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* (RFS, 2014). The plan would include elements of Transgrid's existing *Fire Risk Assessment and Control Measures* (FRACM) process.

6.3 Operation measures

6.3.1 Vegetation management

The main BPM for the project is the removal of vegetation from the new transmission easement and access tracks. Vegetation maintenance must prevent conductors encroaching on clearance distances under all conditions, including consideration of conductor sag due to higher temperatures, and conductor sway due to wind. Additionally, vegetation that has the potential to grow within vegetation removal zones beneath the conductors must also be removed. Hazard trees located adjacent to the easement would also be removed. All these factors would be considered as part of the detailed design process. Where the vertical distance between conductors and nearby vegetation exceeds the minimum requirement (allowing for regrowth), the transmission corridor may not need to be cleared.

6.3.2 Maintenance activities

Work activities, and particularly hot works carry a risk of igniting fires and must be managed. The risks and management measures to be employed are provided in Transgrid's *Hot Work and Fire Risk Work Procedure* (Transgrid, 2020). This procedure includes measures for determining when works must be suspended, such as during periods of elevated fire danger and TOBAN. The procedure does allow for some work activities to be carried out during these times, provided that conditions are met, including any and all requirements from the RFS.

6.3.3 Access tracks

While mainly used for vegetation management and infrastructure maintenance, access tracks may also provide access for bushfire management and response activities, as well as emergency egress in a fire event. This would only occur if fire crews assessed their condition to be suitable based on the access track itself and the fire weather conditions and fire behaviour during and fire event. Access tracks are not intended to provide defensible space in the case of fire but can be used as control line or for operational activities such as planned burning and direct or indirect attack of a fire front. They can also be utilised to evacuate or relocate people from the area.

The *Maintenance Plan – Easements and Access Tracks* (Transgrid, 2018) requires consideration of use by third parties, including as fire trails. As such, it is recommended that access tracks for the project meet the standards for a Category 9 fire trail (RFS, 2023)(see Appendix A).

6.4 Summary of mitigation measures

Table 6.1 lists the mitigation measures that would be implemented to manage the identified bushfire risks identified in section 5.

The mitigation measures recommended for the project are in accordance with a range of standards, requirements, and guidelines, including, but not limited to, the PBP (RFS, 2019) and NSW Fire Trail Standards (RFS, 2023).

Table 6.1 *Bushfire mitigation measures*

Impact	Environmental safeguard	Timing
Bushfire risk management	<p>A Bushfire Management Plan will be prepared and implemented as part of the Emergency Management Plan in consultation with the RFS and NPWS and include the following:</p> <ul style="list-style-type: none"> – asset protection zones (APZs) for construction compounds following consultation with adjacent landowners in related to APZ locations and management – avoidance of local concentration of bushfire fuels from vegetation removal – safe work procedures associated with hot works activities – safe work systems for workforce and firefighter safety from bushfire impacts, including location of any hazards and procedures to manage these hazards – induction and training of personnel, including risks and management measures associated with construction equipment and activities – firefighting equipment to be provided on site – details of site access and internal road plan – provision of adequate water supply for fire fighting. 	Pre-construction Construction
Bushfire emergency management planning	<p>The Emergency Management Plan to be developed for the project will include bushfire emergency management and an evacuation plan consistent with the Guide to Developing a Bush Fire Emergency Management and Evacuation Plan (RFS 2014). The Emergency Management Plan must address the requirements for evacuation routes and access as outlined in NSW Fire Trail Standards (RFS, 2023).</p>	Pre-construction Construction

7. Conclusion

This Bushfire Risk Assessment considers the potential bushfire risks arising from the construction and operation of the project, both in terms of the impacts on the project and impacts arising from the project.

The project footprint is largely considered to be bushfire prone land due to its position within vegetated areas associated with the Gardens of Stone SCA and vegetated areas remaining on the adjacent Mount Piper Power Station and various Centennial Springvale Coal Services facility properties. The vegetation intersected by the project forms part of a relatively small patch of vegetation, which is separated from much larger patches to the north and east by areas of agricultural land and mining operational infrastructure.

During construction and operation, the bushfire risks are associated with two main scenarios:

- The ignition and movement of fires from surrounding vegetation into the project footprint.
- The ignition of bushfires within the project footprint and movement into surrounding areas.

BPMs will be developed as part of a Bushfire Management Plan for the construction phase of the project based on guidance from PBP, electrical network industry sources and Transgrid's existing bushfire management procedures and controls. During operation, bushfire risk will be managed in accordance with Transgrid's existing bushfire management procedures and controls.

A key measure to minimise bushfire risk is the development of the Bushfire Management Plan, which would outline measures to minimise the risks from the two abovementioned scenarios. This would include the confirmation of the construction compounds to be used and the APZ requirements. The Bushfire Management Plan would be prepared in accordance with PBP (RFS, 2019) and in consultation with the RFS and NPWS.

Other measures include design of access tracks, including water crossings and entry/ access gates, to meet the relevant requirements outlined in *NSW Fire Trail Standards* (RFS, 2023) and preparation of a Bushfire Emergency Management and Evacuation Plan consistent with RFS guidelines.

Adoption of the measures described in this report is expected to reduce, to an acceptable level, both the risk of bushfire ignition by construction and/or operation of the project and the risk that bushfires in the landscape pose to the project across the construction and operation phases of the project.

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Appendix D

Aviation impact assessment

AVIATION IMPACT ASSESSMENT

**MOUNT PIPER TO WALLERAWANG
TRANSMISSION LINE UPGRADE PROJECT**

A large, abstract orange graphic consisting of two main shapes: a tall, narrow triangle on the left and a wider, shorter shape on the right with a curved top edge. The shapes are solid orange and set against a white background.

DOCUMENT CONTROL

Document Title: Mount Piper to Wallerawang Transmission Line Upgrade - Aviation Impact Assessment

Reference: 063707-01

Prepared by: P White

Reviewed by: L Wang

Released by: P White

REVISION HISTORY

<i>Version</i>	<i>Description</i>	<i>Transmitted</i>	<i>Reviewed by</i>	<i>Date</i>
0.1	First draft	20 December 2024	GHD	08 January 2025
0.2	Second draft (Rev A)	09 January 2025	Transgrid	11 January 2025
0.3	Third draft	06 February 2025	GHD	07 February 2025
0.4	Fourth draft	10 February 2025	GHD	13 February 2025
0.5	Fifth draft (Rev B)	14 February 2025	Transgrid	14 February 2025
0.6	Sixth draft	28 February 2025	GHD	03 March 2025
0.7	Seventh draft	03 March 2025	BJ	12 March 2025
0.8	Eight Draft	20 March 2025	BJ	21 March 2025
0.9	Ninth Draft	21 March 2025	BJ	24 March 2025
0.10	Tenth Draft	24 March 2025	BP	06 May 2025
1.0	Final	08 May 2025	Transgrid	19 May 2025
1.1	Final added feedback	19 May 2025	Transgrid	03 June 2025
1.2	Final additional feedback	04 June 2025	BJ	9 July 2025
1.3	Final Additional Feedback	17 July 2025		

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ACRONYMS

AAAA	Aerial Agricultural Association of Australia
AC	Advisory Circular
AGL	above ground level
AHD	Australian Height Datum
AIA	Aviation Impact Assessment
AIP	Aeronautical Information Package
AIS	Aviation Impact Statement
AMSL	above mean sea level
ARP	Aerodrome Reference Point
AS	Australian Standards
CAO	Civil Aviation Orders
CAR	Civil Aviation Regulation (1988)
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation (1998)
CSSI	Critical State Significant Infrastructure
DME	Distance measurement equipment
DPHI	Department of Planning, Housing and Infrastructure
EIS	environmental impact statement
ERC-H	en-route chart high
ERC-L	en-route chart low
ERSA	En Route Supplement Australia
GA	general aviation
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
HLS	Helicopter landing site
ICAO	International Civil Aviation Organization
IFR	instrument flight rules
ILS	Instrument Landing System
IMC	instrument meteorological conditions
LGA	local government area

LSALT	lowest safe altitude
MDA	minimum descent altitude
MOC	minimum obstacle clearance
MOS	Manual of Standards
MSA	minimum sector altitude
NASAG	National Airports Safeguarding Advisory Group
NASF	National Airports Safeguarding Framework
NDB	non-directional (radio) beacon
NEM	National Energy Market
NOTAM	Notice to Airmen
NPWS	NSW National Parks and Wildlife Service
OLS	obstacle limitation surface
PANS-OPS	Procedures for Air Navigation Services - Aircraft Operations
PSR	primary surveillance radar
RAAF	Royal Australian Air Force
REZ	Renewable Energy Zones
RFDS	Royal Flying Doctor Service
RFS	Rural Fire Service
RNP	required navigation performance
RSR	route surveillance radar
RWY	runway
SEARs	Secretary's Environmental Assessment Requirements
SSR	secondary surveillance radar
VFR	visual flight rules
VMC	visual meteorological conditions

UNITS OF MEASUREMENT

ft	feet	(1 ft = 0.3048 m)
km	kilometres	(1 km = 0.5399 nm)
m	metres	(1 m = 3.281 ft)
nm	nautical miles	(1 nm = 1.852 km)

DEFINITIONS

<i>Term</i>	<i>Definition</i>
Aerial Application Operator	Specialist pilot and/or company who are required to have a commercial pilot's licence, an agricultural rating and a chemical distributor's licence
Aerodrome	A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft.
Aerodrome reference point (ARP)	The designated geographical location of an aerodrome.
Aeronautical Information Publication (AIP)	Details of regulations, procedures, and other information pertinent to the operation of aircraft
Aeronautical Information Publication En-route Supplement Australia (AIP ERSA)	Contains information vital for planning a flight and for the pilot in flight as well as pictorial presentations of all licensed aerodromes
Civil Aviation Safety Regulations 1998 (CASR)	Contain the mandatory requirements in relation to airworthiness, operational, licensing, enforcement.
Instrument meteorological conditions (IMC)	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minimum specified for visual meteorological conditions.
Manual of Standards (MOS)	The means CASA uses in meeting its responsibilities under the Civil Aviation Act 1988 for promulgating aviation safety standards.
National Airports Safeguarding Framework (NASF)	The Framework has the objective of developing a consistent and effective national framework to safeguard both airports and communities from inappropriate on and off airport developments.
Obstacles	All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

<i>Term</i>	<i>Definition</i>
Runway	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.
Visual meteorological conditions (VMC)	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling that is required for visual flight.

EXECUTIVE SUMMARY

Legislative and policy context

Impacts to aviation safety from construction and operation of the project have been assessed in accordance with the relevant legislation and guidelines as they apply to aviation. Regulations and standards administered by the Civil Aviation Safety Authority, Airservices Australia and National Airports Safeguarding Advisory Group (NASAG) were considered. Consultation with the Department of Defence has also been undertaken to ensure no impact to its operations may arise as a result of the project.

The project

Transgrid proposes to deliver approximately 8 kilometres (km) of new 330 kilovolt (kV) transmission line and double circuit transmission structures located between the Mount Piper and Wallerawang 330 kV substations (the project). The project would incorporate sections of an existing, single-circuit 132 kV transmission line, where the two transmission lines would share a widened easement and transmission structures. The project is located within the Central West region of NSW within the Lithgow Local Government Area (Lithgow LGA).

The project is identified in the NSW Network Infrastructure Strategy (EnergyCo 2023) and also supports the key tenets of the NSW Electricity Infrastructure Roadmap (DPIE 2020). The Roadmap identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from Renewable Energy Zones (REZ) in inland NSW to key demand centres. The Mount Piper to Wallerawang Transmission Line Upgrade Project would provide the additional capacity required to reliably transmit power from the Central West Orana REZ to the Greater Sydney region.

Purpose of this report

This aviation impact assessment has been prepared as part of the Environmental Impact Statement (EIS) to assess potential aviation impacts from the construction and operation of the project. The assessment has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs).

Aviation Impact Statement (AIS)

An AIS has been completed with the following assessments being made within the parameters of the relevant assessment areas:

- The only certified aerodrome located within 30 nautical miles (nm) (55.56 km) of the project is Bathurst Aerodrome (YBTH) at a distance of 19 nm (35.2 km). The project would not impact any identified certified aerodromes.
- The project would not impact the Portland HLS.
- Further, the project would:
 - not impact the Grid and Air route Lowest Safe Altitudes (LSALTs)
 - be located wholly within Class G airspace, which is outside controlled airspace. It is not in any Prohibited, Restricted or Danger areas
 - be located outside the clearance zones for all aviation navigation aids of nearby certified airports
 - not impact the closest air traffic control radar facilities

- not impact the closest aviation communication facilities.

Obstacle lighting and marking

As the transmission line and the transmission structures do not infringe on any certified aerodrome OLS, there is no regulatory requirement to mark or light the transmission line structures or transmission lines.

Following consultation with landowners who may have a runway on their property, if a risk assessment is considered necessary, the following standards outlined in the AS 3891.2:2018 *Air navigation – Cables and their supporting structures – Marking and safety requirements Part 2: Low level aviation operations* will be followed.

Marking of the transmission line

Transmission lines that are located where the pilot considers that they could adversely affect aerial application operations on the particular day should be identified in consultation with local aerial application operators and the uncertified aerodrome operators.

Summary of recommended mitigation and management measures

1. A copy of this technical paper as well as the most recent design of the project with transmission line and structure coordinates and elevations will be provided to the stakeholders identified in Section 4 prior to construction, information received will be included in construction design and/or construction management plans, where relevant and in the final version of this technical paper
2. At locations where the transmission lines will impact existing aerial application operations, consultation will be undertaken with relevant landowners to identify appropriate mitigation arrangements such as the installation of aerial warning markers on the transmission lines (where feasible).
3. The final design of the transmission line structures with coordinates and elevations must be provided to the following stakeholders once the final design is confirmed:
 - AAAA: admin@aaaa.org.au
 - Airservices Australia: vod@airservicesaustralia.com
 - Department of Defence: land.planning@defence.gov.au
 - Relevant local landowners surrounding the project that conduct aerial operations (to a maximum of 5.5 km). This is so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information.
4. In the event a risk assessment is considered necessary, following consultation with aerial operators, the standards outlined in the AS 3891.2:2018 *Air navigation – Cables and their supporting structures – Marking and safety requirements Part 2: Low level aviation operations* will be followed.

1. INTRODUCTION

1.1. Background

The Australian and NSW governments have both established targets to achieve net-zero emissions by 2050. Achieving these targets requires low emissions technologies to be deployed at scale across all sectors of the economy, including the electricity generation sector, currently Australia's largest source of greenhouse gas emissions.

The NSW Transmission Infrastructure Strategy (DPE 2018) aims to engage the private sector to invest in priority energy infrastructure projects, which can deliver low-cost, clean and reliable energy to consumers.

As part of the Transmission Infrastructure Strategy, the NSW government has developed a plan to establish five Renewable Energy Zones (REZs) to increase renewable energy generation, reduce carbon emissions, and help deliver lower wholesale electricity costs to consumers. The Central-West Orana REZ (CWO REZ), being the first REZ established, is planned to generate at least 4.5 GW by the late-2020s.

The NSW Government's Electricity Infrastructure Roadmap (DPIE 2020) identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from REZs in inland NSW to key demand centres. Interest in new energy generation projects in the CWO REZ is forecasted to exceed the existing transmission network capacity in several locations. The existing infrastructure located between the Mount Piper 550/330 kilovolt (kV) substation (Mount Piper 330 kV substation) and the Wallerawang 330/132 kV substation (Wallerawang 330 kV substation) has been identified in the NSW Network Infrastructure Strategy (EnergyCo 2023) as requiring upgrades. The Mount Piper to Wallerawang Transmission Line Upgrade Project (the project) would provide the additional capacity required to reliably transmit power from the CWO REZ to the Greater Sydney region.

1.1.1. Location

The project is located within the Central West region of NSW within the Lithgow City Council Local Government Area (LGA). It is located approximately 14 kilometres (km) north-west of Lithgow situated on the western fringes of the Blue Mountains (Figure 1).

The area that is to be directly affected by the construction and operation of the project, is referred to as the project footprint and is shown in Figure 1. The project footprint is approximately 86.5 hectares in size and is generally bounded by the following:

- Castlereagh Highway to the north
- Former Wallerawang Power Station site to the east
- Gardens of Stone State Conservation Area (SCA) to the south
- Mount Piper Power Station to the north-west.
- Land uses within and adjacent to the project footprint include:
 - Electricity generation at Mount Piper Power Station
 - Electricity transmission, including the Mount Piper and Wallerawang 330 kV substations, and associated transmission lines
 - Mining activities, with several Centennial Coal operations including the former Ivanhoe Coal Mine and Springvale Coal Services overlapping the project footprint
 - Agriculture, primarily livestock grazing

- Conservation, notably the Gardens of Stone SCA
- State and local road reserves including the Castlereagh Highway, Boulder Road and Brays Lane
- Rail corridors including the Main Western Rail Line and a disused railway line near Brays Lane.

A mixture land uses are proposed at the former Wallerawang Power Station site. This may include commercial and industrial land use. Development of a Battery Energy Storage System is also proposed by others at the site.

AVIATION PROJECTS

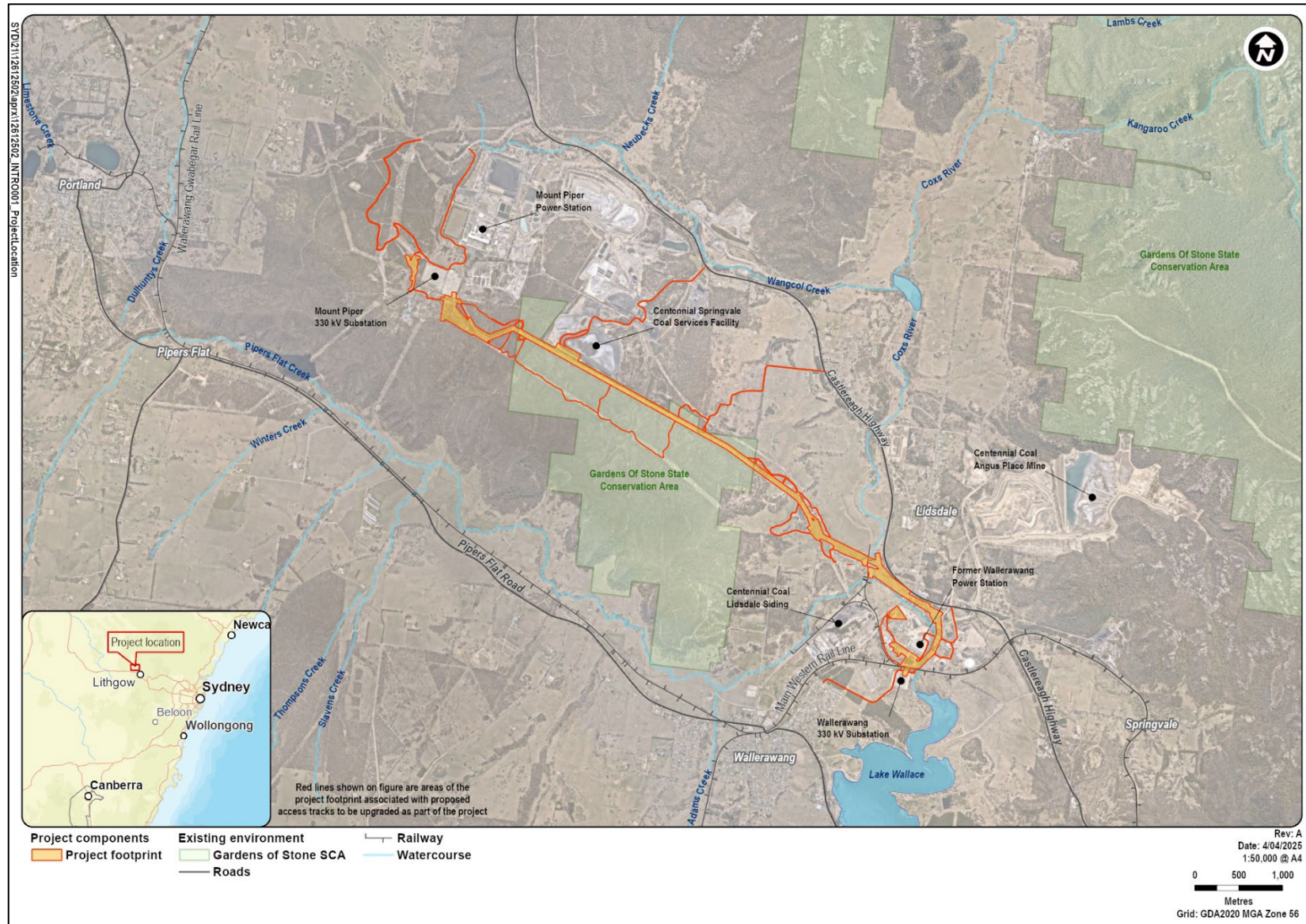


Figure 1 Project location and regional context

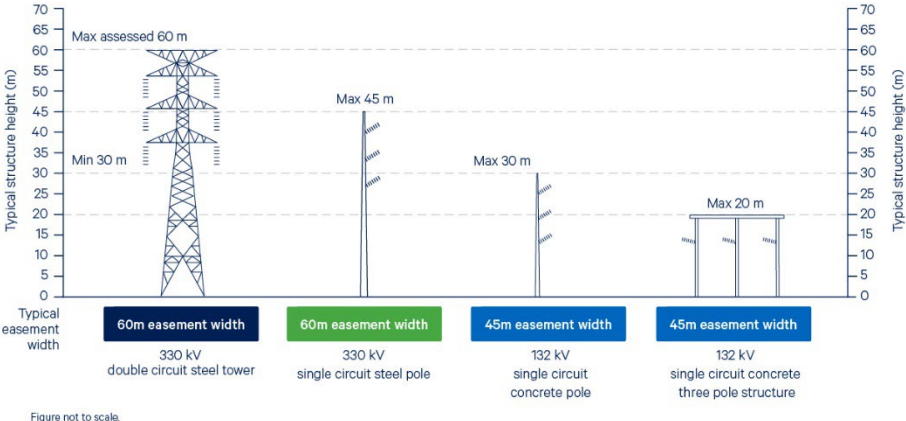
1.2. The project

The project would involve construction and operation of approximately 8 km of new 330 kV transmission line between the Mount Piper and Wallerawang 330 kV substations as shown in Figure 2. The project would also include the replacement of transmission structures, partial adjustment of existing transmission lines, permanent and temporary access tracks, construction compounds and laydown areas.

Table 1 outlines the key features of the project. The description of the project in Table 1 is based on the current concept design. Further detail is provided in Chapter 3 of the Environmental Impact Statement (EIS). The project will continue to be refined as part of detailed design.

Table 1 The Project

Feature	Description
Design	
Transmission line and easement	<p>Approximately 8 km of new 330 kV transmission line between the existing Mount Piper 330 kV and Wallerawang 330 kV substations that would include (from west to east):</p> <ul style="list-style-type: none"> – widening of approximately 0.5 km of existing easements in the vicinity of the Mount Piper 330 kV substation by up to 40 m to accommodate the new 330 kV transmission line and adjustments to existing 132 kV and 330 kV transmission lines – widening of the existing 132 kV easement from 45 m to 60 m for 4.8 km to accommodate double circuit transmission structures for the existing 132 kV transmission line and the new 330 kV transmission line – installation of two 132 kV pole structures where the existing 132 kV transmission line is restrung onto the new double circuit transmission structures – construction of 1.2 km of new 330 kV transmission line from the existing 132 kV transmission line south-east to the intersection of Main Street and the Castlereagh Highway on a 60 m easement – construction of 1.5 km of new 330 kV transmission line on a 40 m easement running parallel to existing 330 kV transmission lines for approximately 1.1 km and then diverging and widening to 60 m for the remaining 0.4 km to the Wallerawang 330 kV substation. <p>The standard easement widths for 132 kV and 330 kV transmission lines are 45 m and 60 m respectively. However, easements may vary in width where multiple transmission lines converge/ diverge or where they overlap with an existing easement.</p>
Transmission structures	<p>Transmission structures for the project include approximately 28 new steel lattice towers and four steel and/or concrete pole structures. Transmission structures would range in height from approximately 14 to up to 60 m, however these heights would be subject to detailed design. The image below presents an indicative illustration of the types of structures proposed for the project and their maximum heights.</p>

Feature	Description																																																																																																																														
	 <p>The diagram illustrates the typical structure heights and easement widths for four different transmission structures. The y-axis represents the typical structure height in meters, ranging from 0 to 70. The x-axis represents the typical easement width in meters. The structures are: 1) 330 kV double circuit steel tower with a height of 60m and a 60m easement width; 2) 330 kV single circuit steel pole with a height of 45m and a 60m easement width; 3) 132 kV single circuit concrete pole with a height of 30m and a 45m easement width; 4) 132 kV single circuit concrete three pole structure with a height of 20m and a 45m easement width. A note below the diagram states 'Figure not to scale'.</p> <p>The steel transmission structures would generally be spaced between 100 m to 550 m apart and the pole structures about 30 m to 50 m apart.</p> <p>New conductors, earth wires and optical ground wire (OPGW) would be installed on the new transmission structures for the new 330 kV and existing 132 kV lines.</p> <p>Local adjustment of existing transmission structures would be required in the vicinity of the Mount Piper 330 kV substation to minimise crossover of transmission lines.</p> <p>Redundant transmission structures, including the gantry immediately north of the Main Western Rail Line, would be removed and recycled, where possible.</p>																																																																																																																														
Construction																																																																																																																															
Program	<p>Construction of the project would commence once all necessary approvals are obtained. It is anticipated that construction would commence in late 2026.</p> <p>Construction would be undertaken in stages over a period of approximately 20 months. The key activities and their indicative durations shown in the below table.</p> <table border="1" data-bbox="391 1258 1364 1545"> <thead> <tr> <th>Activity</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> <th>12</th> <th>13</th> <th>14</th> <th>15</th> <th>16</th> <th>17</th> <th>18</th> <th>19</th> <th>20</th> </tr> </thead> <tbody> <tr> <td>Site establishment</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Civil works</td> <td></td> <td></td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Assembly of structures</td> <td></td> <td></td> <td></td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Testing and commissioning</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> <td>█</td> </tr> <tr> <td>De-mobilisation</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>█</td> </tr> </tbody> </table>	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Site establishment	█	█	█	█																	Civil works			█	█	█	█	█	█	█												Assembly of structures				█	█	█	█	█	█	█											Testing and commissioning											█	█	█	█	█	█	█	█	█	█	De-mobilisation																				█
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Construction methodology	<p>Construction of the project would include:</p> <ul style="list-style-type: none"> – site establishment including vegetation removal, construction compound establishment, access track construction and upgrade – removal of existing transmission structures where required – civil works involving earthworks and establishment of construction benches for each transmission structure, and establishment of brake and winch sites – construction of footings and foundation work for the new transmission structures – assembly and erection of new transmission structures – stringing of conductors. 																																																																																																																														
Construction hours	<p>The proposed construction working hours for the project are 7 am to 7 pm Monday to Sunday.</p>																																																																																																																														

Feature	Description
	<p>Out-of-hours construction work will likely be required between 7 pm to 7 am Monday to Sunday and public holidays, to align with scheduled outages.</p> <p>Justification for the out-of-hours works includes:</p> <ul style="list-style-type: none"> – proximity to live transmission lines requiring the work to be completed under a scheduled outage for network and personnel and contractor safety – the need to complete works within a limited time window to meet a timeframe to re-energise the transmission line to avoid disruption to customers – minimising disruptions to the use of the Main Western Rail Line during stringing.
Construction workforce	<p>Expected to peak at about 150 personnel and contractor, with an average workforce of about 60 personnel and contractor.</p>
Construction compounds and laydown areas	<p>A total of three construction compounds would support the construction of the project. One would be located at the western end of the project near the Mount Piper 330 kV substation and two located at the eastern end of the project within the former Wallerawang Power Station site. The locations of these compounds are shown in Figure 2.</p> <p>Laydown of materials (e.g. poles, cable drums, other large equipment, etc.) would also occur at specified locations along the easement within the project footprint, particularly at transmission structure locations.</p>
Access	<p>To facilitate efficient construction access, the following is required:</p> <ul style="list-style-type: none"> – upgrading and widening of approximately 25 km of existing access tracks to at least 6 m, with some sections widened up to 10 m due to local topography – construction of approximately 2 km of new 6 m wide access tracks. <p>In addition to those tracks, approximately 4 km of existing track would be used only by light vehicles. The light vehicle tracks may require minor repairs (for example, filling potholes), but would not be graded or widened.</p> <p>The project footprint would be accessed from public roads at 13 access points, with the majority of these being existing property access points.</p> <p>Existing access tracks would be used in preference to new tracks wherever possible. Access track upgrades and widening would include required drainage.</p> <p>Access points and access tracks established for the construction of the project that are not required for future operation and maintenance activities would be returned to pre-project conditions, subject to agreement with landowners.</p>
Utility adjustments and infrastructure crossings	<p>The new transmission line would need to cross the following utilities and infrastructure:</p> <ul style="list-style-type: none"> – water pipeline operated by WaterNSW – distribution lines operated by Endeavour Energy – rail signal power supply – council drainage and other assets – public roads at Brays Lane and Main Street – rail lines at the Main Western Rail Line and the disused rail line travelling north of Brays Lane. <p>It is not currently anticipated that the project would require the adjustment of any nearby utilities. Further investigations and consultation with asset owners would be undertaken during detailed design.</p>

Feature	Description
Vegetation clearing	<p>The project would require the clearance of vegetation for a number of activities including but not limited to building new access tracks and widening existing ones, establishment of construction compounds, laydown areas, and brake and winch sites, construction of the transmission structures, and establishing and maintaining the vegetation clearance requirement for the transmission lines.</p> <p>Vegetation clearing would be undertaken either with the use of machinery or manually, where it is unsafe to operate machinery, or when access is limited. Root balls would be retained where possible. Clearing methods would be determined with consideration to vegetation type or structure, slope and terrain, and environmental and ecological constraints. Removed vegetation, which is weed free, would be mulched for beneficial reuse, where appropriate.</p> <p>Areas cleared for construction, that are not needed for operation of the project, would be rehabilitated to a stable and weed free condition.</p>
Testing and commissioning	<p>Testing and structure checks would form part of the final construction and installation work. These activities would ensure the project has been installed in accordance with the design and statutory standards and is safe to proceed to commissioning which would include, but not be limited to:</p> <ul style="list-style-type: none"> – transmission line cut-in and connection to the electrical network – protection, control and metering checks – high voltage equipment operation and energisation – post commissioning testing and verification.
Demobilisation and rehabilitation	<p>Upon completion of the construction works, all construction equipment, temporary fencing and waste would be removed.</p> <p>All disturbed areas would be rehabilitated to a stable, weed-free condition, unless designated as a permanent access track. This would include spreading topsoil, cleared and stockpiled at the beginning of construction, across the disturbed area to stabilise it to a state where natural regrowth can occur.</p>
Operation	
Design life	About 50 years.
Maintenance	<p>All project infrastructure would require regular maintenance to maintain serviceability and maximise its operational life. Maintenance activities would include:</p> <ul style="list-style-type: none"> – transmission structure monitoring – annual aerial inspection – routine vegetation management on the easement and in the hazard tree zone – access tracks would be maintained in a trafficable condition. <p>Should any irregularities be identified following routine inspections, a work crew would be dispatched from existing Transgrid maintenance depots to rectify any defects found.</p> <p>Periodic inspection and maintenance work would be managed by Transgrid as part of existing operations, with no additional staff requirements.</p>

AVIATION PROJECTS

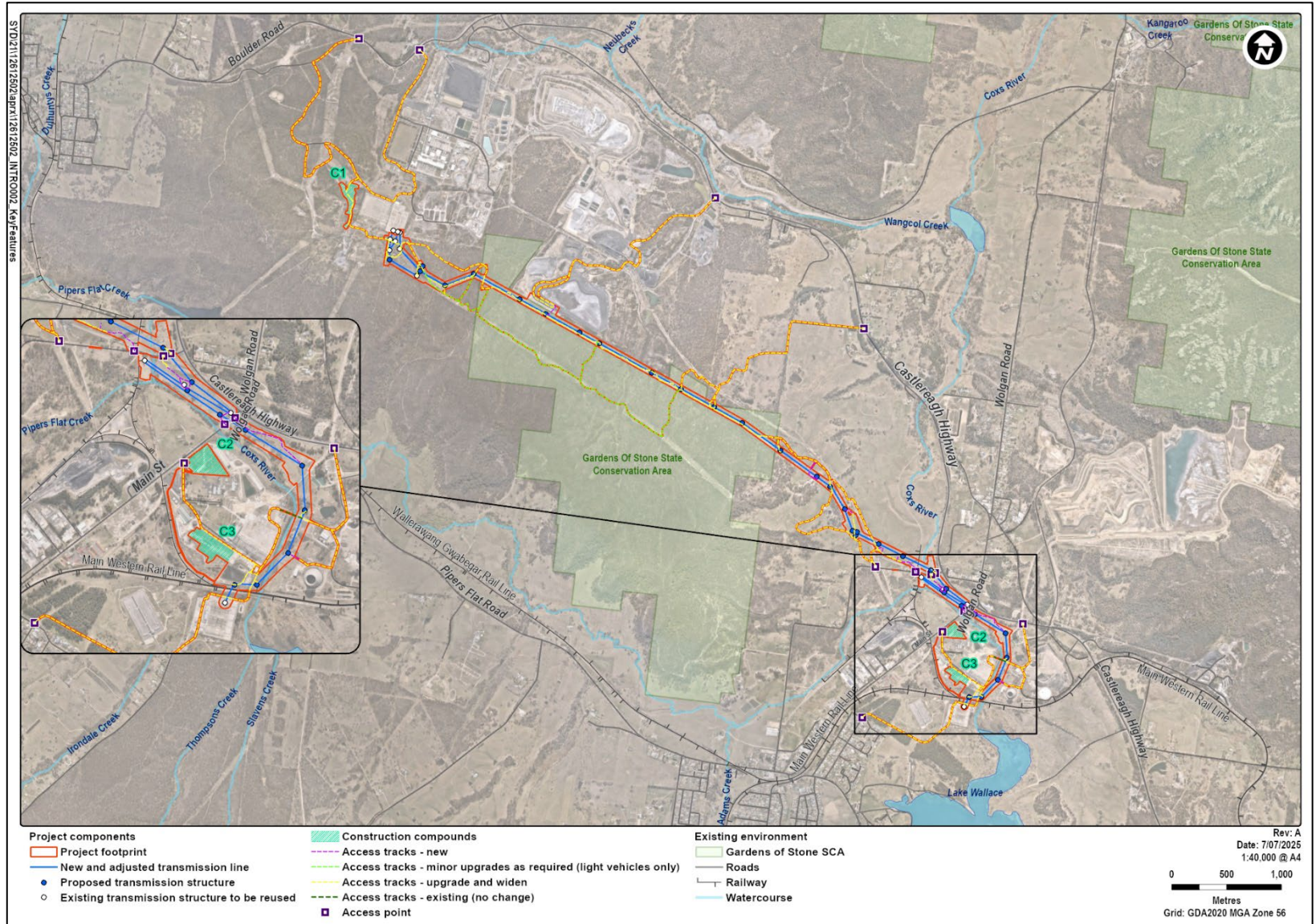


Figure 2 Key features of the project

1.2.1. Environmental assessment requirements

This aviation assessment has been prepared to address the Secretary’s Environmental Assessment Requirements (SEARs) which were issued on 22 May 2025. Table 2 outlines the requirements relevant to this assessment.

Table 2 Relevant Secretary’s Environmental Assessment Requirements – Aviation

<i>Reference</i>	<i>Secretary’s environmental assessment requirements</i>	<i>Where addressed in this technical paper</i>
Key issues: Hazards	Assess potential impacts on aviation safety, including:	
	<ul style="list-style-type: none"> defined air traffic routes, 	Section 6.3
	<ul style="list-style-type: none"> aircraft operating heights, 	Section 3.5
	<ul style="list-style-type: none"> approach / departure procedures, 	Sections 6.1.1.1 and 6.2.4.1
	<ul style="list-style-type: none"> radar interference, 	Section 6.5.2
	<ul style="list-style-type: none"> communication systems, 	Section 6.5.3
	<ul style="list-style-type: none"> navigation aids, 	Section 6.5.1
	<ul style="list-style-type: none"> use of emergency helicopter access, 	Section 4.7
	<ul style="list-style-type: none"> aerial baiting and culling in the National Parks, 	Section 4.6
	<ul style="list-style-type: none"> safe and efficient aerial application of agricultural fertilisers and pesticide, and aerial fire control 	Section 4.5 and 4.8
	<ul style="list-style-type: none"> identify certified aerodromes within 30 km of the transmission line and uncertified aerodromes and landing areas within 10km of the transmission line, and consider the impact to nearby aerodromes, aircraft landing areas, 	Section 6
	<ul style="list-style-type: none"> address impacts on obstacle limitation surfaces, 	Sections 6.1.1.5
	<ul style="list-style-type: none"> identify aviation marking requirements, if any. 	Section 7

1.3. Purpose of this report

This Aviation Impact Assessment (AIA), including the Aviation Impact Statement (AIS), has been prepared by Aviation Projects as part of the Environmental Impact Statement (EIS) for the project.

The purpose of this AIA is to identify and assess the potential aviation impacts in relation to the construction and operation of the project.

This report has been compiled to satisfy the reporting assessment requirements of both the SEARs and the Airservices Australia assessment process described in Section 5. The AIA includes information and assessment that is required by the SEARs but is not required by Airservices Australia to conduct their assessment. The AIS section of this AIA is a specified set of information and assessment that is required by Airservices Australia to conduct their assessment as specified here (www.airservicesaustralia.com/industry-info/airport-development-assessments/). The most limiting factor from each process is used across the report. For example, where the

AIS requires an area of 55.6 km to be searched for certified aerodromes and the SEARs requires 30 km, the most limiting 55.6 km has been assessed.

- This report has been prepared with consideration of regulations and guidelines of the Civil Aviation Safety Authority
 - *Civil Aviation Regulations 1998 (CAR)*.
 - *Civil Aviation Safety Regulations 1998 (CASR)*.
 - *CASR Part 139 Manual of Standards– Aerodromes*, dated February 2024.
 - *CASR Part 173 Manual of Standards– Standards Applicable to Instrument Flight Procedure Design*, version 1.7, dated August 2020.
- National Airports Safeguarding Framework (NASF)
 - *NASF Guideline F: Managing the Risk of Intrusions into the Protected Airspace of Airports*
 - *NASF Guideline G: Protecting Aviation Facilities—Communications, Navigation and Surveillance*
- International Civil Aviation Organization (ICAO)
 - *Doc 8168 Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS)*.
 - *ICAO Standards and Recommended Practices, Annex 14—Aerodromes*.

It should be noted that imperial units are predominately used in aviation. Some values are provided in both imperial and metric for ease of reading, where the regulation refers to imperial, this is left so as to not introduce error.

1.4. Structure of this report

The structure and content of this technical paper is as follows:

- Section 1 – Introduction
- Section 2 – Assessment approach and methodology
- Section 3 – Legislative and policy context
- Section 4 – Existing aviation operations
- Section 5 – Consultation
- Section 6 – Aviation Impact Statement
- Section 7 – Obstacle lighting and marking
- Section 8 – Recommended management and mitigation measures

1.5. Limitations

This report relies on publicly available data, which may not represent the most current information regarding uncertified aerodrome operations. Additionally, uncertified aerodromes are not required to be registered with CASA or Airservices Australia, leading to the potential of incomplete data regarding their operations.

The report has been compiled using the latest regulatory rules and guidelines available at the time of publication. However, future changes in regulations may affect the accuracy or relevance of the findings.

2. ASSESSMENT APPROACH AND METHODOLOGY

This section summarises the legislation, guidelines and/or policies driving the approach to the assessment.

The SEARs relevant to aviation and where they have been addressed in this report are discussed in Section 1.2.1.

2.1. Methodology

This AIA has been prepared in accordance with the following methodology:

1. review the project and establish the relevant compliance framework
2. identify all certified aerodromes that are located within 30 nautical miles (nm) (55.5 km) of the project
3. nominate all instrument approach and landing procedures at these aerodromes
4. identify the Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces associated with the certified aerodromes
5. assess any potential infringements to the OLS and PANS-OPS surfaces as a result of the construction and operation of the project
6. review the potential effect of the construction and operation of the project in relation to the operational airspace of the aerodromes
7. identify air routes published in aeronautical charts which are located near/over the project and review potential impacts of the construction and operation of the project on aircraft using those air routes
8. assess likely impacts of the project on aeronautical navigation facilities
9. identify relevant civil aviation safety requirements/standards with respect to existing aerodrome conditions and whether these standards are met
10. assess low level flight operations including agricultural spraying operations, aerial baiting and culling, and aerial firefighting in the area
11. conduct consultation with airports and aircraft operating agencies that may be impacted by the project, as well as any nearby landowners
12. provide recommendations to minimise impacts and ensure aviation safety is maintained throughout the construction and operation of the project.

2.2. Cumulative impact assessment methodology

Section 21.2 of the EIS outlines the methodology for the assessment of cumulative impacts including the methods for identifying what projects have been considered as part of the issue-specific cumulative impact assessments for the project. The assessment has been undertaken in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects guidelines* (DPIE, 2022).

In accordance with the guidelines, the cumulative impact assessment has considered relevant future projects that could result in a material impact on aviation. A study area for the cumulative impact assessment was selected based on a conservative potential extent of direct and indirect cumulative impacts.

The following 10 projects within 20 km of the project footprint were identified for consideration as part of the cumulative impact assessment:

- Wallerawang Battery Energy Storage System
- Mount Piper Battery Energy Storage System
- Great Western Battery Energy Storage System
- Pinecrest Battery Energy Storage System
- Lake Lyell Pumped Hydro Energy Storage
- Ben Bullen Wind Farm
- Sunny Corner Wind Farm
- Wallerawang Power Station Ash Dam
- Wallerawang residential subdivision (DA226/22)
- Wallerawang Station upgrades.

Future projects were considered where they are within the AIA study area outlined in section 2.3, with these projects largely consisting of major projects within the study area. A scoping process was then used to determine if a project may result in a significant impact and thus warranted further assessment.

2.3. Study area

The study area for this assessment is defined as areas within 30 nm (55.6 km) of the transmission line. This lateral distance has been chosen to comply with the requirements of Airservices Australia to identify potential impacts to certified aerodromes.

A full list of assessed projects can be found in Annexure 3.

3. LEGISLATIVE AND POLICY CONTEXT

3.1. Civil Aviation Safety Authority requirements

The CASA is the government body responsible for civil aviation safety, that administers various Commonwealth Acts of Parliament and Regulations related to aviation safety in Australia.

References to relevant regulations and guidance material is included at appropriate sections within this report and included in Annexure 1.

CASA's main role is related to the safety of the public during air transport flight operations and in the vicinity of certified aerodromes. In other areas, they can provide advice to planning authorities as to whether a tall structure may cause a hazard to aviation activities.

CASA applies international standards determined by the International Civil Aviation Organisation (ICAO) and ensures they are adapted to best fit the civil aviation legislative landscape in Australia.

3.1.1. Protection of Obstacle limitation surfaces

The first group of criteria are used to determine the OLS for a runway. Criteria for determining these surfaces are established by the ICAO. In Australia, CASA publishes these criteria (including any differences from ICAO) in the Manual of Standards for Part 139 of the Civil Aviation Safety Regulations.

Structures, trees or other activities that intrude into the OLS could constitute obstacles to aircraft taking off or approaching to land. The OLS for an airport charts the volume and dimensions of operational airspace that should be kept free of obstacles to aircraft operations being conducted under Visual Flight Rules (VFR) or during the visual stages of Instrument Flight Rules (IFR) operations.

It is important to note that the OLS does not prohibit all intrusions. The aim is to ensure that all objects that intrude into the OLS can be visually identified and assessed by the pilot in command and the aerodrome operator for their potential impact on aircraft operations. The assessment will enable a determination on whether the intrusion is permissible, and if so, a determination on whether any risk mitigation requirements should be imposed.

The requirements to protect operational airspace will be enforced most rigorously along the extended centrelines of runways in the approach and take-off areas. This could extend up to 15 km from the ends of runways at major and regional airports. Other OLS surfaces that protect aircraft circling to land may also extend up to 15 km from major airports.

The effects of individual obstacles may be relatively minor, but together a number of obstacles may seriously limit runway utilisation, cause airspace congestion and reduce the effective handling capacity of the airport. It is therefore important to understand that the pre-existence of a structure or other intrusion into operational airspace does not necessarily mean that a new proposal to penetrate operational airspace will be approved under Commonwealth legislation.

Land use planning authorities and state/territory governments should be aware that all intrusions into the OLS have the potential to create aviation safety risks and to limit the scope of aviation operations into and out of the airport.

3.1.2. Protection of instrument operations

A second group of criteria is used to determine the volumes and dimensions of airspace required to protect the safety of IFR operations. Under IFR operations, pilots fly aircraft relying on instruments for navigation. Airspace protection for IFR operations cannot allow for any long-term penetrations.

ICAO established these criteria which are published in a Document 8168 titled 'Procedures for Air Navigation Services – Operations (PANS-OPS)'. The surfaces determined by using the criteria in the PANS-OPS publication are called PANS-OPS surfaces.

The PANS-OPS surfaces are used in the construction of take-off, landing and approach procedures based entirely on navigation with sole reference to aircraft instruments. They are designed to protect aircraft from colliding with obstacles when weather conditions do not allow pilots to navigate visually in reference to the ground or water. Minimum safe altitudes are established for each segment of an instrument procedure.

If it is agreed by all stakeholders that a long-term penetration of the PANS-OPS surfaces is essential, the PANS-OPS surfaces must be raised so they are clear of the development causing the penetration. However, this may also have operational penalties for airport operations and could have community impacts, such as re-design of flight paths that increase the population exposed to high levels of aircraft noise.

3.2. Airservices Australia requirements

Airservices Australia provide air traffic control services in Australia along with the Aeronautical Information Publication (AIP), including instrument flight procedures and aeronautical charting. They also maintain the aeronautical database containing aeronautical data and obstacle data. Further discussion regarding Airservices Australia's roles and responsibilities via their website and in Section 1.

3.3. National Airports Safeguarding Framework

The National Airports Safeguarding Advisory Group (NASAG) was established by the Commonwealth Department of Infrastructure, Transport, Regional Development, Communications and the Arts to develop a national land use planning framework called the National Airports Safeguarding Framework (NASF). The purpose of the NASF is to enhance the current and future safety, viability, and growth of aviation operations at Australian airports through:

- the implementation of best practices in relation to land use assessment and decision-making in the vicinity of airports
- assurance of community safety and amenity near airports
- better understanding and recognition of aviation safety requirements and aircraft noise impacts in land use and related planning decisions
- the provision of greater certainty and clarity for developers and landowners
- improvements to regulatory certainty and efficiency
- the publication and dissemination of information on best practice in land use and related planning that supports the safe and efficient operation of airports.

NASF Guideline F provides guidance to State/Territory and local government decision makers as well as airport operators to jointly address the issue of intrusions into the operational airspace of airports by tall structures, such as buildings, cranes and transmission lines, as well as trees in the vicinity of airports.

This AIA has assessed all potential aviation activities within the vicinity of the project footprint including recreation, commercial, civil (including for agricultural purposes) and military operations.

3.4. Aircraft operations at non-controlled aerodromes

There are non-controlled aerodromes in the vicinity of the study area as defined in Section 2.3. Advisory Circulars (ACs) provide advice and guidance from CASA to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements. AC 91-10 v1.4 *Operations in the vicinity of non-controlled aerodromes* provides guidance for pilots flying at or in the vicinity of non-controlled aerodromes, with respect to CASR 91.

A conventional circuit pattern and heights are provided in AC 91-10. The standard circuit consists of a series of flight paths known as *legs* when departing, arriving or when conducting circuit practice, while some aircraft (such as helicopters) are not required to conform to this standard circuit, many operators of helicopters elect to follow the standard circuit to maintain a higher level of safety.

CASR 91.390 allows aircraft to manoeuvre as required from an aerodrome. However, if other traffic is already within the circuit area it would be safest to follow the flow of established traffic and operate contra (opposite) circuits in line with AC 91-10 for helicopter operations.

Illustrations of the standard aerodrome traffic circuit procedures provided in AC 91-10 are shown in Figure 3 and Figure 4 (source: CASA).

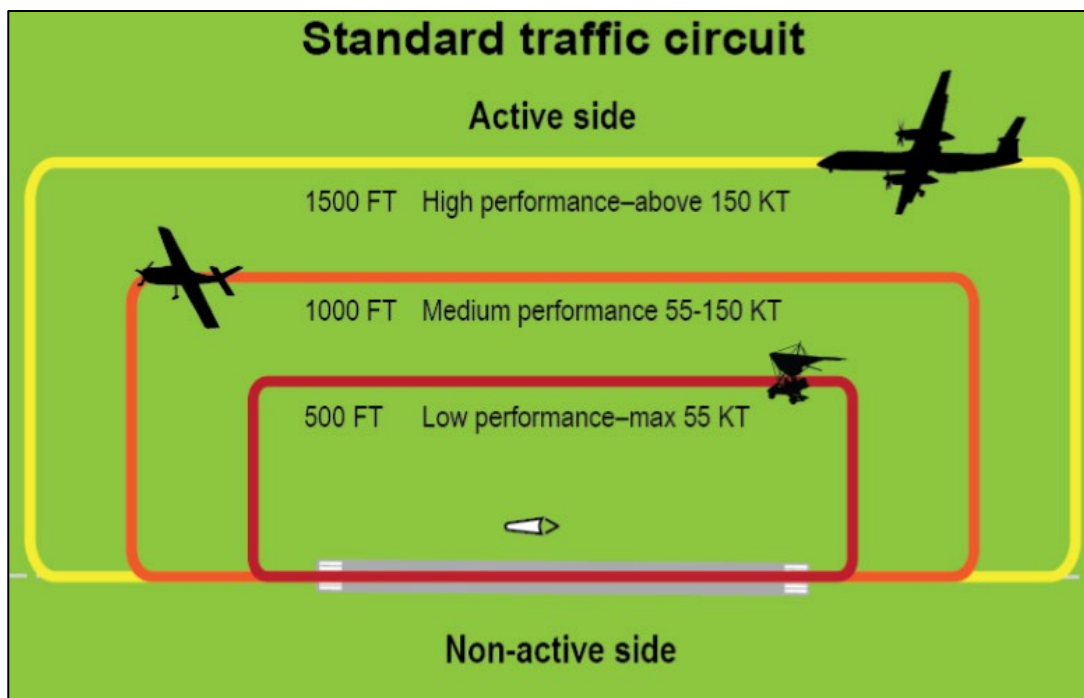


Figure 3 Lateral and vertical separation in the standard non-controlled aerodrome traffic circuit

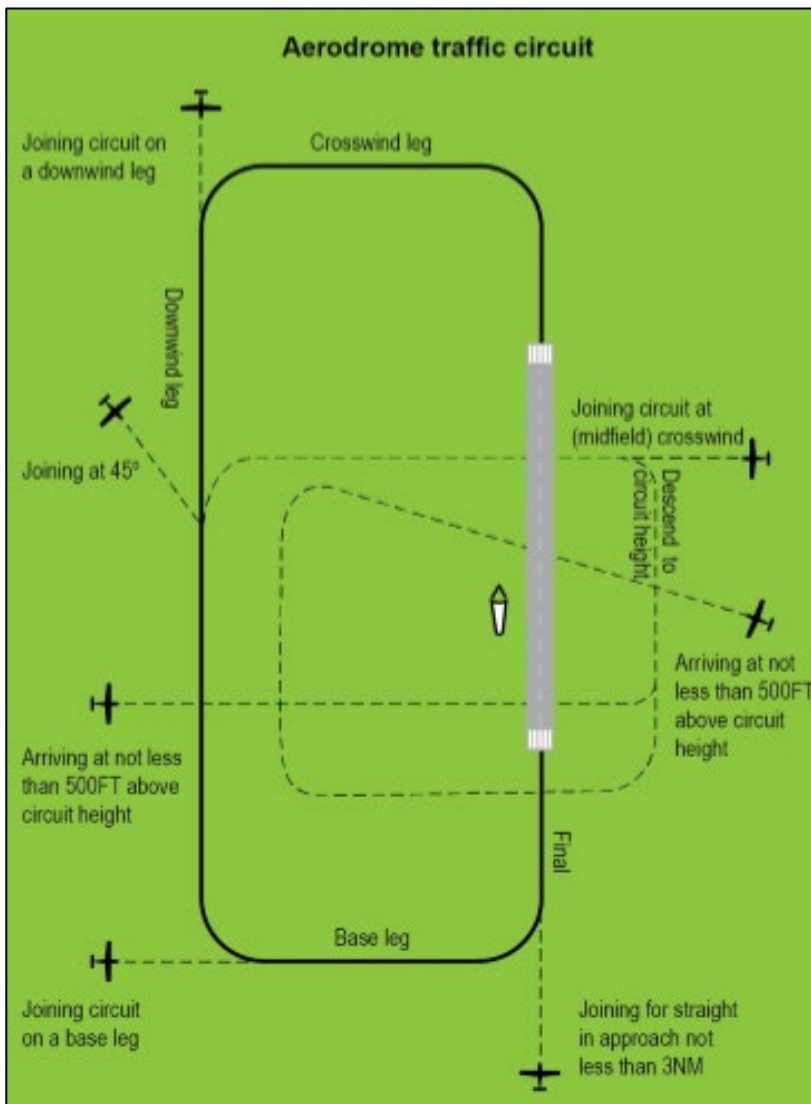


Figure 4 Uncontrolled aerodrome standard traffic circuit, showing arrival and joining procedures

AC 91-10 paragraph 7.11 makes reference to a distance that is “normally” well outside the circuit area and where no traffic conflict exists, which is at least 3 nm (5556 m). The paragraph is copied below:

7.11 Departing the circuit area

7.11.1 Aircraft should depart the aerodrome circuit area by extending one of the standard circuit legs or climbing to depart overhead. However, the aircraft should not execute a turn to fly against the circuit direction unless the aircraft is well outside the circuit area and no traffic conflict exists. This will normally be at least 3 NM from the departure end of the runway, but may be less for aircraft with high climb performance. In all cases, the distance should be based on the pilot’s awareness of traffic and the ability of the aircraft to climb above and clear of the circuit area.

3.5. Rules of flight

3.5.1. Flight under Day VFR

According to Aeronautical Information Publication (AIP), the meteorological conditions required for visual flight in Class G airspace is established in Table 3 below. The project is wholly located within uncontrolled airspace (Class G) airspace. The majority of low altitude airspace in Australia is uncontrolled and as such is designed as Class G.

CASR 91.267 (Minimum height rules—other areas) prescribes the minimum height for flight. Generally speaking, and unless otherwise approved, aircraft are restricted to a minimum height of 500 feet AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas, and 1000 feet AGL over built up areas (within a horizontal radius of 600 m of the point on the ground or water immediately below the aeroplane).

Flight below these height restrictions is also permitted in certain other circumstances as listed in CASR 91.265, 91.267. Outside of these exemptions (such as taking off and landing an aircraft) aircraft would not normally be operated at the same height as the project. In circumstances where the flight operation has approval to operate at the same level as the project a thorough risk assessment must be undertaken for each operation.

3.5.2. Night VFR

With respect to flight under the VFR at night, CASR 91.277 requires that the pilot in command of an aircraft flying VFR at night must not fly below the following heights (unless during take-off and landing operations, within 3 nm miles of an aerodrome, or with an air traffic control clearance):

- a) *the published lowest safe altitude for the route or route segment (if any);*
- b) *the minimum sector altitude published in the authorised aeronautical information for the flight (if any);*
- c) *the lowest safe altitude for the route or route segment;*
- d) *1,000 ft above the highest obstacle on the ground or water within 10 nautical miles ahead of, and to either side of, the aircraft at that point on the route or route segment;*
- e) *the lowest altitude for the route or route segment calculated in accordance with a method prescribed by the Part 91 Manual of Standards for the purposes of this paragraph.*

3.5.3. IFR Day or night

According to CASR Part 91, flight under the IFR requires an aircraft to be operated at a height clear of obstacles that is calculated according to an approved method. Obstacle lights on structures not within the vicinity of an aerodrome are effectively redundant to an aircraft being operated under the IFR.

4. EXISTING AVIATION OPERATIONS

4.1. Aircraft operator characteristics

Flying training may be conducted under either the IFR or VFR. Other general aviation (GA) operations under either IFR or VFR are also likely to be conducted at both certified and uncertified aerodromes in the area.

Operations conducted under VFR are required to remain in visual meteorological conditions (VMC) Table 3 provides VMC requirements for both aircraft and helicopters (source: CASR Part 91 MOS).

Table 3 VMC requirements

<i>Class of airspace</i>	<i>Height/operating height (as per SEARs)</i>	<i>Flight visibility</i>	<i>Distance from cloud</i>	<i>Operational requirements</i>
A, C, E or G	At or above 10,000 feet AMSL	8 km	1,500 m horizontal and 1,000 ft vertical	
A, C, E or G	Below 10,000 feet AMSL	5 km	1,500 m horizontal and 1,000 ft vertical	
D	All heights	5 km	600 m horizontal and, 1,000 ft vertical above cloud and, 500 ft vertical below cloud	
G	At or below whichever is the higher of 3,000 feet AMSL or 1,000 feet AGL	5 km	Clear of cloud	In sight of ground or water Radio must be carried and used on appropriate frequency (MOS 26.18)
G (Helicopter only)	Below 700 ft over land Below 700 ft over water with track guidance from navigation system	800 m	Clear of cloud	Overwater with/without track guidance from navigation system
G (Helicopter only)	Below 700 ft over water without track guidance from navigation system	5 km	600 m horizontal and 500 ft vertical	Overwater without track guidance from a navigation system

Flight under day VFR is conducted above 500 feet (152.4 m) above the highest point of the terrain within a 300 m radius unless the operation is approved to operate below 500 feet above the highest point of the terrain in line with CASR 91.267.

Generally, transmission lines are less visible than the transmission line structures, but pilots can usually see more than one structure and determine where the transmission lines are. The transmission line will be depicted on aeronautical charts to assist pilots to determine the direction of them in relation to their flight path. It is also expected that the transmission line structures would be sufficiently visible to pilots conducting VFR operations within the vicinity of the project to enable them to see them in sufficient time to avoid them and the transmission lines by the appropriate margin according to the type of flight being conducted. It is normal practise for pilots to be taught how to navigate visually across the country by using landmarks such as transmission lines and transmission line structures.

4.2. Passenger transport operations

Air transport operations may occur in the area, especially if the Wolgan Valley resort is to reopen in the future. Further discussion regarding the Wolgan Valley resort is located in Section 6.2.5.

Air transport operations are generally operated under the IFR. These operations are protected by PANS-OPS and the OLS. These operations are assessed in Section 6.

4.3. Private operations

Private operations are generally conducted under day or night VFR, with some IFR. Flight under day VFR is conducted above 500 feet AGL but generally at a much higher altitude for passenger comfort and fuel efficiency.

4.4. Military operations

There may be some high-speed low-level military jet aircraft, transport aircraft, tactical operations and helicopter operations conducted in the area. Military operations are conducted under separate but compatible regulations and standards, including obstacle separation requirements.

4.5. Aerial application operations

Aerial application operations including such activities as fertiliser, pest and crop spraying are generally conducted under day VFR below 500 feet AGL; usually between 6.5 feet (2 m) and 100 feet (30.5 m) AGL.

Aerial application operations may be conducted in the area surrounding the project.

Due to the nature of the operations, aerial application pilots are subject to rigorous training and assessment requirements to obtain and maintain their licence to operate under these conditions.

The Aerial Application Association of Australia (AAAA) has a formal risk management program which is recommended for use by its members to assess the risks associated with their operations and implement applicable treatments to ensure an acceptable level of safety can be maintained.

The inclusion of the transmission line on aeronautical charts will enable the pilots conducting an aerial application flight operation to be aware of the presence of the transmission line and consider its impact during the planning of their low-level flights. When combined with the briefing carried out with the landowner prior to any such flights, and the AAAA formal risk management program, the pilot will have the best possible knowledge about the obstacle environment around the intended flight(s). These briefings are no different to current practices associated with low-level flights near large transmission lines.

4.5.1. Aerial Application Association of Australia

The AAAA has initiated a Powerline Safety Program and identified that “powerlines have been a significant safety issue since the electrification of rural areas and wirestrikes have been a major threat to aerial application since the late 1940s when the industry began in Australia.

While training and ongoing professional development play a significant role in preparing pilots to manage the risks associated with low level operations around powerlines, there are two key initiatives that can support and improve safety for the sector:

- *The provision of mapping information on powerline networks*
- *The marking of powerlines*

Over recent years, AAAA has worked to reshape the Australian Standard on the marking of powerlines (AS 3891 Parts 1 & 2), has developed and delivered world-leading human factor training courses, and has worked with powerline companies to develop mapping and marking systems and make them available to pilots and business owners.

AAAA has now launched its Powerline Safety Program that aims to encourage and facilitate power companies improving aviation safety, and provide a way of both aviation businesses and rural landholders engaging in meaningful safety actions to improve safety.

Wirestrikes account for approximately 57% of all aerial application accidents/incidents. While this is only a fraction of the total safety problem surrounding contact between all vehicles and farm implements with power infrastructure, it is a significant cost to the industry and a personal impact on pilots involved in wirestrikes.

AAAA acknowledges that not all aerial application companies will be able to participate in the program due to the following practical restrictions that are not under the control of the company or AAAA:

- *Availability of energy network mapping that is region specific, clean data that is easily uploadable, useable and updateable. Availability is entirely dependent on energy companies providing the mapping in the same or similar way as Essential Energy already does*
- *Availability of an energy company marking request and action system similar to Essential Energy’s system. There are a range of contributing elements including the Australian Standard rewrite, availability of good markers, and a reasonable price for fitting and installation.*

Those States/Territories and energy companies that are unable to deliver the two requirements above will not be able to participate in the program, but AAAA will seek to work with them to achieve these relatively straight forward requirements.

Currently, Essential Energy in NSW is fully compliant, Ergon Energy in Queensland is working on achieving these systems and has advised it already has a marking system in place, but further work is required on simplifying access and the provision of mapping.”¹

The provision of the project’s final design to Airservices Australia and the Department of Defence would ensure that they are marked on aeronautical charts, enabling pilots to be aware of them and to be compliant with a key AAAA initiative. Similarly, the provision of the data to Department of Defence will ensure that their low-level charts include the project and that the military pilots are aware of them when planning and conducting low level flight operations. Considering the Australian Standards AS 3891 Parts 1 & 2 during design and construction of the project would ensure the initiative of marking powerlines is also achieved.

¹ AAAA Powerline Safety Program www.aaaa.org/aaaa-powerline-safety-program/

The project, with transmission line structures up to a maximum height of 60 m AGL, will not impact upon flight operations beyond that already experienced at other transmission lines around Australia. Landowners in the area surrounding the project footprint were consulted about their use of aircraft for aerial application activities. Their feedback is documented in Section 6.5.

4.6. Aerial baiting operations in National Parks

Aerial baiting operations in National Parks are generally undertaken in helicopters which are able to operate in closer proximity to obstacles and at lower speeds than fixed wing aircraft. The use of helicopters also enables precise delivery of the baits to the required target area.

Due to the inherent nature of helicopter operations, it is unlikely that the transmission line would have an adverse impact on aerial baiting flight operations, especially when considering that the transmission line would be published on aeronautical charts, allowing the pilot to be aware of the location of the transmission line and flight plan appropriately.

Consultation undertaken with NSW Parks and Wildlife Service is outlined in Section 5.

The project, with transmission line structures up to a maximum height of 60 m AGL, will not impact upon flight operations beyond that already experienced at other transmission lines around Australia. Previous consultation with the NSW National Parks and Wildlife Service (NPWS) shows that all obstacles are entered into their customised GIS platform and risk managed appropriately. The recommended mitigation in Section 8 provides NPWS with this information.

4.7. Aeromedical services

Royal Flying Doctor Service (RFDS) and other emergency services operations are generally conducted under the IFR.

Most emergency aviation services organisations have formal risk management programs to assess the risks associated with their operations and implement applicable treatments to ensure an acceptable level of safety can be maintained.

For example, pilots and crew require specific training and approvals, additional equipment is installed in the aircraft, and special procedures are developed.

If a helicopter emergency medical service is required at a location other than an aerodrome, uncertified aerodrome or helicopter landing site (HLS), the pilot will consult aeronautical charts and engage with local emergency services personnel and/or landowners to discover what local hazards, including transmission lines, are in the vicinity of the proposed landing site and take appropriate mitigation action.

The project, with transmission line structures up to a maximum height of 60 m AGL will not adversely impact upon emergency services flight operations.

Consultation was undertaken with the relevant emergency services operators. No response was received as outlined in Section 5.

4.8. Aerial firefighting

Aerial firefighting operations (firebombing in particular) are conducted under Day VFR, sometimes below 500 feet AGL. Under certain conditions visibility may be reduced/limited by smoke/haze.

Most aerial firefighting organisations have formal risk management programs to assess the risks associated with their operations and implement applicable treatments to ensure an acceptable level of safety can be

maintained. For example, pilots require specific training and approvals, additional equipment is installed in the aircraft, and special procedures are developed.

The project, with transmission line structures up to a maximum height of 60 m AGL will not create an adverse impact upon aerial firefighting operations.

Consultation was undertaken with the NSW Rural Fire Service (RFS). No response was received as outlined in Section 5.

4.9. Use of drones during transmission line stringing

Drones may be used for stringing of the transmission lines between the transmission line structures.

These operations are considered to be a normal aviation activity and subject to the Civil Aviation Rules applicable to the type of operation. No additional assessment is required to be considered in this report as it falls outside the scope of the SEARs assessment and the risk assessment would be conducted by the operator completing the stringing work.

AVIATION PROJECTS

5. CONSULTATION

The stakeholders consulted for the assessment include:

- Airservices Australia
- Department of Defence
- Landowners and aerial application operators
- NSW National Parks and Wildlife Service
- NSW Ambulance Service
- NSW Police Air Wing.
- NSW Rural Fire Service

Responses and mitigation actions identified through consultation are provided in Table 4.

Transgrid will consult with NPWS and local landowners separately.

Table 4 Stakeholder consultation details

<i>Agency/Contact</i>	<i>Feedback provided</i>	<i>Action required</i>
Airservices Australia	<p>Feedback received from AirServices via email 06/05/2025: Good afternoon, I refer to your request for an Airservices assessment of the proposed activity at Mount Piper to Wallerawang, NSW.</p> <p>Airspace Procedures With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at a height of 1095m (3593ft) AHD the transmission line will not affect any sector or circling altitude, nor any instrument approach or departure procedure at Bathurst aerodrome, Lithgow Medical helicopter landing site, or any air routes. Note: Procedures not designed by Airservices at any aerodrome were not considered in this assessment.</p> <p>Communications/Navigation/Surveillance (CNS) Facilities We have assessed the proposed activity to the above specified height for any impacts to Airservices Precision/Non-Precision Navigation Aids, Anemometers, HF/VHF/UHF Communications, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links and have no objections to it proceeding.</p>	No action required

AVIATION PROJECTS

Agency/Contact	Feedback provided	Action required								
	<p>Note: Meteorological instruments not owned by Airservices were not considered in this assessment. In accordance with Part 139 (Aerodromes) Manual of Standards, Chapter 19, we recommend consulting with the Bureau of Meteorology (the Bureau) to ensure that the proposed activity does not adversely affect their equipment. The Bureau can be contacted at airport.developments@bom.gov.au</p> <p>Air Traffic Control (ATC) Operations There are no additional instructions or concerns from ATC.</p> <p>Summary The proposed activity does not impact Airservices operations or facilities at Bathurst aerodrome, Lithgow Medical helicopter landing site, or any air routes.</p>									
Department of Defence	Consultation sent 25 March 2025, no response received as of 3 June 2025 so follow-up sent 3 June 2025	Responses can be addressed following receipt or during submissions phase of the project following exhibition of the EIS								
Landowners and aerial application operators	<p>Consultation completed by Transgrid in April/May 2025:</p> <table border="1" data-bbox="533 671 1431 970"> <thead> <tr> <th data-bbox="533 671 723 719">Landowner</th> <th data-bbox="723 671 1431 719">Feedback</th> </tr> </thead> <tbody> <tr> <td data-bbox="533 719 723 767">Greenspot</td> <td data-bbox="723 719 1431 767">No plane or drone usage within the project footprint</td> </tr> <tr> <td data-bbox="533 767 723 855">Centennial Coal</td> <td data-bbox="723 767 1431 855">No plane use within project footprint, however they have indicated infrequent drone use that is intermittent once or twice a year.</td> </tr> <tr> <td data-bbox="533 855 723 970">Energy Australia</td> <td data-bbox="723 855 1431 970">No plane use within the project footprint, however drones are sporadically used for inspections. Explicit permissions must be granted by EA executive team to undertake drone flights.</td> </tr> </tbody> </table>	Landowner	Feedback	Greenspot	No plane or drone usage within the project footprint	Centennial Coal	No plane use within project footprint, however they have indicated infrequent drone use that is intermittent once or twice a year.	Energy Australia	No plane use within the project footprint, however drones are sporadically used for inspections. Explicit permissions must be granted by EA executive team to undertake drone flights.	No action required
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Energy Australia	No plane use within the project footprint, however drones are sporadically used for inspections. Explicit permissions must be granted by EA executive team to undertake drone flights.									
NSW National Parks and Wildlife Service	<p>Feedback received from Transgrid via email on 19/05/2025:</p> <p>No aerial operations within project footprint and no expected drone activity, this includes for aerial baiting. Explicit permission must be granted by stakeholder to undertake drone flights.</p>	No action required								
NSW Ambulance Service	Consultation sent 25 March 2025, no response received as at 3 June 2025	Responses can be addressed following receipt or during submissions phase of the project following exhibition of the EIS								

AVIATION PROJECTS

<i>Agency/Contact</i>	<i>Feedback provided</i>	<i>Action required</i>
NSW Police Air Wing	<i>Consultation sent 25 March 2025, no response received as at 3 June 2025</i>	Responses can be addressed following receipt or during submissions phase of the project following exhibition of the EIS
NSW Rural Fire Service	<i>Consultation sent 25 March 2025. RFS have indicated that they will review the EIS and provide feedback as part of the formal submissions process.</i>	Responses can be addressed following receipt or during submissions phase of the project following exhibition of the EIS

6. AVIATION IMPACT STATEMENT

Airservices Australia requires an AIS to be developed by an aeronautical consultant with suitable knowledge and capabilities to provide a reliable and comprehensive assessment of the potential impacts on aviation from proposed developments. Airservices publishes the following requirements for an AIS (Airservices Australia):

Airspace Procedures

1. Obstacles
 - Co-ordinates in WGS84 or GDA94
 - Elevations in metres (m) Australian Height Datum (AHD).
2. Aerodromes
 - Specify all registered/certified aerodromes that are located within 30NM (55.56km) from any obstacle referred to in (1) above.
 - Identify all instrument approach and landing procedures at these aerodromes.
 - Confirm that the proposed development (known as a potential “obstacle”) does not penetrate the Annex 14 Obstacle Limitation Surface (OLS) for any aerodrome. If a potential obstacle does penetrate the OLS, the AIS should clearly specify the extent of the penetration.
3. Air Routes
 - Identify air routes published in Airservices AIP Charts
 - Specify two waypoint names located on the routes that are located on either side of the potential obstacle.
4. Airspace
 - Identify the airspace classification (i.e. A, C, D, E, G etc.) where the potential obstacles are located.

Navigation/Radar

1. Detect the presence of dead zones.
2. False target analysis.
3. Target positional accuracy.
4. Probability of detection.
5. Radar coverage implications.
6. The AIS should follow the guidelines outlined in the latest version of the EUROCONTROL Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors.

This AIS considers the following aspects of publicly available information from the AIP effective 12 June 2025, searches using National Maps GIS system (nationalmap.gov.au), OzRunways aeronautical flight planning software and Google Earth as of May 2025.

The construction phase of the project is assumed to use cranes (construction equipment) that will extend to a maximum of 20 m above the transmission line infrastructure.

For the purpose of this assessment all transmission support structures have been assessed at 60 m AGL. Indicative proposed structure heights are listed in Annex 2.

6.1. Certified aerodromes

A certified aerodrome means an aerodrome regulated by CASA under CASR Part 139, with defined standards established in CASR Part 139 (*Aerodromes*) Manual of Standards (MOS).

A 30 nm radius from the Project has been used to assess potential impacts on certified aerodromes. The 30 nm radius represents the 25 nm minimum sector altitude (MSA) for aerodromes with terminal instrument flight procedures. The 25 nm MSA minimum altitude is determined by assessing obstacles within 30 nm (25 nm plus 5 nm buffer) of the aerodrome reference point (ARP) or navigational aid on which the MSA is based.

The project is located within 30 nm (55.5 km) of the following certified aerodrome:

- Bathurst Aerodrome (YBTH) – 19 nm (35.2 km).

The location of the project relative to the certified aerodromes is shown in Figure 5 (source: Airservices Australia, GHD, Google Earth).

The orange circle around each aerodrome represents 30 nm from the aerodrome reference point (ARP) of each aerodrome. The red line represents the project.



Figure 5 Location of certified aerodromes in relation to the project

6.1.1. Bathurst Aerodrome (YBTH)

Bathurst Aerodrome (YBTH) is operated by Bathurst Regional Council. The ARP coordinates published by Airservices Australia are Latitude 33° 24'34" S and Longitude 149° 39'07"E.

6.1.1.1. Instrument approach/departure procedures

A check of the AIP via the Airservices Australia website showed that Bathurst Aerodrome is served by non-precision approach procedures. These procedures have been assessed below (source: Airservices Australia, effective 12 June 2025). There are no departure procedures for Bathurst Aerodrome.

6.1.1.2. Minimum sector altitude surfaces

The MSA applies to all instrument approach procedures at Bathurst Aerodrome.

In the case of Bathurst Aerodrome, there are two MSAs published which reference the:

- Bathurst Aerodrome ARP
- Bathurst Non-Directional Beacon (NDB) navigation aid.

Both MSAs have the same heights associated with them. As the Bathurst NDB is located slightly closer to the project, the Bathurst ARP MSA has not been considered further in this assessment. All assessment outcomes for the Bathurst NDB MSA apply to the Bathurst ARP MSA.

An extract of the MSAs published for Bathurst Aerodrome is shown in Figure 6 (source: Airservices Australia).

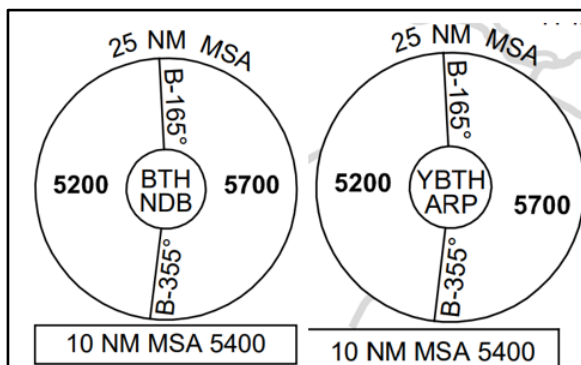


Figure 6 MSAs at Bathurst Aerodrome

The project is located within the protection area for Bathurst Aerodrome's 25 nm MSA.

The project is located wholly outside of the 10 nm MSA protection area.

25 nautical mile MSA

The lowest protection surface for Bathurst Aerodrome's 25 nm MSA overhead the project has an elevation of 1254.6 m AHD (4116 ft AMSL).

The highest segment of the project (structure ID 26D) within the Bathurst Aerodrome's 25 nm MSA protection surface is 1075.1 m AHD (3527.1 feet AMSL).

During construction of the project, the highest construction equipment that may be present within the Bathurst Aerodrome's 25 nm MSA protection surface would be 1095.1 m AHD (3592.7 feet AMSL).

There would be no infringement on the Bathurst Aerodrome 25 nm MSA as a result of the construction and operation of the project.

Figure 7 shows the MSA protection buffer with the highest location of the project marked (source: Airservices Australia, GHD, Google Earth).

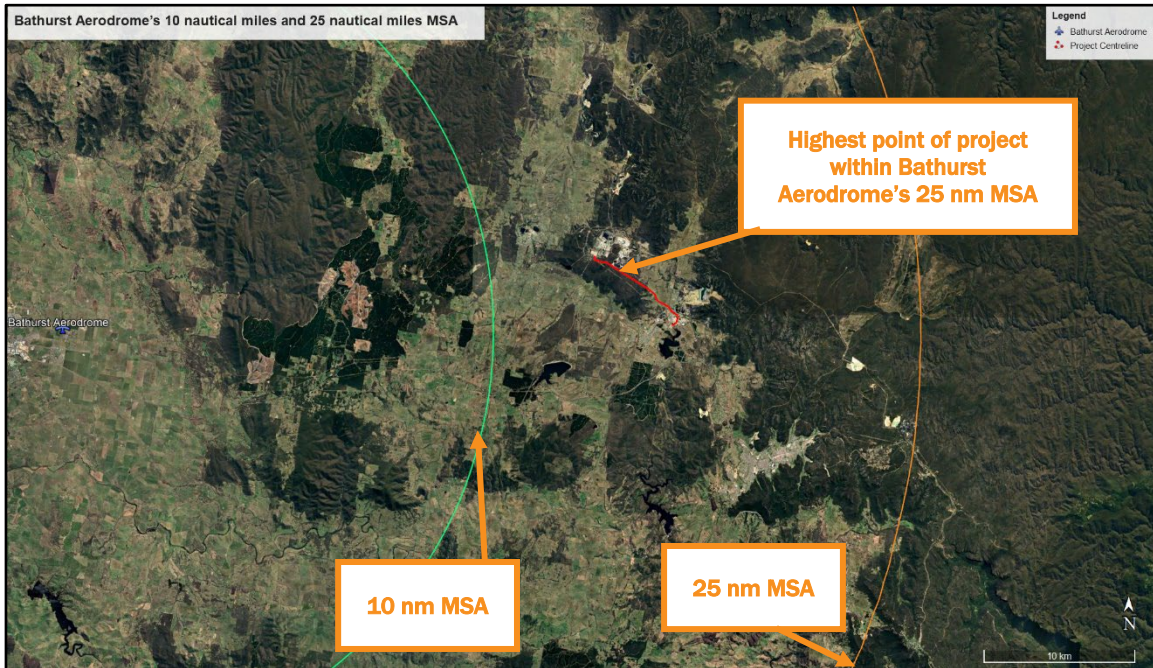


Figure 7 Bathurst Aerodrome's 10 nm and 25 nm MSA

6.1.1.3. PANS-OPS protection surfaces

Each instrument procedure at Bathurst Aerodrome has been assessed for potential impact as a result of the construction and operation of the project against the current PANS-OPS protection surfaces.

Table 5 provides a PANS-OPS assessment outcome for each instrument approach procedure at Bathurst Aerodrome.

Table 5 Bathurst Aerodrome PANS-OPS assessment (transmission line structures)

<i>Instrument Approach Procedure Title</i>	<i>Project Altitude within protection area (m AHD)</i>	<i>Lowest PANS-OPS Surface (M AHD)</i>	<i>Infringement to PANS-OPS surface</i>	<i>Potential solution</i>	<i>Impact to aircraft ops</i>
GNSS Arrival	The project is not located in protection area	N/A	N/A	Nil	Nil
RNP RWY 17	The project is not located in protection area	N/A	N/A	Nil	Nil
NDB-RWY 17	The project is not located in protection area	N/A	N/A	Nil	Nil
RNP RWY 35	The project is not located in protection area	N/A	N/A	Nil	Nil

6.1.1.4. IFR circling areas

The most demanding aircraft performance category provided for by the instrument approach procedures at Bathurst Aerodrome is Category C, with a radius of 8.3 km (4.48 nm).

The closest point of the project is 34.1 km (18.4 nm) from the nearest runway threshold at Bathurst Aerodrome. The project is located outside of the Bathurst Aerodrome circling area protection surfaces.

The construction and operation of the project does not affect the IFR circling areas of Bathurst Aerodrome.

6.1.1.5. Obstacle Limitation Surface (OLS)

For the Code 3 non-precision runway at Bathurst Aerodrome, the maximum lateral extent of the OLS is up to 5.5 km for the conical surface and 15 km for the take-off and approach surfaces.

The closest point of the project is 34.1 km from nearest OLS reference point at Bathurst Aerodrome and is therefore outside of the OLS.

The construction and operation of the project does not affect the IFR circling areas of Bathurst Aerodrome.

6.2. Nearby uncertified aerodromes

Uncertified aerodromes are defined by CASA as those aerodromes that are not certified under CASR Part 139. These include private airstrips, aerodrome landing areas, HLS and airstrips other than certified aerodromes. The operations of uncertified aerodromes are not regulated by CASA, instead the suitability to land and operate an aircraft on or surrounding the uncertified aerodrome is the sole responsibility of the pilot in command of the aircraft.

6.2.1. Assessment of uncertified aerodromes

As a guide, an area of interest within a 3 nm (5.56 km) radius of an uncertified aerodrome is used to assess potential impacts of proposed developments on aircraft conducting taking off and landing operations at or within the vicinity of the airstrip of an uncertified aerodrome. Operations within this distance are considered to be at a higher risk than those away from aerodromes. This area was assessed to identify uncertified aerodromes and then further refined considering orientation and strip length that determined the likely size of aircraft using it and terrain slopes/heights that may determine the use of the uncertified aerodrome.

The 3 nm area of interest generally contains the area in which aircraft manoeuvre after take-off while climbing to intercept their outbound track until above a minimum height of approximately 500 feet or 1000 feet AGL, or manoeuvring to align themselves with the landing runway, in accordance with CASA guidance for operations at such aerodromes.

Each identified uncertified aerodrome and the Portland HLS, were assessed to determine the approximate extent of the impact from the proposed transmission line. Four levels of impact are used in this report and are defined as follows:

- major – the use of the uncertified aerodrome would be compromised by the nearby location of the transmission line. This may include the aerodrome being unusable or a significant modification to its layout being required to enable aviation operations to continue
- moderate – the project 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
- minor – the project would result in some flight paths to require a minor adjustment to avoid the transmission line for some types of flight operations
- no impact – the project is unlikely to have an adverse impact upon flight operations as the uncertified aerodrome is far enough away from the transmission line or oriented, in relation to the transmission line, so that flight operations are unlikely to be impacted if pilots are aware of the location of the transmission line.

A 10 km buffer surrounding an indicative centreline was searched for uncertified aerodromes as per the requirements of the SEARs. Published uncertified aerodromes within 10 km of the project have been included in Section 6.2.2.

Detailed assessment is only conducted on those within 3 nm (5.56 km). The uncertified aerodromes located in areas beyond 3 nm (5.56 km) of the project would not be impacted and are not considered further in this assessment. This distance is in line with CASA publications such as AC 91-10 V1.2 and CASR 91.277.

Uncertified aerodromes identified in this report may be used for aerial agricultural application flight operations, privately owned and operated aircraft. Commercial flights and medical evacuation flights by fixed wing aircraft are unlikely to operate from these airstrips due to the higher regulatory framework that they must adhere to.

Pilots intending to use these uncertified aerodromes are responsible for ensuring that any runway is suitable for the safe operation of their aircraft. They must obtain details of any proposed landing area from the landowner for that purpose, prior to operating there.

Irrespective of the project, not all uncertified aerodromes are usable at all times. Weather conditions including unsuitable winds, wet surface conditions, grass or crop heights and turbulence created from nearby tree lines can limit the use of these airstrips.

6.2.2. Published uncertified aerodromes

A search of various aviation datasets on the 19th of December 2024 identified a number of uncertified aerodromes in proximity to the project footprint. The aviation datasets used included:

- OzRunways, which sources its data from Airservices Australia (AIP). The aeronautical data provided by OzRunways is approved under CASR Part 175.
- Australian Government National Map online.
- Visual search of satellite imagery

There is one uncertified aerodrome 10 km of the project, Portland HLS.

There were two HLS identified outside 10 km which have instrument approach procedures designed for them. These HLS have some of the protections that a certified aerodrome does (PANS-OPS). However, they are still considered uncertified aerodromes. They are listed below:

- Wolgan Valley HLS – instrument approach procedures were withdrawn on 20 March 2025
- Lithgow Medical HLS

Assessment of relevant protection surfaces has been conducted below.

Figure 8 shows the location of these aerodromes relative to the project. The uncertified aerodromes within 3 nm (5.56 km) of the project have their area of interest shown as an orange circle (source: Airservices Australia, GHD, Google Earth).

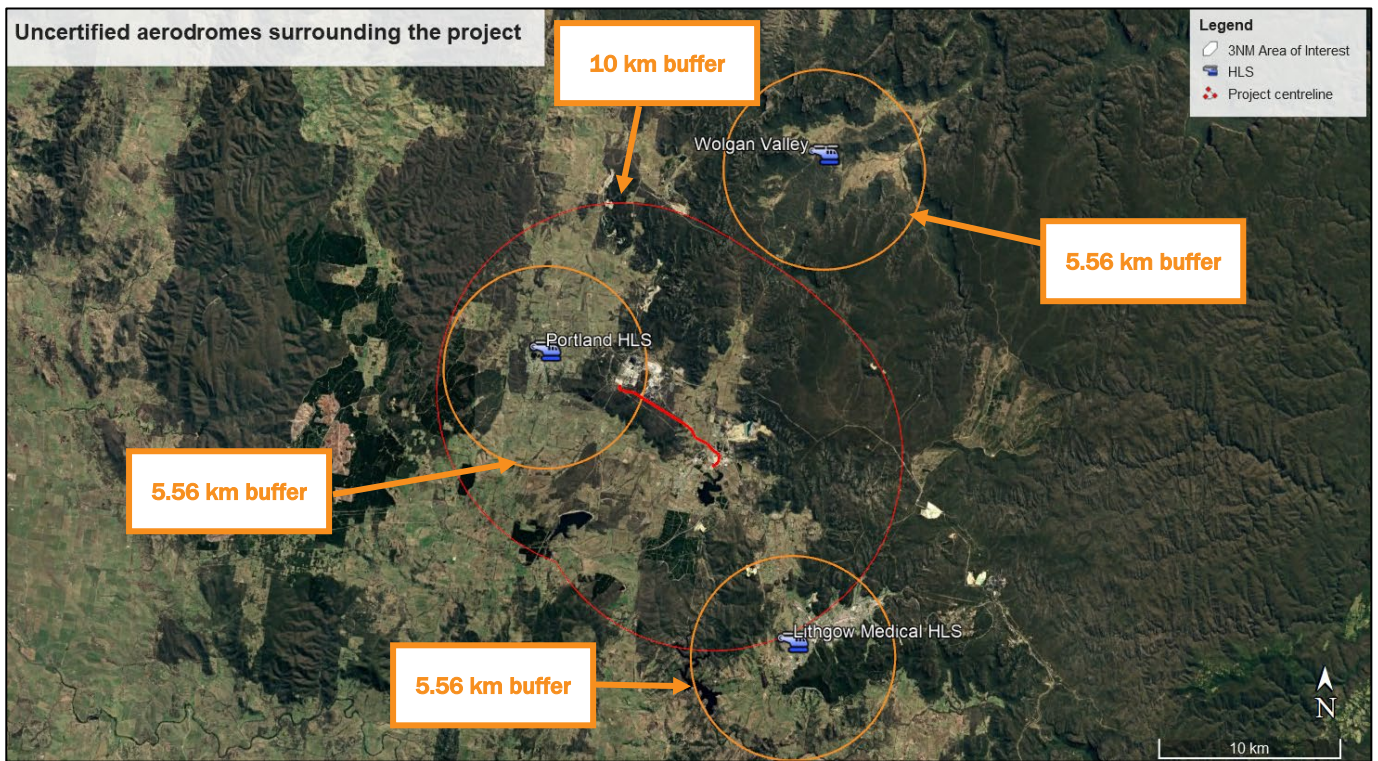


Figure 8 Uncertified aerodromes surrounding the project

6.2.3. Portland HLS

Portland HLS is an uncertified aerodrome. Limited up to date public information regarding the Portland HLS is available. It is located approximately 2.3 nm from the project.

From satellite imagery, the HLS appears to be a cleared patch of grass behind the sports field. The HLS is shown in Figure 9 (source: Google Earth).



Figure 9 Portland HLS

As Portland HLS is an uncertified aerodrome, the protections required by the OLS or PANS-OPS do not apply. The aerodrome is located a sufficient distance away from the project that there would be no impact to the operations at the HLS as a result of the project.

6.2.4. Lithgow Medical HLS

The Lithgow Medical HLS is an uncertified aerodrome located at Lithgow Hospital. Minimal public information is available for this HLS. The HLS is located at Latitude 33° 30'.0S, Longitude 150° 07.7'E.

It is located approximately 6 nm from the project. The HLS is shown in Figure 10 (source: Google Earth).



Figure 10 Lithgow Medical HLS

The HLS is located a sufficient distance away from the project that there would be no impact to the operations at the HLS as a result of the project.

6.2.4.1. Instrument approach procedures

A check of the AIP via the Airservices Australia website showed that Lithgow Medical HLS is served by non-precision flight procedures. These procedures have been assessed below (source: Airservices Australia, effective 28 November 2024).

6.2.4.2. Minimum sector altitude surfaces

The MSA applies to all instrument approach procedures at Lithgow Medical HLS.

In the case of Lithgow Medical HLS, there is one MSA published which reference the HLS ARP.

An extract of the MSAs published for Lithgow Medical HLS is shown in Figure 11 (source: Airservices Australia).

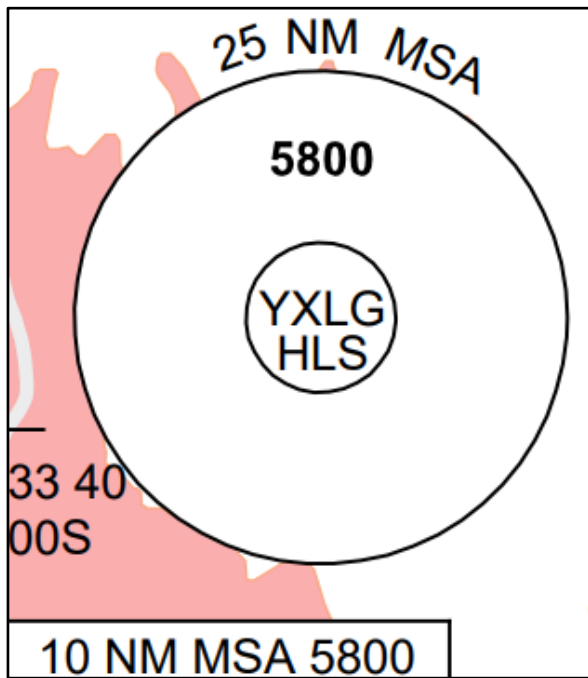


Figure 11 MSA at Lithgow Medical HLS

The project is located within the protection area for Lithgow Medical HLS's 10 and 25 nm MSA.

10 and 25 nautical mile MSA

Both the 10 and 25 nm MSA protection surface for Lithgow Medical HLS has an elevation of 1467.9 m AHD (4816 ft AMSL).

The highest segment of the project (structure ID 26D) within the Lithgow Medical HLS MSA protection surface is 1075.1 m AHD (3527.1 feet AMSL).

During construction of the project, the highest construction equipment that may be present within the Lithgow Medical HLS MSA protection surface would be 1095.1 m AHD (3592.7 feet AMSL).

There would be no infringement on the Lithgow Medical HLS MSA as a result of the construction and operation of the project.

6.2.4.3. PANS-OPS protection surfaces

Each instrument procedure at Lithgow Medical HLS has been assessed for potential impact as a result of the construction and operation of the project against the current PANS-OPS protection surfaces.

Table 6 provides a PANS-OPS assessment outcome for each instrument approach procedure at Lithgow Medical HLS.

Table 6 Lithgow Medical HLS PANS-OPS assessment (transmission line structures)

<i>Instrument Approach Procedure Title</i>	<i>Project Altitude within protection area (m AHD)</i>	<i>Lowest PANS-OPS Surface (m AHD)</i>	<i>Infringement to PANS-OPS surface</i>	<i>Potential solution</i>	<i>Impact to aircraft ops</i>
RNP 063	The project is not located in protection area	N/A	N/A	Nil	Nil
RNP 318	The project is not located in protection area	N/A	N/A	Nil	Nil

6.2.5. Wolgan Valley HLS

The Wolgan Valley HLS is an uncertified aerodrome located at the Wolgan Valley private resort. The HLS is located at Latitude 33° 15'.2S, Longitude 150° 11.3'E.

It should be noted that a recent update to the website for the Emirates One&Only Wolgan Valley indicates that the temporary closure of the resort is likely to be permanent (source: Wolgan Valley, 2024). From the 20th of March 2025 the Wolgan Valley HLS' instrument approaches have been withdrawn by Airservices Australia from publication. Post this date Wolgan Valley HLS is not affected by the project.

Wolgan Valley HLS is located approximately 10.2 nm from the project.

The HLS is located a sufficient distance away from the project that there would be no impact to the operations at HLS as a result of the project.

The HLS is shown in Figure 12 (source: Google Earth).



Figure 12 Wolgan Valley HLS

6.3. Air routes and Grid Lowest Safe Altitude

CASR Part 173 MOS requires that the published lowest safe altitude (LSALT), for a particular airspace grid or air route (also referred to as air traffic routes in SEARs), provides a minimum of 1000 ft clearance above the controlling (highest) obstacle within the relevant airspace grid or air route tolerances.

6.3.1. Grid LSALT

A Grid LSALT is provided for IFR aircraft that are not flying along a published air route. The grid is a 1 degree by 1 degree grid along the whole number latitude and longitude graticule which is depicted on aeronautical charts. CASR Part 173 MOS prescribes a MOC of 1000 feet above the highest terrain or obstacle is maintained within each grid LSALT area to ensure aircraft are kept a safe vertical distance from the obstacle below.

The Grid LSALT that is applicable to the project is 1798.3 m AHD (5900 feet AMSL) with a protection surface of 1493.5 m AHD (4900 feet AMSL).

The highest segment of the project (structure ID 26D) is 1075.1 m AHD (3527.1 feet AMSL).

During construction of the project, the highest construction equipment that may be present within the Grid LSALT would be 1095.1 m AHD (3592.7 feet AMSL).

The construction and operation of the project would not impact the Grid LSALT.

Figure 13 provides the Grid LSALTs and air routes in proximity to the project (source: Aircservices Australia, ERC-Low, Oz Runways 28 November 2024).

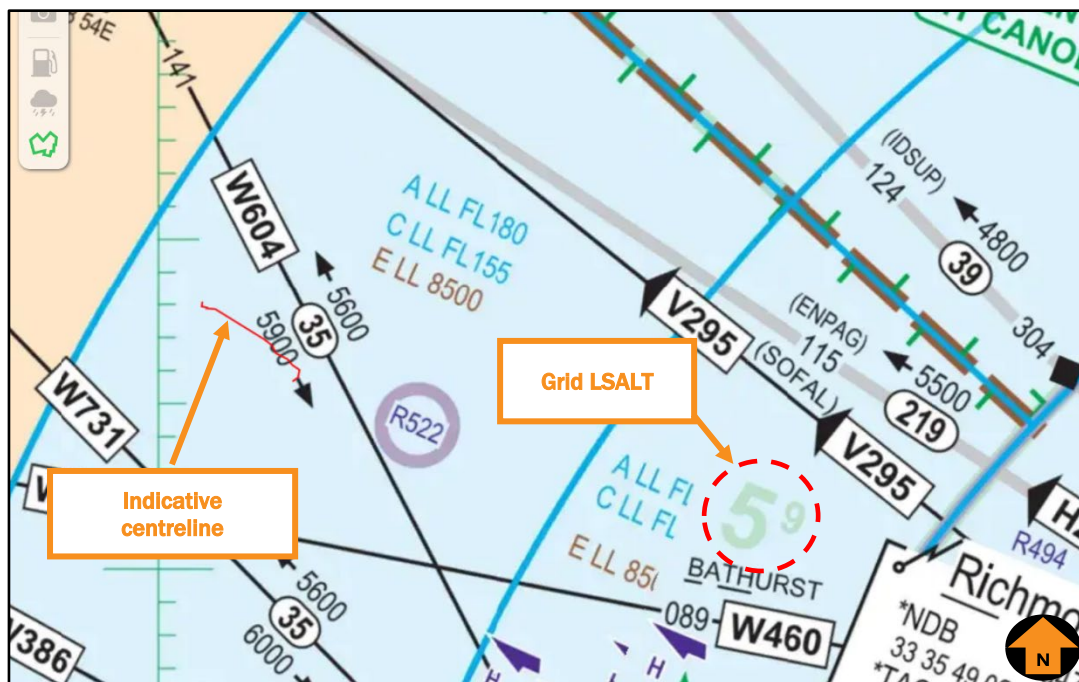


Figure 13 Grid LSALT & air route in proximity to the project

6.3.2. Air Route LSALTs

Air routes between airports are provided with a LSALT, which is the lowest altitude that an aircraft can fly in Instrument Meteorological Conditions (IMC), i.e. where they cannot necessarily maintain visual contact with the ground or water to avoid obstacles.

CASR Part 173 MOS prescribes a MOC of 1000 feet above the highest terrain or obstacle is maintained within the lateral protection area for each air route. The lateral protection area of 7 nm laterally either side of an air route is used to assess the LSALT for the air route.

There are several air routes located within 7 nm of this section of the project. An assessment has been completed in Table 7.

During construction of the project, the highest construction equipment that may be present within the Air route LSALT would be 1095.1 m AHD (3592.7 ft AMSL). The construction phase would not affect any air route LSALTs in line with the assessment below.

Table 7 Air route LSALT assessment

<i>Air route</i>	<i>Project Altitude within protection area (feet AMSL)</i>	<i>Lowest PANS-OPS Surface (feet AMSL)</i>	<i>Infringement to PANS-OPS surface</i>	<i>Potential solution</i>	<i>Impact to aircraft ops</i>
W604	3527.1	4600	No	N/A	N/A
W731	3527.1	4600	No	N/A	N/A
W460	3527.1	4600	No	N/A	N/A

6.4. Airspace protection

The project is located outside of controlled airspace (wholly within Class G airspace) and is not located in any Prohibited, Restricted or Danger areas.

6.5. Aviation facilities

Aviation facilities encompass the use of aviation navigation aids used by pilots to navigate the aircraft when operating under the IFR. Air traffic control radar facilities are used by Airservices Australia and the Department of Defence to facilitate the safe separation and control of aircraft around Australia. Both types of equipment are assessed below.

6.5.1. Aviation navigation aids

The nearest aviation navigation aid is a NDB "BTH" located at Bathurst Aerodrome, approximately 35 km west of the project.

As per CASR Part 139 MOS and the NASF Guideline G, the protection area for the NDB located at Bathurst Aerodrome extends laterally for 300 m. The project is located sufficient distance away from aviation facilities and would not have an impact on any nearby navigation aids.

6.5.2. Air traffic control radar facilities

The nearest radar facility to the project is the Mt Boyce Route Surveillance Radar (RSR). Mt Boyce RSR is approximately 29 km to the east. The project is outside the impact assessment area for the radar. The project footprint is outside the line-of-sight range and will not impact the radar facilities.

6.5.3. Aviation communication facilities

NASF Guideline G specifies the area of interest surrounding aviation communication locations and advises that the area of interest for a Very High Frequency (VHF) facility is 100 m-2000 m. The nearest aviation communication site is the Mt Edith communication site which is located 48 km from the project. This distance is outside the area of interest for Very high frequency (VHF) communication sites.

The project would not interfere with nearby aviation communication facilities.

6.6. Cumulative impacts

Construction of transmission line structures for the project and other proposed, approved or under construction major projects in and around the project would not result in any cumulative impacts on aviation. A full list of assessed projects can be found in Annexure 3.

6.7. Summary

An AIS has been completed with the following assessments being made within the parameters of the relevant assessment areas:

- The only certified aerodrome located within 30 nm (55.56 km) of the project is Bathurst Aerodrome (YBTH) at a distance of 19 nm (35.2 km). The project would not impact any identified certified aerodromes.
- The project would not impact the Portland HLS.
- Further, the project would:
 - not impact the Grid and Air route Lowest Safe Altitudes (LSALTs)
 - be located wholly within Class G airspace, which is outside controlled airspace. It is not in any Prohibited, Restricted or Danger areas
 - be located outside the clearance zones for all aviation navigation aids of nearby certified airports
 - not impact the closest air traffic control radar facilities
- not impact the closest aviation communication facilities.

7. OBSTACLE LIGHTING AND MARKING

As the transmission line and the transmission structures do not infringe on any certified aerodrome OLS, there is no regulatory requirement to mark or light the transmission line structures or transmission lines.

Following consultation with landowners who may have who may have a runway on their property, if a risk assessment is considered necessary, the following standards outlined in the AS 3891.2:2018 *Air navigation – Cables and their supporting structures – Marking and safety requirements Part 2: Low level aviation operations* will be followed.

7.1.1. Marking of the transmission line conductors

Transmission lines that are located where they could adversely affect aerial application operations will be identified in consultation with local aerial application operators and uncertified aerodrome operators where the project may impact operations. Consultation is described in section 1.

Where identified, the transmission line will be marked in accordance with CASR Part 139 MOS Chapter 8 Division 10 section 8.110 (7) and section 8.110 (8) extracted below:

8.110 Marking of hazardous obstacles

(7) Hazardous obstacles in the form of wires or cables must be marked using 3-dimensional coloured objects attached to the wire or cables. Note: Spheres and pyramids are examples of 3-dimensional objects.

(8) The objects mentioned in subsection (7) must:

- (a) be approximately equivalent in size to a cube with 600 mm sides; and*
- (b) be spaced 30 m apart along the length of the wire or cable.*

7.1.2. Marking of the transmission line structure

As the transmission line structures of the project are less than 100 m AGL and do not infringe on any certified aerodrome OLS surface, there are no legislative requirements or guidelines for specific aviation related marking outside of Australian Standard AS 3891.1:2018 and AS 3891.2:2018.

7.1.3. Lighting of the transmission line structure

As the transmission line structures are less than 100 m AGL, there are no legislative requirements or guidelines for specific aviation related lighting. The lighting recommendations of AC 139.E-05 v1.0 - *Obstacles (wind farms) outside the vicinity of a CASA certified aerodrome* do not apply to this project and as such lighting is not required for the project.

8. RECOMMENDED MANAGEMENT AND MITIGATION MEASURES

8.1. Management

Management of the impacts on aviation safety require consultation and notification of stakeholders.

The final design of the transmission line structure coordinates and elevations would be provided to Airservices Australia as they have been assigned the task of maintaining a database of tall structures, the top measurement of which is:

- 30 m or more above ground level—within 30 km of an aerodrome; or
- 45 m or more above ground level elsewhere.

As the transmission line infrastructure (maximum height 60 m AGL) is planned to be above the minimum reporting height, all transmission line structures must be reported to Airservices Australia.

The purpose of notifying Airservices Australia of these structures is to enable their details to be provided in aeronautical information databases and maps/charts etc used by pilots, so that the obstacles can be avoided.

The notification to Airservices Australia should be made as early as possible following the final design of the project. Aeronautical charts are updated twice per year, in June and December, with cut off dates approximately six months prior. The Amendment Cycle is available at airservicesaustralia.com/industry-info/aeronautical-information-management/document-amendment-calendar/

8.2. Mitigation measures

The proposed mitigation measures and recommendations resulting from the AIS are outlined in Table 8.

Table 8 Proposed mitigation measures

<i>Reference</i>	<i>Impact</i>	<i>Mitigation measures</i>
AS1	Safety of Aircraft Movements	<p>A copy of this AIA as well as the most recent design of the project with transmission line and structure coordinates and elevations will be provided to the following stakeholders prior to construction. Where relevant, information received from stakeholders will be included in construction design and/or construction management plans and in the final version of this technical paper:</p> <ul style="list-style-type: none"> • Airservices Australia • Department of Defence • Local aerial application operators/adjacent landowners • NSW National Parks and Wildlife Service • NSW Ambulance Service • NSW Police Air Wing • NSW Rural Fire Service <p>Subsequent notifications will be undertaken if the final detailed design of the project alters the details previously supplied to these stakeholders</p>

<i>Reference</i>	<i>Impact</i>	<i>Mitigation measures</i>
AS2	Safety of Aircraft Movements	<p>The final design of the transmission line structures with coordinates and elevations must be provided to the following stakeholders once the final design is confirmed:</p> <ul style="list-style-type: none"> • AAAA: admin@aaaa.org.au • Airservices Australia: vod@airservicesaustralia.com • Defence: landplanning@defence.gov.au • Landowners/occupiers within 5.5 km of the transmission easement that engage aerial application operators to facilitate the flight planning of any potential future aerial application operators conducting flight operations <p>Further notification to identified stakeholders will occur if the finalised design of the project is altered.</p>
AS3	Safety of Aircraft Movements	<p>If local aerial operators identify the need for a risk assessment, the standards outlined in the AS 3891.2:2018 Air navigation – Cables and their supporting structures – Marking and safety requirements Part 2: Low level aviation operations will be followed.</p>

ANNEXURES

1. References
2. Indicative Transmission line structure details
3. Projects with the potential for cumulative impacts

ANNEXURE 1 – REFERENCES

Airservices Australia, Aeronautical Information Package; including AIP Book, Departure and Approach Procedures and En Route Supplement Australia, effective 12 June 2025

Airservices Australia, Designated Airspace Handbook, effective 12 June 2025

Civil Aviation Safety Authority, Civil Aviation Regulations 1988 (CAR)

Civil Aviation Safety Authority, Civil Aviation Safety Regulations 1998 (CASR)

Civil Aviation Safety Authority, Advisory Circular (AC) 91-10 v1.4: *Operations in the vicinity of non-controlled aerodromes*, dated May 2025

Civil Aviation Safety Authority, *Part 91 (General Operating and Flight Rules) Manual of Standards 2020*, dated February 2024

Civil Aviation Safety Authority, *Manual of Standards Part 173 – Standards Applicable to Instrument Flight Procedure Design*, version 1.7, dated August 2020

Civil Aviation Safety Authority, *Part 139 (Aerodromes) Manual of Standards*, dated December 2024

Department of Infrastructure, Transport, Regional Development, Communications, Sports and the Arts: Australian Government, National Airport Safeguarding Framework

International Civil Aviation Organization (ICAO) Doc 8168 *Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS)*

ICAO Standards and Recommended Practices, Annex 14—*Aerodromes*

OzRunways, aeronautical navigation charts extracts, dated May 2025

Wolgan Valley Resort Website, Accessed May 2025.

ANNEXURE 2 – INDICATIVE TRANSMISSION LINE STRUCTURE DETAILS

<i>Longitude</i>	<i>Latitude</i>	<i>Name</i>	<i>Structure ID</i>	<i>Ground Elevation (m AHD)</i>	<i>Theoretical max structure height (m AGL)</i>	<i>Total height (m AHD)</i>	<i>Tower Height (ft AMSL)</i>	<i>Max construction Height m AHD (+20 m)</i>	<i>Max Construction height (ft AMSL)</i>
150.0346971	-33.36913357	Structure 26D - New 330kV/94E	26D	1015.07	60	1075.1	3527.1	1095.1	3592.7
150.0294127	-33.36878028	Structure 28D - Line 94E/ New 330kV	28D	998.861	60	1058.9	3474.0	1078.9	3539.6
150.0317721	-33.37000321	Structure 27D - New 330kV/94E	27D	989.822	60	1049.8	3444.3	1069.8	3509.9
150.0448469	-33.3741851	Structure 23D - New 330kV/94E	23D	979.377	60	1039.4	3410.0	1059.4	3475.6
150.0264472	-33.36774612	Structure 25C - Line 70/71	25C	983.641	60	1043.6	3424.0	1063.6	3489.6
150.0604635	-33.38195475	Structure 18D - New 330kV/94E	18D	974.666	60	1034.7	3394.6	1054.7	3460.2
150.0642054	-33.38436528	Structure 17D - New 330kV/94E	17D	997.512	60	1057.5	3469.5	1077.5	3535.1

AVIATION PROJECTS

<i>Longitude</i>	<i>Latitude</i>	<i>Name</i>	<i>Structure ID</i>	<i>Ground Elevation (m AHD)</i>	<i>Theoretical max structure height (m AGL)</i>	<i>Total height (m AHD)</i>	<i>Tower Height (ft AMSL)</i>	<i>Max construction Height m AHD (+20 m)</i>	<i>Max Construction height (ft AMSL)</i>
150.0296527	-33.36835249	Structure 33A - Line 94E	33A	1000	60	1060.0	3477.7	1080.0	3543.3
150.041597	-33.3725678	Structure 24D - New 330kV/94E	24D	967.433	60	1027.4	3370.8	1047.4	3436.5
150.0467431	-33.37512869	Structure 22D - New 330kV/94E	22D	966.468	60	1026.5	3367.7	1046.5	3433.3
150.0273525	-33.36549254	Structure 70-M - Line 71 terminates MP End	70-M	961.057	60	1021.1	3349.9	1041.1	3415.5
150.0275444	-33.36555538	71-M - New Line Terminates MP End	71-M	961.048	60	1021.0	3349.9	1041.0	3415.5
150.0268985	-33.36535592	7G-M - Line 70 terminates MP End	7G-M	961.03	60	1021.0	3349.8	1041.0	3415.5
150.0390725	-33.37131137	Structure 25D - New 330kV/94E	25D	964.24	60	1024.2	3360.4	1044.2	3426.0

AVIATION PROJECTS

<i>Longitude</i>	<i>Latitude</i>	<i>Name</i>	<i>Structure ID</i>	<i>Ground Elevation (m AHD)</i>	<i>Theoretical max structure height (m AGL)</i>	<i>Total height (m AHD)</i>	<i>Tower Height (ft AMSL)</i>	<i>Max construction Height m AHD (+20 m)</i>	<i>Max Construction height (ft AMSL)</i>
150.0678822	-33.38673364	Structure 16D - New 330kV/94E	16D	972.571	60	1032.6	3387.7	1052.6	3453.3
150.0518389	-33.37766417	Structure 21D - New 330kV/94E	21D	958.857	60	1018.9	3342.7	1038.9	3408.3
150.0577681	-33.38061396	Structure 19D - New 330kV/94E	19D	958.251	60	1018.3	3340.7	1038.3	3406.3
150.054592	-33.3790339	Structure 20D - New 330kV/94E	20D	955.808	60	1015.8	3332.7	1035.8	3398.3
150.0690736	-33.38750104	Structure 15D - New 330kV/94E	15D	942.576	60	1002.6	3289.3	1022.6	3354.9
150.0702365	-33.38928819	Structure 14D - New 330kV/94E	14D	911.5	60	971.5	3187.3	991.5	3253.0
150.0813973	-33.40575177	7G-W - Line 70 terminates Wal End	7G-W	875.36	60	935.4	3068.8	955.4	3134.4
150.0758147	-33.39325897	Structure 11D - New 330kV	11D	876.71	60	936.7	3073.2	956.7	3138.8

AVIATION PROJECTS

<i>Longitude</i>	<i>Latitude</i>	<i>Name</i>	<i>Structure ID</i>	<i>Ground Elevation (m AHD)</i>	<i>Theoretical max structure height (m AGL)</i>	<i>Total height (m AHD)</i>	<i>Tower Height (ft AMSL)</i>	<i>Max construction Height m AHD (+20 m)</i>	<i>Max Construction height (ft AMSL)</i>
150.070961	-33.39108406	Structure 13D - New 330kV/94E	13D	891.999	60	952.0	3123.4	972.0	3189.0
150.0799716	-33.39601813	Structure 9D - New 330kV	9D	875.023	60	935.0	3067.7	955.0	3133.3
150.0797265	-33.39637084	Structure 8C - Line 70/71	8C	874.823	60	934.8	3067.0	954.8	3132.6
150.0814069	-33.39748146	Structure 7C - Line 70	7C	874.093	60	934.1	3064.6	954.1	3130.2
150.0856309	-33.3998198	Structure 5C - Line 70	5C	875.528	60	935.5	3069.3	955.5	3134.9
150.0830771	-33.40500831	Structure 2C - Line 70	2C	873.326	60	933.3	3062.1	953.3	3127.7
150.0713966	-33.39118611	Structure 14A - 94E	14A	889	60	949.0	3113.5	969.0	3179.1
150.0785286	-33.39447492	Structure 10D - New 330kV	10D	876.132	60	936.1	3071.3	956.1	3136.9
150.0818944	-33.40493781	Structure 1C - Line 70	1C	875.329	60	935.3	3068.7	955.3	3134.3
150.0847589	-33.40364544	Structure 3C - Line 70	3C	873.065	60	933.1	3061.2	953.1	3126.9
150.0734825	-33.39221397	Structure 12D - New 330kV	12D	879.956	60	940.0	3083.8	960.0	3149.5

AVIATION PROJECTS

<i>Longitude</i>	<i>Latitude</i>	<i>Name</i>	<i>Structure ID</i>	<i>Ground Elevation (m AHD)</i>	<i>Theoretical max structure height (m AGL)</i>	<i>Total height (m AHD)</i>	<i>Tower Height (ft AMSL)</i>	<i>Max construction Height m AHD (+20 m)</i>	<i>Max Construction height (ft AMSL)</i>
150.0857254	-33.40179212	Structure 4C - Line 70	4C	872.76	60	932.8	3060.2	952.8	3125.9
150.0827047	-33.39819994	Structure 6C - Line 70	6C	873.796	60	933.8	3063.6	953.8	3129.3
150.0712689	-33.39143822	Structure 13A - 94E	13A	887	60	947.0	3107.0	967.0	3172.6

AVIATION PROJECTS

ANNEXURE 3 – PROJECTS WITH THE POTENTIAL FOR CUMULATIVE IMPACTS

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
Wallerawang BESS	Design changes to optimise the layout of the approved Wallerawang BESS (500 MW and 1,000 MWh of battery storage capacity)	500 m east of the project footprint	Approved 4/8/2022 Current modification at response to submissions stages Construction period of 1 to 2 years, expected to commence from 2025, construction does not appear to have commenced Operational period unchanged	Nil
Mount Piper BESS	Development of a grid-scale BESS with a capacity of up to 500 MW	Immediately north of the project footprint	Approved 15/11/2024 Construction period of 18-24 months expected to commence from mid-2026 at the earliest Potentially operational by 2027/2028 and would operate for about 20 years	Nil
Great Western BESS	Development of a 500 MW / 1,000 MWh BESS and associated infrastructure	300 m west of the project footprint	Approved 2/11/2023 Project has not yet commenced construction and construction start date is not known however is expected to occur over 12-14 months once the modification is approved The BESS is intended to have an operational life of up to 20 years	Nil

AVIATION PROJECTS

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
Pinecrest BESS	Development of 500 MW battery storage capacity and 1,000 MWh of storage with (2-hour duration) connecting to the grid via underground cabling	Layout shown in scoping report is located within project footprint, with Transgrid undertaking ongoing consultation with Banpu Energy regarding positioning of the site.	Scoping report prepared with SEARs not yet issued EIS is expected to be submitted in early 2026 Construction period of 18 months commencing in late 2026 if approved. Operations proposed to start in 2028	Nil
Lake Lyell Pumped Hydro Energy Storage	Development of the Lake Lyell Pumped Hydro Energy Storage Scheme (that will provide between 300 to 350 MW of electricity generating capacity for up to 8 hours during peak demand	10 km south of the project footprint	EIS in preparation Technical design expected to conclude in 2025. Construction expected commence in late 2026 and to take four years with operation commencing in 2029	Nil
Ben Bullen Wind Farm	Construction of approximately 64 wind turbine generators, a BESS and ancillary infrastructure	20 km north-west of the project footprint	EIS in preparation Construction in 2028 for 18-24 months Operational life of 35 years+	Nil
Sunny Corner Wind Farm	Construction of approximately 80 wind turbine generators, a BESS and ancillary infrastructure	6 km west of the project footprint	EIS in preparation Construction in 2030 for 36 months Operational life of 30 years	Nil
Wallerawang Power Station Ash Dam	Use of part of the lands lying north of the Castlereagh Highway that were once used by the former Wallerawang Power Station as coal ash dam repositories	Immediately north of the project footprint	Approved 13/10/2023 The modification proposes an additional ten years for the importation of capping material	Nil

AVIATION PROJECTS

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
Wallerawang Residential subdivision DA226/22	Torrens Subdivision - 1 Lot into 54 Residential Allotments, 4 New Roads, 2 lots for drainage and public reserve Allotment	19 Barton Avenue Wallerawang 2 km south-west of the project footprint	Currently being re-exhibited till 13 June 2025	Nil
Wallerawang Railway Station upgrade	Works to upgrade the existing station, closed in 1989, so that passenger services can be restated.	850 m southwest of project footprint	Project has been announced on Transport for NSW website Early enabling works will be carried out from March to August 2025. Once the design is finalised, construction will commence later in 2025, with re-opening of the station planned for late 2026	Nil



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